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2012

YEAR IN REVIEW

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InfoBeam

Putting The Program Into Practice (GVF + Intelsat).....Page 12
Signed, Sealed + Delivered (Boeing + Orbital Sciences)Page 12
Single Button Access (Hermes Datacomms)Page 12
ITSO Mandate To ContinuePage 13
Reserving Propulsion (Sea Launch + AsiaSat)Page 14
Signing On For Strategic Product Development (Beam).....Page 14
Bringing More To Brazil (SES).....Page 14
Vacuum Victory Milestone (Skybox Imaging).....Page 16
Switched On (COM DEV International)Page 16
GaNamic DTH Solutions (Advantech Wireless).....Page 16
Analysis For Canada Welcome (Telesat).....Page 16
Helping Pléiades 1B To Find Its Way (Arianespace)Page 18
Grace In Space + A Major Meddling (Astrium)Page 19
No Power Cord Needed (SES + ESA)Page 20
Retired? Don't Count On It (SSTL).....Page 20
Gaining Even More Services (Globecom)Page 21
Stunning Satellite Views (NASA)Page 21
Celebrating Capacity Cumulation (KVH Industries)Page 22
Works Better Than A Trail Of Breadcrumbs.....Page 22
Just The Ticket For South Sudan (YahSat)Page 23
No Separation Anxiety (Sea Launch AG)Page 102



Features



Forrester On SatBroadcasting™

Several issues ago in SatMagazine, we wrote that Ultra-HDTV (U-HDTV) is coming... "and fast"... were the precise words used in that column. Well, it seems we were wrong. Ultra-HDTV (U-HDTV), at least in its 4K version is, in terms of satellite time, now just around the corner.

Page 24

by Chris Forrester, Senior Contributing Editor



NSR Analysis: EO Concentration + Commercial Revenues

DigitalGlobe and GeoEye are due to complete their merger in 2013. Separately, both companies were already the two biggest Earth Observation (EO) players, and the resulting entity will enjoy a very comfortable position.

Page 30

by Stéphane Gounari, Senior Analyst, NSR France



Antonovich On SatBroadcasting™: Is "OTT" Truly "Over-The-Top"?

Has the 3DTV wave crested? From what I saw at the IBC show and at SATCON 2012, I'd say so. NOBODY was talking about 3DTV. The buzz was about the far more lifelike images produced by the 4K (twice the number of pixels as today's HDTV) technology on display.

Page 32

by Mike Antonovich, Contributing Editor



Ku- Vs. Ka-Band—Pondering Performance

All of the new Ka-band satellite systems entering the market have prompted fevered comparisons between the Ku-band platforms—there has been, and continues to be, much debate about which of the two technologies provide better service to customers.

Page 34

by Chris Hudson, Senior Solutions Architect Engineer, Intelsat General



Event: Waikiki, Capacity, Capability... + Satellites... All @ PTC'13

All of the new Ka-band satellite systems entering the market have prompted fevered comparisons between the Ku-band platforms—there has been, and continues to be, much debate about which of the two technologies provide better service to customers.

Page 38

by Tim Logue, Sr. Director, Thales Alenia Space North America



Pulham's View: Passion Wears A Pocket Protector

If there's one thing that makes the space industry profoundly different from most other industries you can think of, it is the passion that each and every one of us brings to our job, day in and day out.

Page 40

by Elliot Pulham, CEO, Space Foundation



Futron Analysis: 2012 Space Competitiveness Index

Exploring the vast unknowns of space is an ancient human aspiration. The same impulse that led nomadic tribes to seek out what was beyond the next mountaintop, and civilizations to traverse the oceans in search of new lands, today animates governments, enterprises, entrepreneurs, scientists, and citizens alike to pursue frontiers beyond our planet.

Page 42

Features



Gottlieb On Maritime + Commercial Aviation Markets—2012 Review

The battle for control of the maritime and aviation markets is no longer just a skirmish. It's now apparent that Intelsat means business in its attempt to wrestle maritime and aviation market dominance from Inmarsat—and Intelsat is fighting back.

Page 48

by Alan Gottlieb, Senior Contributing Editor



SatNav: GNSS, Apps + Sims

The origins of satellite navigation date back to the late 1950s, when the U.S. Navy began to develop the Navy Navigation Satellite System (better known as TRANSIT), which became known as the world's first global navigation satellite system (GNSS).

Page 52

by Andreas Blumenschein + Markus Bochenko WORK Microwave + Günter Heinrichs, IFEN GmbH



Sadtler On Careers: Take 'Em Or Leave 'Em For 2012

Best Practice Recruiting should include an original approach, the focus on building trust with the talent, the determination to hire the best candidate and an opportunity for the employer to be favorably represented in the marketplace.

Page 56

by Bert Sadtler, Contributing Editor



Heyman On Launches: 2012 Year In Review

At the time of this writing it is predicted that by November 1, 2012 we will witness 142 spacecraft involved in 78 launches. This tally includes seven satellites deployed from the International Space Station. As to their purpose, an analysis is provided in the two tables on the following page.

Page 58

by Jos Heyman, Senior Contributing Editor



SatBroadcasting™: Moving To A More User-Centric TV Experience

Over-The-Top Television (OTT TV) continues to work its way into the broadcasting world—by storm. For satellite broadcasters, such brings a number of questions to the forefront...

Page 62

by Ofer Shayo, Co-Founder + CEO, Tvinci



Survey: The Size + Health Of The United Kingdom's Space Industry

The 2012 Size and Health of the United Kingdom's (UK) Space Industry survey represents the latest incarnation of the key biennial barometer of the UK space industry. The UK Space Agency contracted Oxford Economics to conduct this edition, covering the years 2009/10 and 2010/11; Oxford Economics also conducted the 2010 survey.

Page 64



2012: YEAR IN REVIEW, Roundtable Index

Welcome to SatMagazine's annual YEAR IN REVIEW issue. Dozens of leading companies have offered their insights and an examination of their experiences regarding their operations during 2012... and they look forward to the coming year, generally speaking, despite global economies that are somewhat lethargic.

Page 72

Advertisers

2013 International Satellite Directory.....	Page 37
Advantech Wireless	Page 11
AnaCom, Inc.	Page 23
Arabsat Satellite	Page 05
AVL Technologies	Page 33
Azure Shine International, Inc.....	Page 17
Brüel & Kjær	Page 02
Comtech EF Data	Page 63
EADS Astrium Limited.....	Page 07
Futron.....	Page 44
Gottlieb International Group.....	Page 49
Global Link Productions, Inc.	Page 69
Harris Corporation	Page 09
MITEQ Inc. / MCL	Page 21
Newtec CY	Page 13
Northern Sky Research (NSR).....	Page 31
O3b Networks Ltd.	Page 03
Optimal Satcom	Page 15
SatFinder	Page 103
Teledyne Paradise Datacom LLC.....	Page 35
W.B. Walton Enterprises Inc.	Page 29
Wavestream Corporation	Page 47

Putting The Program Into Practice

Quality assurance is at the heart of Intelsat's US\$1.2 billion Global Xpress system.

The launch of this new satellite service will be enhanced through the implementation of mandatory Earth station testing requirements. This will be done in coordination with the Global VSAT Forum (GVF), the international association of the satellite communications industry.

GVF provides Earth station testing through a mutually-recognized type approvals framework and an industry-authorized network of testing entities. Major satellite operators rely upon or conduct their own testing in coordination with the service, which is provided by GVF through its Mutual Recognition Arrangement Working Group (MRA-WG).



Through Intelsat's testing program, Earth station products to be used with the 2013 launch of Global Xpress broadband services will be required to demonstrate high levels of performance to ensure customer satisfaction.

Intelsat's program will be aligned with the GVF Product Quality Assurance Framework, and meet the GVF Quality Products Industry Initiative.

"Intelsat is committed to ensuring that our customers receive high-performance broadband satellite products," said Leo Mondale, MD of Global Xpress. "Our decision to require product testing in alignment with the GVF Product Quality Assurance Framework is a clear demonstration of that commitment."

"The global satellite industry is taking next-generation broadband solutions to a higher level of performance," said David Hartshorn, Secretary General, GVF. "Intelsat's requirement for type-approved Earth station products, and Global Xpress' coordination with the GVF Quality Products Initiative will give customers the standard of quality that is essential in today's demanding marketplace."

"Global type-approvals, which have a major bearing on industry profitability and competitiveness, have gained in importance as demand for satellite-based systems and services have increased and volumes have risen," said Colin Robinson, Chairman of the MRA-WG. "Intelsat's support for the industry's quality-assurance initiative is well timed to address that trend."

The MRA-WG maintains procedure GVF-101, which defines a set of standard tests that an antenna or Earth station manufacturer must perform in order to apply for type approval from any satellite operator who is a member of GVF.

Use of this procedure assures the quality of the ground communication equipment and provides the Earth station operator with a complete set of measured and verified test data. This helps reduce the time and cost required to bring new ground-segment technology to the market, provides credible measured performance data for use in developing link budgets, thereby advancing the competitiveness of satellite communications services. #



Signed, Sealed + Delivered

Boeing and partner Orbital Sciences Corporation are a step closer to helping the government of Mexico provide advanced communications services throughout the country and surrounding maritime area with the completion of the MEXSAT Bicentenario communications satellite.

Orbital designed, manufactured and tested MEXSAT Bicentenario before shipping the completed spacecraft to Kourou, French Guiana, where it is scheduled to be launched aboard an Arianespace Ariane 5 rocket on December 19th (Flight VA211).

Under a contract with Boeing, Orbital completed the work on MEXSAT Bicentenario as part of a three-satellite order for the Federal Government of Mexico. As prime contractor for MEXSAT, Boeing is providing two

larger satellites in the series that are scheduled for launch in 2013 and 2014. The Secretaria de Comunicaciones y Transportes de Mexico will take over day-to-day operations of the satellites as they are launched and undergo on-orbit testing, verification and positioning.

Boeing Space & Intelligence Systems is the overall integrator of the MEXSAT communications network, which will comprise three satellites, two ground telemetry and control sites, associated network operations systems, and reference user terminals. The second and third MEXSAT satellites will be Boeing 702HP geomobile satellites that will each supply 14 kilowatts of power and carry a 22-meter L-band reflector for mobile satellite services. #



Single Button Access

Hermes Datacomms has developed a mobile wireless VSAT solution.

The trailer mounted system is self-contained, simple and reliable in hot, dusty and wet conditions.

With the touch of a single button, the system is deployed and ready to use in four minutes, providing instant WiFi Internet access.

Bill Green, Global Account Director, said, "We are very excited about this new product development. It builds on our existing deployed mobile systems

in Ethiopia and Kenya, offering an even greater level of simplicity and reliability".

Barry Bouwmeester, Account Manager, added, "Hermes Datacomms now provides extensive coverage in Africa using AMOS-5 satellite which features a high power C-band beam and regional KU-band beams. The new Wireless mobile VSAT technology is an add on to the services we can offer to our customers who are often working in difficult and challenging environments". #

ITSO Mandate To Continue

Representatives from more than 80 countries convened in Uganda in July 2012 to debate the future of the International Telecommunications Satellite Organization (ITSO).

The decisions taken were significant and could have a far reaching impact on the overall development and evolution of the global satellite industry.

ITSO is the residual intergovernmental organization which remained following INTELSAT's privatization in 2001—when the operational assets of the international organization, including the satellite fleet, customer contracts and management, were transferred to Intelsat, a private company currently registered in Luxembourg.

Pursuant to the terms of an amended international treaty, ITSO is charged with ensuring that the privatized Intelsat meets several public service obligations including continuing to offer public telecommunications satellite services and maintaining global connectivity and coverage.

These obligations were also agreed to by Intelsat and ITSO when the company was formed and are separately enshrined in a formal Public Services Agreement entered into between the two entities.

While the creation and role for a residual organization made sense in 2001, the advent of new satellite services and increased options for global connectivity raised questions about the organization's future. Indeed, some within industry and Intelsat—as well as certain ITSO Member States—have questioned whether ITSO should continue at all.

This was the crux of the issues considered at the July 2012 Assembly of Parties. Ultimately, the Parties determined that the rationale for ITSO's existence remained as strong in 2012 as it had been in 2001, and that ITSO continued to have a significant role to play in ensuring that the principles, obligations and objectives for the organization that were established in 2001 would be adhered to by the

privatized Intelsat. The Parties agreed to again reassess the future of ITSO in another 8 years, and extended the mandate of the current Director General, Mr. Jose Toscano, through July 2017.

Of interest to many within the satellite community is the funding mechanism for the organization. Funding for the organization through July 2013 has been provided by an annuity established in 2001 for that purpose. After July 2013, Intelsat has agreed in the Public Services Agreement to cover the organization's future funding requirements on an annual basis, the amount of which is to be determined based on the final year of funding provided by the annuity, which was set at \$1.8 million USD.

One of Director General Toscano's first tasks under his renewed mandate will be to develop a strategic plan for the period from 2014 through 2017. ITSO's staff is lean, and its resources tight, but it has several opportunities to make the most of its extended life. Building upon its strong relationship with member governments, it can continue to craft a relevant role in providing capacity building, regulatory guidance and advice in a changing world in ways that would benefit the satellite industry as a whole.

To better meet the evolving satellite communications requirements of its Member States, ITSO is fully committed to becoming a more powerful advocate for the interests of its membership in a manner consistent with the scope of its overall mandate.

ITSO's biggest challenges in this regard will be the continued protection of the Parties' Common Heritage (i.e., orbital locations and associated frequency assignments that Intelsat uses to meet its obligations) and the continued preservation of the public service obligations embedded in the ITSO Agreement, so as to ensure that all ITSO Parties are able to receive access to satellite services with affordable pricing, global coverage and continuity. #

Reserving Propulsion

Sea Launch AG and Asia Satellite Telecommunications Co., Ltd. have recently entered into an option agreement covering launch services using the Sea Launch Zenit 3SL launch system.

The agreement provides an option which AsiaSat may exercise for the launch of a future AsiaSat satellite on Sea Launch. Sea Launch will provide AsiaSat with an integrated schedule assurance plan in support of AsiaSat's satellite deployment plan.

"We are very pleased to build upon our relationship with AsiaSat with this very important agreement" said Kjell Karlsen, President of Sea Launch. "Sea Launch is excited to play a role for AsiaSat in assuring the on-time deployment of its spacecraft."

"AsiaSat is pleased to secure this launch option with Sea Launch to ensure the timely deployment of our satellites" said William Wade, President and Chief Executive Officer of AsiaSat.

"Sea Launch has demonstrated its flexibility in meeting the needs of our future launch requirements and we look forward to closely working with their teams moving ahead." #



Sea Launch Zenit 3SL on the Odyssey platform preparing for launch. Photo courtesy of Sea Launch

Signing On For Strategic Product Development

World Reach Limited has revealed that its wholly-owned subsidiary, Beam Communications Pty Limited, has entered into a strategic product development initiative with Iridium Communications.

The agreement signed by the two companies defines a new product development initiative for which Beam Communications will be the Primary Contractor and Original Equipment Manufacturer of the end customer solution.

The initial order commitment for the new product will produce incremental sales revenues exceeding AU\$3M in the first 12 months of commercial sale. The prospective launch of the product will be in the second half of 2013.

Joel Thompson, Vice President Product Line Management of Iridium Communications, said, "Beam was appointed a Value Added Manufacturer ten years ago and since this time has developed a strategic range of Iridium

based accessories and terminals for the Iridium satellite network. This new initiative however is the first whereby Iridium is directly utilizing Beam's engineering and manufacturing expertise to design, develop and manufacture a new dedicated Iridium product."

"This undertaking by Iridium clearly demonstrates, once again, Beam's capabilities in developing leading edge high tech solutions for satellite network operators. This initiative will enhance the company's overall position in developing products under contract in the future. For commercial reasons the exact details of the product being designed and manufactured cannot be disclosed, however the company is extremely excited that Iridium has contracted Beam to undertake this new product initiative" said Michael Capocchi, Managing Director, Beam Communications. #

Bringing More To Brazil

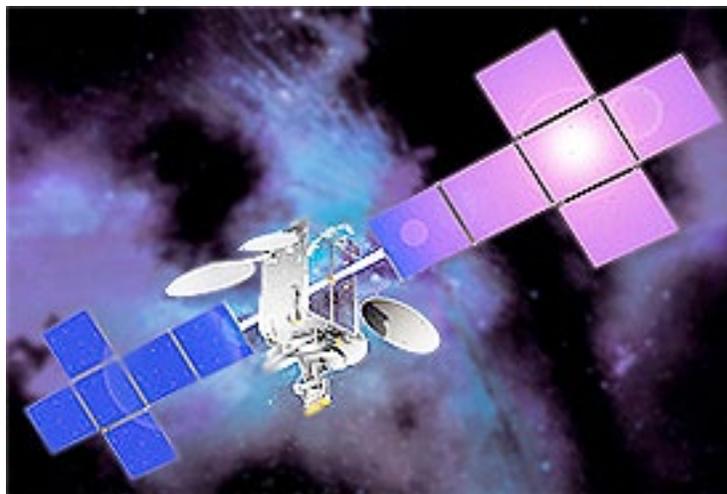
SES has a new long-term capacity agreement with Level 3 Communications.

The new agreement is for the delivery of advanced corporate communications services to businesses across Brazil.

Level 3 in Latin America is using 25MHz of Ku-band capacity aboard SES' new SES-4 satellite to deliver

high-speed broadband, and unified and highly reliable IP communications to small and large enterprises in Brazil.

The two companies have a long-time business relationship through which they deliver sophisticated telecom and video solutions to businesses in Argentina, Colombia, Chile, Venezuela and Brazil. #



Artistic rendition of the SES-4 satellite

Vacuum Victory Milestone

Skybox Imaging has successfully completed the simulated space environmental test of its first high-resolution imaging microsatellite.

During the 16-day test campaign conducted at NASA's Ames Research Center in Moffett Field, California, the satellite was placed in a thermal vacuum chamber that accurately simulated the thermal and environmental conditions of low Earth orbit.

Skybox evaluated the spacecraft's performance in a variety of operational modes. This included a "day-in-the-life" test where the Skybox operations team simulated flying the spacecraft for 20 orbits. The test data collected was used to accurately correlate the detailed spacecraft thermal and power models and verify that all subsystems performed as expected.

"Spacecraft thermal vacuum testing is the largest and most important phase in our integrated spacecraft test program," said Jonny Dyer, chief

engineer at Skybox. "Successful completion of this milestone gives us greater confidence that our first spacecraft will perform well in the space thermal environment."

Skybox is now entering final testing phases of the spacecraft, including integrated system testing and launch base testing. The next key test is set to take place in early 2013, when the spacecraft will undergo vibration testing. This will be the last major milestone preceding the satellite's planned launch in the second quarter of 2013.

"Our team is the foundation of our success, and we are extremely proud of the completion of this milestone which brings us one crucial step forward in the lead-up to launch," said Tom Ingersoll, Skybox CEO. "This marks only the beginning of our endeavors as we advance toward the deployment of the constellation." #



Switched On

COM DEV International Ltd. has revealed that the ChinaSat 12 satellite, successfully launched on November 28, was reliant upon a number of COM DEV-built switches on board.

Thales Alenia Space built ChinaSat 12 for Beijing-based satellite operator China SATCOM; it carries 24 C- and 23 Ku-band high power beams. The satellite will provide communications, satellite broadcasting, data transmission, digital broadband multimedia and media streaming services in China, East Asia, South Asia, the Middle East, Africa and Australia, as well as the Indian Ocean and China Sea

regions from its orbital position above the Indian Ocean. #



GaNamic DTH Solutions

Advantech Wireless Inc. has acquired a major sale of its unique Direct-To-Home (DTH) Uplink Solution in Latin America.

The combination of the Advantech Wireless 2.4 kW Ku Phase Combined Outdoor GaN High Power Amplifier, matched to the Advantech Wireless 13m A-Line Antenna, offers unprecedented ground power, linearity and resiliency for DTH uplink systems on the planet.

"We are the only company capable of offering this powerful combination. It is a technological achievement beyond any of our competitors, thanks to our leadership employing GaN technology, expertise in switchless outdoor phase combined high power amplifiers, and in house integration expertise in ground stations", said Paul Sandoval, VP Americas.

"We have successfully deployed these solutions in other parts of the world, including Brazil, Japan and Europe. This solution delivers the most watts per dollar in extended Ku-Band—no other company in the market can make such claims".

Following on the heels of an extremely positive year, Advantech Wireless is confident this multi-million dollar win will continue to increase our profitability and secure new markets in the Americas.

Adding emphasis to this product technology revelation is the fact that Advantech Wireless Inc. has just announced major sale of the aforementioned Direct-To-Home Uplink Solution in Latin America. #

Analysis For Canada Welcomed

Telesat has welcomed the Report of the Aerospace Review just released and believes that its recommendations provide a clear path forward for the Government of Canada.

Telesat congratulates Minister Paradis for mandating the Aerospace Review and Mr. Emerson and his colleagues for their work in delivering a timely and focused report that addresses many of the critical issues facing Canada's space industry.

Among the key aspects of the Report is a clear statement that the imperatives of development and security in the North should be high on the list of Government priorities in a Canadian Space Program.

"Telesat agrees that the North presents an important opportunity and believes that it can be best addressed by leveraging the advanced capabilities of today's satellite services", said Dan Goldberg, President and CEO.

"For the past several years, the Government of Canada has studied the development of a capability to provide broadband communications infrastructure for sovereignty, safety and security objectives in the North and to allow for meteorological observation in the Arctic to permit weather forecasting, modeling and environmental monitoring.

"Creating such a capability would greatly enhance the government's ability to deliver on some of the key objectives identified in the Report, using satellites as a key instrument of policy."

The Aerospace Review Report also identifies that one of Government's key responsibilities relates to making procurement decisions that strengthen domestic industries, and therefore the national economy, while respecting international trade rules and acquiring the best products at a reasonable price.

Telesat applauds the Report's approach in relation to procurement practices of the Government. "Given that Canada is making fewer space investments than certain other countries the Government of Canada must be highly targeted and strategic when it procures space related services and goods with a view toward enhancing the competitiveness of the Canadian space sector while at the same time achieving a good value proposition for the Canadian taxpayer", said Mr. Goldberg. #

Helping Pléiades 1B To Find Its Way

The maturity of Ariespace's Soyuz launch system at French Guiana, and its confirmed role as a full-fledged member of the company's launcher family, were demonstrated once again by the successful orbiting of the Pléiades 1B satellite from the Spaceport.

During a flight lasting 55 minutes, the Soyuz vehicle deployed its 970kg. passenger into a targeted circular orbit of 695km., inclined 98.2 degrees, marking the medium-lift vehicle's fourth mission from French Guiana since its introduction at this near-equatorial launch site in October 2011.

Pléiades 1B is a very-high-resolution dual-use satellite designed to provide optical imaging coverage for French and European defense ministries, institutions and civil users. It joins the twin Pléiades 1A spacecraft that was launched in December 2011 on Ariespace's second Soyuz mission from the Spaceport.

Ariespace Chairman & CEO Jean-Yves Le Gall noted that this launch was the ninth at French Guiana in 2012 for the company's launcher family; following the lightweight Vega's maiden flight in February; medium-lift missions with Soyuz in October and December; along with heavy-lift Ariane 5 flights in March, May, July, August, September and November. Le Gall thanked all involved in these successes, including the teams who work at the Spaceport for such an "impressive" year—during which a total of 23 primary and secondary payloads were placed into orbit from French Guiana.

The Pléiades 1A and 1B satellites launched by Ariespace create an optical observation system with great agility, a quick-response ground segment and daily revisit capability—offering a new generation of "real-world" satellite Earth imagery at a resolution of 70cm.

Both Pléiades spacecraft are based on smaller, less expensive and more agile platforms than their predecessors—the highly-successful Spot satellite series that was lofted by Ariespace on its Ariane family launchers beginning in 1986.

France's CNES space agency is prime contractor and architect for the Pléiades system, which is organized as part of a joint effort with Italy – whose Cosmo-Skymed satellite series delivers radar imaging coverage of the Earth.

Pléiades program participants are the space agencies of France, Austria, Belgium, Spain and Sweden; along with the defense ministries of France,

Italy and Spain. The Pléiades 1A and 1B spacecraft were built by EADS' Astrium division. Ariespace will wrap-up its 2012 launch activity at the

Spaceport with a year-ending Ariane 5 mission on December 19 to orbit the Mexsat Bicentenario and Skynet 5D satellites. #



Soyuz is shown prior to liftoff from the Spaceport in French Guiana with its Pléiades 1B passenger. Photo courtesy of Ariespace.

©2012 ESA-CNES-ARIANESPACE / Optique vidéo du CSG - P. BAUDON

Grace In Space + A Major Melding

Astrium has been commissioned to build two new research satellites for NASA's Jet Propulsion Laboratory, Pasadena, California.

The agreement was signed in Friedrichshafen, Germany. For a minimum of five years from August 2017, the Gravity Recovery and Climate Experiment Follow-On (Grace FO) mission will continue the extremely accurate measurement data collection of the first twin Grace satellites, which have been in orbit since March 17, 2002. Astrium's Grace satellites have been making a hugely important contribution to global climate research since 2002.

Based on their observations of changes in the Earth's gravity field over time, geoscientists are gaining new insights into the dynamic processes in the planet's interior, into deep and surface currents in the oceans, and into variations in the extent of ice coverage at the poles, in Greenland and over mountain ranges.

The original Grace mission allowed scientists for the first time to identify which masses of water, ice and solid material are moving; Grace is even able to provide long-term observation of water table levels around the world.

Each of the Grace FO satellites measures approximately 3 x 2 x 0.8 metres and weighs around 580kg. Like their predecessors, they will be placed in a polar orbit at an altitude of some 500 kilometres and follow each other 220km apart.

As they fly, the two satellites constantly and extremely precisely determine the distance between them, which varies under the influence of the Earth's gravity; this fluctuating distance provides the data for continued measurement of our planet's gravity field.

The measurements taken by the Grace FO satellites will be exceptionally accurate as their positions will be minutely ascertained using on-board GPS (Global Positioning System) receivers, while a satellite-to-satellite microwave link will enable the exact distance between them to be calculated to within a few thousandths of a millimetre.

In contrast to the original Grace mission, the distance between the new satellites will also be measured using lasers—a technological experiment in preparation for future generations of gravity-research satellites.

Throughout the five-year mission, these measurements will be used to generate an updated model of the Earth's gravitational field every 30 days. In addition, every day each satellite will create up to 200 profiles of temperature distribution and water vapour content in the atmosphere and ionosphere.

With this new two-satellite contract, Astrium in Friedrichshafen is building on the success of its unique series of small satellites. Numerous important scientific missions, such as Champ, GOCE and Swarm, have been based on Astrium's satellite platform.

The Grace satellites, launched in 2002, have now been successfully carrying out their mission for double their nominal five-year service lifetime. Moreover, they were delivered to NASA on time and on budget.

Astrium Americas, an EADS North America company, has also announced a new subsidiary, Astrium Services Government, Inc.

The new subsidiary will serve the U.S. government's growing need for innovative, new fixed and mobile commercial satellite solutions.

Astrium Services Government, Inc. combines the teams and assets from the former Vizada Americas group and the U.S. satellite services

provided by Astrium Services (formally Paradigm Solutions).

"This is a new chapter in our more than 50 year history here in the U.S. of working with the government providing leading edge satellite services wherever they are needed," said Bob Baker, CEO of Astrium Services Government, Inc.. "Today, our mission includes both the mobile satellite service (MSS) offerings for which we are well known, along with the customized fixed satellite services (FSS) upon which we are building our future. We have the market expertise, the innovative service offerings, the contract vehicles and the ability to create customized solutions making us a strong partner for addressing today's U.S. Government needs."

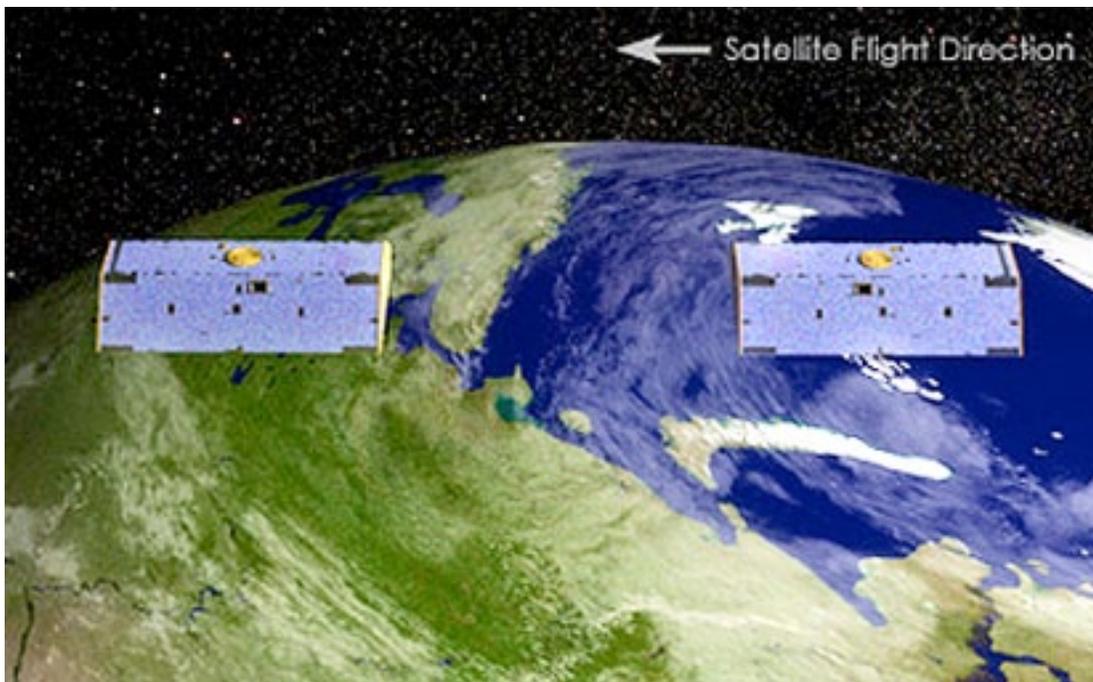
In addition to offering L-band services from providers such as Inmarsat, Iridium and Thuraya, Astrium Services Government, Inc. will provide services from Astrium's SKYNET MiSATCOM X-band and UHF satellites plus C-, Ku- and Ka-Band (commercial and military) from industry leading fixed satellite service providers.

Astrium Services Government, Inc. will also provide supplemental services key to the U.S. government and DoD customers including: Secure Network Operations Center (SNOC), Multiprotocol Label Switching (MPLS) network, Virtual Network Operator (VNO) platforms, remote field support, host nation agreement (HNA) services and The Source®, our proprietary web based portal for government end-users and service providers.

Continuing its commitment to providing services through its own world-class network, Astrium Services Government, Inc. owns and operates assets that provide MAC1 capabilities on a global basis.

The company will also continue to offer its standard systems of business support including training, technical support, and integrated billing services and to work closely with our Service Provider Partners to service the needs of this market.

U.S. government customers can procure Astrium Services Government, Inc. services from a range FCSA contract vehicles, listed under Vizada, Inc. including one to provide the U.S. Government with custom satellite communication solutions. #



Artistic rendition of NASA's two GRACE satellites

No Power Cord Needed

SES S.A. announced its participation in the upcoming Artes-33 program "ELECTRA" of the European Space Agency (ESA).

Under the ELECTRA program, SES and ESA will establish a public-private partnership aimed at developing a full-electric propulsion small/medium sized satellite platform manufactured in Europe.

Specifically, the project aims to develop, implement, launch and commercially operate an innovative geostationary satellite platform that utilizes electric propulsion (instead of conventional chemical propulsion) for transfer into geostationary orbit as well as on orbit station keeping.

Thus, the satellite platform can take advantage of smaller launch vehicles or dual launch capabilities, while carrying payload capabilities equivalent to current mid-sized satellites in terms of power consumption and number of active transponders.

ELECTRA is one of the main ESA programs to which the Grand Duchy of Luxembourg has significantly subscribed at the recent ESA Ministerial Conference in Naples.

SES will lead the ELECTRA project and in particular the satellite design definition phase. To this end, SES will work in close cooperation with OHB System AG of Bremen, who will act as the prime contractor to SES.

"ELECTRA perfectly fits into the innovation priorities of SES. Decreasing the total cost of putting a payload into orbit is a key strategic element for the satellite operator community. Electric

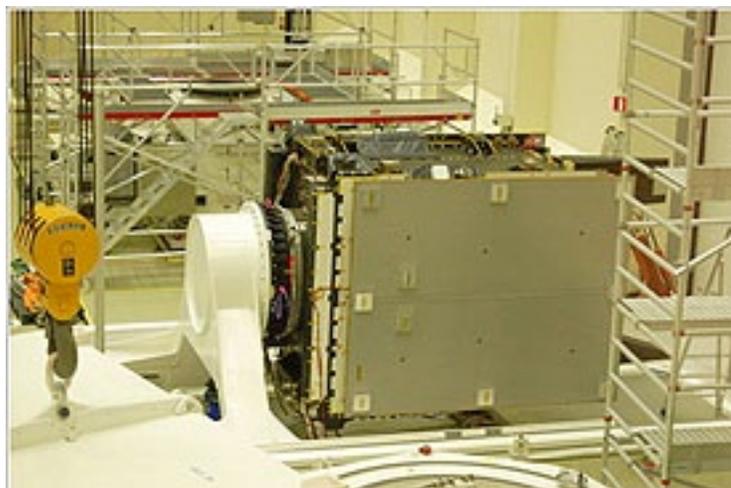
propulsion is poised to inject increased competitiveness into the satellite industry, an essential element for the sustained development of the satellite-based commercial telecommunications market. SES is pleased to trigger this ELECTRA initiative and to establish a strong relationship with ESA," said Martin Halliwell, SES Chief Technology Officer.

Through the Advanced Research in Telecommunications Systems (ARTES) program, ESA has been supporting the European SATCOM industry since 1975. The term ARTES may not be familiar to the end user of SATCOM; however, industry has called ARTES the key source in Europe for innovation in satellite communications.

ARTES offers different levels of financial aid allowing European industry to take bigger risks in developing new technologies. This secures Europe's place in the worldwide SATCOM market.

But ARTES is more than a funding structure. It also includes the assistance of an experienced team of engineers offering guidance and invaluable advice, ensuring the best product possible will be created on time, and on budget.

This new section of telecom.esa.int will showcase the achievements the European SATCOM industry has experienced with the assistance of the ARTES program. From improvements to the devices used on the satellite itself, to ways signals can be improved and received on the ground, ARTES has played a large part in European SATCOM innovations. #



Small GEO prior to lifting it out of its container. Small GEO is a general-purpose small geostationary satellite platform that is giving European industry the opportunity to play a significant role in the commercial telecom market. Credits: ESA-R. Gruenagel

Retired? Don't Count On It

An experimental GPS receiver, built by Surrey Satellite Technology Limited (SSTL), has successfully achieved a GPS position fix at 23,300km altitude—the first position fix above the GPS constellation on a civilian satellite.

The SGR-GEO receiver is collecting data that could help SSTL to develop a receiver to navigate spacecraft in Geostationary orbit (GEO) or even in deep space. GPS is routinely used on Low Earth Orbit (LEO) satellites to provide the orbital position and offer a source of time to the satellite.

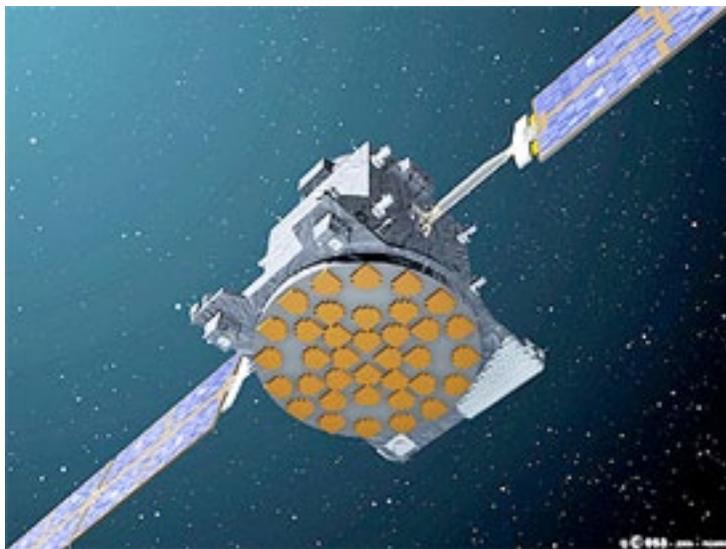
Spacecraft in orbits higher than the 20,000km of the GPS constellation, however, can only receive a few of the signals that "spill over" from the far side of the Earth, meaning that the signals are much weaker and a position fix cannot always be secured.

With the support of the European Space Agency (ESA) and the ARTES 4 program, SSTL included the SGR-GEO receiver on the GIOVE-A satellite to prove that a receiver could achieve a position fix from a higher orbit.

The SGR-GEO is adapted from SSTL's SGR range of receivers and incorporates a high-gain antenna and a precise oven-controlled clock. It will demonstrate special algorithms to allow reception of weak signals and an orbit estimator intended to allow a near continuous position fix throughout orbit.

The experimental GPS receiver onboard GIOVE-A has been inactive for 6 years while the satellite has been used for its primary purpose of transmitting prototype Galileo signals. GIOVE-A's retirement in June 2012 has allowed the commissioning of the experiment and is now providing valuable data to SSTL and ESA in support of the future use of spaceborne GNSS receivers at GEO altitudes.

Engineers at SSTL will continue operations, testing out, tuning and improving the receiver software onboard GIOVE-A to achieve the best possible performance. #



Artistic rendition of the GIOVE-A satellite

Gaining Even More For Services

Globecomm Systems Inc. has been awarded option year two of a five year contract from a U.S. Government agency that is valued at \$6.8 million.

This contract is a combined effort between Globecomm's wholly-owned subsidiaries, Globecomm Services Maryland, Globecomm Europe and Cachendo. Globecomm previously announced approximately \$6.0 million in contracts from this US Government agency, bringing the combined contract value to approximately \$12.8 million.

Under the terms of the contract, Globecomm will provide In-Country Field Engineers, IT services via its teleport facility, Voice over IP, Satellite television, WAN optimization, program management, operations and maintenance, storage, distribution, and network connectivity. #

Earth as Art features images from the Landsat 5 and 7, Terra, Aqua, and Earth Observing-1 (EO-1) satellites. All are among a fleet of U.S. environmental satellites used for scientific research and applied purposes.

Instruments on these satellites measure light outside of the visible range. The images produced from these data reveal features and patterns not always visible to the naked eye.

The Terra, Aqua, and EO-1 satellites are managed by NASA. Landsat satellites are managed by the U.S. Geological Survey.

The iPad version of Earth as Art allows users to zoom into the book's 75 satellite images and access additional information on selected features and the satellites used. The app can be downloaded by visiting: <http://www.nasa.gov/apps>

Earth as Art is available for purchase from the U.S. Government Printing Office online at:

<http://bookstore.gpo.gov>

A free ebook version of Earth as Art in PDF format may be downloaded by visiting:

http://www.nasa.gov/connect/ebooks/earth_art_detail.html

Stunning Satellite Views

A broad array of images of our home planet, taken by Earth-observing science satellites, are featured in a new NASA publication.

The book, Earth as Art, is available in hardcover, electronically, and as a free iPad application. The 158-page book celebrates the aesthetic beauty of Earth in the patterns, shapes, colors and textures of the land, oceans, ice and atmosphere.



Images include snow-capped mountain peaks in the Himalayas, Arizona's Painted Desert, the Mississippi River Delta spreading into the Gulf of Mexico, a Saharan dune sea in Algeria, and Byrd Glacier in Antarctica.

Celebrating Capacity Cumulation Works Better Than A Trail Of Breadcrumbs

KVH Industries, Inc. has just completed a major upgrade to the mini-VSAT Broadband network that will provide customers in Europe, the Middle East, and northern Africa (EMEA) with a 60 percent increase in satellite capacity.

The added capacity was provided by consolidating bandwidth covering two separate regions into one powerful unified beam, and by implementing Variable Coding, Spreading, and Modulation (VCSM) technology provided by ViaSat, Inc., KVH's partner in the mini-VSAT Broadband network.

"We actively monitor and manage our mini-VSAT Broadband network to ensure we are delivering the speeds and quality of service our customers expect," said Marc Edwards, KVH's director of network operations. "Rapid growth of our customer base, which now includes well over 2,500 systems in the field, resulted in increased utilization of the network during peak periods in the EMEA region. We reconfigured our satellite coverage to more effectively serve this region with a single beam."

VCSM will be introduced throughout the remainder of the mini-VSAT Broadband network in coming months. The KVH mini-VSAT Broadband network uses both C- and Ku-band satellite capacity provided by leading commercial

satellite operators including Intelsat, Eutelsat, SES, and SKY Perfect JSAT.

Currently, 14 powerful satellite transponders deliver KVH's Ku-band capacity, which provides one of the broadest coverage areas of any Ku-band network. This year, KVH added three global C-band beams to the mini-VSAT Broadband network, making it the first and currently the only modern maritime VSAT service using a 1m antenna to provide full global coverage outside of the polar regions.

KVH manufactures three onboard antennas for the mini-VSAT Broadband network—the new enterprise-grade TracPhone® V7-IP, the compact TracPhone V3, which is the world's smallest maritime VSAT antenna measuring only 37cm diameter, and the new dual-mode TracPhone V11, which provides coverage of 95 percent of the Earth thanks to its ability to receive C- and Ku-band satellite signals.

The mini-VSAT Broadband service equips vessels with the highest data rates available today, with downloads as fast as 4Mbps and uploads as fast as Mbps, as well as Voice over IP (VoIP) telephone lines with optimized service and prioritization of applications. #

How can technology that does so much be so small, and receive signals from 24 satellites orbiting Earth?

Tracksticks are tiny GPS location recorders capable of continuously logging their own location histories for extended periods of time.

The Trackstick records its own location, time, date, speed, heading and altitude at preset intervals.

Traveled routes can be viewed directly in Google Earth™, and includes GPX photo stamping feature for adding favorite photos to maps. Trackstick is a division of Telespial Systems. With more than 1MB of memory, this device can store months of travel information.

The Trackstick is a perfect tool for individuals looking for a way to track anything that moves, and can be used for recording the exact routes taken when hiking, biking or vacationing; record the location of every location traveled; import pictures and other information into Google™ Earth to offer an entirely new perspective of the journey.

How it works: The Trackstick II receives signals from 24 satellites orbiting Earth. With this information, the Trackstick II can precisely calculate its own position anywhere on the planet to within 15 meters.

Where it works: The Trackstick II will work anywhere on Earth. Your exact location and the route traveled can be viewed and played back directly within Google™ Earth. Everything is included and there are no monthly fees. The Trackstick II's applications and features include...

- *Seamless integration into Google™ Earth*
- *GPS tracking / location history recording*
- *Weatherproof design*
- *Employee & vehicle monitoring*
- *Mileage recording & verification*
- *Public Safety*
- *Law Enforcement*
- *Homeland Security*
- *Jogging, Hiking and Biking*
- *Photo Tours*
- *Child / Family Safety*

#

The advertisement features a central image of the Trackstick II device on the left and a globe with a red arrow pointing to the right on the right. Below the globe is the text "This is what trackstick can do!". At the bottom, there is an image of a car dashboard with a red arrow pointing to the sky, accompanied by the text "GIVE IT A CLEAR VIEW OF THE SKY". The advertisement also includes a "BUY NOW" button and a list of international resellers.

Just The Ticket For South Sudan

Yahsat, the Abu Dhabi, UAE-based satellite operator, is gearing up to launch its innovative YahClick "broadband everyone" satellite service in South Sudan over the coming months.

The hotly anticipated service is set to provide wide reaching, high performance, satellite broadband Internet to unserved and underserved locations and communities across the country.

Yahsat selected local based Internet Service Provider RCS-Communication as their Service Partner for South Sudan based on RCS-Communication's in-country experience, proven track record of delivering new and innovative services and a common focus to bring faster and more affordable Internet connectivity to a wide range of users.

Commenting on the upcoming launch, Tareq Abdul Raheem Al Hosani, Yahsat CEO, said, "As the world's youngest country, South Sudan is facing multiple infrastructure building priorities. YahClick brings Internet

connectivity instantly to the population, irrespective of the state of the local telecommunications infrastructure that is within their reach. Providing much needed Internet connectivity to a new nation presents YahClick with tremendous opportunity as well as pride in helping address at least one of the many requirements of this young country."

Flippie Odendal, RCS-Communication, Republic of South Sudan, Managing Director stated, "YahClick is the first Ka-band satellite Internet service in Africa that offers true broadband speeds at affordable prices. We are proud to bring the service to South Sudan and anticipate a wide interest across the country."

"Based on anticipated growth we will be adding and training VSAT technicians and support staff (with a focus on South Sudanese candidates) to our existing team. Parallel to this process we will be running extensive tests of the new service and processes over the next months to ensure all

aspects are working well before the service is made available to clients."

Yahsat believes in providing individuals with a platform to access information no matter their geographical location, thus enabling them, through the power of information to enhance and help change their world in order for them to have a positive economic and societal impact on the world around them.

Al Hosani added, "Our YahClick service aims to bring broadband to everyone and deliver the power of Internet collaboration to individuals and global communities across three continents. We believe it is the right of every individual to have high speed and reliable Internet. Our team is excited about the prospect of helping connect a portion of the world's un-served communities in the Republic of South Sudan and providing them with the tools to aid their own success." #



Forrester On SatBroadcasting™: The Shape Of Future Broadcasting

by Chris Forrester, Senior Contributing Editor + Editorial Director, Broadgate Publishing

Several issues ago in SatMagazine, we wrote that Ultra-HDTV (U-HDTV) is coming... "and fast"... were the precise words used in that column. Well, it seems we were wrong. Ultra-HDTV (U-HDTV), at least in its 4K version is, in terms of satellite time, now just around the corner.

At the giant IBC broadcasting technology show in September, news emerged that News Corp.-backed payTV operator Sky Germany has a team working on Ultra HDTV technology. While Sky Germany CEO Brian Sullivan didn't give a precise start-date, it was clear that his target for the introduction of 4K transmissions is three or so years from now.



4K LIVE Transmission via ASTRA



Sullivan was quite clear. "We already have an Ultra-HDTV project working here. It's all early days but I am a great enthusiast and a big and positive supporter of Ultra High Def. I first saw a demo about six years ago when the camera was about the size of a small car but even when I saw that almost static picture, I was totally—totally captivated— and when it happens, I can promise you we will be one of the first. It makes sense for payTV to showcase this technology in the first instance."

His comments confirm the widespread industry gossip that suggests other parts of the News Corp. payTV broadcasting arms could also be looking at U-HDTV for an early introduction. *Sullivan's* experience included many years working at BSkyB on technology aspects of the business, notably the introduction of the Sky+ set-top box (STB), HDTV and then 3DTV. He has been running Sky Deutschland now for three years.

Sullivan is not alone in planning for U-HDTV. Satellite operator **SES**, already carrying Sky's UK and German signals, as well those of pay-box **Canal Plus**, is also ready. *Ferdinand Kayser* is CCO at SES. "It's been at the heart of SES since its early days to deliver a large choice of linear TV in the highest possible quality. With Ultra-HD we now see our customers, some of the largest broadcasters in the world, embracing an even higher picture quality. It will be the next big thing in broadcasting taking the consumer experience to the next level. It will make linear TV even stronger and more compelling, and ensure satellite will remain the most powerful TV infrastructure in the future."

Kayser added SES would go the 'extra mile' for U-HDTV, and is "contributing to the development of the necessary ecosystem, both operationally and technically, in order to make Ultra-HD happen."

Indeed, SES carried superb test-4K transmissions at IBC (displayed on giant 84-inch Sony sets) and had a permanent crowd of enthusiasts examining every pixel of detail.

It is the same at SPS, the SES-owned Munich play-out centre used by Sky Deutschland, whose CEO is Wilfred Uerner. "For me, the question is not so much as when we might start to play it out, for we could do this tomorrow. To make U-HD a success for our clients, today's flat screens will have to be Ultra-HD ready. It wasn't so many years ago that we had the same problem with high-definition (HD)."

STB specialist Pace is also busy on the reception end of the equation. Mike Pulli is Pace's CEO. "HEVC (High Efficiency Video Coding) is undoubtedly the base line for the next major steps in Digital TV both in 2D, 3D and especially 4K Ultra-HD where we expect a booming market around 2017."

Dr. Giles Wilson, head of TV Compression Business at Ericsson, says his team is well ahead with HEVC/2H.265's development, which will be standardized this coming winter. At IBC, Ericsson unveiled its SVP 5500 HEVC encoders. "We have been looking at 4K transmission, because we are firm believers in it. We believe HEVC will have a pivotal role in its deployment. New decoders, when properly designed for H.265, will deliver a very good 4K experience." Dr. Wilson expects these encoders to gain early acceptance by the cellular community. "Indeed, moving towards 4K was one of the key aspects of the technical development work carried out by the technical teams and standards bodies. They, in particular, wanted to achieve extra-high resolutions so there are some special tools within the specification to help achieve this."

Dr. Wilson says that the final video result in terms of received quality depends on the bit-rate employed by the broadcaster. "I expect that on premium TV services the broadcasters will not push the compression bit-rate too far, but I also expect that new decoders, when properly designed for H.265, will deliver a very good 4K experience. They should work better than H.264 because more attention has been paid to these aspects. We at Ericsson have had a considerable input on the 'In-Loop Filtering' aspects of the technology, for example."

Setting aside for a moment the challenges still to be overcome in the adoption of 4K for TV (baseband standards, basic connectivity, and such, none of which are covered by the H.265 'standard') the German scheme seems sensible. For example, it is not a huge country (138,000 square miles. Texas is almost twice the size at 268,000 square miles), but its population of 82 million is significant. Moreover, the nation is crisscrossed with good highways and it is thought that an initial OB truck, equipped for 4K, could easily manage two or three major sports events each week.

This, plus movies, could kick-start a payTV service similar to those already being transmitted in 3D, where sport, movies and some documentary footage comprise a 'channel' for many broadcasters.

However, Pierre Larbier, CTO at compression specialists Ateame, also speaking at IBC, urged some caution. Larbier, who was showcasing Ateame's own 4K encoders at the show, said, "some network broadcasters might not want to make an investment in a technology such as 4K transmission which they can see being overtaken in a few years. NHK in Japan for example, is going straight into 8K-line transmission. Also, it takes time for standardization, especially in baseband and core connectivity. Therefore, we still have a time before 4K transmission gets real. Only the future holds the answer as to whether 4K or not will be bypassed, or becomes the standard."

Satellite Loves 4K

IBC visitors saw live satellite-delivered 4K transmissions. (See this column's introductory image on the preceding page.)

Satellite operator SES carried the signals via 1.5 transponders used (50 Mb/s) and using 'ordinary' MPEG4 compression. H.265 compression is expected to trim this by about 50 percent. In other words, the plan could be for a single 36 MHz transponder to probably carry two Ultra-HDTV channels at 4K.

When is 4K not 4K?

When it's 3840x2160 pixels

Forrester On SatBroadcasting™ (Cont.)

It is 'standards' that broadcasters need, which prompted another far-seeing debate at IBC.

Hosted by many of the leading names in standards development and coordination, the Future of Broadcast Television (FoBTv) initiative, held an extremely well-attended meeting at IBC. They stated they were looking to the shape of terrestrial television broadcasting globally 10 years from now, and even beyond. Given that anything that happens in terrestrial TV has to be fed/matched by satellite, the session was quite revealing.

Phil Laven (chair/DVB) posed a couple of questions to delegates, asking them whether there should be a global TV standard. This query elicited a 95 percent 'yes' response from the (mostly) European delegates present. When asked whether the project could be successful, considerable doubt was initially expressed.

Mark Richer, president/ATSC, outlined the thrust of the task ahead, saying that terrestrial broadcast would continue to stay extremely important as the cheapest and most effective way of achieving mass distribution of signals. "But the industry should show, through this project, its commitment to a standard which could be in place for the next 50 years and would be a win-win-win for broadcasters, manufacturers and governments."

Richer stressed that FoBTv was *NOT*, in itself, intending to be a standards body or development organization. It now has 43 members and he said the IBC meeting might be seen as a "defining moment for DTT" following on from similar sessions at NAB and a special 'Summit' in Shanghai, China.

IHS/Screen Digest's chief analyst *Ben Keen* said the FoBTv project had to take on board some tough questions, not the least of which was the role of the primary TV set in the home. "Increasingly, this primary display is not connected to a terrestrial signal and depends, instead, on cable or satellite. Fewer and fewer people are watching a terrestrial signal. While viewing time per day continued to rise, so does non-linear consumption."

Keen told delegates that any talk of web or Internet-based mass-market TV viewing could be ignored as the costs on a per-home basis were simply too high. However, he asked that thought must also be given to the role of 3D, of 4K transmission and beyond, and of mobile TV, which remained an important option for some markets. "We must also remember connected TVs which are an increasingly important feature in many homes and will only grow in numbers."

About the author

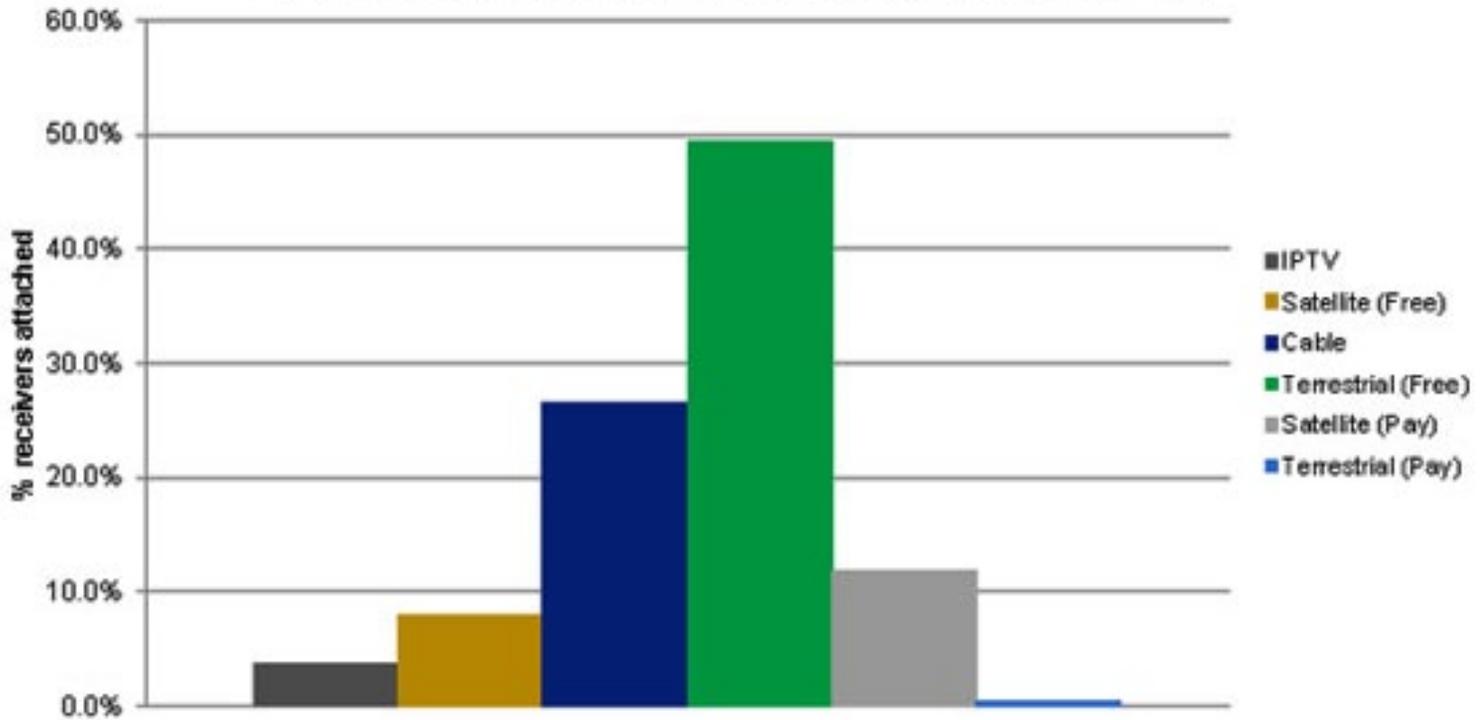
Senior Contributing Editor Chris Forrester is a well-known broadcasting journalist and industry consultant. He reports on all aspects of broadcasting with special emphasis on content, the business of television and emerging applications. He founded Rapid TV News and has edited Interspace and its successor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

FoBTv's founding organizations

- » Advanced Television Systems Committee (ATSC)
- » Canadian Broadcast Corp
- » Communications Research Center
- » Digital Video Broadcasting Grp (DVB)
- » European Broadcasting Union (EBU)
- » Electronics & Telecommunications Research Inst. (ETRI)
- » Globo TV, Brazil
- » IEEE Broadcast Technology Soc. (IEEE-BTS)
- » National Assoc. of Broadcasters (NAB)
- » National Eng. & Research Center of Digital TV, China (NERC-DTV)
- » NHK Science & Technology Research Labs (NHK)
- » Public Broadcasting Service (PBS)
- » The Brazilian Soc. Of Television Engineers (SET)

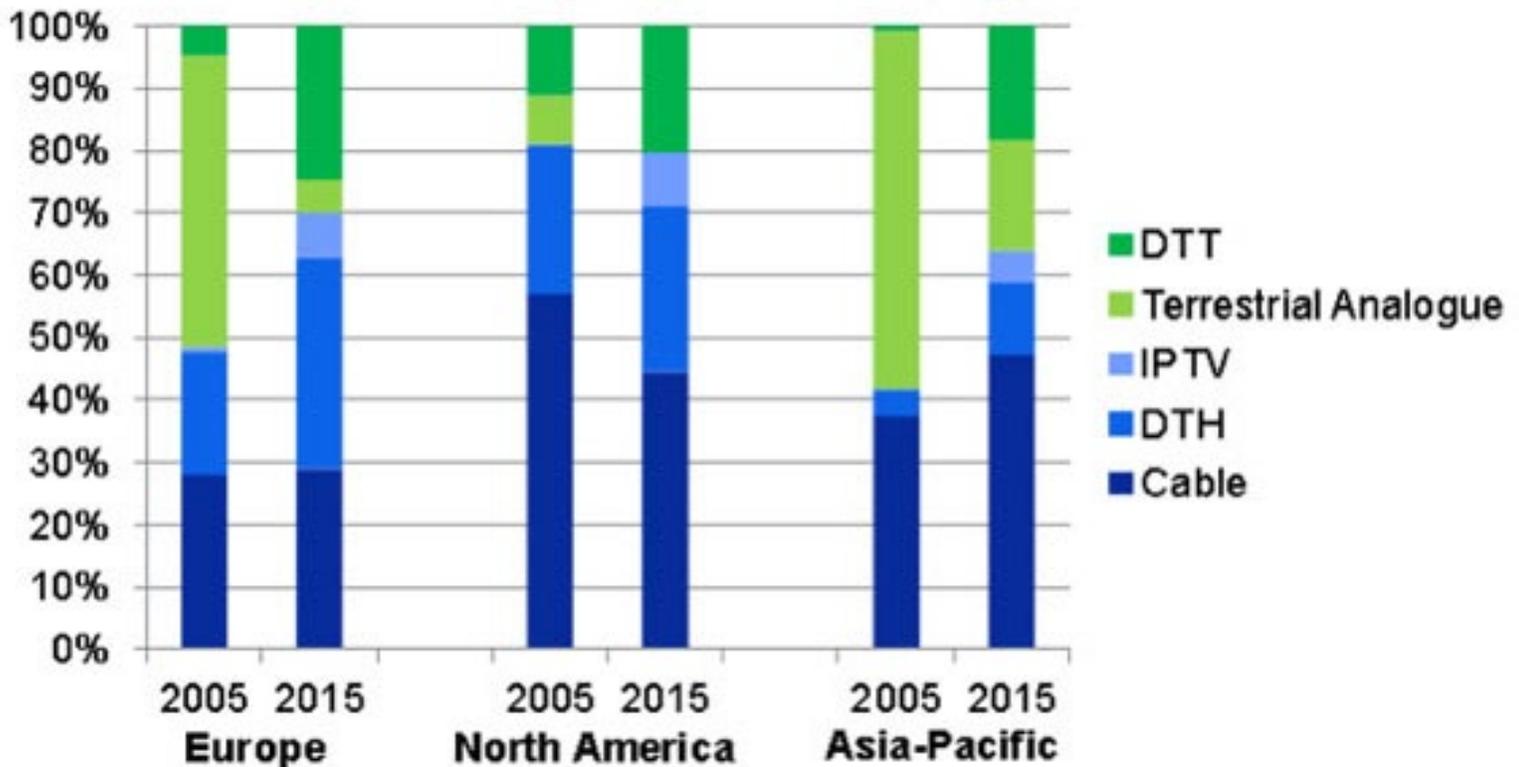


World 2012: distribution of receivers attached to TV sets



Data: IHS-Screen Digest/FoBTV, IBC Sept 2012

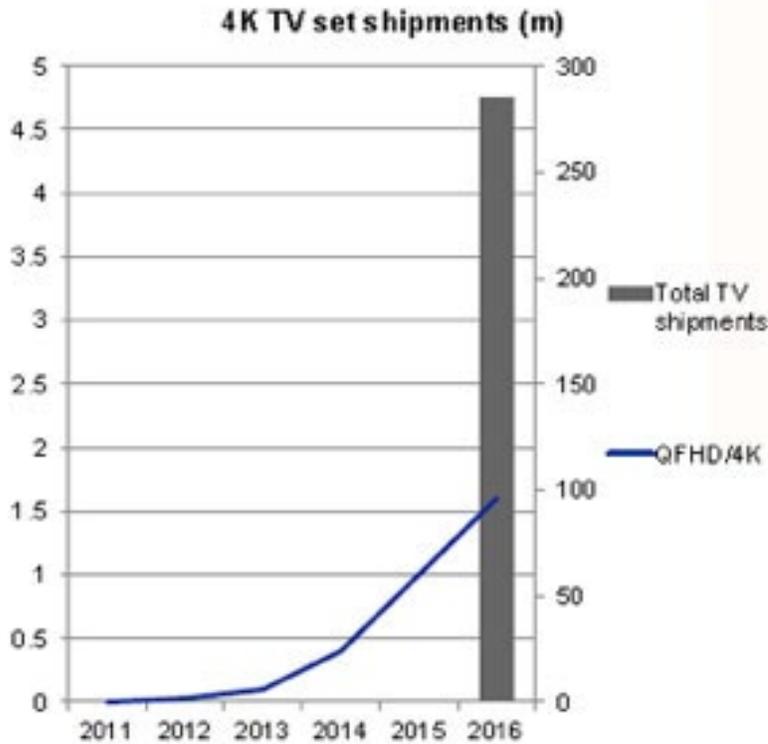
Primary TV penetration by region



Data: IHS-Screen Digest/FoBTV, IBC Sept 2012

Forrester On SatBroadcasting™ (Cont.)

4K is on the horizon – and could offer a platform for glasses-free 3D



Data: IHS-Screen Digest/FoBTV, IBC Sept 2012



NSR Analysis: EO Concentration + Commercial Revenues

by Stéphane Gounari, Analyst, NSR France



DigitalGlobe and GeoEye are due to complete their merger in 2013. Separately, both companies were already the two biggest Earth Observation (EO) players, and the resulting entity will enjoy a very comfortable position. The merger being the result of the concretization of an overdependence-risk, the new entity now is tasked with diversification of its revenues. However to do so, it will have to deal with some issues related to Enhanced View (EV).

DigitalGlobe and GeoEye together represented approximately 61 percent of the EO data market in 2011. However, in 2013, the new entity should represent 48.5 percent.

While down by more than 10 percent compared to 2011, one player will still represent almost half of the market. This will also occur in NAM as, while representing 20 percent less than in 2011, one player will represent almost 70 percent of 2013 NAM revenues.

This merger should give the new entity a much better position in Asia, LAM and Europe where the market share of **AstriumGEO** is much bigger than DigitalGlobe or GeoEye. In the Middle-East and Africa, where the three largest companies represented comparable shares of the market in 2011, the new entity should represent almost 40 percent of the market.

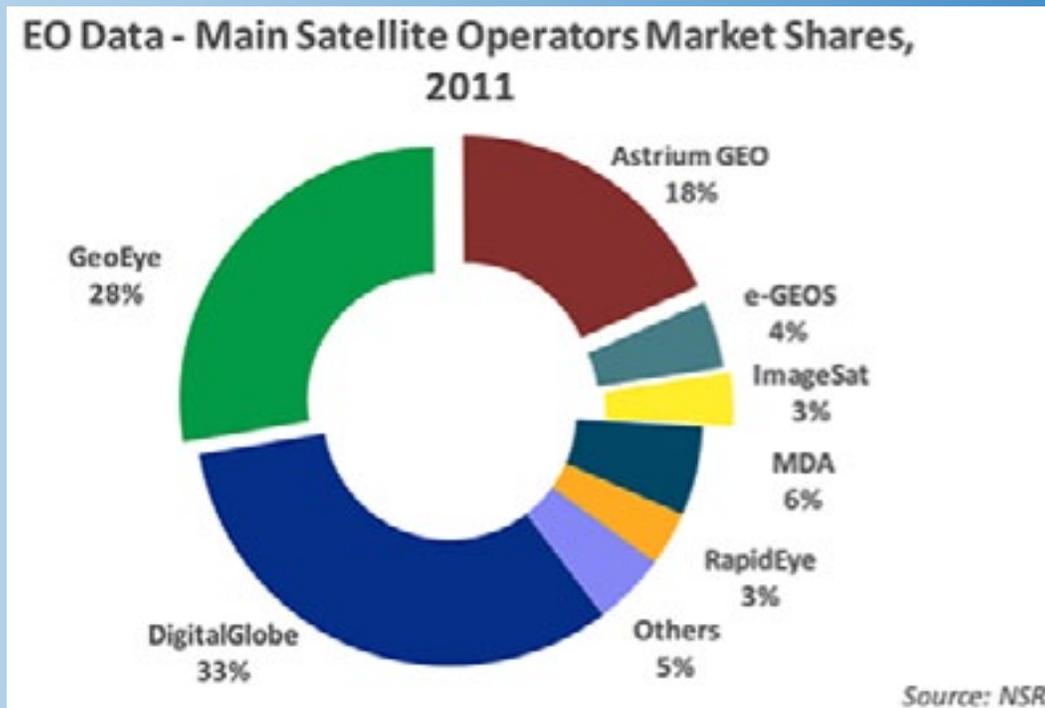
In terms of imaging capabilities, the merger will allow the new entity to manage both companies' satellites as a constellation. Due to GeoEye's SLA downsizing, only one satellite will be launched in the 2013-14 timeframe (likely **WorldView-3**); the other one will be retained as ground spare until 2016-2018, then launched to replace older satellites.

In terms of revenues, both GeoEye and DigitalGlobe had their "peak" dependence on the U.S. **Defense & Intelligence (D&I)** orders in 2009, when they represented 75 percent of DigitalGlobe's revenues and 67.1 percent of GeoEye's.

Since 2009, both companies have slightly diversified their revenues; geographically for DigitalGlobe (from non U.S. D&I) and, in terms of verticals, for GeoEye (from NAM-based but Non-U.S. Government organizations).

DigitalGlobe indicated that in 2013 the new entity should derive only 50 percent of its revenues from the U.S. Government. The other 50 percent would comprise revenues from non-U.S. governments (D&I and Civil) as well as from commercial organizations. Following EV's downsizing and spreading budgetary constraints, the new entity may decide to considerably increase its revenues from commercial end-users.

If it does, it will compete with the considerable new HR optical imaging capability launched recently, or waiting to be launched, by competitors (AstriumGEO, KARI, Deimos, etc.). This imaging capability is such that NSR estimates there will be overcapacity around 2015 and





Artistic rendition of the WorldView-3 satellite

forecasts that HR optical imagery prices will decrease by more than 10 percent between 2014 and 2016.

Moreover, EV reserves an important amount of DigitalGlobe and GeoEye's imaging capabilities, complicating considerably smaller customers' access to their satellites. The guarantee of access to an imagery source has historically been a major driver for commercial end-users as they rely on satellite imagery for operational needs.

The Bottom Line

If the new entity decides to increase its commercial focus, it will have to deal with this guarantee of access issue. This difficulty may be the reason behind DigitalGlobe's focus on Direct Access Programs (mainly D&I customers) and long-term contracts. More predictable than one-shot orders, they are easier to integrate/combine with EV.

The extent of EV's downsizing will determine how much imaging capability will be available to address commercial end-users; perhaps it may prove necessary to launch additional capability and not keeping a satellite on the ground until 2016.

About the author

Mr. Gounari joined NSR in 2010 and supports NSR's senior analysts on multi-clients reports and consulting projects. Prior joining NSR, Stéphane worked on business development missions at Ad Astra Rocket Company where he identified new potential markets, provided necessary market information and proposed, designed and evaluated solutions to address based on the company's product. Stéphane obtained a Master of Space Management (MSM) degree from the International Space University (Strasbourg) during which he authored a report on Orbital Tourism. Stéphane also holds a Master in Risk Management from the business school of Marne-La-Vallée (Paris) and a Bachelor in Law from the University of Toulouse. Stéphane currently resides in France and is fluent in English and French.



Antonovich On SatBroadcasting™: Is "OTT" Truly "Over-The-Top"?

by Mike Antonovich, Contributing Editor

Has the 3DTV wave crested? From what I saw at the IBC show and at SATCON 2012, I'd say so. **NOBODY** was talking about 3DTV. The buzz was about the far more lifelike images produced by the 4K (twice the number of pixels as today's HDTV) technology on display. The same display manufacturers who overhyped 3D are marketing 4K displays under the "Ultra HD" moniker. The difference, though, is that this really is worthwhile. Absolutely stunning images that won't have you stumbling into your furniture wearing those goofy 3D glasses. And some really **HUGE** displays! What could be bigger than that?



Actually, something more potentially game-changing to the *Television World Order*.
Is the *Next Big Thing* something *Smaller* and more mobile than what has come before?



Image: FastCodeDesign.com

The answer is the highly disruptive change taking place in the television business due to the computer and mobile viewing behaviors of consumers. "Tablet Television" on mobile phones and, most especially, the iPad and Android tablets, is increasingly the norm for anyone under 30. Those of us who are slightly older might prefer slumping on the couch in front of our mega-TV's, but how many of us do so with an iPad on our lap instead of a bucket of popcorn? <Sigh> But I do miss that popcorn...

The "sweet spot" for **Tablet TV** is, of course, mobility. Whether the tablet is used by a teenager wandering around the house, a working stiff sneaking in a missed TV episode during their commutes, or Dad watching a major league game instead of little Johnny's tee ball game, people love to watch TV on the go. And it is all going to get better (or worse, depending on your viewpoint).

TV manufacturers aren't in love with this idea, and linear TV programmers aren't quite sure how to best monetize these trends... just yet. Mobility does create its own unique technology and commercial challenges. We need infinitely more bandwidth in what are already crowded terrestrial mobile frequencies. Some of the bandwidth challenges are overcome by new compression and transmission techniques. But what isn't going away is the continued encroachment to the commercial satellite frequency bands.

The more interesting challenges, however, are in the commercial disruption that non-linear and *Over-The-Top (OTT)*, (which typically bypasses the traditional last-mile service provider as the delivery and billing "partner") pose to the profitable and successful linear television distribution businesses of Cable Television and DTH satellite services. This, too, is all going to get better (or worse, again depending on your viewpoint).

Telcos and *Content Delivery Networks (CDNs)* are salivating to get into this business, Cable MSO's and DTH operators want to keep them out, and programmers want to serve everybody, everywhere, but don't want to go broke doing it. All of this is uncharted territory; existing programmers such as **Home Box Office** offer streaming and on-demand OTT as a value-added benefit to existing subscribers through existing service providers at low or no cost.

Other broadcasters and programmers license content to platforms such as **Hulu**. **DISH Network**, the DTH operator, acquired **Blockbuster** to create an outlet and network for terrestrial streaming delivery. **Netflix** went from a mail-delivered movie model to an on-demand live streaming model... and screwed up their business by splitting those services apart... and then decided, instead of continuing to buy CDN services from the **Limelights** and **Level 3s** of the world, to become a CDN of their own. They also took a page out of the HBO playbook and, instead of just licensing content, now create some of their own programming.

Where does this all lead? To quote the great poet, philosopher and technology savant of our times, *Jimmy Buffett*, "Where it all ends, I can't fathom my friends..." However, I'd be more than interested in your viewpoints. I'll be at the guy at the end of the bar, the one with a Margarita and a Cheeseburger in what passes for Paradise these days...

About the author

Mike Antonovich is a frequent contributor to *SatMagazine*, drawing on his more than 30 years in the television, satellite and fiber-based video service industry for market leading companies like ESPN, Group W Satellite, PanAmSat, Genesis Networks and Global Crossing. He is presently Vice President, Sales and Marketing of Roberts Communications Network (RCN), the leading provider of video and wagering transmission services to the racing and pari-mutuel industries. RCN is also one of the world largest providers of live and on-demand video streaming services, producing more than 40,000 hours of live video streams annually. Roberts also operates an 80-channel satellite DTH service, owns the world's largest transportable uplink fleet and leases more than 400 MHz across more than a dozen satellite transponders.



Ku- Vs. Ka-Band—Pondering Performance...

by Chris Hudson, Senior Solutions Architect Engineer, Intelsat General



All of the new Ka-band satellite systems entering the market have prompted fevered comparisons between the Ku-band platforms—there has been, and continues to be, much debate about which of the two technologies provide better service to customers.

Intelsat has long been a proponent of selecting the correct spectrum for the application—and for some applications, the capabilities of the two spectrum bands are identical. When this is the case, governments and other users seeking to save money on communications systems might shift their focus as to whether or not one system is less expensive to operate than the other.

The latter consideration just mentioned is where Ku-band networks may have a distinct advantage. The first compelling reason is that customers with existing Ku-band terminals will be able to use the same equipment they already possess on the ground as well as on board ships, combat vehicles, and aircraft. Secondly, a recent study found that the new high-power Ku-band satellites, such as the **Intelsat** spacecraft, will have higher throughput per MHz than the planned Ka-band constellations of other companies.

A Closer Look

A clearer understanding of the differences and similarities between the two spectrum bands will help to illustrate why the Ku-band may, ultimately, have the advantage over its new rival for customer attention.

For example, using a single spot beam, if a Ka-band and a Ku-band satellite have equal-sized amplifiers and spot beam size on the Earth, the beam's power as it leaves the satellite is identical. This is called the *Effective Isotropic Radiated Power*, or **EIRP**.

On the ground, if the Ku- and Ka-band receiving Earth stations are the same size, the reflector gain will be greater for a Ka-band signal. This is because the reflector gain of a signal is proportional to the square of the signal's frequency, a benefit to the higher frequencies of the Ka-band. However, the Ka-band signal has greater path loss than the Ku-band signal as the two transmissions travel from the satellite to Earth. The Ka-band's path loss is exactly equal to its reflector gain, so the two offset one another. The net result is that, given a constant reflector size, the carrier power level out of the antenna reflector is identical for both Ka and Ku-band.

With the carrier strength being the same for each band, one must look at the received noise to determine the quality of the signal, as measured by the signal-to-noise ratio. Ka-band receivers have higher noise figures than Ku-band. In this example with equal sized satellite amplifiers, coverage beams and receive antennas, the quality of the signal will be better using the Ku-band satellite.

Those advocating Ka-band satellite capacity point out that the Ka-band beams usually have higher EIRP values than Ku-band to offset the signal-to-noise issue. While this is true, it is due to the fact that the Ka-band beam is more narrowly focused—such means the beam has a smaller coverage area on the ground. With smaller satellite beams, a satellite operator needs to have multiple beams to cover an identical geographic area that a single, broader Ku-band beam can cover.

Decisions, Decisions

This introduces a challenge for the customer who may not want to be shifting from one beam to another while operating in a specific region. As the spot beams are side-by-side, they each have to have a different polarization and/or frequency range within the Ka-band to avoid interference with one another. Is this acceptable to the customer? Does such also multiply the amount of capacity the customer needs to buy, depending upon the application?

Multiple spot beams may also create operational issues in mimicking single beam coverage. The same signal needs to be transmitted on several adjacent beams so that an on-the-move user, such as an aircraft or a ship, can pass seamlessly from one beam to another without signal loss. Can this occur automatically, or only by re-transmission from a gateway? If the latter, this introduces cost and operational into the equation. More importantly, does the beam-to-beam handoff meet all of the customer's needs?

Another important consideration is whether there is adjacent satellite interference, or **ASI**. Ku-band satellites typically are spaced only 2 degrees apart from one other. This raises the possibility of interference with neighboring spacecraft that operate on the same frequency band. As Ka-band satellites are spaced further apart, they produce less ASI.

However, a final factor is rain fade. Atmospheric rain, snow or ice will absorb radio frequency signals above 11GHz. A Ka-band signal suffers more degradation than a Ku-band signal. This is a win for Ku- if there is sufficient rain in the region.

Signal degradation from rain and ASI varies greatly depending on a customer's specific situation (e.g., satellite and terminal locations)—making broad generalizations about either factor is not a valid exercise.

A recent study validated the hypothetical conclusion that the new, higher-power Ku-band satellites deliver superior performance to certain of the planned high-power Ka-band satellites. The study, *High Throughput Ku-band for Aero Applications*, analyzes the differences between Ku-and Ka-band and concludes that performance has much more to do with spot beam size than frequency band.

According to the paper, Ku-band is currently the one most used in the *aeronautical mobile satellite systems (AMSS)* broadband market. The AMSS service is offered to commercial airlines by such providers as **Panasonic eXConnect**, **Row44** and **ViaSat Yonder**, and to government users by **Tachyon**, **Boeing** and others. The satellite bandwidth used on these platforms is leased from *fixed satellite service (FSS)* providers such as **Intelsat** and **SES**. These Ku-band satellites use wide beams with maximum throughputs of approximately 28Mbps on the fastest systems.

Ku- Vs. Ka-Band — Pondering Performance... (Cont.)

The study is entitled *High Throughput Ku-band for Aero Applications* and was authored by Chris McLain and Sunil Panthi of Panasonic Avionics Corporation and James Hetrick of LinQuest Corporation. Readers may download a PDF containing the study at this [direct link](#).

Correcting Misunderstandings

Satellite operators planning to launch new Ka-band systems state they will deliver substantially greater throughput than current Ku-band offerings, with promised speeds of up to 50Mbps. However, this new study demonstrates that the superior performance of Ka-band is the result of customized satellites and multiple spot beams. According to the study, "A Ku-band satellite using similarly sized spot beams can equal or exceed the performance of Ka-band satellites, and Intelsat's new EpicNG satellites take advantage of this fact."

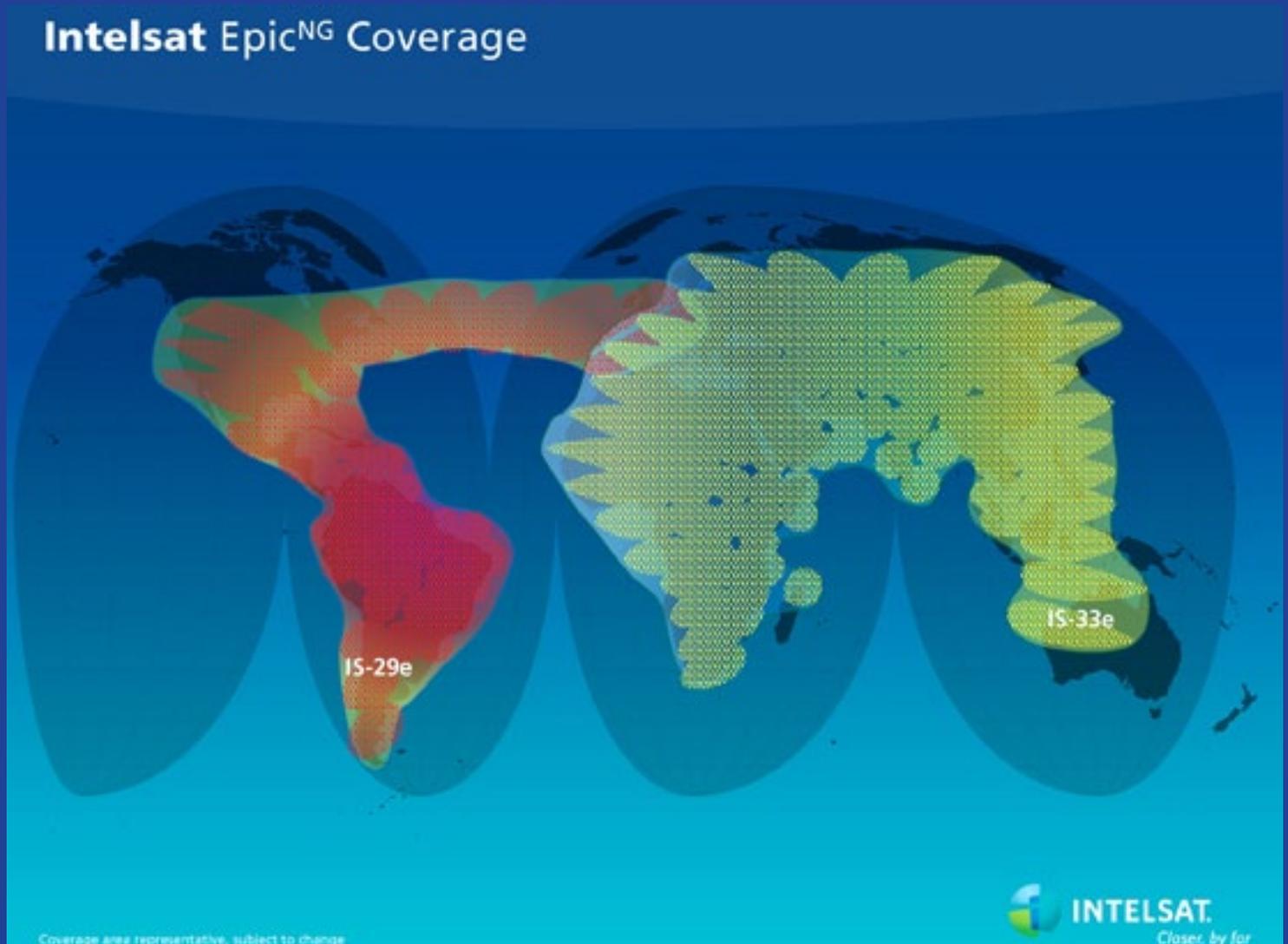
Intelsat EpicNG uses a combination of C-, Ku-, and Ka-bands as well as a combination of spot beams and wide beams to provide high throughput communications for media, broadband, mobility and government service. The first two satellites using the Intelsat EpicNG platform are the **Intelsat-29e** and **Intelsat-33e**, scheduled for service in 2015 and 2016, respectively.

According to the study, a spot beam two degrees wide from the Intelsat-29e satellite will have expected throughput to an aero terminal of 160Mbps on the downlink, compared to a maximum of 84Mbps on Intelsat's planned Ka-band satellites.

The study notes that existing Ku-band systems were developed primarily for video distribution and widely dispersed VSAT networks.

When Direct-To-Home (DTH) Internet services were envisioned a few years ago, most of the Ku-band capacity was already committed—companies had to turn to unused spectrum on the Ka-band to provide services. As these networks were designed for high throughput from the start, Ka-band has gained a reputation for being faster than Ku-band.

However, as the study makes clear, the reason a Ku-band AMSS system can equal or outperform similar Ka-band systems is dependent on spot beam size. Correcting the current misunderstanding of many around the performance characteristics of these frequencies is important. Such can provide an evolution path to greater satellite capacity with current Ku-band satellites, thereby avoiding the need for expensive changes to terrestrial hardware and other infrastructure.



Event: Waikiki, Capacity, Capability... + Satellites... All @ PTC 2013

by Tim Logue, Senior Director, Thales Alenia Space North America



The “big tent” of the **Pacific Telecommunications Conference** will again be pitched at the *Hilton Hawaiian Village* hotel campus in Honolulu’s Waikiki section between January 20 and 23, 2013. Those who have attended *PTC 2013* in the past know that this conference is unique not only for its setting, but also for its effort to bring together senior level executives from all parts of the satellite, fixed and mobile telecommunications, IT and broadcasting industries to talk about issues that impact them all, often in different but interrelated ways. Thus, the “big tent” metaphor works, as it provides a shelter for all sectors to mingle in a way that is unique in our increasingly specialized sectors.

This year’s conference theme is “*Capacity, Capability and Collaboration*”, focusing on how ever-expanding capabilities due to the expansion and deepening of global networks are leading to new ways of collaboration. Without doubt, this is a really broad conference theme, typical of the leading edge themes that PTC often chooses for its conferences, but which often work out quite well.





Satellite operators, teleport operators, satellite manufacturers and launch services providers, and everyone in between—in short, the entire satellite “family”—typically find a home in mid-January for a brief time to commune with each other and meet customers and representatives from other SATCOM sectors. PTC provides an excellent setting within which to start the New Year and to establish the agenda for the coming months, starting discussions that will be followed up throughout the year at industry specific conferences.

The satellite industry has often played a key role in the conference due to its continuing importance to the region. Within the Asia/Pacific region, one can find thousands of islands spread across vast waters, complementing land-bound countries of all sizes with equally varied levels of economic and network development.

Satellites play an important role in the region, stitching networks together over large areas and extending advanced services into areas where no other method is feasible or economical to operate. It’s no wonder that the region is home to more satellite system operators than any other part of the world. Without these satellite systems, some nations in the Asia-Pacific region would have no other way of extending bandwidth and services into areas that otherwise would be left beyond the reach of 21st Century, networked civilization.

Is it any wonder, then, that cellular backhaul services rivals video distribution and broadband data services as the largest satellite capacity uses in the region—even before second, third and fourth generation mobile wireless services arrive in many places?

Filled With Focus: Day One

To address the themes of the conference and the many sub-themes of interest to the satellite industry, several satellite focused sessions have been organized for PTC 2013.

Three workshops are planned for the first day of the conference, Sunday, January 19. The first is courtesy of the **World Teleport Association**, followed by a roundtable discussion on *Broadcasters and the Carrier ID Initiative*, focusing on efforts to reduce mutual interference among the parties who get involved in such major satellite and video events such as the London Olympics of 2012. The session, chaired by *Frederick Morris*, Vice President for Global Engineering for **Comtech EF Data**, will have as participants *Martin Coleman*, Executive Director of the **Satellite Interference Reduction Group (sIRG)**; *Robert Potter*, President, **SAT Corporation**.; *Glenn Tindall*, Vice President, Sales, for **SES** in Singapore; and *Robert Tong*, Vice President for Engineering and Operations, for **AsiaSat**.

The first day will conclude with a second roundtable looking at the challenges and solutions for, and from, the satellite industry. Presenters will include *Mark Ayers*, RF Engineering Manager, **GCI Communications Corporation**; *Stuart Daughtridge*, Vice President, Advance Technology, **Kratos-Integral Systems**; *Eric Jones*, Managing Director, New Zealand and Pacific Islands Operations for **Intelsat**; and *Ahsun Murad*, President & CEO, **Optimal SATCOM**.

Filled With Focus: Day Two

The second day of the conference will also have several sessions conducted by leaders from the satellite sector.

An opening keynote session on the *Dawn of the Global Satellite Broadband Era* that focuses on the launch of new broadband satellite networks and what it will mean for the users in the region is offered. This session will be followed by an **Executive Insight Roundtable, Improving Efficiency and Expanding Horizons: Satellite Communications Today and Tomorrow**, co-chaired by *Patricia Cooper*, President of the Washington-based **Satellite Industry Association**, and *Susan Irwin*, President of **Euroconsult**’s US operations. They will query several leaders in the industry for insights as to what can be expected from the industry. Panelists will include *Yutaka Nagai*, Senior Executive VP, **Sky Perfect JSAT Corporation**; *Phillip Spector*, Executive Vice President, Business Development, and General Counsel, **Intelsat**; *Mark Dankberg*, CEO of **ViaSat**; and *William Wade*, CEO of **AsiaSat**.

The infrastructure providers—satellite manufacturers and launch services providers are next who, as in recent years, underwrite the the best luncheon of the day and carrying on a rapid-fire dialogue under the knowledgeable probing of chairman *Peter Jackson*, retired CEO of **AsiaSat**. Participating in this year’s industry luncheon are *Arnold Friedman*, Senior Vice President, Marketing and Sales, of **Space Systems/Loral**; *Eddie Kato*, CEO of **Thales Alenia Space North America**; *Jean-Yves Le Gall*, Chairman and CEO, **Arianespace**; *Barry Matsumori*, Vice President, Commercial Sales and Business Development for **SpaceX**; and *Frank McKenna*, President of **International Launch Services**.

The hectic pace of satellite sessions will conclude with a topical session *From Pure Capacity to Full Capability* chaired by *Christopher Baugh*, President of **Northern Skies Research (NSR)**, and featuring *Daron Elinav*, Vice President, Marketing and Business Development for **Gilat Satellite Networks**; *Serge Van Herck*, CEO of **Newtec**; *Imran Malik*, Regional Vice President, Middle East and Asia-Pacific for **O3B Networks**; and *Dr. Nongluck Phinainitisart*, Chief Commercial Officer of **Thaicom**.

While the formal sessions will close at this point, the satellite sector then retires to various suites for bilateral meetings and elsewhere around the Hilton campus for receptions, informal gatherings, and the other typical and highly enjoyable distractions that are part of PTC. Feel free to join all as participants!

About the author

Timothy J. Logue is the Senior Director for Marketing and Sales for Thales Alenia Space North America in its Washington, D.C. area office, having joined Thales in 2009. Mr. Logue has been involved in the satellite industry for more than 30 years, starting with the original Communications Satellite Corporation as a policy analyst. He is also active in professional organizations. He is currently Treasurer of the Arthur C. Clarke Foundation and chairman of the Advisory Council of the Pacific Telecommunications Council.

[Access this direct link to register for PTC’13](#)



Pulham's View: Passion Wears A Pocket Protector

by Elliot Pullham, CEO, Space Foundation



If there's one thing that makes the space industry profoundly different from most other industries you can think of, it is the passion that each and every one of us brings to our job, day in and day out.

Participating in a Space Foundation-Toffler Associates dinner in New York City's financial district recently, I was struck by how, time and again, attempts to discuss business models and investment methodologies returned to passionate discussions about the need for improved access to space and a solid, unwavering direction for NASA.

I had really been looking forward to being a fly on the wall for some hard-nosed, no-nonsense financial discussions. Instead, I was treated to an object lesson in how our industry brings a unique passion to what we do.

We really do believe that what we do is important—not just for shareholders and investors, but for all of human kind. We care about our business models, but we seem to care a lot more about whether we continue to explore and find new uses for space, and whether we can bring the next generation of space explorers along with us on the journey.

Passion, it seems, wears a pocket protector.

Going into the dinner, I expected the prevailing topics of interest to be:

- *What are the most lucrative space markets for the next 10 years?*
- *With venture capital in retreat, what are the likely sources of investment in these markets?*
- *How do the innovators and the investors get together and make magic?*

Instead of those analytics, what we experienced was a soul-searching discussion on:

- *How do we set NASA on a meaningful course that ignites innovation in our industry and fires the imaginations of our next generation of explorers?*
- *How do we address the U.S. national crisis in education and the flight of intellectual property and industrial capacity overseas?*
- *How can we revolutionize a 1 percent fraction of our industry - the space transportation segment—to ignite explosive growth in the remainder of the business?*

Now, don't get me wrong. I'm not saying that no one in the room was concerned with their own company's performance. Of course they were. But there is a contextualization at work here that one simply doesn't see in other industries. At the end of the day we realize, in the space business, that what we do doesn't just matter to our immediate stakeholders—it matters to each of us, as human beings. It matters to the world.

Space Needs To Matter

Certainly the question of a more meaningful course for NASA is one that we grapple with nearly every day. And it seems to me that, across the space community, our collective sense of urgency is growing exponentially as the political leaders who hold NASA's fate in their hands become more cynical and disconnected. In the current presidential election, it seems that space matters not at all to either candidate or either party. Except, of course, when they were campaigning in Florida—where we saw pandering platitudes and snippets of obscure space policies trotted out for the local electorate. Space never seems to rate a mention when the candidates are on the stump in California, Colorado or Texas—respectively the largest, second-largest and third-largest space economies in the nation.

This political cynicism and factual cluelessness are galling and probably never represented in a more appalling fashion than when then-presidential candidate *Rick Santorum*, appearing in Denver, mocked competitor *Newt Gingrich* for promoting a space agenda. Here was a candidate for President, campaigning for office in the state with the second largest space economy in the nation - a state where space industry accounts for the second largest payroll - mocking space exploration.

This unfortunate political dynamic has a number of profoundly negative effects on our industry, not the least of which has been a massively destructive influence on NASA, which effectively is expected to stop what it is doing and change course every time there is an election.

Every administration wants to put its own "brand" on NASA. When the *Obama* administration came into office for his first term as President, some \$9 billion in progress on the **Constellation** program was discarded in order to make way for a new plan.

This is not unique to the current administration. As administrations change, and as majorities and chairmanships of key Congressional committees change, so do the rules and priorities for NASA.

During the 30 years that **Space Shuttle** orbiters flew, NASA was required to start, stop, and discard some billions of dollars (estimates range from \$25 to \$90 billion) worth of work to develop a successor spacecraft. This is not only a tremendous, in fact, offensive, waste of

taxpayer resources, but also a practice with a couple of debilitating side effects: First, the devastation of the space industrial base as programs inevitably fail to make it into production and, second, the evolution of a culture at NASA that accepts and expects program terminations and no longer revolves around program completion or success.

Space Foundation's NASA Report

Thus, the **Space Foundation** made a decision one year ago to use most of 2012 to undertake an exhaustive research and analysis project examining the political, managerial and engineering history of NASA, with an eye toward offering a new way forward for the agency that would return America's civil space program to the highest levels of relevance while establishing a framework for assured sustainability.

In addition to relentless archival research and analysis of budgets, programs and political events of the past 50 years, our research team conducted in-depth interviews with more than 100 of the most experienced senior leaders in our industry. Our report, *Pioneering: Sustaining U.S. Leadership in Space*, is undergoing final edits in anticipation of its release the first week of December.

Without giving too much away before the release of the report, I will say that one of the most consistent observations of our research actually tracks amazingly well with the flow of our dialogue in New York's financial district: We, as an industry, are incredibly passionate about wanting NASA to succeed. In fact, we're so passionate about it, that—in the absence of a sustainable, long-term plan for the agency—we break apart into camps with competing views and visions. Thus, the very passion that unites us behind our space agency, fractures and devolves.

Our hope at the Space Foundation is always to bring people together. Whether that looks like 9,000 people assembled at a **National Space Symposium**, or 30 people gathered for dinner in New York, we are always looking for ways to strengthen the bonds among those of us who care so much about the exploration, development and utilization of space. Our hope with this new report is to lay out a master plan for civil space that we can all examine, discuss, revise, modify and ultimately embrace with all of our passion.

My view is that passion wears a pocket protector. And no one is better equipped than the space industry to passionately engineer the future.

About the author

Named chief executive officer of the Space Foundation in 2001, Elliot Pulham leads a premier team of space and education professionals providing services to educators and students, government officials, news media and the space industry around the world. He is widely quoted by national, international and trade media in their coverage of space activities and space-related issues. Before joining the Space Foundation, he was senior manager of public relations, employee communication and advertising for all space programs of Boeing, serving as spokesperson at the Kennedy Space Center for the Magellan, Galileo and Ulysses interplanetary missions, among others. He is a recipient of the coveted Silver Anvil Award from the Public Relations Society of America - the profession's highest honor. In 2003, the Rotary National Awards for Space Achievement Foundation presented him with the coveted Space Communicator Award, an honor he shares with the late legendary CBS News Anchor Walter Cronkite and former CNN News Anchor Miles O'Brien. Pulham is chairman of the Hawaii Aerospace Advisory Committee, a former Air Force Civic Leader and advisor to the Chief of Staff and Secretary of the Air Force and a recipient of the U.S. Air Force Distinguished Public Service Medal.



Futron Analysis: 2012 Space Competitiveness Index

Exploring the vast unknowns of space is an ancient human aspiration. The same impulse that led nomadic tribes to seek out what was beyond the next mountaintop, and civilizations to traverse the oceans in search of new lands, today animates governments, enterprises, entrepreneurs, scientists, and citizens alike to pursue frontiers beyond our planet. Relentless curiosity, the quest for resources, the desire for knowledge, and an instinctive drive to push outward toward new horizons all combine to inspire space activity. Alongside these, of course, are the motivations of the modern nation-state: competitive advantage, technological development, scientific understanding, economic growth, global prestige, and security enabled by command and control of the strategic environment offered by space.



At the national level, space has always represented simultaneously a competitive and collaborative endeavor. Countries accrue tangible benefits from space activity—benefits that can set them apart from their peers. At the same time, space by its very nature reinforces the notion that people across separate societies are more united in their similarities than divided by their distinctions.

Just as the Earth appears small when viewed against the enormity of outer space, human differences can seem trivial alongside the promise of combined space exploration efforts. Accordingly, since the dawn of the space era, countries have sought to balance between unilateral and multilateral space activity, calibrating their approaches over the decades depending on both the larger geopolitical context and their own respective capabilities and limitations in resources, technology, and national will.

Whether nations have conducted space activity jointly or individually, though, the effect on the everyday lives of individuals has been profound. A half-century after Sputnik, we live in a world transformed by space. Communications satellites link the globe, providing information, entertainment, and connectivity to hundreds of millions of people instantly. The weather forecast that determines our weekend excursion, the electronic roadmap that plans our route, and the global positioning system that guides us along the way are all enabled by spacecraft orbiting overhead. Moreover, these uses of space services by individuals are the legacy of even greater, and ongoing, demands from governments, militaries, enterprises, and institutions: for launch vehicles capable of sending missions into orbit or beyond; global networks to connect widespread populations, forces, and assets; systems to geo-locate people and equipment anywhere in the world; and imagery of the Earth and its resources from above.

Today, space has been transformed from an object of wonder to an arena of practical, economic, and strategic consequence. Yet to understand this arena, and the motivations informing the national and business actors operating within it, a structured framework is required. Leaders who seek to maximize their investments in space activity require a nuanced, methodical, and rigorous analysis of its changing dynamics. Futron Corporation, a premier provider of decision management solutions, created its annual, independent, and self-financed **Space Competitiveness Index (SCI)**, published by Futron since 2008, for this express purpose.

The SCI is a decision management tool. It offers decision-makers an ongoing benchmark to continuously re-assess the competitive landscape of space activity—and to contemplate its meaning for their respective governments, enterprises, and institutions in an organized way. Now in its fifth year, the SCI methodology has been annually updated and refined. This 2012 edition expands the number of countries evaluated from 10 to 15, providing a critical half-decade of insight on the relative strengths, weaknesses, trends, and trajectories of leading space-participant nations.

What Is Futron's SCI?

Futron's SCI is a globally-focused analytic framework that defines, measures, and ranks national competitiveness in the development, implementation, and execution of space activity. By analyzing space-related government, human capital, and economic drivers, the SCI framework assesses the ability of a country to undertake space activity, and evaluates its performance relative to peer nations, as well as the global space arena.

The SCI considers comparative space-related strengths, weaknesses, opportunities, and threats for 15 leading space-participant nations: Argentina, Australia, Brazil, Canada, China, Europe (treated as a single integrated actor), India, Iran, Israel, Japan, Russia, South Africa, South Korea, Ukraine, and the United States. These nations are

compared across 50 individual qualitative and quantitative metrics, each collected for all 15 nations, which span three overarching competitiveness dimensions: government, human capital, and industry.

Futron Corporation evaluates these indicators using a proprietary data model whose assumptions are annually reviewed and refined. The resulting scores form the foundation of the index itself, which is then interpreted through a written analysis featuring country-by-country profiles of national space activities and competitiveness dynamics.

What's New?

Since Futron's inaugural study in 2008, the globalization of space activity has only accelerated. Some countries with zero participation in space five years ago now have space agencies; others with negligible space involvement have significantly increased the scope of their activities. Recognizing this change, Futron has added five new nations to its Space Competitiveness Index.

- **Argentina**
- **Australia**
- **Iran**
- **South Africa**
- **Ukraine**

These five nations comprise a tier of emerging space leaders, and are evaluated metric-by-metric alongside the original ten in the 2012 SCI. Although the five new nations are not evaluated retrospectively—and therefore do not feature five-year trends—their space competitiveness dynamics will be tracked in comparison with an enlarged group of 15 nations going forward.

The inclusion of five new countries has altered the scoring mathematics behind the SCI model. The denominator by which nations are pro-rated against one another in individual metrics has changed from 10 to 15. Reflecting this change, the 2012 SCI marks the introduction of re-centered scores, which will continue in future editions of the study. For the convenience of our longtime readers, we also provide non re-centered scores in a master table, allowing for easy comparison of 2012 country scores consistent with those used in the first four editions of the SCI.

Also in 2012, Futron has reviewed its foundational 2008, 2009, 2010, and 2011 studies to provide a fresh perspective, surveying five-year trends to enhance discussion of national strengths, weaknesses, opportunities, and threats. Futron's 2012 SCI expands its country profiles, providing added data on national space assets, infrastructure, budget, and commercial sector revenues. In addition, the 2012 SCI continues to use an optimized written analysis structure, designed to accommodate the interests of both casual readers and executive decision-makers.

Key Space Competitiveness Themes

Global space activity drives a substantial economic engine, fosters national pride, and advances science and exploration. Some nations invest in space for the domestic esteem and international respect associated with independent technological and infrastructure capabilities. Others focus more on the societal benefits derived from satellite communications access, imagery, and natural resource management. Militaries also have long realized the force multiplication potential of space assets, including secure communications, reconnaissance, tracking, and coordination of war-fighting forces.

Yet increasingly, military space is interwoven with civilian and commercial space systems and infrastructure—adding a new layer of complexity to governmental decision-making, national industrial policy, and the participation of the private sector within the space arena. And



whatever the purpose of space investment, it is underpinned by a common denominator: human capital. Knowledge, skills, and expertise ultimately define the leading edge of space activity. In a world where talent is mobile, the ability to educate, attract, retain, and continuously enrich a base of skilled professionals is a growing determinant of which nations and actors lead in space competitiveness.

While nations invest in space in pursuit of different outcomes, the overarching themes of space competitiveness share common linkages: government policy, national security, science and technology, educational infrastructure, and economic strength. Together, the civilian, military, and commercial space sectors focus the broader space discourse around key questions such as the relative competitive position of traditional space leaders, the role of emerging space powers, and the aims of newer or smaller space participants. This study seeks to address pivotal and timely strategic questions about space power and competitiveness:

- *What are the core drivers of space competitiveness, and how are they changing?*
- *As the second decade of the 21st century begins, how will nations leverage both competitive and collaborative strategies to maximize their space goals?*
- *How does space competitiveness impact larger socio-economic trends?*
- *How has the worldwide economic slowdown altered government and enterprise space plans?*
- *How will the loss of human spaceflight capacity in the U.S. civil space program affect the competitive trajectory of the United States over the next decade?*
- *What will be the strategic interplay among the three traditional, and current, leading space actors: the United States, Europe, and Russia?*
- *Is China on track to achieve the ambitious space goals it has set for the second half of this decade?*
- *As Japan continues to implement its comprehensive Basic Space Law reforms, will it convert administrative momentum into more pronounced regional space leadership?*
- *Will Indian investments in new launch and spacecraft platforms lead to market advances?*
- *Will Canada move into closer alignment with the United States and Europe, or increase investment in independent capabilities?*
- *Will South Korea rebound from its two failed launch attempts to conduct its first successful orbital mission, reshaping the Asian space dynamic?*
- *Will Israel develop the political consensus to make more substantial space investments in*

order to convert its niche strengths into an expanded international presence?

- *How will Australia's renewed focus on space policy translate into national space investments?*
- *Will Brazil convert its newly increased space funding into concerted national action? Will Argentina expand partnerships regionally and internationally to enhance its global role?*
- *How can Ukraine successfully productize its considerable space industrial base?*
- *How do Iran's civilian and military space objectives overlap, and where do they remain distinct?*
- *What is the role of public-private-partnerships in South Africa's newly announced space investments?*

Some top-level findings of the Futron SCI are provided next...

Summary Highlights

Argentina is adapting its satellite manufacturing sector for the international marketplace, exploring both commercial

RELATIVE COMPETITIVENESS CHANGES BY COUNTRY, SCI 2011 TO SCI 2012

	Argentina	Australia	Brazil	Canada	China	Europe	India	Iran	Israel	Japan	Russia	South Africa	South Korea	Ukraine	USA	Average Change
Argentina	0.0															
Australia		0.0														
Brazil			0.0							+0.60						-0.59
Canada				0.0											-0.56	
China					0.0							+3.04				
Europe						0.0					+1.10					
India			+1.28				0.0									+0.69
Iran								0.0								
Israel				+1.49					0.0							
Japan							-1.88			0.0						
Russia					-2.89						0.0					
South Africa												0.0				
South Korea									-0.89				0.0		+0.03	-0.52
Ukraine														0.0		
USA						-1.28									0.0	

Futron Corporation

and government-to-government deals. It stands to benefit from increased investment in spacecraft subcomponents.

After more than a decade of dormancy, Australia is back. The government is refreshing its national space policy segment-by-segment, focusing on space not only a driver of innovation and expertise, but also for its benefits to Australian society.

Brazil has begun to re-examine its national space priorities, increased funding, expanded its partnerships, and laid plans for a new launch vehicle. It remains to be seen whether these steps will keep Brazil ahead of regional counterparts that are also emerging onto the space scene.

Canada retains a skilled space workforce, but delays in space policy refresh and implementation are significantly offsetting these competitive advantages.

China performed a record number of launches in 2012, surpassing the United States for the first time, while increasing investment in technical education programs and civilian research institutes.

Europe's integrated approach is complemented by the rise of new national space agencies across the continent—from the United Kingdom to the Czech Republic to Estonia—as well as more assertive space export financing.

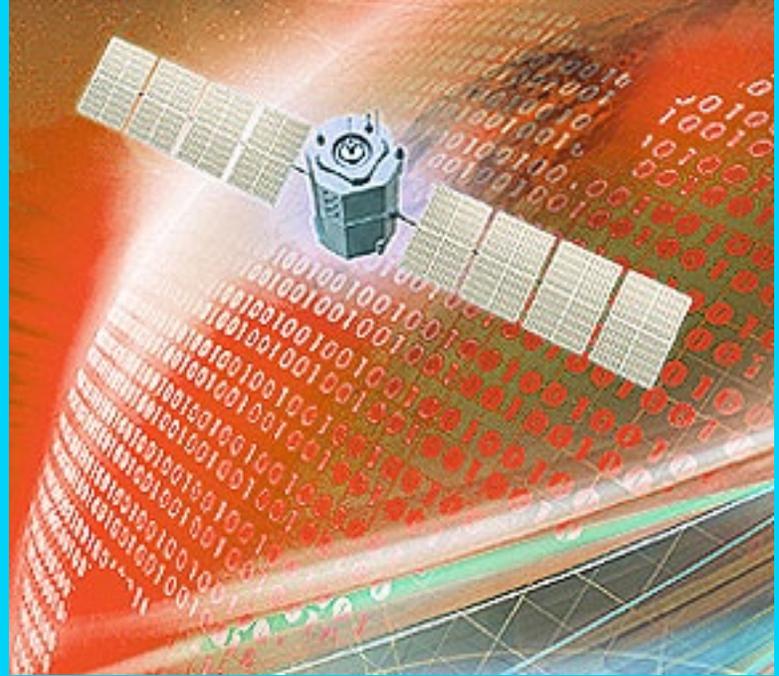
India is enhancing its space-related technical education, while gradually progressing toward a completely self-reliant set of next generation launch vehicles.

Iran has made faster progress than any other newly emergent space nation. The tenor of Iran's space program—civilian or military—will hinge on geopolitics. Other international actors have substantial power to influence the future focus of the Iranian space program.

Israel, despite funding increases, remains challenged by its lack of domestic industry scale, and has difficulty sustaining a commercial space presence in global markets.

Japan, despite ongoing benefits from its policy reforms, is losing competitive ground relative to most other actors, and can benefit from a greater focus on commercializing its industrial base.

Russia remains the world's launch leader, and promises to retain that role in the near term, thanks to its vital role in transporting astronauts and cargo to the International Space Station, as well as the introduction of Soyuz launches from the European spaceport at Kourou. These strengths, however, are offset by weaknesses in retention of human capital talent.



South Africa is divided, from a budgetary standpoint, between space investments focused on societal usage of external assets already in space and investments focused on building the country's own space industrial base.

South Korea's two failed launch attempts contributed to an organizational shakeup, but have not reduced its determination to become the newest country to achieve independent spaceflight.

Ukraine has an enviable space industrial base, but limited domestic demand for its space hardware. It is aggressively seeking partners overseas, but has not yet engaged with key emerging markets.

The United States remains the overall leader in space competitiveness, but its relative position has declined for the fifth straight year, as other countries enhance their capabilities while the U.S. undergoes major transitions amid significant uncertainty.

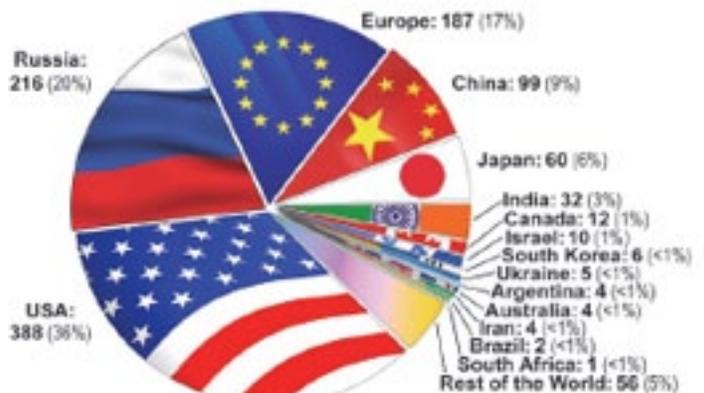
International collaboration is increasingly taking shape as a concerted space competitiveness strategy, especially among smaller actors.

Four distinct space competitiveness tiers have emerged. The top two remain dynamic, but have shown some stabilization; meanwhile, the bottom two are subject to especially intense competition, with very small gaps making the difference in competitive rankings.

ORBITAL LAUNCH AND SPACECRAFT MANUFACTURING TRENDS, 2002-2011



TOTAL: 640 Successful Orbital Launches



TOTAL: 1,086 Spacecraft Manufactured

Relative Space Competitiveness Changes By Country

A critical benefit of the SCI is the ability to track competitiveness trends over time, supported by statistical analysis. Since introducing the SCI in 2008, Futron has identified notable movements among leading space-participant nations, now supported by five years of tracking data, which are detailed in the 2012 edition of the report.

For instance, of the 10 countries analyzed, only the United States has shown five straight years of competitiveness declines. By contrast, China, Japan, Russia, and India have improved their own space competitiveness by 41, 37, 11, and 10 percent, respectively, over their relative starting points from when Futron's benchmarking process began in 2008.

The SCI also allows direct comparisons between individual countries. The table below offers a sneak preview of competitiveness changes. Positive scores indicate competitiveness gains, while negative scores indicate competitiveness losses. For instance, Israel gained 1.49 basis points in overall space competitiveness relative to Canada, while the United States lost 1.28 basis points against Europe.

Historic Trends

In addition to providing a framework for analyzing current space competitiveness, Futron's 2012 Space Competitiveness Index equips decision makers with the ability to review trends over time. Futron has tabulated spacecraft manufacturing and orbital launch activity over the past ten years. The results are shown below. Additional historic data are included in the full report.

Full Report Outline

Although the past decade can show us where we have been, the real question is: Where are we going? The full report of Futron's 2012. Space Competitiveness Index features approximately 150 additional pages of research and analysis including:

- *An Introduction offering insight into the SCI concept, purpose, methodology, and structure, as well as overarching themes driving the evolving discourse regarding space competitiveness*
- *Added data on national space assets, infrastructure, budget, and commercial sector revenues*
- *Optimized country-by-country profiles of each nation's space activities and plans, featuring:*
 - *2012 Index Findings*
 - *Competitiveness Changes Relative to Other Leaders*
 - *Overview of 2011 Activities*
 - » *Preview of The Year Ahead*

» National Space Capabilities

- ◇ *Government*
- ◇ *Human Capital*
- ◇ *Industry*

- *Strengths, Weaknesses, Opportunities, and Threats Analysis*

In addition, Futron Corporation is pleased to announce that the extensive full data set used to produce the 2012 SCI is also available. For further details, please visit Futron's website at www.futron.com.



Gottlieb On Maritime + Commercial Aviation Markets—2012 Review

by Alan Gottlieb, Senior Contributing Editor

The battle for control of the maritime and aviation markets is no longer just a skirmish. It's now apparent that Intelsat means business in its attempt to wrestle maritime and aviation market dominance from Inmarsat—and Inmarsat is fighting back. Those who followed the October 8th *GX Investor Conference* and its aftermath found themselves witnessing a battle of conflicting claims and counterclaims between the two communications giants.

To counter the Inmarsat threat and assure that the market understands the unique advantages of *EpicNG*, Intelsat Vice President, *Michael DeMarco*, has taken the offensive and is spearheading the launch of a new, dedicated mobility-marketing group. Led by former Head of Maritime for Inmarsat, *James Collett*, the new Group carries with it the mandate to take on Inmarsat with a dedicated and well-financed marketing thrust. As the companies struggle for dominance, certain segments of Maritime VSAT markets continue their growth while others remain constrained. In Aviation, adoption of VSAT Broadband continues to accelerate.



Maritime

In *Offshore Service Vessels*, *Product* and *LNG Tankers* as well as the *Cruise* markets, VSAT demand remains robust and largely unaffected by the economic downturn. However, Tanker and Containership companies continue to delay purchases of VSAT as daily *spot freight rates* fall to new lows, causing operators to charter at rates below Break-Even (see the chart below).

Baltic Dry Index Jan 08 to Date

To date, continuing additions to the world's *Offshore Service Vessels (OSV)* and *Cruise Fleet* and Japan's growing demand for LNG imports have supported these VSAT Markets, while in Brazil, demand is soaring for VSAT for new OSVs. In the *Cruise Industry*, the just closed competition for **Carnival's 107 Vessel Tender** and the increased demand for bandwidth demonstrates healthy growth in that sector.

Despite these select segments, unfavorable economics in the *Oil Tanker* and *Containerships* sectors have combined with the confusion created by the recent introduction of **Global Xpress** and now, Intelsat **EpicNG** to restrain overall market demand. Furthermore, numerous providers of *MVSAT* services entered the market in the last three years. The result is a wave of industry consolidation.

Industry Consolidation

As the recent acquisition of **Speedcast Ltd.** by **TA** of Boston and the potential sale of **Globe Wireless** illustrate, industry consolidation is well underway. Daily, we hear rumors that several of the other well-known providers are seeking buyers, and we expect that the number of *MVSAT* vendors will be vastly reduced as we move into 2013. In addition to the trend to consolidate, we also see big changes in industry product and service offerings.

Technology Change

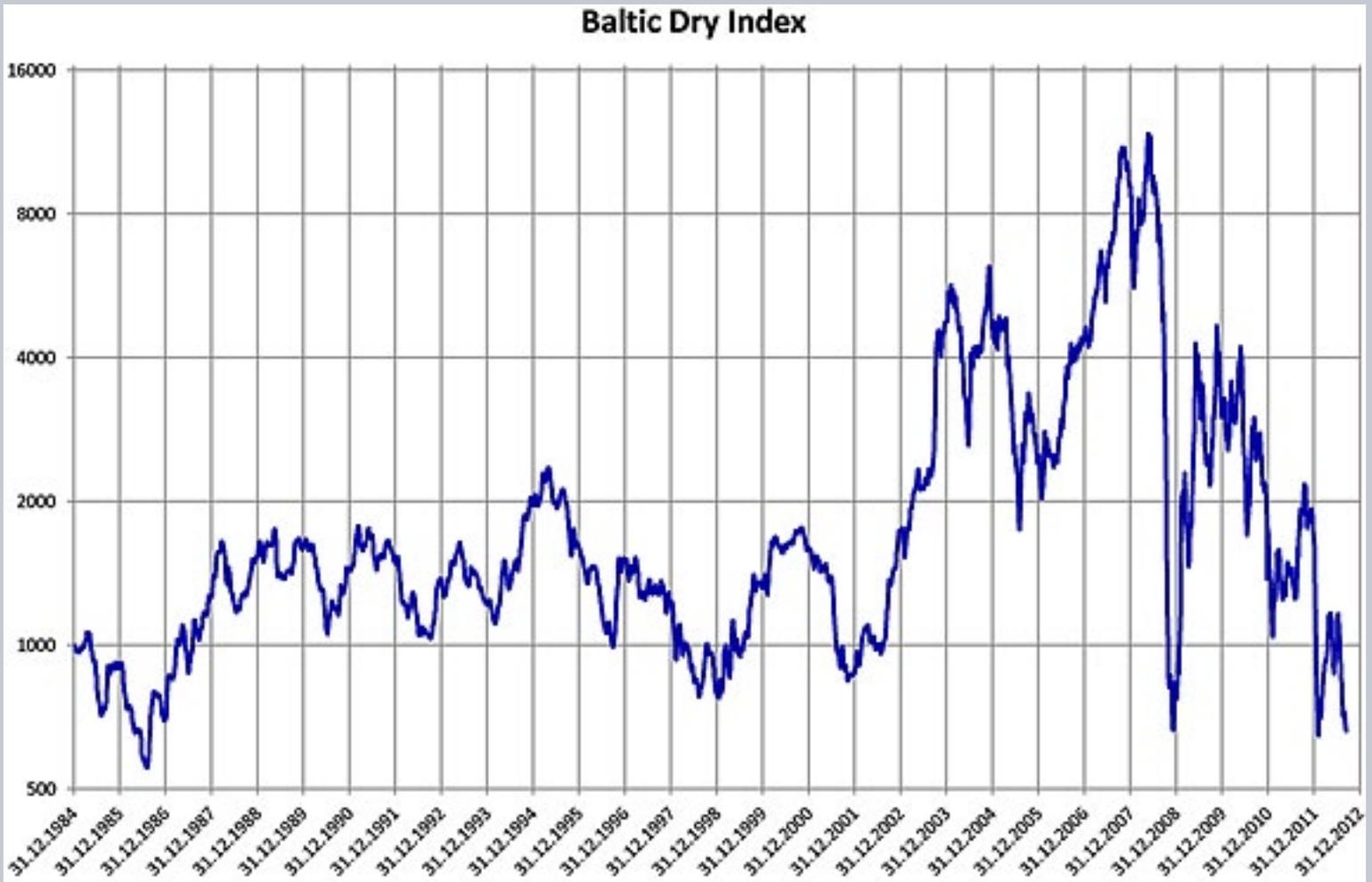
As **Harris CapRock's** win of the **Royal Caribbean** business demonstrates, the demand for high capacity systems capable of providing high throughput on the uplink is increasing in such markets as *Cruise* and *Oil and Gas*—a trend that should benefit such providers as **Comtech** and now **iDirect** with its new **Evolution 7 Platform**.

In addition, the race for an Inmarsat-free Broadband alternative has become a top priority among former Inmarsat distribution partners who, stung by Inmarsat's *going direct* initiative, and their price hike on low volume, backup FBB services, now compete against Intelsat with their own Ku-based *MVSAT* services.

For example, **KVH's V11**, which employs a combination of Ku- and C-band delivered on a single antenna, **Spread Spectrum** platform, is the first major competitive offering to emerge that offers global coverage without the need for Inmarsat. Other vendors, as well, are rushing to alternative solutions such as **Iridium Pilot** and the use of C-band.

As Ku-Band coverage of more remote ocean routes is increasing and *Near Shore Broadband* solutions such as **WiMax**, **LTE**, and **Stabilized Microwave** become available, overall satellite capacity requirements will drop. Witness the just announced **MTN Nexus** service. We expect

Gottlieb On Maritime + Commercial Aviation Markets (Cont.)



this reduction in overall satellite MHz requirement to open the market for small, low-priced, Spread Spectrum C-band antennas, thereby offering Inmarsat competitors the opportunity to offer Ku-/C-/Near Shore Broadband Service alternatives to Inmarsat.

In summary, we see a temporary lull in the purchase of MVSAT in the *Tanker* and *Containership* segments to continue until economic conditions improve. We see industry consolidation on the rise and a rush toward Inmarsat-free Broadband solutions. Accordingly, we expect Inmarsat will, ultimately, share maritime Broadband markets with a broad selection of alternative services, rather than be the dominate provider, as it has in the past with L-band.

Aviation

The *Aviation* market for Broadband continues to take flight as carriers around the world see this as a key factor in maintaining or increasing market share, especially among *Business Class* and *First Class Passengers*. While the initial thrust of adoption has been driven by passenger demand, the technology is seen as having a potential impact reaching far beyond allowing passengers to surf the net.

According to **Southwest Airlines'** Brian Gleason, *Director of Flight Operations*, and Neal Young, *Manager of Aircraft Communications*, and **JetBlue's** Charles Cook, *Manager of Fleet Programs and Technology*, introduction of Broadband to commercial aircraft will enable graphical weather information to be received in the cockpit, allow reporting of maintenance issues in real-time, facilitate credit card verification, and even provide enhanced onboard emergency medical services.

On the maintenance and efficiency front, a new venture-backed company, **iJet Onboard™**, is building a unique platform for integrating and reporting aircraft operational data. The Company is working with partners as well as developing a series of applications on its own that will integrate and deliver *Flight Operational Quality Assurance (FOQA)* data, make *Graphical Weather Maps* available on the Flight Deck, predict equipment failures through real-time transmission of flight data via satellite—all of which, when combined with satellite Broadband, will improve aviation economics and safety. Passengers will also benefit from Broadband connectivity through real-time flight attendant access to passenger databases.



The passenger experience will improve as flight attendants are able to click on seat maps on tablet computers and identify passengers by name, re-schedule connecting flights when necessary, access drink and meal preferences as well as travel profiles, all resulting in greater personalization of the traveler experience and improved services.

While much of the domestic market for provision of Broadband services to commercial aircraft has been captured by **GoGo** (formerly **Aircell**) with a ground-to-air cellular-based system, the battle to claim the international, satellite-based market is intense as **Inmarsat**, **Intelsat** and **ViaSat** are all rushing to dominate this potentially lucrative niche.

While ViaSat is largely selling direct, Intelsat and Inmarsat are in the process of inking deals with the major providers. To date, **Panasonic** has committed to Intelsat. GoGo is remaining technology agnostic and has signed an MOU with Inmarsat for **Global Xpress** and has a deal with Intelsat for Ku-band capacity on their **Global Mobility Network**; **Row 44** is using the **Hughes HX** platform on Intelsat satellites, and **OnAir** will market Global Xpress. As in Maritime, there is significant controversy over the advantages and disadvantages of each of these individual platforms.

Of greatest interest is the fact that the frequency employed, (*i.e.*, Ku- vs. Ka-Band) is not as important as how the network infrastructure is deployed. According to a recent study (downloadable from www.gottliebinternationalgroup.com under "Published Articles"), by **Panasonic Avionics** and **LinQuest Corporation** entitled *High Throughput Ku-Band for Aero Applications* by Messrs. *Chris McLain* and *Suni Panthi* of Panasonic and *James Hetrick* of LinQuest, it is not the frequency but the diameter of the *Spot Beams* that matters most.

This is best illustrated by the highly effective ViaSat Ka- system employed by **JetBlue** in which many relatively narrow, highly concentrated beams cover the much smaller U.S. footprint vs. the Global Xpress service that covers one-third of the Earth with a network of much wider and less powerful Spot Beams.

The report further concluded that the **Intelsat Global Mobility Network** with its coming **EpicNG** overlay and its combined use of Wide and Spot Beams represents a more efficient and higher capacity alternative to the Ka-Band Global Xpress Service.

In addition, given the \$300,000 to \$500,000 cost to equip a commercial jet with Broadband, the article casts doubt on the acceptability of a "no spare" satellite service given the high cost of antenna installation and the potential loss of Business and First Class Passengers to other carriers should the satellite fail.



Summary

In conclusion, we expect that most major international commercial carriers will install Broadband systems within the next two years. We predict that Ku- Broadband technology will be the frequency of choice for major international air carriers. Alternatively, we believe that Global Xpress may have practical application on smaller, corporate aircraft where passenger loads are minimal and small antennas are an attractive element of a Broadband solution.

About the author

Mr. Gottlieb is Managing Director of **Gottlieb International Group Inc.** Established in 2001, his firm is a recognized Global authority on the use of VSAT in Maritime and Oil and Gas and Aviation VSAT markets. Gottlieb International Group provides Product Development, Marketing Research, and Sales Training to VSAT Service Vendors, Equipment Manufacturers, Satellite Operators, and M & A support to Private Equity firms. To date, he has an unmatched record for accurately predicting Maritime Satellite trends and events.

Mr. Gottlieb is the author of numerous articles in *SatNews* publications, *Digital Ship*, and *Satellite Market Research* and is a frequent speaker at *Digital Ship*, *Offshore Communications*, *The Pacific Telecommunications Conference*, *Nor Ship*, *The Riviera Marine* and *ACi Conferences*, the *Washington Satellite Exhibition*, and other industry events. He also founded and manages "Maritime Satellite and VSAT - Independent Opinions," a well-known Group on "LinkedIn" with more than 1,400 members.

Editor's note

The introductory image to Mr. Gottlieb's article shows sailors manning a dual-mounted M-60 machine gun aboard the guided-missile cruiser *USS Leyte Gulf (CG 55)* as an *SH-60 Sea Hawk* helicopters from *Anti-Submarine Squadron (HS) 11* and *Helicopter Anti-Submarine Squadron Light (HSL) 48* embarked aboard the aircraft carrier *USS Enterprise (CVN 65)* and *Leyte Gulf* hover near the Philippine-flagged merchant vessel *M/V Falcon Trader II* after a distress call reported it had been boarded by pirates. (U.S. Navy photo Mass Communication Specialist 3rd Class Robert Guerra/Released)



Image courtesy of ViaSat

SatNav: GNSS, Apps + Sims

by Markus Bochenko + Andreas Blumenschein, WORK Microwave GmbH + Günter Heinrichs, IFEN GmbH

The origins of satellite navigation date back to the late 1950s, when the U.S. Navy began to develop the Navy Navigation Satellite System (better known as TRANSIT), which became known as the world's first global navigation satellite system (GNSS). TRANSIT, and its successors—the U.S. Global Positioning System (GPS) and the Russian GLONASS system—was originally designed to serve military needs, but later evolved to serve civilian purposes as well. This sparked the formation of a rapidly developing GNSS industry and has made possible the development of a variety of different GNSS applications. Specifically, car and personal navigation devices as well as location-based services in the form of various smartphone apps have made GNSS a part of our everyday lives.



The emergence of an ever-growing number of GNSS applications has driven the need to use GNSS simulators to ensure time- and cost-efficient development cycles. This article provides an overview of how GNSS applications can efficiently be tested, the type of simulators and simulation methods that are used, and which simulation capabilities a modern simulator should include.

The Evolution Of GNSS

Before discussing **GNSS** simulators, it's important to gain a basic understanding about the different GNSS types available today and how they work. GNSS help to pinpoint a geographic location of a user's receiver anywhere in the world by using a constellation of orbiting satellites in conjunction with a network of ground stations. For example, the most widely used GNSS—**GPS**—relies on a combination of 24 nominal satellites in approximately 12-hour orbits.

Each satellite transmits coded signals at exact intervals, and the receiver converts that information into position, velocity, and time estimates. These estimates are then used to calculate the position of the transmitting satellite, as well as the distance between it and the receiver, based on the transmission time delay. Finally, the receiver accurately determines the user's position after coordinating signal data from four or more satellites.

There are currently two global systems fully operational today: **GPS** and **GLONASS**, with the most well-known GNSS being the United States' GPS. GPS was initially developed for military purposes, and selective availability was applied to the signal, which introduced errors to the civilian signal. However, in the year 2000, the U.S. government set the selective availability of GPS signals to zero, thereby eliminating the deliberate errors that were previously introduced into civilian receivers. This action paved the way for widespread consumer adoption.

The other active GNSS today is Russia's GLONASS, which first launched in 1982, but fell into a state of disrepair until it recently achieved global coverage and full operational capability at the end of 2011.

Following the success of GPS and GLONASS, other countries are currently developing navigation systems and have already launched satellites in space for construction and in-orbit validation. The **European Union (EU)** is creating a civilian-operated GNSS called **Galileo**, which will be interoperable with GPS and GLONASS. Additionally, China is designing a global system known as **BeiDou**, and India and Japan also have regional satellite navigation systems in the works, respectively known as the **Indian Regional Navigational Satellite System (IRNSS)** and **Quasi-Zenith Satellite System (QZSS)**.

Additionally, there are several *satellite-based augmentation systems (SBAS)* such as the **European Geostationary Navigation Overlay Service (EGNOS)** and the **Wide Area Augmentation System (WAAS)**. Created jointly by the **European Commission** and **Eurocontrol** (the European organization for the safety of air navigation), EGNOS expands the U.S. GPS system by making it suitable for safety critical applications such as flying aircraft or navigating ships through narrow channels. Alternatively, WAAS was developed by the U.S. **Federal Aviation Administration** and **Department of Transportation** and consists of a series of satellites and ground stations that work with GPS to improve the quality of signals and to rectify errors. Used primarily for precision flight approaches, WAAS significantly enhances the quality of signals, producing a signal that is up to five times better than standard GPS signals.

Typical GNSS Applications

In addition to the personal navigation use that most of us associate with satellite navigation systems, there are many other useful applications¹ for GNSS technology, including:

- **Aviation:** Air flight navigation requires a high level of accuracy for the en route navigation, approach, and landing.
- **Automotive:** Customized in-vehicle navigation systems help users by providing reliable driving directions. New modernized

systems include safety enhancements that improve vehicle handling characteristics.

- **Weak signal navigation:** Certain applications, such as indoor environments where the signal quality is poor, require an enhanced GNSS rather than standalone system.
- **Marine:** GNSS are standard on all boats today.
- **Space:** GNSS are primarily used in low Earth satellites, but are increasingly being used in space vehicles operating at higher altitudes.
- **Agriculture:** GNSS field measurements combined with geographic information system tools provide accurate regional maps for resource monitoring and management.
- **Geodesy and surveying:** The precise positioning information afforded by today's sophisticated GNSS enable us to monitor the movements of the Earth's crustal plates or ice shelves.
- **Scientific:** GNSS can be used for remote sensing of the environment and space weather studies.

The Benefits Of GNSS Simulators

An RF-based GNSS signal simulator is an excellent way to validate the performance of GNSS receivers and systems for research and development, manufacturing and system integration testing. GNSS simulators are used in approximately all applications, from aviation to civilian and military use, and offer an advantage over live GNSS signals by enabling complete control over the signals and conditions. This allows users to more accurately test GNSS systems before they are used in a real-world setting.

A simulator produces the identical signals that are transmitted from GNSS satellites under a controlled setting so users can regulate certain parameters such as the date, time, and location; vehicle motion; environmental conditions; and signal errors and inaccuracies. Therefore, using an RF-based GNSS signal simulator is the preferred method for testing satellite navigation receivers during R&D, design, manufacturing, certification, and maintenance stages because it offers a more reliable approach than using a live satellite.

Types Of Simulators

In order to understand why it is useful to perform GNSS tests with a simulator, it is important to comprehend the testing needs of different user groups and the simulation requirements that can be derived from various test applications. There are a number of simulator devices, and each is ideally suited to a particular application or user group based on its design.

There are two types of full-scale RF signal simulators: *single-channel* and *multichannel*². A single-channel system can simulate a signal from one satellite and usually has the capability to control a signal's *Doppler* profile. This type of simulator is suited for production and R&D testing.

On the other hand, multichannel simulators perform simulation of multiple satellite signals and are commonly used for R&D, design, manufacturing, and post-launch tests. One key benefit of a multichannel RF simulator is that it provides repeatability of the signal generation. Not only does it simulate multiple satellite channels, but also complete constellations at runtime. RF simulators are also capable of simulating single or multiple frequencies, which is advantageous for users, as they can work with a number of frequencies from a sole platform.

While analog simulators were the original type of system developed, today's modernized digital simulators offer many benefits, including the flexibility to reprogram the simulator on the fly. An analog simulator usually requires a separate frequency generator for each satellite, whereas a digital one may only need one synthesizer for each frequency. This means that digital systems are able to eliminate

SatNav: GNSS, Apps + Sims (Cont.)

interchannel biases that are more prevalent in analog simulators. Analog systems also introduce higher phase noise compared with digital versions, making digital systems the ideal solution for today's GNSS simulator needs.

In general, an arbitrary band limited RF signal can be generated by an I/Q modulator³. This analog component has three main inputs: **I, Q, and LO**. It receives two independent baseband signals at the I and Q ports, commonly referred to as the *in-phase* and *quadrature* components, respectively. This is also the origin of the term *I/Q modulation*. The LO input of the modulator is usually connected to a frequency synthesizer generating the RF carrier wave.

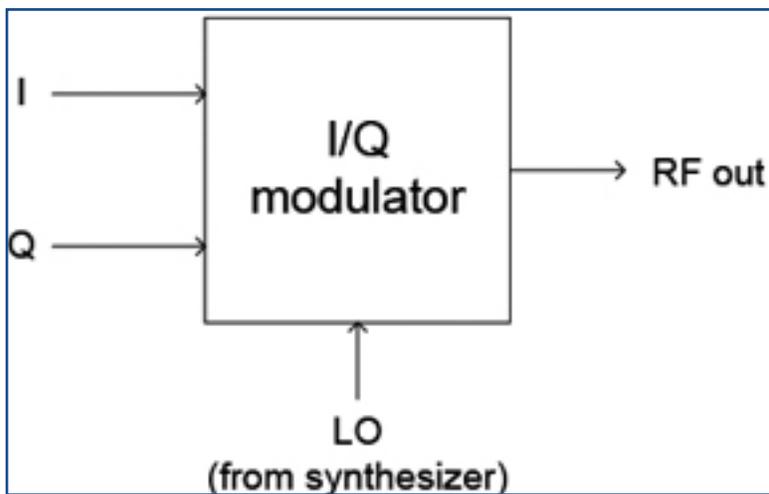


Figure 1: Simplified block diagram of an I/Q modulator

Mathematically, I/Q modulation works by using the carrier wave twice, once directly and once with a phase shift of 90°. The two orthogonal carrier signals with the frequency f_c are individually multiplied with either the I or Q input signal. The output is generated by adding both products.

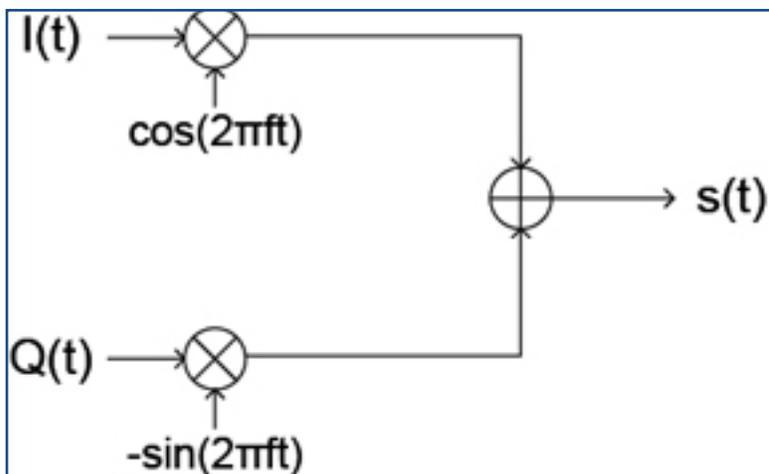


Figure 2: I/Q modulation principle

Consequently, I and Q form a complex baseband signal with real and imaginary parts. The main advantage is that the baseband signal is already the combination of all simulated satellite vehicles at this frequency. In this case, interchannel bias is eliminated completely.

An *RF recorder/replay system* is yet another type of signal simulator that collects data which is then processed by a software receiver. A recorder simulator is perfect for aviation applications, where it is necessary to test the integration of GNSS receivers with inertial

navigation systems. In this situation, a RF recorder system can be used to generate the information from one flight that would otherwise require hundreds of flights. Replay devices enable a user to play back a recorded signal and reverse the operations it went through. This is helpful in situations where the *digitized intermediate frequency (DIF)* signal is insufficient and needs to be bypassed.

A final type of simulator is a *pseudolite*, which is a single-channel simulator that provides in-the-field simulation of future satellite systems. This type of system is ideal for testing the signals of upcoming GNSS such as Galileo in Europe or BeiDou in China; however, a pseudolite simulator is limiting in that it can only be used for R&D purposes and in restricted areas.

Modern Simulation Capabilities

Modern GNSS simulators are designed to meet the needs of any application, ranging from research and development of GNSS safety and professional applications, to system integration and production testing of mass market applications including automotive SatNav, mobile phone apps, chip-sets, and handheld personal navigation devices. As discussed earlier in this article, they support a variety of channels and frequencies and, while most standard GNSS services can only simulate one simultaneous transmit antenna, some of today's more sophisticated systems provide additional flexibility by giving users the capability to simulate two, three, or four multi-GNSS sources from a single unit. Additional advancements include:

- **Smooth Doppler shift simulation** for precise signal simulation even when simulating high-dynamic trajectories.
- **GNSS correction data generation.** Correction data, usually in the RTCM format, minimizes the effects of atmospheric and satellite errors on position determination.
- **Vehicle motion models** that simulate the motion behavior of any type of vehicle, such as an airplane, car, ship, or pedestrian user.
- **CAN-Bus interface** for automotive applications, which emulates a wheel's sensor data in real time according to the motion behavior of the vehicle.
- **Antenna patterns** to simulate the effects of different receiver antennas
- **Multipath models**, such as point reflector, statistical channel model, and import of multipath data by file help users more precisely simulate environmental effects.
- **A remote control interface** that includes commands to control and steer the simulator without using the GUI. This means that the GNSS simulators can be integrated with an existing automatic test system, thus providing users with the capability to build commands into existing test systems.

One practical example of a modern GNSS simulator is shown in the picture on the next page. For this experiment, a **WORK Microwave NavX®-NCS Professional** GNSS simulator was used and a **u-blox AEK-4H** served as the receiver. The generated RF signal is directly fed into the receiver input. A static position is simulated, and the *Google Earth* visualisation displays its position, which is directly located at the foot of the Statue of Liberty. The receiver on the right shows the correct position and simulated satellites in the sky plot.

Of course, it would also be possible to simulate movement, such as driving from New York to Philadelphia or flying from Paris to Amsterdam. The receiver perceives no difference in the RF signal than it would from a signal picked up from an antenna. It is also possible to add specific errors to the signal for receiver tests, which cannot be achieved using the real signal in space.

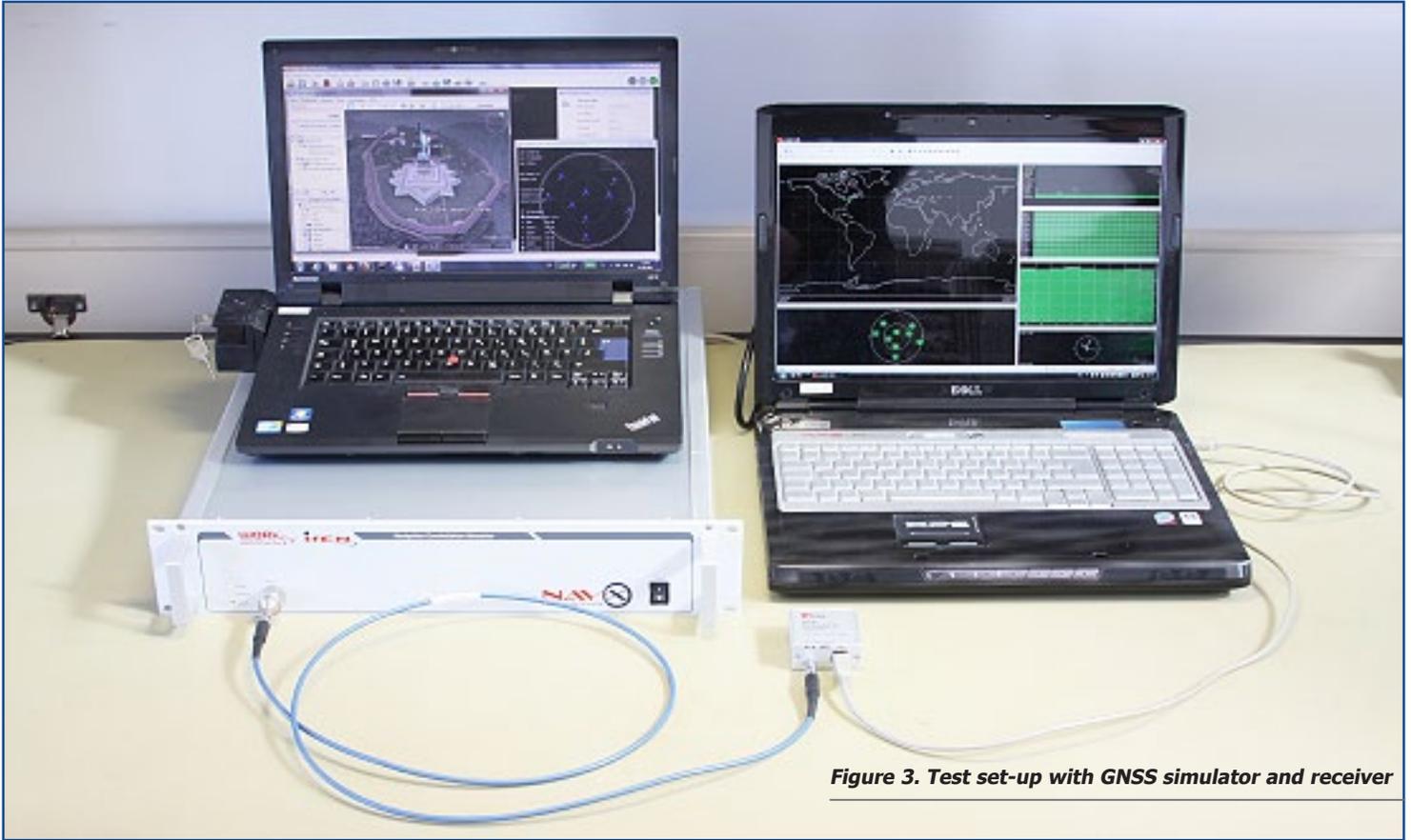


Figure 3. Test set-up with GNSS simulator and receiver

More Streamlined Systems Yet To Come

These are just some of the innovative features that modern GNSS simulators offer while aiding in the successful research and development of global satellite navigation systems. As additional GNSS signals become available and augmentation systems drive forward new growth, more enhancements will be made to GNSS.

Technological developments in the near future promise to greatly improve the functionality of GNSS. For example, the United States is currently working on the third generation of GPS, and Russia continues to innovate GLONASS.

Additionally, Europe's Galileo system and China's BeiDou system are on pace to achieve global coverage by roughly 2020, providing the world with even more reliable satellite navigation systems.

The accuracy and reliability of GNSS will also be improved by third-party augmentation systems, such as WAAS and EGNOS. As these augmentation systems are optimized, users will experience an even more streamlined satellite navigation system.

Editor's note: The capabilities discussed in this article are based on the WORK Microwave and IFEN NavX-NCS GNSS RF signal simulator (pictured below), a full-featured, multifrequency, multisystem, and multichannel signal generator. NavX-NCS



provides support for all of today's SatNav systems, including GPS, Galileo, GLONASS, QZSS and Beidou, simultaneously, and from a single platform. It is ideally suited for R&D of GNSS safety and professional applications, as well as system integration and production testing of mass market applications, including automotive SatNav, mobile phone apps, chip sets, and handheld personal navigation devices. NavX-NCS GNSS simulators feature as many as nine L-band frequencies and 108 channels, offering users more than twice the number of channels than standard simulators. Advanced features include Doppler shift simulation, multiple RF outputs, RTCM correction data, and more. For further information, contact sales@work-microwave.de.

About the authors

Markus Bochenko is an R&D Engineer and has worked with Work Microwave GmbH in Holzkirchen, Germany since 2009. He is responsible for development and the hardware implementation of complex algorithms as well as FPGA and Embedded System Design.

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Sadtler On Careers: Take 'Em Or Leave 'Em For 2012

by Bert Sadtler, Contributing Editor

Best Practice Recruiting should include an original approach, the focus on building trust with the talent, the determination to hire the best candidate and an opportunity for the employer to be favorably represented in the marketplace.

We all work in a community under change. Success includes adopting new trends while embracing change. And so, with the new year almost upon us, let's identify some recruiting-related activities that we wish to be left in the past and others we would like to take into 2013...



- **Leave it:** Employers who want to "hire someone" but are not able to first define their business problem.
- **Take it:** Employers who ask the difficult questions: "Do I have the right senior level talent for our needs today? Will the leaders who got our company to this point be able to grow our company to the next level?"
- **Leave it:** Poor preparation. Employers need to first make sure they define their business problem but also need to invest time in preparing a description of what they want the talent to do in their job in order to solve the business problem.
- **Take it:** Employers with passion and focus who are determined to drive growth and profit through strong leadership and the empowerment of their critical talent. Their style drives higher employee retention and makes the acquisition of new talent an easier process.
- **Leave it:** Employers who measure the success of a recruitment effort by the large number of résumés. It is not about the number of résumés. It is about the quality of the qualified candidates who are both a technical fit and also a cultural fit.
- **Take it:** Employers who recognize changes and trends in the marketplace including the trend that good recruiting is an active process, not a passive process, which requires an investment of personal interaction with business professionals in the business community.
- **Leave it:** Employers who want to check references before they spend any time getting to know the candidate. What benefit can be gained by hearing comments about a candidate who you have never met? Shouldn't the employer first invest time in developing a relationship with the candidate so when they conduct reference checking, the employer has a baseline of familiarity to work with?
- **Take it:** Employers who have abandoned standard interview questions and adopted a discussion approach. The interview effort must be more creative and include original dialogue with the candidate.
- **Leave it:** Employers who still focus on a résumé and formal degrees while not focusing on critical talent's capability to solve the current problem.
- **Leave it:** Hiring managers who take a direct role in interviewing. If they are going to report to you, make sure you take a direct role in the interview process. It is critical to get it right. Taking a direct role shows strong leadership, commitment and increases the overall success of the recruitment.
- **Leave it:** Employers who use search words to identify top candidates. While candidates can insert specific words into their résumés so their résumé will reach the top of the pile, ask yourself how including the "right words" into a résumé correlates to a candidate's true fit and qualifications.
- **Leave it:** Employers who are driven by making a hiring and having a hiring quota. Best practices recruiting should be less about the hire (or the wedding day) and more about the value the candidate can deliver (or the marriage)

- **Take it:** Employers who first reach a verbal agreement and then send a written offer for formal acceptance. The ping-pong of a negotiation is mitigated or eliminated this way. Negotiations should not occur as you are "walking-up the aisle" to an employment marriage.
- **Leave it:** Employers who invest time and effort in recruiting critical talent and then provide little to no support once the candidate starts the new job. A six month on-boarding program is vital to integrate the new talent into your organization. You want the most from the newly hired talent. It requires continuing to invest after they have agreed to join your company.

Here's wishing that great recruiting practices will become the standard in 2013.

About Boxwood Search

There is a battle for senior level talent. A great hire can make a long term positive impact and a failed hire can prove to be very expensive. How does a company recruit and hire the right talent? It is more than just networking within the community of friends and business associates. It requires focusing on results through a process oriented approach. We are committed to reaching a successful outcome. Our recruitment method has repeatedly proven to deliver very qualified senior talent.

We exclusively represent employers in the marketplace as a dedicated resource and discrete trusted advisor. Through original research and industry contacts, we will target qualified candidates and motivate them to consider the opportunity.

We will screen candidates against key criteria, analyze technical fit along with cultural fit, interview, contact references and present our recommendations. Upon making the offer, we are the employer's advocate and an active participant in communicating with the candidate until offer acceptance has been secured. Results are guaranteed.



Heyman On Launches: 2012 Year In Review

by Jos Heyman, Senior Contributing Editor



At the time of this writing it is predicted that by November 1, 2012 we will witness 142 spacecraft involved in 78 launches¹. This tally includes seven satellites deployed from the International Space Station. As to their purpose, an analysis is provided in the two tables on the following page.

Two launch vehicles failed to place their payloads in orbit. Plus, this was the first year that the U.S. no longer had its own capability to send astronauts into space, and, in particular, to the International Space Station. Instead, by the end of the year, the U.S. will have flown four astronauts to the ISS via a Russian Soyuz TMA spacecraft at the cost of \$63 million per flight.



¹This may vary with the launch forecast selected.

Photo of the GPS IIF launch aboard a Delta IV launch vehicle courtesy of United Launch Alliance

Objective	Launched	To be launched	Total
Scientific and technology	42	9	51
Crewed (incl. support)	12	2	14
Interplanetary	0	0	0
Earth observation	14	3	17
Communications	29	15	44
Navigational	10	1	11
Misc. military	5	0	5
Total	112	30	142

Table 1. Satellites launched in 2012 (as of November 1, 2012)

There is some glimmer of light on the horizon, now that **NASA** has contracted and financed three proposals for the **Commercial Crew Development (CCDev)** program for further development.

Of these three proposals (**SpaceX** with a crewed version of the **Dragon** cargo craft, **Boeing** with the **CST-100** spacecraft, and **Sierra**

Year	Launches	Satellites
2002	62	90
2003	61	90
2004	53	73
2005	52	73
2006	63	94
2007	65	115
2008	67	105
2009	75	124
2010	70	122
2011	80	130

Table 2. Annual launches and satellites 2002-2011



Dragon spacecraft captured by the Canadarm of ISS (NASA)

Nevada, with the winged **Dream Chaser®**), the Space X proposal seems to have advanced the furthest, with two of the Dragon cargo craft having docked with the **ISS**. Also, **Blue Origin**, with the **New Shepard**, even though no longer part of CCDev, conducted a successful launch abort test of its proposed spacecraft.



Sierra Nevada Space Systems' Dream Chaser® spacecraft.



Rendering of a Boeing CST-100 capsule mated with an Orbital Sciences Cygnus spacecraft. (Credit: Ben McGee)

With President *Obama* having been re-elected for another four years, the author believes there will be little change in the approach towards space. Instead, it can be expected that there will be more bad news for space. Having said that, the author does not believe that it would have been any different if *Mitt Romney* had been elected.

Budget restrictions will, undoubtedly, continue, affecting not only major programs, such as the **James Webb Space Telescope (JWST)** that has been further delayed to 2018—however, such also impacts on smaller programs.

Heyman On Launches: 2012 Year In Review (Cont.)



Artistic rendition of the James Webb Space Telescope

An example of this was the cancellation of the **Gravity and Extreme Magnetism (GEMS)** mission, which was to be the 13th mission in NASA's **Small Explorer (SMEX)** program.

Although this involved relatively little money, the program was cancelled due to an overrun in expenses. While possibly not the case for GEMS, this cancellation was a good management move and a warning to scientists and engineers that you cannot submit a low bid, get it accepted, and then rely on payments for over-expenditures. Instead, scientists and engineers should provide realistic bids that take the possibility of over-expenditure into full account.

The U.S. budget cuts have also taken its toll on European programs, as well. During 2012, the U.S. cancelled its participation in the **European Space Agency's ExoMars** program as a result of the on-going stand-off between the U.S. Congress and the President. The unfortunate element is that the cancellation of the U.S. participation, in spite of a restructure of the program, could ultimately lead to the cancellation of the entire ExoMars project. What the long term effect of this may be on U.S./European cooperation in space is anyone's guess. The machinations by the U.S. have impacted upon the European space efforts before: Remember **Spacelab**, which was such a great idea, but eventually was shipwrecked by U.S. decisions.

Unrelated, but equally far reaching, was the European Space Agency's decision to stop production of the **ATV** cargo spacecraft after the remaining two spacecraft had been launched in 2013 and 2014. The decision to do so is attributed to obsolescence as well as waning political support.

A proposal to redesign of the spacecraft and provide it with a hardened re-entry capsule was recently dropped, as it would require major upgrades and a redesign of the avionics system.

The expectation is that now commercial flights by U.S. spacecraft will make up for the lost capacity with the close of the ATV program.

In Russia, problems of a different genre were encountered. In the wake of the failure of a **Proton M/Briz M** to place two satellites into geostationary orbit on August 7, 2012, the head of **Khrunichev** (the state owned company that produces the Proton M as well as the Briz M) resigned the day after Russia's Prime Minister reprimanded space officials over a failed launch. The Prime Minister stated that the failures tarnished Russia's image as a "leading space power".

He further ordered the Russian space agency, **Roscosmos**, to take practical measures to improve the quality of work in the space industry. He did not consider the ageing production base, low-quality electronics, and shortage of skilled human resources as a justification for the failures. In the past year-and-a-half, Russia suffered seven failures and 10 satellites were lost.



Artistic rendition of the ExoMars program, courtesy of ESA

It seems more and more likely that, while the commercial space effort in the shape of communications and (some) Earth observation satellites is flourishing, government funded space exploration effort is gradually grinding to a halt, not just in the U.S., but also in Europe and Russia. The only ones that seem to be moving forward are the Chinese. Or, are they?

Following 18 successful launches in 2011 that placed 17 Chinese and four foreign satellites in orbit, China planned to maintain the pace in 2012 and announced a plan for 21 launches to place 30 satellites in orbit. This was part of a plan to conduct 100 launches in the 2011 to 2015 period. It is expected that, by the end of the year, the Chinese will have conducted 16 launches, placing one Chinese satellite into orbit as well as three non-Chinese satellites. This compares with the U.S. (13 launches, 31 satellites) and Russia (26 launches, 37 satellites).

However, China is certainly 'on the move'—the country successfully launched the **Shenzhou-9** mission that docked with the **Tiangong-1** docking module and has continued to expand the Beidou navigational satellite system.



Concept illustration of China's Shenzhou-9 mission



'Self portrait' of the Curiosity Rover composed from 55 high resolution images by the Mars Hand Lens Imager (MAHLI) (October 31, 2012 NASA)

Not all was gloom and doom.

On February 12, 2012, the European Space Agency successfully launched the new **Vega** vehicle that fills a gap in the marketplace for smaller payloads. The **Mars Science Laboratory (MSL)**, also known as the **Curiosity Rover**, landed on Mars on August 6, 2012, and started the commencement of an exciting exploration of the Martian surface. The Curiosity Rover's arrival and landing was a demonstration of new and exciting technology. Approaching Mars, MSL's interaction with the atmosphere started at 1100km altitude. After a re-entry phase of about seven minutes, and at an altitude of 125km, the spacecraft's 15m diameter parachute was deployed, following which the heat shield was separated. At an altitude of 20m and 12 seconds before the landing, the upright rover was lowered by the sky crane structure, which was powered by eight descent engines to the surface on a 7.6m tether. The sky train then flew away from the landing site and was dumped in the immediate Martian surroundings as were other components that were involved in the landing and no longer of any use. Early information sent back by the Curiosity rover indicates that some exciting results can be expected during the first year of operation.

On a less spectacular scale, the U.S. was also expected to launch the first **X-37B** military spacecraft on its second mission (**OTV-3**) before the end of the year.

There has also been an increase in the number of CubeSats launched this year. A total of 26 CubeSats will have been launched before the end of the year. As many as another 18 could have been added to this score if a Russian **Dnepr 1** launch had not been postponed until early 2013.

These small 1kg platforms, whether placed in orbit in their single (1U), double (2U), or triple (3U) unit configurations, have made space access far more affordable for smaller institutions. A large number can be fitted virtually anywhere within a launch vehicle's fairing where there is available space, such as the 11 that were mounted at the base of the Centaur upper stage that was launched on September 13, 2012. The use of CubeSats have seen Hungary, Poland, and Rumania join the ever-growing list of space faring nations

The space related activities of Iran and North Korea continue to ruffle feathers in western nations as the launch attempts are being seen as disguised tests of ballistic missiles that could carry nuclear weapons. Both countries suffered one launch failure during the year—Iran did manage to orbit one satellite.

In both countries, and totally separated from the military value, the space program is a matter of national prestige—these countries can inform their citizens that they are on equal space terms with the powerful U.S., Russian and Chinese programs. This has led to a very unusual move by the North Korean regime, when 200 foreign journalists were taken to the launch site on April 8, 2012, to view the launch vehicle. As a result of the presence of the journalists, North Korea had to officially admit the failure of their April 12, 2012, launch.

Another nation that pushed ahead with its space programme, in spite of the poverty in the country, is India—there are plans for manned flights and Mars missions. Interestingly, the launch of an imaging satellite by India (**RISAT-1** on April 26, 2012) and a ballistic missile test did not seem to concern western countries.

2012 was also the year wherein *Neil Armstrong* passed away, on August 25, 2012. After his legendary spaceflight on Apollo-11 and his famous first step on the Moon, Neil became a living, national treasure for the U.S. and, intentionally or not, never attempted another spaceflight.

To the entire world he became the man who uttered what is perhaps the most famous sentence of the 20th century,

"One small step for man, one giant leap for mankind."

Armstrong was described as 'a reluctant hero', and, as a former Navy officer, his ashes were scattered at sea.

At this point in time, *John Glenn* is still with us. He is now 91-years-old—only two of the six astronauts that flew on **Mercury** remain alive.

One could certainly state that 2013 is going to be a year filled with launch challenges.

About the author

Jos Heyman is the Managing Director of Tيروس 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 organisations. An accountant by profession, Jos is the editor of the **TSI News Bulletin** and is also a regular contributor to the British Interplanetary Society's Spaceflight journal.



SatBroadcasting™: Moving To A More User-Centric TV Experience

by Ofer Shayo, Co-Founder + CEO, Tvinci

Over-The-Top Television (OTT TV) continues to gain a significant share of the video consumption market. For satellite broadcasters, this will force them to ask themselves some significant questions:

- *What will the effects of changing consumer habits have on existing satellite and cable subscriptions?*
- *How can payTV providers use OTT to reduce churn?*
- *How can an OTT service transform the TV experience by incorporating the best elements of an existing, successful model?*

The pre-eminence of Cable and Satellite providers as the dominant force in broadcasting has, for a long time, been undisputed. However, the growing popularity of OTT TV might suggest that the industry is experiencing the beginnings of a fundamental change. Somewhat predictably, there are mixed feelings about what the burgeoning success of companies such as **Netflix** and **Hulu** means for the market. Plus, there's a general lack of consensus about what is the best way to manage these newcomers to the industry.

For consumers, OTT TV provides much needed flexibility. OTT TV allows them to select what content they want to watch and when, where such will be viewed, and on what particular consumer device the content is to be enjoyed. In an age where convenience is so highly valued, and where consumers are averse to relying on programming schedules, it is easy to see why OTT is flourishing.

In some circles, OTT has been viewed as a threat for several reasons; some providers believe OTT will encourage users to cut the cord (or "drop the dish"). Others see the viewing patterns established by OTT as fragmented and worry such will adversely affect their advertising model. OTT is a disruptive technology, especially for the satellite industry. Embracing OTT, however, does actually represent a huge opportunity for the satellite industry.

Some innovative satellite broadcasters are already ahead of the pack, using elements of OTT to drive their strategy. **BSkyB** in the UK recently added OTT TV to its existing subscription model with the launch of **NOW TV**, the Company's proprietary platform that leverages its vast content rights to deliver on-demand video, such as movies and, eventually, live sport, across a multiplicity of devices. The appeal of such a service to some consumers is that it is there is no need for a commitment to a full subscription of the full **Sky** package, and consumers are given far more choice over the type of content they access and how much they pay. In response to the gradual slowing of growth in subscriber figures, Sky's strategy is to target households who haven't yet subscribed to what can be expensive payTV bundles, and to target those consumers who are increasingly watching content on mobile devices.



Embracing OTT

By incorporating OTT into a satellite distribution model, service providers can considerably extend their reach and open up new revenue opportunities, all the while attracting new customers. By acting quickly to get ahead of the game and by looking at the demands of its existing subscriber base, **BskyB**, to continue this example, has anticipated the future and strategically pioneered a move into the OTT environment.

The logic behind the thinking, as mentioned before, is that consumers will be increasingly inclined to pay for a more flexible and often less expensive service. A similar shift was seen in the early 2000s as students and others began to give up the traditional phone service in favor of mobile phones—10 years later, one in four US homes does not have a landline (*US Centers for Disease Control and Prevention (CDC), 2010*).

There will also be consumers who, for whatever the reason, have not paid for a subscription to a satellite bundle but will still be part of the satellite provider's customer base through an OTT offering, whereas without the OTT offering, they might not be so inclined to access such a satellite service. Importantly for existing customers, OTT TV provides a premium service in addition to what is already being paid for, so providers are not cannibalizing their own user-base for new business.

An important goal for any provider is to reduce churn as much as possible. Having the ability to deliver content to multiple devices goes some way in helping achieve that objective, extending the reach of the service. Instead of OTT being deployed as a method of defense, it should be looked at as a key component of the company's ecosystem and a way of driving significant return on investment (ROI). It holds a two-fold advantage; it has the potential to lure new customers, while simultaneously reducing churn within the existing customer base.

Capitalizing On OTT

One of the best routes whereby Satellite broadcasters can become part of, and succeed commercially in, the OTT environment is by moving towards a personalized, user-centric approach to content delivery; enabling consumers to watch the content of their choice—based on their preferences or their friends' activities—on any device, at any time of day. This is an issue at the moment, as delivering content to multiple devices and delivering the interactivity that consumers are increasingly expecting, is difficult to provide via DTH signals.

The solution to this problem does not have to be an aggressive switch from broadcast to an OTT infrastructure. However, it does make sense to take advantage of and incorporate IP as a method of delivery into a satellite offering.

Satellite does not offer the same capacity, or capabilities, as IP; without elements of OTT being incorporated into the model, second screen viewing (mainly via tablets) and interactivity is not easily achieved for operators. Satellite companies can look to mirror their channels and programs over OTT in order to reach second screen devices, or offer a hybrid service where bundles of the more niche channels are delivered over the top to the TV; this would have the additional effects of clearing space for other premium channels and allowing operators to reduce



broadcast costs. With the correct tools and commitment, satellite broadcasters can use OTT to create a relevant and cutting edge TV service, and this is the future of the TV industry. OTT is not only a new method for satellite broadcasters to offer their content everywhere, but also an opportunity to transform the TV experience by providing a new TV viewing experience through the incorporation of the best elements of OTT to an existing, already successful model.

OTT 2.0: Revolutionizing TV As We Know It

In order to really transform TV, an inherent part of the satellite TV service should include "OTT 2.0" capabilities by creating an experience that truly uses what the intersection of web and TV has to offer, and provides consumers with a completely intuitive and personalized TV service.

OTT 2.0 differs from earlier generations in several key ways. The most important is that content consumption is now an entirely personal experience. A tailor-made viewing experience for each member of the household is created by the facilitation of personalized recommendations, interactivity, and complete integration with a multiplicity of companion devices. It is a native system, fundamentally designed to meet the challenges of newcomers to the OTT industry and those operators branching out of traditional TV.

Tvinci's OTT 2.0 platform integrates the second screen seamlessly within the TV service, targeting each user individually within the household and allowing true personalization. Tablets and smartphones are used for direct viewing (first screen) and for playing with while watching TV (second screen), to provide complete synergy within the entire ecosystem.

By changing the way we discover and interact with selected content, OTT 2.0 is shaping the future of content consumption and enabling the personalized, user-centric service that consumers want and need. Satellite already has the benefits of being reliable and able to deliver

unique live programming to the living room, but as it expands to additional Internet connected devices, delivering the content alone is not enough: Viewers use these devices differently, and the viewing experience should use each device's capabilities and the array of new monetization possibilities the medium (Internet) offers.

Satellite and OTT are not mutually exclusive; if used correctly, OTT can provide a complementary technology, working in harmony with Satellite broadcast to deliver a blockbuster service to viewers.

Once Satellite operators take this leap forward, OTT 2.0 will reach every tablet and smartphone owner, offering unprecedented interaction, social content discovery and personalisation, and television really will be revolutionized for everybody.

About the author

Ofer is a seasoned Internet entrepreneur with a background in IPTV services, selected by Forbes as one of the 300 most promising young entrepreneurs in Israel. As a senior project manager at CoolVision, Ofer successfully lead the development and deployment of an international video chat operation. Ofer was a partner at Frido, a boutique provider of creative Internet solutions and co-founded Tvinci in 2007 with Ido Wiesenberg.



Survey: The Size + Health Of The United Kingdom's Space Industry

The 2012 *Size and Health of the United Kingdom's (UK) Space Industry* survey represents the latest incarnation of the key biennial barometer of the UK space industry. The UK Space Agency contracted Oxford Economics to conduct this edition, covering the years 2009/10 and 2010/11; Oxford Economics also conducted the 2010 survey. This article presents an executive summary of the findings.

This edition of the survey invited almost 420 companies and institutions to participate, selected through their involvement in previous surveys and their inclusion in the online *UK Space Directory*. Of those contacted, 234 were deemed to be actively involved in the UK space industry through their responses to this and previous surveys. The range of business activities captured encompassed both the upstream (providers of space technology) and downstream (users of space technology) space sectors, with respondents ranging from sole-traders to large multinationals with multi-million pound turnovers.

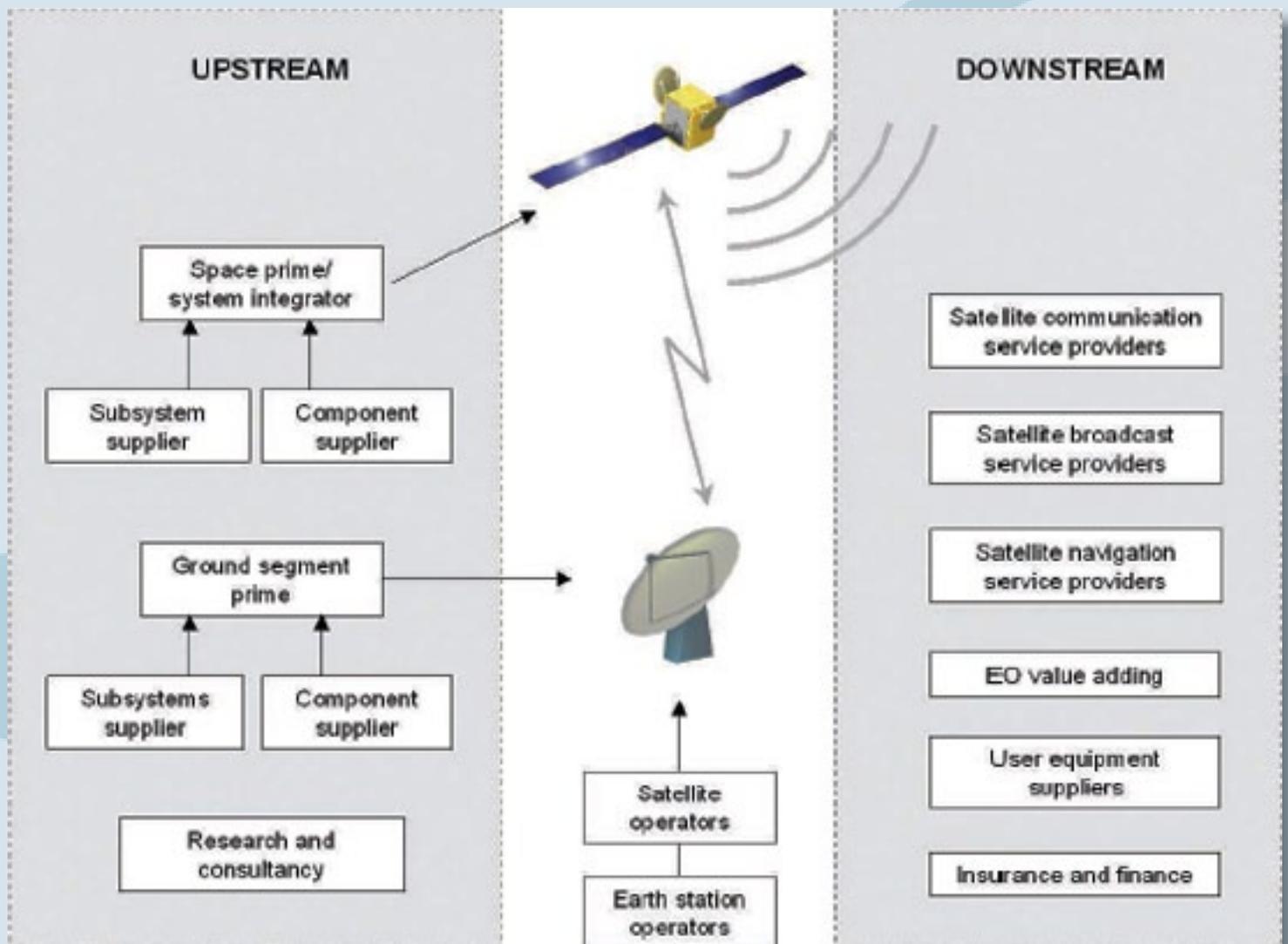


Figure 0.1: Definition of the UK Space Sector

Given the prolonged period of poor economic performance in the UK and wider instability in Europe, the 2012 survey is possibly the most important ever conducted. Not only will its findings provide a crucial insight into how the sector has fared, they will also provide a guide for government and industry associations as to where companies are experiencing difficulties and barriers to growth. Encouragingly 42 respondents were not included in previous editions of the survey, suggesting that these companies were newcomers into the sector.

To ensure consistency with previous editions of the survey, the significant majority of questions remained unchanged from the 2010 version. However, three questions were added to the end of the 2012 survey in order to capture industry opinion on the factors currently limiting growth, potential strategies that the industry is seeking to employ to generate further growth, and the industry's medium-term growth forecast.

Size Of The Industry

Together the 234 companies deemed to be actively involved in the UK space industry recorded a total space-related turnover of over 9.1 billion pounds in 2010/11 (Chart 0.1). As in previous editions of the survey, the industry is dominated by the downstream sector, accounting for almost 8.2 billion pounds (89 percent) of the total. This represented a real (adjusted for inflation¹) growth of 6.5 percent between 2009/10 and 2010/11, and by 15.6 percent since 2008/09 (the year covered by the previous survey)—an average annual growth rate² of 7.5 percent.

This strong performance indicates that the space industry continues to grow despite the uncertainty in the UK economy. Indeed, the average annual real growth rate over the last two years is only slightly below the long-term real growth trend for the industry (8.6 percent per annum since 1999/2000). However, that is not to say the space industry is immune from prevailing economic conditions; the industry's growth has slowed from that recorded in the 2010 survey (when an average annual real growth of 10.2 percent was experienced between 2006/07 and 2008/09). Furthermore, industry expectations for growth in 2011/12 are low, with the industry anticipated to grow by just 0.7 percent in real terms.

Examining the industry in greater depth shows that the strong growth recorded by the industry since 2008/09 is almost solely down to the robust performance of the downstream sector, which reported a

real growth of 17.6 percent between 2008/09 and 2010/11 (an annual average of 8.5 percent). Conversely the upstream sector continued to face a more difficult sales environment, with real turnover increasing by only 1.3 percent between 2008/09 and 2010/11 (an annual average of just 0.6 percent). However, 2010/11 was a stronger year for the upstream sector, with a real growth of 3.3 percent (compared with a real decline in turnover of 1.9 percent in 2009/10).

Indeed, over the period 2008/09-2010/11, the upstream sector outperformed the UK economy as a whole, which reported an average annual real decline of 0.1 percent³. Nonetheless, 2011/12 is expected to be a difficult year for both the upstream and downstream sectors of the space industry; downstream turnover is expected to grow by just 1.0 percent in real terms, while the upstream sector is anticipating a real decline in turnover of 1.8 percent. Despite this, the outlook for the UK space industry beyond 2012 is extremely positive, an aspect explored in more detail later in this report.

¹As measured by the Consumer Price Index.

²Computed as the compound average growth rate.

³Source: Office for National Statistics.

Economic Impact Of The UK Space Industry—Value-Added

While turnover provides a good indication of the size of an industry, the value-added (defined as turnover less all input costs) an industry creates provides an indication of the impact of the space industry on the UK economy.

From a turnover of almost 9.2 billion pounds in 2010/11, the UK space industry made a value-added contribution to UK GDP of 4.2 billion pounds. This represents a real growth of 5.3 percent from 2009/10, and 7.3 percent from 2008/09 (an average annual real growth of 3.6 percent).

As Chart 0.2 shows, the majority (88 percent) of space value-added was generated by the downstream sector, which saw real growth of 7.8 percent between 2008/09 and 2010/11 (an annual average real growth of 3.8 percent). Over the same period, the smaller upstream sector also recorded real growth (3.7 percent), but this was the result of a strong performance in 2009/10 when value-added increased by 4.8 percent in real terms; in 2010/11 the upstream sector recorded a real decline in value-added contribution to GDP of 1.0 percent.

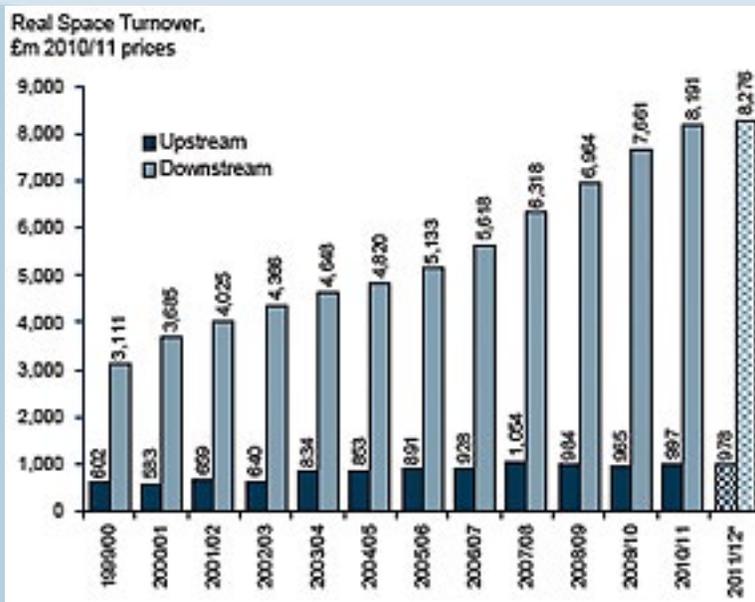


Chart 0.1: UK downstream and upstream space industry turnover, 1999/2000 - 2011/12

Source: Oxford Economis

* 2011/12 projected based on survey responses

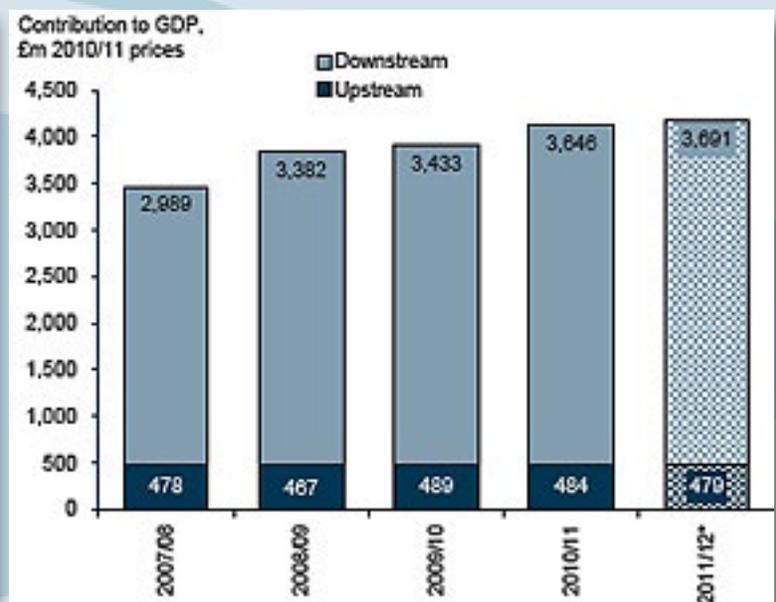


Chart 0.2: UK space industry gross value-added, 2007/08 - 2011/12

Source: Oxford Economis

* 2011/12 projected based on survey responses

Survey: The Size + Health Of The UK's Space Industry (Cont.)

Given the projected slowdown of turnover in 2011/12, the associated weakening of the space industry's value-added contribution to UK GDP displayed in *Chart 0.2 (below)* is anticipated. The space industry as a whole is expected to increase its contribution to the UK economy by 1 percent in real terms in 2011/12; however, this is purely driven by the contribution from the downstream sector, which is projected to grow by 1.2 percent in real terms. Conversely the upstream sector is expected to continue to see its value-added contribution to GDP decline in real terms.

Economic Impact of the UK Space Industry—Employment

Employment in the space industry has continued to grow rapidly since the previous survey to reach 28,943 in 2010/11. Survey responses indicate that these employees are highly skilled, with almost 80 percent holding at least a first degree. Although the average annual growth recorded between 2008/09 and 2010/11 was just half of that witnessed between 2006/07 and 2008/09 (7.8 percent compared to 14.8 percent), this performance is in line with the average annual growth rate of 7.4 percent recorded since 1999/2000 (*Chart 0.3*). Industry expectations for 2011/12 are of a 3.7 percent growth in employment, with over 30,000 industry jobs expected to be supported.

As expected, the downstream sector dominates employment, accounting for over 21,825 jobs in 2010/11 and up 24.1 percent compared to 2008/09; however, the upstream sector has not shared this employment growth: between 2008/09 and 2010/11 employment declined by 2.5 percent to just over 7,100 jobs. The number of upstream jobs is expected to grow by 0.7 percent in 2011/12, while downstream employment is projected to reach 22,850—a 4.7 percent growth on 2010/11.

Responding companies' UK locations were noted and categorised regionally to give an indication of where the work is undertaken. This is potentially misleading for organisations that have a number of offices and plants across the country, but in practice the main companies in the field tend to be based in the South East of England, which dominates the numbers.

The distribution of space industry employment is highly concentrated, with the UK's South East corner accounting for 91 percent in 2010/11: the Greater London region contains 55 percent of UK space employment, with the South East accounting for a further

24 percent (up from 20 percent in 2008/09) and the Eastern region 12 percent (*Chart 0.4, below*). Space employment outside of the South East corner is concentrated in the South West and East Midlands, which together hold 8 percent of total space employment (up from 6 percent in 2008/09).

Economic Impact of the UK Space Industry—Multiplier Impact

The space industry has a greater impact on the UK economy than simply the activity and jobs in those companies directly part of the industry. Both upstream and downstream companies source goods and services from UK-based companies outside the space industry thereby generating activity in the rest of the economy (known as the *indirect impact*). Further, individuals employed in the space industry and its suppliers spend their earnings in the UK, stimulating additional economic activity (the *induced impact*). Together, these impacts are known as the industry's *multiplier impact*.

Using the survey responses, the space industry's value-added multiplier has been estimated to be 1.99. This means that the industry's direct value-added contribution to GDP of 4.1 billion pounds in 2010/11 results in an additional GDP contribution of 4.1 billion pounds through the multiplier impact; therefore, the industry's value-added contribution to UK GDP in 2010/11 was estimated to be a total of 8.2 billion pounds (*Chart 0.5, next page*).

Similarly, the employment multiplier for the UK space industry is estimated at 3.50. This means that the total UK-based employment supported by the UK space industry was estimated to be 101,200 in 2010/11. The employment multiplier is significantly larger than the value-added multiplier reflecting the high productivity nature of the industry. As productivity levels in the space industry are higher than the economy average, relatively few employers in the industry are able to support a large number of jobs through the indirect and induced channels.

Both the value-added and employment multipliers for the space industry have increased since the previous survey (value-added from 1.91 to 1.99 and employment from 3.34 to 3.50). These increases are positive news for the UK as they indicate a strengthening of UK-based supply chains for the space industry and mean that more of the value generated by the space industry and its suppliers is retained in the UK economy.

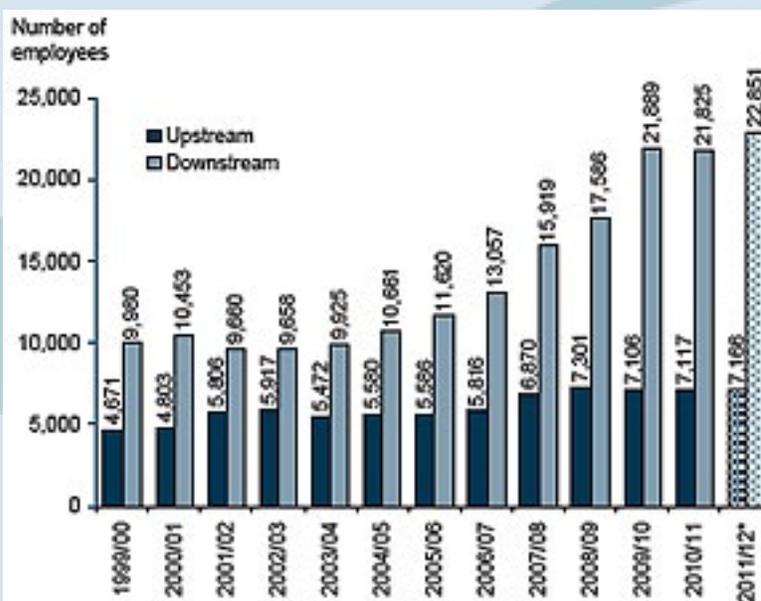


Chart 0.3: UK downstream and upstream space industry employment, 1999/2000 - 2011/12

Source: Oxford Economics

* 2011/12 projected based on survey responses

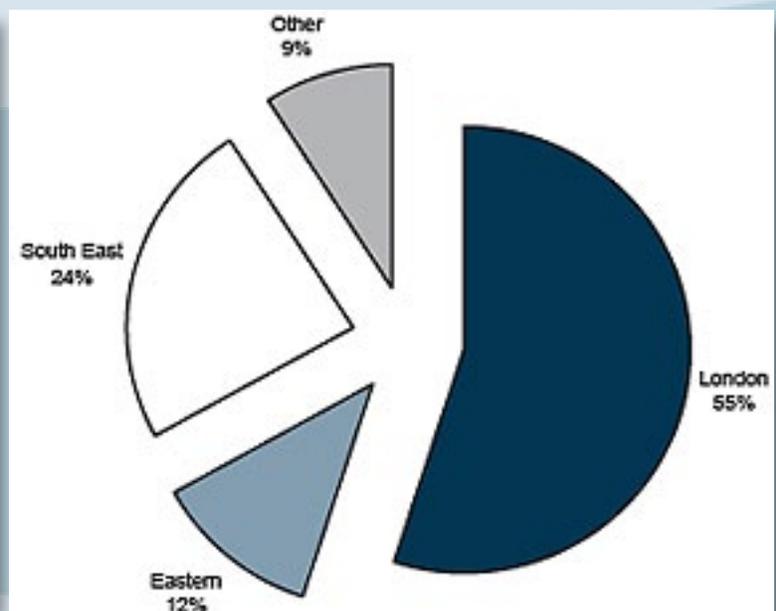


Chart 0.4: Regional distribution of space employment, 2010/11

Source: Oxford Economics

Business Categories

Responses to the 2012 survey have highlighted that there has again been a significant shift in the composition of the upstream sector since the previous survey. In the 2010 survey, the *Space Subsystem Supplier* business category was responsible for the largest share of upstream turnover, accounting for 40 percent of the total. However, as *Chart 0.6 (below)* demonstrates, the upstream sector has become more diverse, with no activity accounting for more than 17 percent of turnover. Indeed, the previously dominant Space Subsystems Supplier only accounted for 16 percent in 2010/11.

Large increases have been witnessed in the market shares held by businesses operating in *Contract, Research, Design and Consultancy*, including university research departments (from 6 percent of turnover in 2008/09 to 10 percent in 2010/11), and the *Space Prime/System Integrator* category (from 10 percent in 2008/09 to 17 percent in 2010/11).

Whereas the two previous editions of the survey reported a movement from Space Prime to Space Subsystems, with the indication that the UK upstream sector was increasing its emphasis on the provision of payload subsystems, rather than complete spacecraft, the results of the 2012 survey suggest that the movement has reversed. However, it should be noted that a business changing the definition of activities does not mean that there is a substantive alteration in the actual processes conducted.

The 2010 edition of the survey noted that the division of employment between upstream business categories was not as extreme as that for turnover; the 2012 survey indicates this remains the case, with no category accounting for more than 16 percent of total upstream employment (*Chart 0.7, on the next page*). The largest movement in terms of the proportion of employment was experienced by the Space Subsystem Supplier, which fell from accounting for 28 percent of employment in 2008/09 to just 15 percent in 2010/11. Conversely *Space Prime/System Integrator* and *Space Component or Material Supplier* business categories both saw significant jumps in their share of employment over the same period, from 9 percent to 16 percent and 10 percent to 16 percent respectively. A similar pattern can be seen for upstream employment by business category.

As found in previous surveys, the downstream sector continues to be dominated by the *Satellite Broadcast Provider* subsector (*Charts 0.8 and 0.9*); once again this was driven by *Direct-To-Home (DTH)* satellite television. Indeed, between 2008/09 and 2010/11, the share of turnover accounted for by the Satellite Broadcast Provider subsector increased slightly to 70 percent.

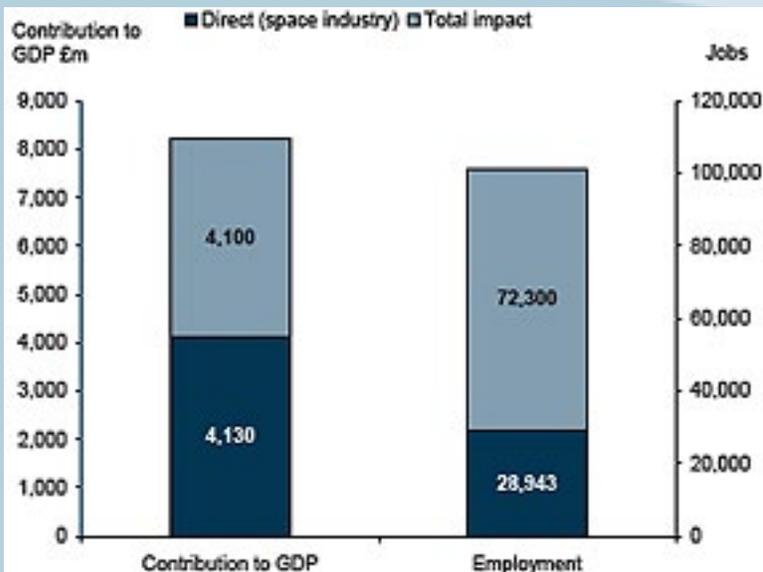


Chart 0.5: The total economic impact of the UK space industry, 2010/11

Elsewhere in the downstream sector, there has been little change in the proportion of turnover and employment held by each subsector. In terms of turnover, subsector contributions have remained static: aside from the Satellite Broadcast Provider subsector, only the *Satellite Communications Provider* subsector saw a notable change in its share (from 18 percent in 2008/09 to 14 percent in 2010/11). The composition of downstream employment has been more flexible. However, even this has been limited to incremental changes in share, the largest of which was the 2 percentage-point fall held by Satellite Broadcast Provider (from 67 percent to 65 percent) and a 2 percentage-point increase for Support Products and Service businesses (from 10 percent in 2008/09 to 12 percent in 2010/11).

Customers

Previous editions of the survey have noted that the UK space industry's largest customer group was the commercial sector. The 2012 survey indicates that this remains the case, accounting for 85 percent of total industry turnover (*Chart 0.10*). The commercial sector also accounted for 85 percent of turnover in the 2010 survey, albeit with a marginally different breakdown between *Business-to-Business* and *Business-to-Consumer*; the 2012 survey indicates that Business-to-Consumer sales have become more important to the industry (up 2 percentage points to 62 percent) since 2008/09.

The breakdown of sales to other types of customer have remained static since 2008/09, with *Military* sales slightly more important (7 percent) than those to *Space Agencies* (5 percent) and *Civil Government* (3 percent).

The dominance of Business-to-Consumer sales results in a significant UK focus to space industry activities, and this intensity has increased by 3 percentage points since 2008/09 to 78 percent in 2010/11 (*Chart 0.11*). While the UK focus increased, the proportion of sales accounted for by customers in the rest of Europe and the Americas declined, by 3 and 1 percentage points respectively; however, Asia has become a slightly more important market for the UK space industry, accounting for 4 percent of sales in 2010/11 (compared to 3 percent in 2008/09).

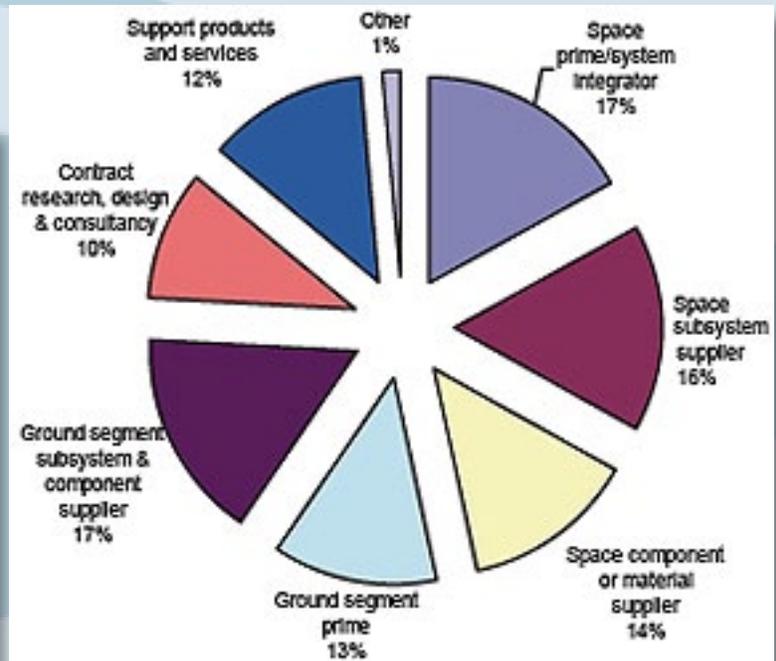


Chart 0.6: Upstream sector turnover by business category, 2012/11

Source: Oxford Economics

Survey: The Size + Health Of The UK's Space Industry (Cont.)

The movement from Europe and the Americas to Asia is not surprising given the relative economic performance of the regions: Europe and the Americas (the US, in particular) have been slow to emerge from recession, while the large Asian markets of China and India have continued to grow. As such, the shifting pattern of exports encountered by the space industry is not dissimilar to the experiences of other industries.

Applications

The domination of *Broadcasting* as the main method of use of UK space products was reported in each of the previous two surveys, and this pattern continues in the 2012 survey (*Chart 0.12*), with it accounting for 69 percent of all sales (up 1 percentage point compared to 2008/09).

The second largest method of use—*Telecommunications*—has experienced a slight fall in its importance, accounting for 21 percent in 2010/11, compared to 24 percent in 2008/09. This fall has been countered by increased market shares in *Space Transportation and Navigation*, both up 1 percentage point to 1 percent and 3 percent of total sales respectively.

Broadcasting sales increased by 17.6 percent in real terms between 2008/09 and 2010/11, with this growth alone accounting for 80 percent of all growth since 2008/09. The use of UK space products for *Navigation* witnessed an even greater growth rate, increasing by almost 80 percent in real terms between 2008/09 and 2010/11; this accounted for 10 percent of the industry's total growth. Growing from a far smaller base, the use of products for *Space Transportation* accounted for 5 percent of industry growth since 2008/09.

Research + Development

Spending on *research and development (R&D)* is crucial for the growth of the UK's knowledge economy. Sectors such as the UK space industry that are R&D intensive play a central role in driving the UK's knowledge base. As in the previous three editions of the survey, respondents were asked about the level of R&D investment undertaken and the source of funding.

The 2008 and 2010 editions of the survey both reported that R&D spending in the upstream sector as a percentage of turnover had declined from the previous survey. The 2012 survey has found that this trend has continued (*Chart 0.13*), with total upstream R&D activity equating to 5.2 percent of turnover (in 2004/05 upstream R&D expenditure was 14.1 percent of turnover; in 2006/07 this had dropped

to 8.3 percent; the 2008/09 value was 7.3 percent of turnover). Having said this, the level of internal funding for R&D activities in the upstream sector has increased, from 3.2 percent of turnover in 2008/09 to 3.3 percent of turnover in 2010/11.

R&D expenditure in the downstream sector remains significantly lower than in the upstream, although this has increased as a share of turnover to 0.8 percent, compared to 0.7 percent of turnover in 2008/09, as R&D investment in the downstream sector increased by a third in real terms. The breakdown of downstream R&D funding between internal and external sources reported in the 2012 Survey indicates a movement towards greater reliance on internal funding: internal funding accounted for 72 percent of total in 2010/11 as compared to 55 percent in 2008/09.

The *Department of Business, Innovation and Skills* estimates that the 1,000 largest companies (by R&D spending) in the UK invest 1.7 percent of their turnover into R&D activities⁴. Although the space industry as a whole falls below this marker, the upstream sector is 50 percent more R&D intensive than the Aerospace and Defence sector (which invests 3.5 percent of turnover in R&D).

⁴BIS (2010) *The 2010 R&D Scoreboard*.

Beyond 2012

This edition of the survey presented respondents with a series of new questions examining the challenges their business faces, the strategies the company is planning to implement to stimulate growth, and their expectations of future performance.

The most common barrier faced (33 percent of respondents) in the year 2009/10 was a lack of sufficient demand for the products or services companies produced. A lack of skilled employees was a close second, with 32 percent of respondents reporting their company had encountered this barrier. A lack of investment and working capital were less common, but still reported by enough respondents to provide a concern (24 percent and 16 percent respectively). Survey responses indicated that the greatest barriers faced by the smallest companies were a lack of access to working and investment capital.

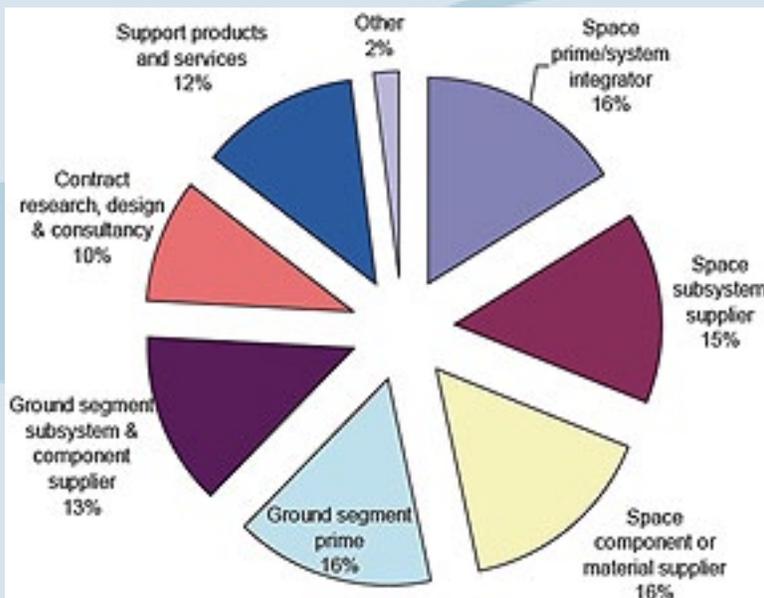


Chart 0.7: Upstream sector employment by business category, 2010/11

Source: Oxford Economics

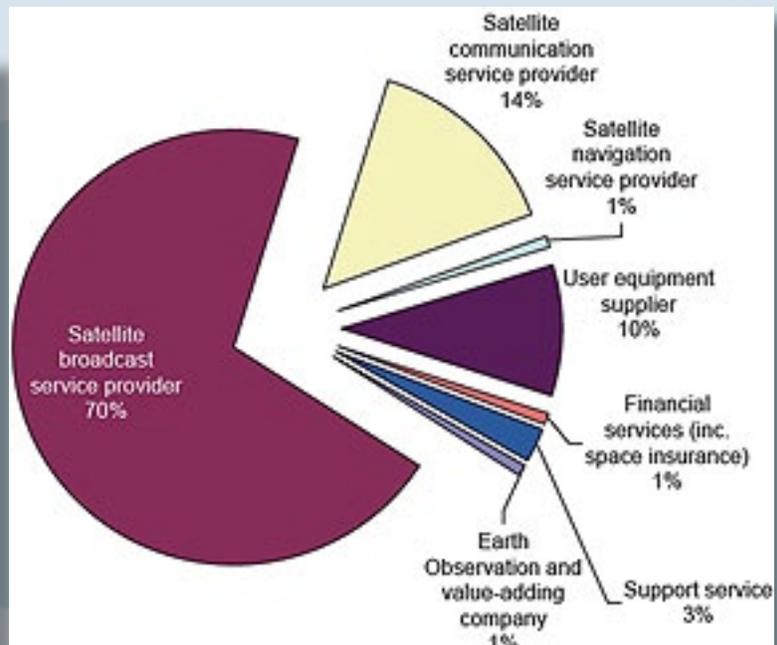


Chart 0.8: Downstream sector turnover by business category, 2010/11

Source: Oxford Economics

Looking forward, half of responding companies were seeking to expand independently into new geographic and product markets in order to deliver future growth (*Chart 0.14*); 40 percent were also considering recruiting extra permanent staff. From a turnover perspective, the most common strategy is independent expansion into new geographic markets—possibly continuing the trend of the increasing importance of sales to Asia. Businesses also appear to be open to the possibility of forming alliances or joint ventures in order to effectively exploit new markets. Furthermore, more than 60 percent of respondents (weighted by turnover) will be seeking to make new capital investments.

The outlook for the UK space industry is extremely positive. Almost two thirds of companies are expecting to see performance pick up at least slightly, with half of those expecting significantly stronger performance (*Chart 0.15*). Indeed, companies accounting for 80 percent of respondents' turnover expected slightly stronger growth, and a further 10 percent expected significantly stronger growth. This positive outlook is no better illustrated than through the recent achievements of two UK companies, **Astrium** and **Surrey Satellite Technologies Ltd. (SSTL)**.

Astrium has been selected by the **European Space Agency (ESA)** as the prime contractor for the **Solar Orbiter** mission that will perform close-up observations of the Sun. The 300 million euros contract was signed in April 2012. Astrium UK will lead a team of European companies who will supply various parts of the spacecraft. The contract is one of the largest ever signed between the ESA Science Programme and a UK company.

SSTL signed a contract with **OHB** in July 2012 for the construction of a further eight navigation payloads for the European **Galileo** programme. Under the contract, worth approximately 80m euros, SSTL will construct the navigation payloads for the second batch of **Full**

Operational Capability satellites (**Work Order No. 2**), continuing a successful cooperation between the two companies to build the first 14 satellites (**Work Order No. 1**) under the supervision of the ESA.

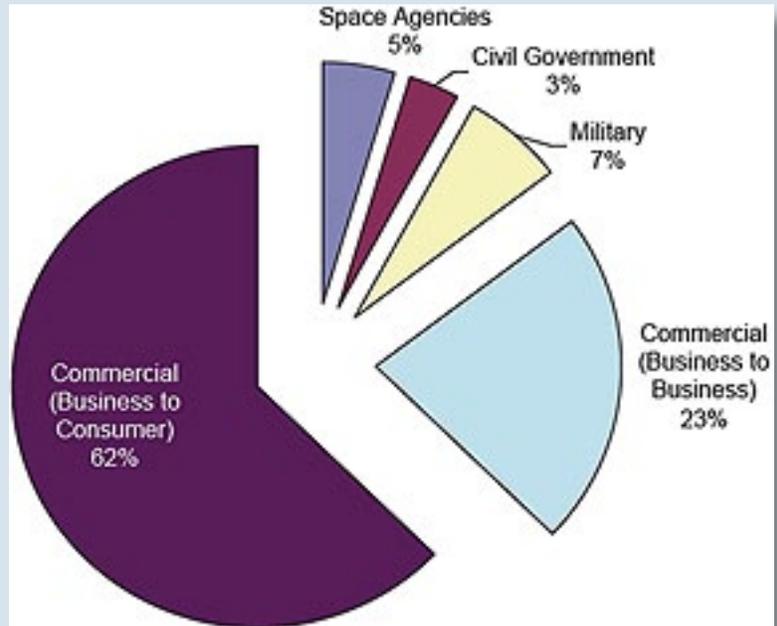


Chart 0.10: Market share by customer type, 2010/11
Source: Oxford Economics

Survey: The Size + Health Of The UK's Space Industry (Cont.)

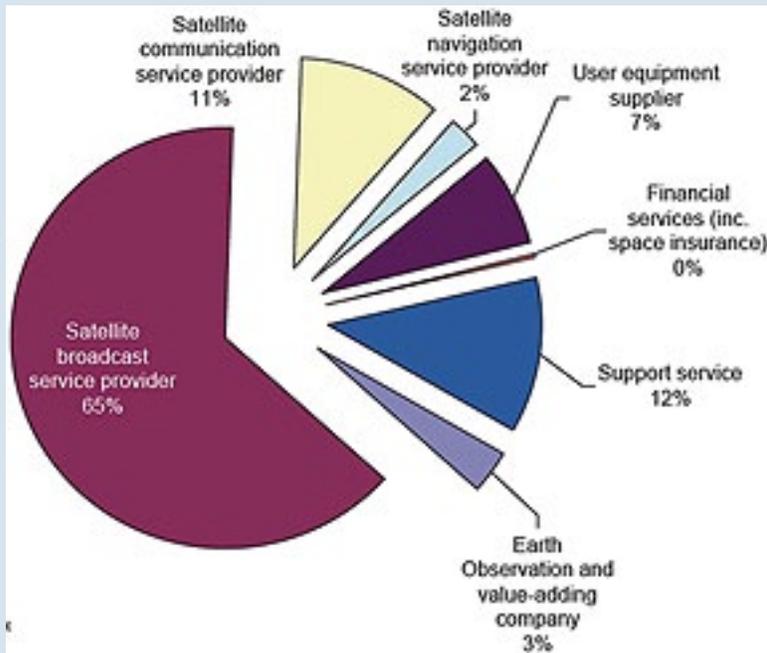


Chart 0.9: Downstream sector employment by business category, 2010/11

Source: Oxford Economics

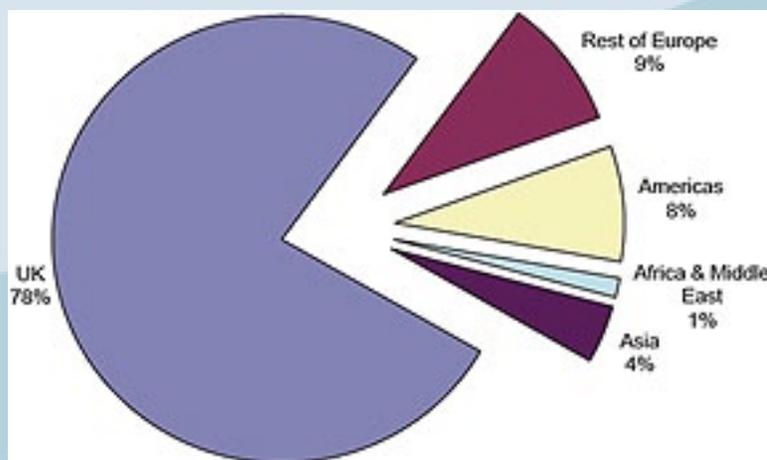


Chart 0.11: Market share by customer location, 2010/11

Source: Oxford Economics

About the agency...

The UK Space Agency is an executive agency of the Department for Business, Innovation and Skills (BIS) and at the heart of UK efforts to explore and benefit from space.

Space is an essential part of all our everyday lives and one of the key enablers of the global economy. Space has revolutionized telecommunications services, climate and weather forecasting, commerce, environmental management, security, banking, navigation and TV broadcasting.

Reporting to the Minister of State for Universities and Science, the UK Space Agency is at the heart of UK efforts to explore space, exploit space-based applications and technology and support our academic and industrial communities.

The UK Space Agency was launched officially on March 23, 2010, and became a full executive agency of BIS on 1 April 2011. On this date the responsibility for all space activities was transferred from a number of bodies, including government departments, Research Councils and non-departmental public bodies. The Agency therefore became responsible for the entirety of the UK space activities.

Representatives of the above bodies were invited to join the Space Leadership Council, which advises the Minister. A Steering Board was established to advise the Chief Executive, and an Audit Committee to provide guidance and formal oversight. The Chief Executive chairs an Executive Board, which is comprised of UK Space Agency directors.

UK space policy is carried out within the framework of the UK Civil Space Strategy 2012-2016. (PDF, 4.6 Mb) This strategy shapes the direction of UK space policy.

The UK Space Agency also interfaces with other departments on security and military programmes. Although it does not manage these programmes directly, the UK Space Agency is kept informed and involved in decisions relating to the programmes as necessary.

Collaboration lies at the heart of the UK Space Agency ethos and applies across Government as well as to external organisations including European and global partners such as the European Space Agency (ESA), the European Union, national space agencies and the United Nations.

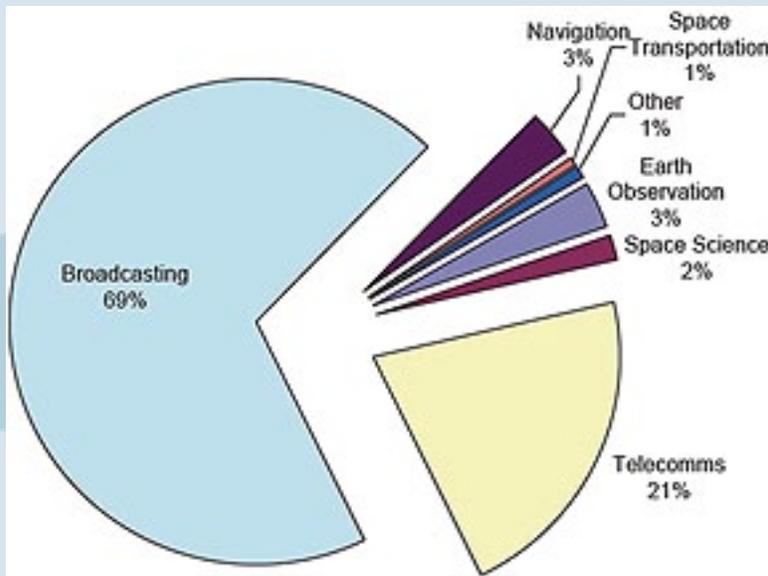


Chart 0.12: UK space turnover by application, 2010/11

Source: Oxford Economics

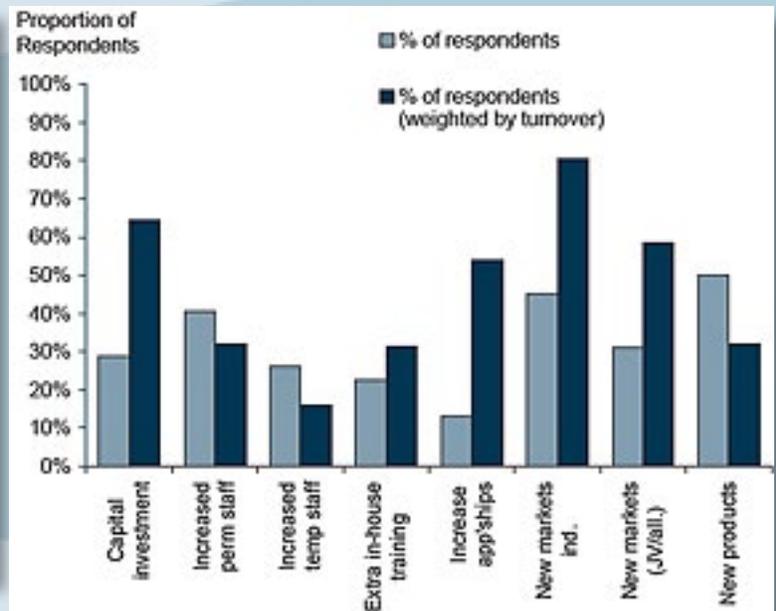


Chart 0.14: Growth generating strategies employed by the space industry

Source: Oxford Economics

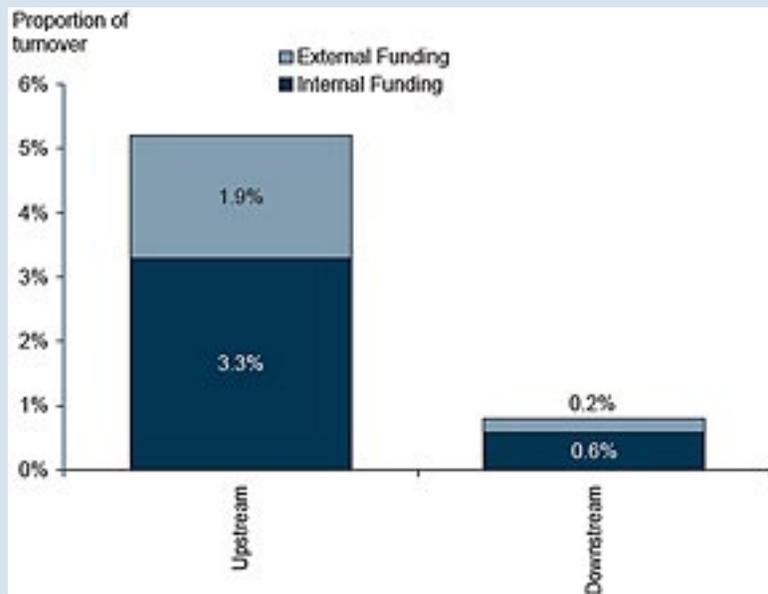


Chart 0.13: UK space research and development expenditure, 2010/11

Source: Oxford Economics

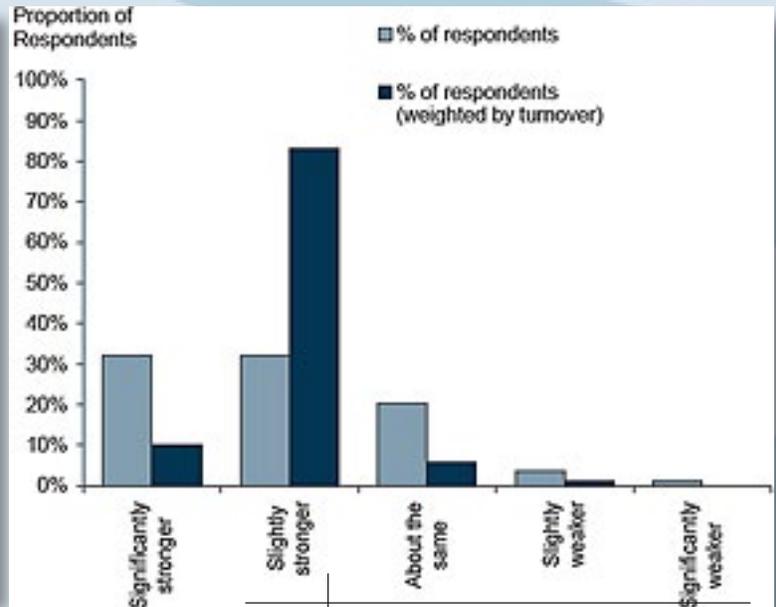


Chart 0.15: Growth prospects, 2012-2015

Source: Oxford Economics





2012

YEAR IN REVIEW

Welcome to *SatMagazine's* annual YEAR IN REVIEW issue. Dozens of leading companies have offered their insights and an examination of their experiences regarding their operations during 2012... offered in alphabetical order, these major representatives of the SATCOM and related industries look forward to the coming year despite global economies that are, generally speaking, somewhat lethargic. We can report that the SATCOM industry, as a whole, appears to be solid and experiencing growth. There have been, and will be, mergers and acquisitions as well as transitions of personnel and projects in a variety of companies around the globe.

Company executives were asked by *SatMagazine* about their 2012 successes, the challenges they faced and overcame, and their look into the future. Some companies decided to follow a Q&A format, while others preferred a narrative style. In either instance, we hope the readers of *SatMagazine* find the following Roundtable to be of interest and, most importantly, an inspiration realizing that the SATCOM and related industries face a bright future. *All our best...* the editors.

Analytical Graphics (AGI)	Page 73	Iridium	Page 88
Asia Broadcast Satellite (ABS)	Page 74	Marlink	Page 89
AsiaSat	Page 75	ND SatCom	Page 90
Astrium Services	Page 76	NewSat Limited	Page 91
Beam Communications	Page 77	Newtec CY	Page 92
Boeing Space & Intelligence Systems	Page 78	Norsat International, Inc.	Page 93
Communciations & Power Industries (CPI)	Page 79	ORBIT Communication Systems	Page 94
DeLorme	Page 80	Pactel International	Page 95
EM Solutions	Page 81	SkyWave Mobile Communications	Page 96
Hermes Datacomms	Page 82	Space Systems / Loral (SS/L)	Page 97
HTN Communications	Page 83	Telespazio VEGA UK	Page 98
Hughes	Page 84	Thermopylae Sciences + Technology	Page 99
iDirect	Page 85	ViaSat	Page 100
Intelsat	Page 86	Vislink	Page 101
Intorel	Page 87	WORK Microwave	Page 102

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

by Frank Linsalata, Chief Operating Officer

What successes did AGI enjoy over the past year?

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

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

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

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

Beyond the free product, we've repackaged our advanced modules and have added new ones specifically designed to address our shift to Systems Tool Kit and a broader market. We have incorporated new products that address the marketplace's conversion toward software tools for enterprise interoperability and web-based clients.

For example, AGI's cloud-based server, the **STK Data Federate**, is hosted as a service to users. You can search and retrieve standard STK objects such as satellites, facilities and aircraft, and download scenarios of standard space systems that are ready to be customized for your particular analysis. Another example is STK Server, which provides a scalable architecture for distributing user-defined analytic services over the web, or an enterprise network, to support desktop and browser applications. And, to complete the picture, we also have released **Cesium**, a zero footprint web-based visualization client that will tie into our web services and STK collaboration efforts.

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

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

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

Finally, the industry has been talking for years about the engineering talent drain. While this is always a concern, our workplace helps us out.

In March 2012, AGI CEO **Paul Graziani** took top honors in the **Workforce** category of **Aviation Week & Space Technology's Laureate Awards**. This recognition of AGI's innovative workplace, and our consistent outreach to tomorrow's engineers via STEM-focused activities, helps us retain and attract an unbelievable talent pool in a field that is otherwise being depleted.

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

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



YEAR IN REVIEW: Asia Broadcast Satellite (ABS)

by Scott Sprague, Chief Operating Officer



What successes did ABS enjoy over the past year?

Since ABS's inception in 2006, ABS has become one of the fastest growing satellite operators in the world averaging over 30 percent of year-on-year growth. ABS has four satellites in orbit serving customers from Asia to Africa from three premium locations at 3 degrees West, 75 degrees East and 116

degrees East. The fifth satellite, ABS-2 is scheduled for launch in 2013.

To keep the momentum, ABS has taken a strategic move to solidify its global expansion plan with the procurement of two Boeing 702SP satellites, planned for launch in 2015 for the 3 degrees West and 75 degrees East locations respectively. These additional assets have transformed the company from a regional into a global satellite operator by expanding its current fleet to serve the Atlantic, Pacific and the Indian Ocean regions.

The Export-Import Bank of the United States (Ex-Im Bank) has authorized two separate transactions for a total of USD461 million to finance ABS expansion. The funds will finance the purchase of the ABS-2 satellite from Space Systems/Loral, and the purchase and launch of two Boeing satellites on SpaceX launches.

We have also completed a major investment in upgrading our global operations including ground infrastructure and playout facilities across our teleports. This expansion of our global facilities will enable us to offer a richer portfolio of services to ensure best-value solutions for our customers as well as applications on a global basis.

Tom Choi, CEO of ABS, was awarded *Satellite Executive of the Year 2012* by Asia-Pacific Satellite Communications Council (APSCC). Tom was recognized for his outstanding leadership to the satellite communications industry. The accolade was received at the annual APSCC Satellite and Exhibition event in Seoul, September 2012.

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

In the past year, ABS has also spent a lot of effort in overcoming challenges from submarine cable networks, especially in the African region. Upgrading our teleport facilities in Bahrain, Nairobi and Tel Aviv has enhanced our ability to offer premium Africa services and coverage. We can provide reliable and valued solutions for our clients through premium bandwidth and tailored services.

ABS-3 at 3 degrees West—an inclined orbit satellite over the Middle East and Africa—offers an affordable Internet solution via satellite on C-band (OCB). As part of this service we are also providing tracking antennas as part of the bundle solution and 24/7 customer support from our teleport facilities.

Certain markets are more competitive than others—for instance, southeast Asia as compared to Russia. We continue to face competition from terrestrial and satellite infrastructure. However, our diverse customer base and expanding fleet of global assets allows us to grow our business at an industry leading pace.

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

ABS-2

We are very excited about the upcoming launch of our fifth satellite, ABS-2, during the second half of 2013. It will be one of the most powerful commercial satellites in the Eastern Hemisphere. ABS-2 will have more than 12kW of payload power and will be fitted with as many as 89 active C-, Ku-, and Ka-band transponders, with 10 high-powered beams. The satellite will provide optimized direct TV broadcast, telecommunications and data transmission services to support Asia Pacific, Africa, the Middle East, Eastern Europe and the CIS regions.

ABS-3A + ABS-2A

The technology-rich *small platform* satellites are the next generation satellites with the all-electric propulsion system. The Boeing 702SP is designed to be flexible and affordable, with next-generation technology and avionics designed to enhance performance, simplify operations and streamline access to critical data. Each satellite will weigh only 1,800 kilograms and will have more payload capability at a lower cost orbit.

These two Boeing 702SP satellites are the next generation satellites with all-electric propulsion system. The 702SP is designed to be flexible and affordable, with next-generation technology that enables increased performance and more payload capability at a lower cost orbit.

ABS-3A has completed its preliminary design review, continues to track on plan, and will be launched on a Falcon-9 vehicle. It will allow the extension of ABS' C- and Ku-band services into the Atlantic Ocean region for our existing customers, diversifying our market base for our future growth.

The second satellite ABS-2A is currently in its final stage of design and will start construction shortly.

Over the coming months, we are working to secure pre-commitments for the expansion slots for the new satellites. We are also considering making further investments into additional satellites over the next few years to continue our global expansion, increasing our global coverage and gaining access into new markets.



Artistic rendition of the ABS-2 satellite

YEAR IN REVIEW: AsiaSat

William Wade, President + CEO

What successes did AsiaSat enjoy over the past year?

At the start of 2012, we successfully completed the in-orbit testing of our new satellite **AsiaSat 7**. **AsiaSat 7** is a replacement satellite launched well ahead of the date on which it is needed to replace **AsiaSat 3S** at the orbital location of **105.5 degrees East**. This initiative not only ensures our ability to continue to provide uninterrupted service to our existing customers upon the retirement of **AsiaSat 3S** in 2014, but also provides us the flexibility to explore near-term growth opportunities and to develop new markets before this new satellite eventually replaces **AsiaSat 3S**.

We also made encouraging progress in the construction of our new satellite projects **AsiaSat 6** and **AsiaSat 8**. Early this year, we secured launch service contracts for both satellites and we are pleased that over the past months, the construction of these new satellites is moving according to plan.

While we are working to continue to grow our satellite fleet, we have also successfully enhanced our ground infrastructure following the completion of our **Tai Po Earth Station** expansion in the first half of 2012.

In addition to housing our satellite control facilities for the *Tracking, Telemetry and Control (TT&C)* of our satellite fleet we provide customer service and SNG occasional use services. Additionally, the **Tai Po Earth Station** also houses the facilities that serve as the 24/7 broadcast and operations centre for customers such as **FIC**, **SpeedCast** and **DishHD**, while also hosting equipment for many of our customers' services. The expansion has added more space for infrastructure and equipment, thus enabling us to further strengthen our capability to serve a more diverse customer base with a comprehensive range of teleport services including playout, MCPC platforms, uplinking, fibre connectivity, disaster recovery facilities and backup.

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

Despite capacity shortage in certain Asian markets, pricing pressure continues to exist across most markets and sectors. On the other hand, we see strong momentum for increasing capacity supply, in particular Ku-band, over the next two to three years driven by the aggressive plans of many operators to expand their fleet, through satellite collocation, or the use of unexploited frequency bands. We expect competition will escalate when these new satellites are in place.

The advances in compression and transmission technologies that allow the use of higher modulation and more sophisticated coding in broadcast and telecommunications networks have driven industry growth but, at the same time, added challenges to our sales and marketing efforts. These new technologies enable the delivery at as low as 2Mbps per SD channel, and as a result, this requires us to double our efforts to fill up our inventory.

In addition, the advent of new distribution platforms such as *OTT*, *Digital Cable*, *DTT*, and the growing availability of fibre optic in more and more developing countries are also challenging conventional satellite distribution markets such as *DTH* and C-band content distribution. Coupled with the impact of the adverse economic conditions in the United States and Europe on Asian economies, we expect market conditions to become increasingly more competitive.

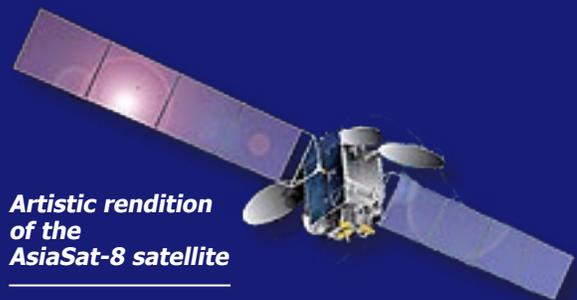
What upcoming projects are in the works and what may we expect to see from AsiaSat over the next three to four quarters?

Our next exciting projects definitely include our two new satellites **AsiaSat 6** and **AsiaSat 8**, currently under construction at our satellite manufacturer **Space Systems/Loral**.

AsiaSat 6 will have 28 high-powered C-band transponders offering an Asia-Pacific-wide beam at the orbital location of **120 degrees East**. This new satellite will bring additional high-quality capacity and powerful beam coverage for a broad range of broadcasting and telecommunications services.

AsiaSat 8 will carry 24 Ku-band transponders and a Ka-beam. Its high-powered beams are specially designed for DTH television, private networks and data distribution services in the high growth markets of South Asia, East Asia and the Middle East. **AsiaSat 8** will be co-located with **AsiaSat 5** at **100.5 degrees East**, a popular orbital slot for Middle Eastern, European, Asian and international programme distribution in the Asia Pacific. The additional Ku-band capacity on **AsiaSat 8** at 100.5 degrees East will boost our ability to further develop the slot for DTH, data broadcasting and mobile backhaul services in various Asian markets.

With its ability to provide exceptional power and additional beam coverage with inter-beam switching capability, **AsiaSat 8** will become the most powerful member of the **AsiaSat** fleet, with a payload power of about 8,500 watts. While building our new satellites to meet the growing demand for quality transponder capacity in the region, and to support future business growth, we will continue our efforts in delivering quality and professional services to the broadcast and telecom industries through our fleet of four in-orbit satellites.



Artistic rendition of the AsiaSat-8 satellite



YEAR IN REVIEW: Astrium Services

by Erik Ceuppens, Chief Executive Officer

More Than Lively

Always a market in constant transformation, 2012 was a particularly eventful year for the satellite industry. The global financial downturn combined with evolutions in technology as well as industry consolidation all had their part to play in the developments we

witnessed, and contributed to, throughout the year.

As a leading player within this industry, **Astrium Services** was at the heart of these evolutions. Our primary focus continues to be on the *maritime market* which, despite a morose economic climate, has shown encouraging signs of growth. The past couple of years have been tough in shipping, with low freight rates putting pressure on players across the board. Despite this, we've seen a steady number of new vessels leave global shipyards, and maritime companies making a priority of installing the right satellite communications systems to ensure operational efficiency.

At Astrium Services we have extensive experience providing these systems to our shipping customers, and, over the past 12 months (and before), have witnessed an evolution in their requirements that can be summed up in four main areas: essentially an increasing need for **1) long-term stability from partners and providers**, **2) for innovative products and services to meet business and human resources requirements**, **3) greater flexibility from providers in the context of a complex shipping market**, and last, but not least, **4) greater bandwidth requirements** to quench the ever-growing thirst for data on board ship.

Anticipatory Strategies

If we look at the major developments driven by Astrium Services this year, we can clearly identify a strategy geared to anticipating these evolutions and strengthening our market position to best serve their needs. Astrium Services itself is a leading provider of fully managed satellite services, born from the acquisition of **Vizada** and **Marlink** by the **EADS** group in 2011. The acquisition was finalized in Q3 2012, as was the transition of Vizada and Marlink into the new **Astrium Services** division.

This major evolution will enable our partners and customers to benefit from the most complete range of satellite services on the market: a service portfolio covering the full range of systems (L-, C-, Ku-, to Ka-band) and a scope of solutions from airtime and hardware sales to fully managed and outsourced solutions. Following the acquisition, Astrium Services now has an enhanced network infrastructure, as well as the strategic and financial backing of EADS, the global leader in aerospace, defense and related services, to continuously develop new innovations and opportunities. The acquisition was also a key milestone **EADS' 2020 Vision Strategy**.

The significant size and scale of the EADS group and its resources will enable the new Astrium Services to continue its technology-agnostic approach, with a sales strategy dedicated to providing shipping companies with an extensive choice of satellite systems, both through indirect and direct channels. Today's companies have eclectic requirements and the best providers have understood the level of flexibility necessary to cater for these when it comes to coverage zones, terminal sizes, pricing, and data rates.

On the subject of data, shipping companies' ever-increasing broadband requirements are a key factor in the satellite sector today. In a tough financial context, investment in high-speed systems such as VSAT is often made for corporate or business purposes only, although we are increasingly seeing crew benefit from additional lines put in place for private communications (web browsing, chat, *Facebook*, *Skype*, etc.)

Better Broadband

Astrium Services has been at the forefront of a number of significant industry changes linked to broadband satellite. The year 2012 saw the company launch **Pharostar™**, the new addition to its maritime VSAT portfolio. This latest innovation was developed with a view to making maritime VSAT easier to install and more accessible to a wider range of vessels including medium-sized transportation, fishing and leisure boats. With data rates up to 1.5Mbps, Pharostar is based on data allowances to compliment the traditional throughput-based VSAT offering.

An important development in late October saw the Pharostar coverage zone significantly extended over the *Indian Ocean Region (IOR)*, with a further expansion due over the southern part of the Atlantic Ocean by the end of the year. Customers currently using all Astrium Services' VSAT systems will automatically receive coverage in the new areas.

For shipping companies wishing to benefit from the choice of a *mobile satellite services (MSS)* terminal on board in addition to VSAT, the **Vizada XChange** platform enables ship administrators to select the type of connectivity required at any one time (VSAT/MSS), configure access for crew and management staff, as well as re-bill and split costs. Vizada XChange is essentially a wall- or rack-mounted unit which is installed on the vessel, and also comes with a user-friendly web portal. The latter is accessible from shore as well as on the ship and makes it easy to customize settings according to the shipping company's needs.



Role-Playing

In many ways, Vizada XChange perfectly sums up the direction the satellite industry is moving in right now. It is an innovative solution which significantly simplifies the management of communications systems for ship managers, while providing easy access to multiple satellite systems.

Over the next six months we expect the market to continue heading this way, with consolidated players such as Astrium Services harnessing technological advances and the launch of new satellite systems to provide the most innovative and varied services to shipping company customers.

Have a great 2013.

YEAR IN REVIEW: Beam Communications

by Michael Capocchi, Managing Director

What successes did Beam Communications enjoy over the past year?

It has been an exciting and challenging year for Beam Communications. With some major investments in research and development we have successfully launched 10 new products during the past year. Sales of the Inmarsat products gained momentum through the first half of the year while the new docking units for the Iridium 9575 Extreme handset were released to the market in February 2012. Both sets of products have been well received by the market. The growth in sales revenues this last financial year over the previous year was 29 percent.

The new Inmarsat terminals **Oceana** and **Terra** are specifically targeting high volume deployments in emerging satellite markets and are designed to support voice, data and tracking communications of the FleetPhone maritime service and the IsatPhone Link land service.

With the release of **Iridium Extreme**, the toughest satellite handset ever made, **Beam Communications** has developed a range of next-generation docks to complement the phone's functionality and features, and enables customers to extend the use of the handset in other environments such as maritime, vehicle, and indoors. Beam was, in fact, the first manufacturer in the world to receive Iridium's official certification of a docking unit for the Iridium Extreme handset.

As a result of the new Oceana terminals and Extreme docking stations, Beam launched two new *anti piracy solutions* for the maritime industry. The piracy solution provides a dedicated system for a safe room or citadel on board a vessel. The system ensures that, in the event of a piracy attack, essential communications on board the vessel can be maintained and used for alerting authorities. The Beam-designed piracy antenna is intended for covert placement, and to be less likely to be spotted and targeted prior to an attack. So far, nearly 500 piracy systems have been installed. Beam also secured a US\$5.1M commitment from **Telstra Corporation Limited** to purchase satellite equipment and product bundles mainly featuring the Iridium **9575** 'Extreme' handset and a range of docking units over the 12 month period to May 2013.

Another major breakthrough trial and initial order was for the maritime industry in China. Beam deployed 200 **Oceana 400** and **Oceana 800** terminals on fishing vessels in China over the Inmarsat **FleetPhone Service**. Beam is working closely with a leading satellite communication services provider in China that possesses more than 20 years of experience providing a full range of sea, land and air mobile satellite terminals and technology integration services for Chinese users. After the trial period, the customer expects to commit to a minimum order of 1,000 units for expansion into the broader maritime market in China.

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

The major impact were the changes to Inmarsat's pricing plans and, specifically, on the small vessel plans that directly affected the sales of Oceana products. The other impacts were the uncertain economic times globally, particularly in Europe impacted by Greece and Spain and specifically in Maritime. While the U.S. still continues to be performing at sub 2009 level, due to the weakness remaining in the U.S. economy, corporate and government customers have minimized spending. The Iridium handset recall in mid 2012 also had an impact on sales, just as the new products were gaining some momentum, further complications came with the lack of availability of the Extreme handset Iridium attempted to recover its stock levels and has now returned to normal levels.

In the current economic climate, users are more and more focused on value and price. The challenge over the coming months will be the ability to know the market needs and fulfill the user's requirement to deliver value, while being considerate about investment and price to market. Our products, and our team of commercial and technical staff ensure that we

are extremely well positioned to capitalize, and meet the opportunities that are arising throughout strategic markets and applications.

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

Beam maintains a strong position in the international mobile satellite services market through the new products recently introduced into its portfolio. Additionally, Beam is well positioned to take advantage of new opportunities to support the strategies of the key satellite operators, Iridium and Inmarsat.

The satellite industry is converging more toward the consumer mobile industry and Beam is certainly moving into that direction. Data communication is becoming critical for operational, business and social reasons, and connectivity is becoming a primary need—anytime, anywhere. We continue to identify means, so that we can be at the forefront in smartphone access technology applications, and higher speeds in data communication platforms.

The launch of the GPS Inmarsat **IsatPhone Pro** services into Japan will provide strategic opportunities for growth and the impact of Beam's sales into this market is expected to be very strong based on the companies success in Japan with **KDDI** over the last few years.

The company is optimistic that the China trials will be a success and this will then provide a major opportunity to increase sales into this strategic market for both Beam and Inmarsat.

Beam is developing the next generation satellite communications today. Some of these new products will be launched to the market in the next year and will enhance the access to satellite communications for everybody to whenever it's needed.



YEAR IN REVIEW: Boeing Space & Intelligence Systems

by Jim Simpson, Vice President, Business Development

What successes did Boeing enjoy over the past year?

Boeing Space & Intelligence Systems was proud to announce its newest satellite design, the 702SP for “small platform” in March, in conjunction with a four-satellite joint procurement

from Asia Broadcast Satellite (ABS) and SatMex. The 702SP is an all-electric satellite that is lighter in weight and compatible for dual-launch with a wider array of launch vehicles, including the SpaceX Falcon 9. With the addition of the 702SP, we expanded our product portfolio to include satellites that operate in the 3 to 18 kilowatt range.

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

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

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

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

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

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

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

The changes we made to improve our efficiency enabled us to invest in product development. For example, we invested four years in the development of the 702MP satellite, which we introduced in

2009. Learning from that activity, we were able to introduce the 702SP satellite in approximately two years.

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

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

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

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

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

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

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



Artistic rendition of Boeing’s 702SP platform

YEAR IN REVIEW: Communications & Power Industries

by Andrew Tafler, CPI Vice President + President, SATCOM Division

What successes did CPI's SATCOM Division enjoy over the past year?

Over the past year the market has remained strong for us, especially in Ka band where CPI continues to lead the way with both tube-based and solid state amplifiers. Our commercial business in North America and around the world remains strong and stable. In the military communications space, although some of the largest programs in the last number of years (e.g. *Win-T, GMT*) have slowed down or are coming to an end, we still see good business and good future potential with many new smaller, and a few quite large, upcoming programs. The selection of CPI solid state and TWT amplifiers recently by a major U.S. OEM for a very significant, five year, U.S. military program recently is a good example.

An important milestone for us over the past 12 months is our acquisition of **Codan SATCOM** and **Locus Microwave**, which has greatly enhanced our solid state product line, and which will contribute greatly to our solid state product development capabilities. Solid state technology is on the verge of making some impressive breakthroughs and with this acquisition CPI will remain at the leading edge of solid state technology used in satellite communications.

On the *traveling wave tube amplifier (TWTA)* side, we continued to push the envelope with respect to higher power, wider bandwidth, higher linearity and smaller size and weight in Ka-band, and other frequencies, as well as leading the way in power efficiency in all frequencies and power levels.

What challenges did CPI's SATCOM Division need to overcome this past year, and what challenges will the satellite industry—and specifically your market segment—face over the next few months?

The high-throughput Ka-band satellite systems being established depend on the latest state-of-the-art high power amplifiers for their gateways and cost-effective lower power amplifiers for their consumer terminals, whether it be for commercial locations or a military SOTM application. The success of these satellites is critical to the future of the satellite industry.

Meeting the satellite system providers' requirements for very high power and very high quality gateway HPAs at Ka-band pushed the envelope for what is considered "state-of-the-art" for both amplifier as well as traveling wave tube design and manufacture. I am proud to say that CPI and other manufacturers responded to this challenge successfully, enabling these systems to be established on-time.

With our acquisition of Codan/Locus solid state product lines, CPI will be focused on effectively integrating these products with our existing industry-leading manufacturing, R&D, sales and service infrastructure. This will allow us to offer what has now become the broadest product line of low, medium and high-power amplifiers and BUCs to our extensive satellite communications customer base. We will also be focussed on ensuring that the maritime and off-shore energy customers, a key market for the Codan product line, know that CPI is committed to this market.

What upcoming projects are in the works and what may we expect to see from CPI's SATCOM Division over the next three to four quarters?

CPI continues to invest heavily in new product development for both tube-based and solid state amplifiers. For example, our **SuperLinear®** amplifiers have proven to be very popular since the introduction of high power rack-mount models a few years ago, and we have been expanding this product line to accommodate outdoor and lower power products for commercial and military applications. Since they are more power-efficient than traditional TWTAs, GaAs and even emerging GaN SSPAs, they can save customers thousands of dollars per year over these other products.

On the solid state side, in addition to the Codan acquisition, we have recently introduced X- and Ku-band **GaN** solid state amplifiers, as well as Ka-band SSPAs.

We also continue to develop and offer amplifiers for transportable and mobile terminals that are state-of-the-art for being small and lightweight, yet offering relatively high RF powers. We also have the broadest range of Ka-band amplifiers using both TWT and solid-state technologies. We continue to add to this range of millimeter-wave amplifiers and are already manufacturing V-band amplifiers that will be used to evaluate possible future communications in the 48 to 51GHz range.

CPI is a complete-solution amplifier supplier, and we intend to always provide a complete line of state-of-the-art amplifiers using all available technologies to meet our customers' needs.



AvL terminal with CPI HPA

by Jim Skillings, Vice President of Commercial Products

As 2012 opened, we were just rolling out our new inReach two-way satellite communication devices.

As the year progressed, inReach has been a tremendous success for our company as it created a new market category that leverages our expertise in SATCOM technologies, mapping and GPS. inReach provides users affordable two-way text messaging and email capabilities, SOS alerting, message delivery confirmation, remote GPS Follow-Me/Find-Me tracking and locating, and worldwide satellite coverage, anywhere on Earth.

For the 90 percent of the Earth not covered by cellular networks, satellites are the only solution. inReach operates over the **Iridium** satellite network, providing truly global two-way satellite communications, high network reliability and low-latency data links of less than 60-second delivery of messages end-to-end, anywhere on Earth, even in areas outside of traditional cellular coverage.

Early in 2012, inReach won the coveted *National Marine Manufacturers Association (NMMA) Innovation Award for Consumer Electronics* and *Backpacker* magazine *Editors' Choice Award*, after previously capturing the *2011 Popular Science Best of What's New*, *2011 Gear of the Year* awards from *Men's Journal* and *National Geographic Adventure*, as well as *2012 CES Innovations* honors. In September, inReach was awarded the *Occupational Health & Safety New Product of the Year Award* in the *Emergency Response* category. We were also recently notified that inReach is a finalist for the esteemed *2012 Design Awards METS (DAME)*, recognized around the world as among the most prestigious design competition for new marine equipment and accessories.

Safety Communications

Over the course of the year, inReach has provided an extra margin of safety for users, augmenting other one-way emergency transmitters, for boaters, pilots, outdoors enthusiasts, workers and anyone whose jobs and other pursuits take them beyond cell phone range. The Iridium two-way data link provides a critical tool for search-and-rescue authorities to determine whether an SOS message is a false alarm, communicate with the sender to understand the nature of the emergency prior to launching a response and reassure the sender that help is on the way.

In May, DeLorme introduced a new version of inReach that can be wirelessly paired with the most popular smartphone and tablet devices. inReach now opens new opportunities to leverage the power of smart mobile devices and the worldwide coverage of the Iridium satellite network for two-way text messaging and emailing in regions that are beyond cellular coverage.

Going Vertical

In the *marine sector*, DeLorme partnered with the *Boat Owners Association of The United States (BoatUS)* to offer their members easier access to the two-way communications capabilities of inReach when in need of on-the-water towing assistance from **TowBoatUS** and **Vessel Assist**. Combined, these towing fleets offer boaters the world's largest network of towing ports with over 300 locations and over 600 towing assistance vessels.

For the *aviation sector*, DeLorme introduced new, low-cost aviation airtime subscription plans for inReach which provide flight tracking capabilities that give near-real time aircraft position data in as frequent as two-minute intervals for as low as \$1 per hour. In August, the flight tracking, which also reports GPS altitude, course, and speed, was successfully tested during the *2012 World Gliding Championships*.

In the *enterprise + GIS sectors*, lone worker and GIS sectors, DeLorme introduced **ArcSync**, a software engine that synchronizes and automates the processes of data collection in the field and bringing that data back to the enterprise database, a highly effective solution for organizations that collect and distribute GIS data to field personnel.

Major upgrades for inReach include improved battery performance

and additional map options. The DeLorme **Earthmate** app now enables downloading of seamless topographic maps of the world. Maps can be downloaded and stored for use when traveling all around the world.

Additionally, **XMap 8.0**, the latest edition of DeLorme's GIS software suite, was launched in October. Enterprise workers in industries such as oil and gas, railway transport, and wind energy, in addition to professionals in lumber and forestry, law enforcement and search-and-rescue, can benefit from the functionality of this latest and most enhanced version of the XMap product.

Also, in keeping with our commitment to provide the most accurate and complete, pole-to-pole topographic map database products to professional, enterprise and consumer customers around the world, this year DeLorme also introduced the 2012 editions of the **Digital Atlas of the Earth (DAE 2012)** and **World Base Map**. DAE 2012 is the first-ever 1:125,000 scale seamless topographic map with consistent coverage of the world and is fully compatible with all **Esri** platforms and solutions. This complete seamless global data set includes all of the world's countries and all continents, upgraded to include more roads and railroads, rivers and streams, updated elevation data and airport information, as well as the latest country and administrative district boundaries.

International Expansion

Throughout 2012, DeLorme established strategic partnerships with companies and customers around the world. Through a partnership with **Pivotal Satellite**, a mobile telecommunications company, inReach is being sold through a network of more than 200 value-added resellers throughout Australia, New Zealand and Indonesia. DeLorme has also partnered with **Kimberley Group** of Australia to provide inReach devices and the **Explore** service portal directly to consumers whose travels and activities take them to remote locales.

Through DeLorme's first Latin American partnership, **Spacenet Communications Services de Mexico (Spacenet Mexico)** has made inReach available to customers throughout Mexico, across all markets, including those in the marine, aviation, enterprise, consumer and government sectors.

inReach is also being offered to customers throughout Central and South America through **Robotec Colombia**, which provides specialized technologies for large enterprise clients across a range of industries including defense and national security, oil, mining and energy, construction, corporate security and transport and logistics. Robotec will deliver inReach to customers throughout Colombia, Peru, Panama, Guatemala and Costa Rica.

In Europe, **Sierra Echo**, a security solutions company, now distributes the inReach communication solution in France, having integrated into the **SatView** online platform to offer a comprehensive personal safety and geolocation solution to its customers.

Looking Ahead

We will continue the strong momentum with the global distribution of inReach into other parts of the world. With a full range of location-based mapping and communication solutions, our vision is to change how our customers work and stay connected using dependable, affordable two-way satellite services—anywhere on the face of the Earth.

YEAR IN REVIEW: EM Solutions

by Jamie Smith, Director, Marketing + Sales

What successes did EM Solutions enjoy over the past year?

EM Solutions continued to enjoy success with its best in class Ka-band *SatCom-On-The-Move* (SOTM) terminal. The terminal was originally developed in 2009/2010 for the Australian Defence Force for use on the *Wideband Global SATCOM* (WGS) satellite constellation under the sponsorship of the DSTO (Defence Science and Technology Organization).

The ADF contracted EM Solutions in 2011 to build three additional terminals to achieve *Technical Readiness Level seven (TRL-7)* and to conduct WGS certification for the SOTM terminal. These three new terminals are now built and EM solutions has completed WGS Phase #2 SOTM certification testing—the terminal has passed all of the tests. The next step is to manage the SOTM terminal's entry into WGS Phase #3 certification testing in the USA as soon as possible.



In addition, EM Solutions won a tender in May 2012 with Tokyo based partner **Jepico Corporation** to provide its Ka-band SOTM platform to the Japanese Government's **National Institute of Information and Communications Technology (NICT)**. The project is currently in build phase, with delivery expected to be achieved in early 2013 for acceptance testing in Japan.

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

Several years ago, EM Solutions set out to design and manufacture the world's best Ka-band SatCom RF equipment—SSPA/BUC's up to 20W linear and LNB's. In spite of our current customer's delight with the overall quality, performance, reliability and unrivaled power to size / weight of our Ka-band SSPA/BUC and LNB product offerings, the overall Ka-band ground equipment terminal and RF system market demand has been slow in establishing itself.

Why? There are already significant numbers of Ka-band satellites in orbit and the USA / Australia-led WGS program is in the process of signing up more countries to share in the global constellation's bandwidth. We hope for more terminal acquisition programs to roll-out in the not-too-distant future.

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

EM Solutions remains committed to invest a significant proportion of our annual revenues into Ka-band RF product Research and Development in response to what we perceive as key technology drivers—wide-band

radios (up to 2GHz, switchable between 500MHz and 1GHz bands), high power SSPA's (up to 150W output power (Psat) at Ka-band), small and lightweight SSPA/BUC's mounted straight onto the dish with integrated linearisers as well as watching out for emerging component technology such as GaN.

As part of a vertically integrated company, EM Solutions Operations Division will continue to invest in the manufacture of the company's own products, providing rapid turn-around of prototypes called for by our Engineering design teams. The Division also works with a range of contract manufacturers to assemble products that are in large quantity production, while retaining test and final assembly at EM Solutions' Australian headquarters.

The Division will also provide an extensive range of manufacturing support services to ensure client needs are met when the final products are activated for work in the field.

The Company will continue to build a proven team of engineering experts with deep microwave, electromagnetics, digital, control systems, telecommunications, and industrial design experience under the one roof. In fact, the engineering and manufacturing teams have a combined total of more than 600 years' experience working on microwave and RF products and systems that are engineered to order for customers. This means the Engineering Services team is able to respond more rapidly than most other teams in developing products specific to stated needs, as many solutions can be based on EM Solutions' pre-existing extensive product range.

Although we advertise a broad range of our most commonly requested products, if there are specific requirements not covered, chances are such that our teams we will continue to be able to tailor an existing RF or microwave design in the 1 to 40GHz frequency range to meet customers' needs. Systems, such as our Ka-band SOTM terminal, or the Ku-band **E1000** microwave radio link, prove EM Solutions' expertise in microwave circuits as well as in developing complex electromagnetic antenna feeds, digital signal processing, filtering and demodulation, firmware control, and mechanical control and design as well.

We have also recently expanded our proactive marketing and sales efforts with a view to signing up new distribution partners and integrators across the globe in key markets. These include the USA, and Europe to complement existing, long standing sales channel partners such as **Phiteq Telecoms** in France, **UR Group** in Italy, **G-Tech Ltd.** in Israel, **WellBe** in Hong Kong / China, **Jepico** in Japan, and **Vanguard Engineering** in Maryland, USA. We also plan to expand our reach through the Australian Defence Force's *Global Supply Chain* program with major defence primes such as **Thales Australia**, **Boeing**, **Lockheed Martin**, **Raytheon**, and so on.

EM Solutions continues to participate in major SATCOM industry events that include the Satellite symposium in Washington DC, MILCOM and IBC in Amsterdam.



YEAR IN REVIEW: Hermes Datacomms

by Bill Green, Global Account Director



What successes did Hermes Datacomms enjoy over the past year?

Hermes continued to support Oil & Gas sector customers in both business as usual and challenging areas.

Hermes built on their current customer base with a number of renewals and upgrades to existing contracts, evidencing the confidence built in this dynamic business sector. Most exciting was the reception by customers to the newly launched *Intelligent Network Outsource (INO)* proposition. INO addresses key market concerns including allowing focus on management of internal users and customers within the oil & gas company while minimizing resources to manage service provider contracts and creating cost efficiencies. A number of customers have acknowledged and welcomed this unique marketplace approach and we have seen customers supporting the proposition with their budgets and as a result have gained a number of new contracts.

Hermes Datacomms continued to specialize in providing Wide Area Communications to the upstream Oil & Gas sector, worldwide. With more than 20 years of experience and service in 54 countries, Hermes Datacomms forged forward in this active market segment by providing the satellite and fibre links to some of the most remote and challenging locations—onshore and offshore.

The Company continued to offer solutions tailored specifically to the Oil & Gas industry as well as international connections, managed networks and oilfield infrastructure. Hermes Datacomms remains proud of its listing in *The Sunday Times Tech Track 100 2011* as one of Britain's 100 private tech companies, with the fastest-growing sales over a three year period of time.

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

Hermes continued to be challenged by the short timescales and dynamic requirements capture typical in the Oil & Gas sector. Hermes have demonstrated they are flexible commercially to be able deploy equipment and personnel to meet deadlines and support drilling operations which are key to revenue generation for our customers.

Technically Hermes have enabled critical data to be shared and decisions to be made more quickly as well as supporting back office functions and crew welfare. Geographically, Hermes continued to support customers in typical city locations as well as in remote and offshore regions. Hermes added *Ethiopia, Kurdistan, Kenya* and *Mauritania* to its increasing country capability list, supporting their coverage in 92 percent of Oil & Gas producing regions globally.

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

Next year's focus will continue to be on maintaining the SLA for existing customers and supporting their key revenue earning projects globally.

Strategically, Hermes will look to increase their global footprint including throughout Africa and South East Asia. The INO continues to receive plaudits from customers and it is expected that the marketplace will continue to embrace this commercially progressive model.

Projects in the pipeline include delivering communications terrestrially and via satellite in *Angola, Mauritania, Kenya, Brunei* and throughout the oil and gas producing regions as the demand necessitates; at the time of this writing, there will be additional projects raised which will be in delivery by the time of this publication.



YEAR IN REVIEW: HTN Communications

by Christian Kneuer, Senior Director, Operations + Client Relations

What successes did HTN Communications enjoy over the past year?

The past year has been a busy and exciting time for HTN. One of our biggest accomplishments has been the renewal of our contract with the MLB Network to provide backhaul services for the **Ballpark Cam**, installed at all 30 MLB ballparks in the U.S. and Toronto, Canada. Baseball fans love this Emmy Award-nominated system, which provides up-close video of players going through batting and fielding practice and other non-game activities. Plus, it offers interesting footage and interviews to supplement the MLB Network's pre- and post-game programs and analysis. We've been supporting the Ballpark Cam since the MLB Network's launch in 2009, and the new contract extends our partnership for another three seasons.

Speaking of the MLB, HTN provides seamless point-to-multipoint live HD transmissions from every MLB venue (just what we do for the NBA and the NHL). Another huge accomplishment this year has been the completion of a major new network infrastructure at all 30 MLB stadiums. By upgrading the network to 1.48Gbps HD-SDI local loops, we're delivering a tenfold increase in usable bandwidth for MLB broadcasts. These improvements will pave the way for the MLB Network to add additional cameras and services, and expand Ballpark Cam's usage for high-profile MLB Jewel Events such as the *All-Star Game*, the *Postseason* and *World Series*.

In addition to MLB Networks, two more examples this year are satellite-driven **DIRECTV Sports Networks**, parent company of **ROOT SPORTS™**, and **Altitude Sports & Entertainment**. DIRECTV Sports recently renewed our contract to provide A/V backhaul services for ROOT SPORTS' away broadcasts of all *Pittsburgh Penguins* hockey games, as well as *Pittsburgh Pirates*, *Colorado Rockies*, and *Seattle Mariners* baseball games.

In addition, we will now provide full-time connectivity between ROOT SPORTS' regional studios in Pittsburgh, Denver, and Bellevue, Washington, and its master control location, managed by **Encompass** in Atlanta, to facilitate studio shows as well as pre- and postgame broadcasts. For Altitude Sports & Entertainment, our contract has been extended to continue providing A/V backhaul services for Altitude's broadcasts of all *Denver Nuggets* NBA and *Colorado Avalanche* NHL games.

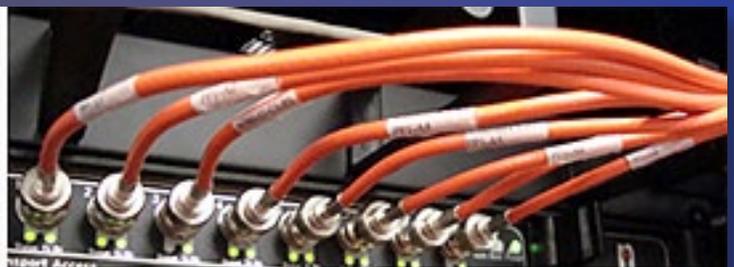
What challenges did HTN Communications need to overcome this past year, and what challenges will the satellite industry—and specifically your market segment—face over the next few months?

Just like other segments of the broadcast market, including truck companies and networks, our business can be severely affected by the collective bargaining in major league sports. In the latter half of 2011, the NBA lockout posed some real challenges—and we're dealing with an even bigger threat now with the NHL lockout. Cancelled games mean lost revenue, which makes our business interesting at times—but the diversity of our client base is one thing that has kept HTN going since the 1960s with the launch of our first backhaul service for the **Madison Square Garden Network**.

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

We're continually building out our transport infrastructure to ensure high network performance and the increased bandwidth necessary for new broadcast and data-intensive services.

As the latest example, we are in the exploratory stages of installing a new, full-time connectivity and transmission equipment architecture at all Major League Soccer and NFL venues. It's similar to the infrastructure we already have in place for NHL, MLB, and NBA stadiums. Staying on the leading edge of technology is a core value at HTN, and our commitment to research and development will help ensure that we can deliver top-quality results for our sports broadcasting clients well into the future.



YEAR IN REVIEW: Hughes

by Pradman Kaul, President



What successes did Hughes enjoy over the past year?

Clearly, the launch on July 5 of our next generation EchoStar®XVII satellite, with JUPITER™ high-throughput technology was the most significant event. With well over 100Gbps of Ka-band capacity, it's the cornerstone

of our new HughesNet Gen4 consumer Internet service in North America, delivering greater speeds—from 10Mbps up to 15Mbps—and enabling customers to do more online than ever before.

Since unleashing service on October 1, we're experiencing increased demand in what was already the fastest growing business at Hughes—now with more than 700,000 HughesNet subscribers, the world's #1 high-speed satellite Internet service—and the largest Ka-band network of any kind.

On the enterprise side, notable wins include expansion of the Camelot lottery managed network in the U.K. to over 38,000 sites; major networks by our subsidiary in India—named a repeat winner of 'Best VSAT Operator'—including banking and digital cinemas; the launch in April of Yahsat's Ka-band YahClick service throughout the Africa/Middle East region employing Hughes ground system technology; and in Europe, expansion of our ground network supporting Avanti's Hylas 2 satellite launched in August, following Hylas 1 last year.

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

The economic downturn has clearly constrained growth in the corporate and government sectors, in particular in Europe and North America. Yet this has meant many organizations are seeking to improve their productivity and bottom lines, which is why we continue to push the envelope of managed services and powerful value-added applications—especially for distributed enterprises—where, for example, in retail and hospitality sectors, Hughes digital signage solutions delivered via satellite help boost sales and provide back-room online training for personnel.

On the regulatory front, through the diligent work of GVF and other groups, we continue to successfully defend against encroachment by the wireless industry for satellite spectrum—in particular, C-band. In the U.S., we've joined forces with wireline, wireless and media groups in lobbying against the Federal Communication Commission's proposed higher regulatory fee structure.

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

In 2012 we crossed the milestone of three million cumulative terminals shipped to customers in more than 100 countries—there's no let-up in our strategy to invest in both satellite broadband technology and services—in particular, Ka-band.

As noted earlier, the Ka-band footprint globally now covers North America, Europe, MEA, and, next year, will likely include Latin America and Russia. Hughes is well positioned to capture our usual 50 percent or more market share as opportunities arise, and we see a bright future globally for satellite broadband across all sectors—especially consumer, as more Ka-band means greater capacity and affordability.

The EchoStar® XVII launch, photo courtesy of Arianespace



HUGHES. Connect to the future.™

YEAR IN REVIEW: iDirect

by David Bettinger, Chief Technology Office + Senior Vice President, Engineering

What successes did iDirect enjoy over the past year?

iDirect's overriding objective for 2012 was to expand the addressable market for our partners and prepare for the emergence of high throughput satellites.

We started the year with a product launch that expanded the **iDirect Platform** to serve large-scale narrowband networks and utility applications. We introduced **iDX 3.1** and the **Evolution® X1**, which is a remote bundle that combines a low power, compact remote with a highly efficient BUC and LNB.

We also launched an outdoor version of the X1, which features an **IP67** weatherproof housing, offers an extended temperature range and can be powered by solar or an alternative power source.

In October, iDirect announced the first product from our next-generation platform—the Evolution X7 remote—which will be released in Q1 2013. The X7 is built on an entirely new multi-core hardware system. It is optimized to deliver best-in-class performance and operate with high throughput satellites and all frequency bands.

The X7 can reach up to 100Mbps of combined inbound and outbound throughput, with more than 20Mbps on the return channel alone. With this remote, iDirect has achieved data speeds on a TDMA platform that until now have only been possible on an SCPC dedicated link. In future software releases, the X7 will support higher modulations and much higher data rates.

The X7 also features dual **DVB-S2** demodulators with fully independent RF chains. This makes it uniquely suited for a range of enterprise voice and data services while simultaneously receiving 12 shared, high-definition (HD) multicast channels over the same or a second transponder or satellite. And it also can combine spot-beam HTS capacity with traditional Ku- and C-band capacity.

Another major accomplishment was our ongoing work designing and manufacturing the ground infrastructure platform for delivery to **Inmarsat** in 2013 for their **Global Xpress™** service. We are working with Inmarsat's designated terminal manufacturers to develop core module technology for each terminal option that will be deployed in the maritime, aeronautical and other markets.

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

This year was a critical year for iDirect and for the satellite industry because of the emergence of **high throughput satellites (HTS)** and services. We've seen the market for enterprise services emerge, and along with it, new satellite architectures, service provider business models and end-user requirements.

In response to these challenges, iDirect is redesigning the core technology that powers our platform to handle higher data rates and scale much more broadly. We're also developing a new family of high throughput remotes and terminals, which are easier to install, quicker to deploy and even more finely customized to distinct market requirements. The X7 is just the first of these.

As our platform grows in scale, we'll ensure it can deliver carrier-class service reliability—both in the field and at the hub side. Plus, we'll continue to invest heavily in the capabilities of our **Network Management System**, enabling our partners to reach new levels of network and business performance.

With these improvements in scale, satellite operators and service providers can leverage iDirect's hub infrastructure to deploy high bandwidth networks that exceed hundreds of megabits per remote site and that can support hundreds of thousands of terminals.

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

In early 2013, iDirect will begin shipping the X7 and introduce a critical update to our operating software, **iDX 3.2**. The key feature will be **Adaptive TDMA**, which enhances return channel performance and increases network availability under rain fade and spectral degradation.

Our partners will be able to design their networks with more than 20dB in fade margin without compromising clear weather throughput. A typical fixed VSAT system can achieve a 20 to 40 percent throughput gain. A typical mobile network can gain about twice as much with improvements in handling rain fade and beam contours.

We will be working with several major satellite operators to develop the optimal ground technology and go-to-market strategy for their HTS projects. And as always, we will continue our development efforts to push the boundaries of efficiency, optimization and throughput. We want our partners to have the best possible technology so they can continue to build their businesses and advance their operations. It will be a truly exciting year, especially given our achievements in 2012 and the overall industry's promising future.



iDirect's Evolution® X1 satellite router

by Steve Spengler, Executive Vice President of Sales, Marketing and Strategy



What successes did Intelsat enjoy over the past year?

We enjoyed many successes in 2012. Our most significant was our announcement of Intelsat EpicNG, Intelsat's next generation satellite platform. We redefined the high throughput category, using a high performance design that features backwards compatibility and open architecture—two features that

were very important to our customers and their focus on total cost of ownership.

Open architecture allows customer control of systems, demonstrating that we understand the entire ecosystem requirement from capacity, to hardware design, to operational and maintenance considerations.

Initially, the **Intelsat EpicNG** platform will feature two next generation satellites that will be fully integrated with the existing Intelsat global network. The first satellite, **Intelsat 29e**, will be manufactured by **Boeing** and is scheduled for launch in 2015. The second satellite, **Intelsat 33e**, is scheduled for launch in 2016 and will expand EpicNG coverage to most of the globe.

The development of Intelsat EpicNG demonstrates our focus on providing global broadband for wireless carriers, as well as enterprise, government and media customers. Intelsat EpicNG meets the needs of operators and service providers who are seeing massive increases in bandwidth demand due to the growing presence of smart phones in emerging regions, requirements for broadband on commercial and government flights as well as on cruise ships and sea vessels.

Our customers already have demonstrated their commitment to Intelsat EpicNG. **Harris CapRock Communications, Panasonic Avionics** and **MTN** have contracted for a combined \$500 million in capacity and ground services over 10 years.

We also launched five satellites in 2012 as part of our fleet replenishment program. The launches of **Intelsat 19, 20, 21, 22** and **23** delivered new and replenished capacity to our customers around the globe, and freed up other in-orbit assets to provide new capacity and services for regions where demand is growing.

Three of our new satellites include beams that comprise our **Global Broadband Mobility Platform**, which will be the world's first global broadband satellite network, featuring 10 Ku-band beams on seven satellites when complete early next year. We see the potential for growth in the maritime sector that includes oil and gas exploration, cruise and leisure ships, and commercial shipping. In the aeronautical sector, commercial airlines are clamoring for new satellite infrastructure to support in-flight Wi-fi and other entertainment services.

Intelsat 22 was noteworthy, in part, as it included a UHF payload for the **Australian Defense Force (ADF)**, which saved the ADF \$150 million and delivered the capability several years faster than a traditional procurement. We believe this is part of an overall future architecture approach that will see the provision of this type of communications capability distributed via commercial operators.

The development of our **IntelsatOne** terrestrial network allowed customers to expand into new regions via PCCW Global's extensive and robust network. Intelsat also opened a new Miami **Point of Presence (PoP)** that will enable programmers and service providers to bring content into and out of Latin America and the South Florida region with ease.

What challenges did Intelsat need to overcome over the past year?

As part of the continued industry-wide effort to combat the harmful effects of satellite interference, Intelsat and other satellite operators

conducted a successful test of **Carrier ID** technology during the London Olympics. The satellite industry has been working collaboratively to develop Carrier ID, a stamp on uplink signals that will enable satellite operators to more efficiently trace the source of transmissions to their satellites and accelerate coordination with earth station operators in the event of signal interference. The ability to more quickly identify and correct sources of signal interference will have a significant impact on the satellite sector.

Intelsat also expanded its sponsorship of **Global VSAT Forum (GVF) Professional Training** to reach customers and installers of Intelsat technologies. Currently, more than 1,000 Intelsat employees and customers across the globe have been provided the Intelsat-sponsored training and this expansion will provide training to even more VSAT installers and operators.

There is also a sense of uncertainty regarding the U.S. government's budget, especially the potential of sequestration and its consequences, if implemented. While there are plans to reduce the number of troops on the ground, we will continue to support operations in Afghanistan and Iraq. We believe that the demand for connectivity will not change dramatically, as increased UAV usage for *intelligence, surveillance and reconnaissance (ISR)* operations will require Ku-band capacity for the next decade and beyond, as there is no plan to move away from commercial capacity.

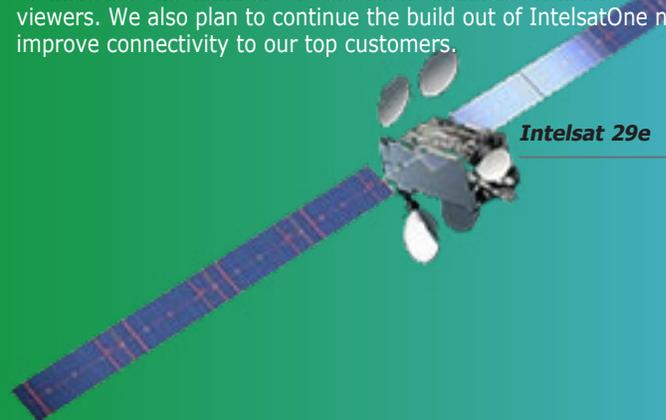
There is an agenda item at the **World Radio Conference** in 2015 to consider new spectrum allocations to the mobile service sector and to identify new spectrum for IMT (International Mobile Telecommunications). There were no frequency bands specifically excluded from consideration for this WRC-15 agenda item, but based on past debates on this subject, the valuable and essential C-band spectrum used by satellite end-users has been targeted.

The intervening years will provide a most interesting debate between the terrestrial mobile broadband community and all other spectrum users. The satellite industry will unite to defend this spectrum and communicate the importance that satellite services play in the daily lives of hundreds of millions of users around the world. The industry will actively participate in the studies that will take place leading up to WRC-15—these studies will look into the interests and needs of both the terrestrial and satellite sectors.

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

In the first quarter of 2012, the launch of **Intelsat 27** will bring valuable and expanded capacity to the Latin America region, the Caribbean and the northern Atlantic Ocean. The ocean coverage will complete our Global Broadband Mobility Platform. We will add powerful Ku-band coverage over Brazil for **DTH (Direct-To-Home)** services, and we will expand our video distribution neighborhood across the Americas, complementing our industry leading neighborhoods on **Intelsat 21** and **Intelsat 11**.

We will build on the initial success of moving **Horizons 2** to Russia to increase the number of television channels available to Russian viewers. We also plan to continue the build out of IntelsatOne nodes to improve connectivity to our top customers.



YEAR IN REVIEW: Intorel

by Dragana Lazic-Mijanovic, Chief Operating Officer

What successes did Intorel enjoy over the past year?

With the on-going switchover to digital transmission, Intorel's goal was to develop a product that would answer the challenges that broadcasters are facing every day—how to insure uninterrupted, reliable transmission of the content. We answered these challenges by developing DVB Master Commander (DVBMC).

DVBMC is the ultimate cross-platform software for monitoring and controlling of DVB equipment. It is the first universal solution targeted directly toward today's broadcasting operators.

The software runs on all platforms and comes as a complete system consisting of full network device management, service management, real-time alarming, as well as trending and scheduling functions, which are usually sold as separate products.



Intorel's DVBMC, compatible with any smartphone or tablet

Long-term relationships are crucial in the ever-changing market where clients are looking more and more to cut costs by engaging the competition. Intorel take it as a success and a sign of trust that over the years the list of our long-term clients faithful to our products and services has grown bigger. We take it as an ultimate proof of the quality of our products. Long term cooperation is beneficial for both the client and the supplier. We know what clients need and want, and we can easily, and with full understanding, answer their needs.

Independent execution of the projects—In the last year we mostly executed the projects directly with the customers. We have seen many of the system integrators disappear over the last few years. Now, clients are taking over specification of the project and the project management and working directly with the manufacturers. This direct contact allows for fast and extremely efficient execution of the projects. In addition, direct contact with the customer is giving us an access to the real-time situations and enabling us to get the information that is necessary for the development of the future products fully tailored to the customers' needs.

New markets—Intorel's experience and expertise, quality of our products and flexibility of the execution were the main reasons which allowed us to enter new markets, such as *Myanmar*. With the appropriate preparation, it is possible to execute the project even on a long distance with the same quality and speed. That was a case with the uplink project that we executed in close cooperation with our local partner and the client.

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

Cutting costs—With the content that is more and more available on the Internet and fibre, clients are less ready to pay for the content-only (sport, kids entertainment and the adult industry remain the contents that are earning money). Broadcasters are facing a rough time as their revenues are diminishing. At the same time, they are facing tough competition and ever increasing demands from their clients. For that matter, the need for the reliable automation and products that will increase reliability is obvious. Of course, our answer is DVBMC.

Cutting staff costs—It's a challenge, as the staff should be an engine of the development of the new products and the implementation of the projects. It's not rare that projects are late because the staff is overbooked and companies understaffed. This leaves us with more work for suppliers. The investors are blocking development, so the projects are getting longer and longer and there is no space for the development of the new advanced features and products. The staff has less time to develop proper ideas for improvement of the work process.

Purchasing managers and investors—The cutting of costs and staff is complicating the process of orders. Administration costs are growing and we do wonder if there is any merit to this additional control. No more development and research. The contact with suppliers is quite often damaged as investors are doing all in their power to cut costs, even if such extends projects, damages relationships, and at the end, makes the projects even more expensive...

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

Intorel is working on the overhaul of its flagship monitoring and controlling software, **Visionic**. We will be releasing **Visionic 6.0** in 2013—we also expect a lot from our DVB Master Commander.

Visionic has been in the market for more than a decade and it's fair to say that Visionic has become an industry standard for monitoring and controlling. We are keeping pace with the latest software and hardware developments and making the product more stable and easier to use with every upgrade. We are also planning to organize worldwide road shows to demonstrate and advertise Intorel's products; the exact dates will be confirmed at our Company website, so please visit when such is convenient to do so.



YEAR IN REVIEW: Iridium

by Matt Desch, Chief Executive Officer



What successes did Iridium enjoy over the past year?

Whether it was reaching critical design milestones with our next generation satellite constellation, **Iridium NEXT**; continuing growth in our M2M business; reintroducing our service in Russia; or introducing a revolutionary change to global air traffic

management, 2012 was a good and important year for our long-term strategic plan.

2012 was also a year to highlight our latest innovations. Early in the year, we unveiled **Iridium Pilot™**, a maritime solution that is engineered to perform in blazing sun, frigid cold, or high winds. Iridium Pilot delivers broadband data and high-quality voice in one low-cost platform and is able to keep ships connected anywhere on the planet.

What followed soon after was the introduction of the **Iridium® 9603**, the world's smallest commercially available two-way satellite data transceiver that combines our satellite constellation with the low latency of the Iridium Short Burst Data service to provide highly reliable satellite communications from pole-to-pole.



In July, we launched **Aireon**, a planned joint venture that will revolutionize the way the world tracks and monitors air traffic around the globe. We are particularly excited about Aireon, which will be a subsidiary of Iridium and includes partnerships with some of the world's leading innovators, because it leverages the hosted payload space on Iridium NEXT to transform the business of commercial aviation.

Aireon is a unique public-private partnership that offers a solution that the industry needed, but wouldn't have been possible through any other avenue without significant cost, infrastructure and time investments. By equipping the **Iridium NEXT** satellites with ADS-B receivers, Aireon will be able to detect signals from equipped commercial aircraft all over the world, relaying them seamlessly to air traffic controllers on the ground, including vital airways over oceans, mountains, remote areas and Polar Regions—an innovation that was unthinkable without an interconnected low Earth orbiting system like Iridium.

What challenges did Iridium need to overcome over the past year?

Similar to most companies, we were challenged by macro-economic conditions during 2012, such as the troop drawdown and reduced government spending. However, we are very optimistic about the future of our relationship with the government as they continue to invest in Iridium, evidenced by the recent IDIQ contract awarded to Iridium by the Defense Information Systems Agency (DISA) to upgrade the Defense Department's dedicated Iridium gateway.

In addition, we are actively working with the Department of Defense (DoD) to renew our long-term contract and we will ensure that the strategic nature of our work with them remains unchanged. We are

also continually diversifying our customer base by teaming with key defense contractors and specialized system integrators.

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

I like to say that Iridium is on, what we call in the aviation industry, a "climb". Every year, we continue to make progress and we have been steadily on an upward trajectory that will get us over the mountain and into a whole new era of operation. The next year is certainly shaping up to continue that upward trajectory as we expect our M2M, maritime and aviation markets will be an important part of our growth.

Our work with our partners enables them to innovate and bring the best solutions to their customers. For example, our partner **LiveTV** recently announced a successful business aviation test flight for our **Iridium OpenPort AeroSM** system, allowing passengers to stay connected via Wi-Fi to their Smartphone, tablet or laptop from takeoff to landing.

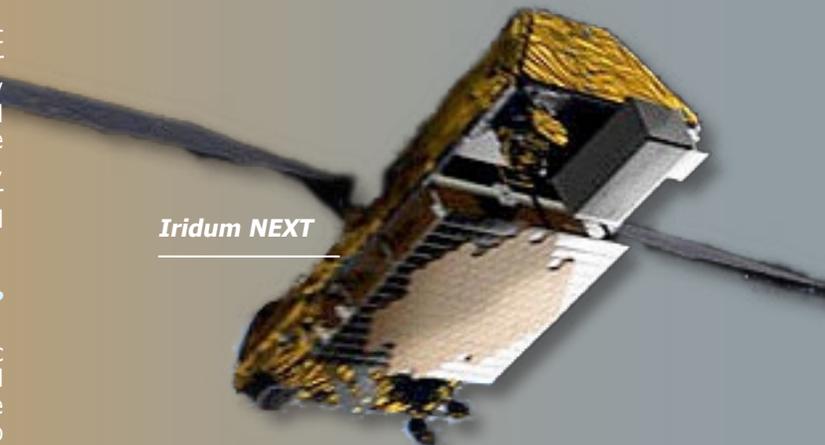
We also expect to see continued success in the maritime industry, as we have doubled the number of partners now selling Iridium Pilot and our VSAT companion offering continues to grow in popularity because of the critical service it provides for keeping ships connected anywhere their business takes them.

Over the next few years you will be hearing a lot about Iridium NEXT, one of the largest commercial space programs currently underway. We are excited about the progress being made as we approach the halfway point of our five-year build, but we will continue to innovate and bring new solutions to market before our first launch. Because the Iridium NEXT design ensures backward compatibility for all earlier generation user equipment, our subscribers can be confident that the products they purchase now will still be fully capable when we transition to Iridium NEXT.

The examples above are just a few proof points of the industry-leading work Iridium is doing in our market segments. I am encouraged by the momentum I am seeing in the satellite industry and the important role that Iridium plays in this space as the only truly global satellite communications provider.

As we continue our "climb" and clear the mountain of our next generation network build, I am confident that Iridium will reach greater success and bring increased innovation to our partners and customers in 2013. We're excited about this journey and I'm sure our many stakeholders are thrilled by the final destination.

Iridium NEXT



YEAR IN REVIEW: Marlink

by Jan Einar Bringedal, Vice President, Sales

Our integration into Astrium Services Business Communications means that change has been a major theme at Marlink this year. However, we've given high importance to ensuring it's business as usual for our customers and the industry at large. To ensure such endures, we have continued to develop our services, processes and portfolio to support the growth of satellite communications within the maritime sector.

This development is vital as the hunger for connectivity at sea shows no signs of slowing down. More and more applications designed to improve operational efficiency and reduce fuel consumption and emissions are being developed. This drives the need for fast, stable satellite broadband, while in parallel, there is an on-going requirement to support crew welfare with personal connectivity.

As part of **Astrum Services Business Communications**, we have been able to enhance global presence, commercial reach and commercial capabilities. Partners and customers are experiencing the most complete range of satellite services from our technology agnostic service portfolio covering the full scope of solutions from airtime and hardware sales to extensive customized solutions.

During 2012, we have continued to meet the dynamic needs of the various maritime sub-sectors based on foundations of standardized and customized connectivity. We re-launched our standardized VSAT product to fit different usage levels and complete the path from small/basic to large/advanced usage communications usage. This rationalised our product portfolio, ensuring customers could choose the right service at the right level for their specific vessel and operational requirements.

Many ship owners, especially those in the transportation segment, wait as long as possible before upgrading. This equates to a large number of vessels sailing with older systems—such reflects a healthy market potential going forward. Likewise, those sectors traditionally choosing C-band (such as offshore and cruise/ferry) may be mature markets but opportunities are still available. At **SMM 2012**, this year's largest and most prominent maritime trade show, we announced two different contracts for customers with significantly varied requirements for their connectivity.

German tanker owner and manager **Ernst Jacob** selected **Marlink** to enhance connectivity across a fleet of 15 tankers it operates for several major oil companies. The solution we provided was based on **WaveCall** standardized Ku-band VSAT with **SAILOR 500 FleetBroadband** for back-up, all securely managed through the **Vizada XChange** platform, either on board the ship or from shore. Ernst Jacob will primarily use the connectivity for operational purposes, including management of on board IT networks remotely from shore and automated content delivery, such as reporting and forms. Communication and connectivity for crew will also be made available on the new system.

These survey vessels are highly specialized, with focus on environmentally friendly operations in Polar Regions, so stable and always available connectivity is vital, especially considering Polarcus' strong commitment to reduce the environmental impact of oil & gas operations.

At the opposite end of the spectrum to Polarcus' requirements, we see a significant growth in the number of vessel owners and operators looking for standardized Ku-band VSAT, such as the technologies provided for the Ernst Jacob tankers.

New developments supporting this growth in 2012 include our introduction of more capacity on the **Intelsat 22** satellite to enhance our coverage in the Indian Ocean and Southern Atlantic—both major trading routes. In addition to expanding our coverage, we have also worked hard at improving the procurement and installation aspects of VSAT, which have been quite complex in the maritime sector. We have developed a concise antenna installation and commissioning system that will support engineers and crews to have vessels fully connected to Marlink's WaveCall standardized VSAT service in just 24 hours.

This means that Ku-band services can be installed during scheduled port-calls anywhere in the world, without affecting a vessel's operational schedule. With field engineers all over the world, Marlink is able to board a vessel in port and have VSAT connectivity up and running quickly, as long as the operator and owner agree to support the process by preparing certain aspects in advance.

Looking forward, the goal of Marlink, as Astrium Services Business Communications' direct to end-user channel, is to continue increasing our share in the Ku-, L- and C-band segments. We are also committed to widening our offerings, including the provision of enhanced Ku-band services on **Epic** and forthcoming Ka-band services. In addition to a potential agreement with **Inmarsat** to provide **Global Xpress**, we also have capacity options on the **Thor 7** satellite, which is expected to provide the first Ka-band services for maritime use in 2013.

It's important to note, that although it's necessary to demonstrate different bands' suitability for different vessels, in order to continue the growth in maritime SATCOMs, the focus should be on how best combinations of solutions can ensure continuous, reliable and always-on connectivity. To that end, Marlink will continue to offer combined solutions, using **Xchange** to provide seamless integration and value-added service such as SkyFile mail, to ensure that, regardless of vessel type, we can provide a solution to meet any communications needs.



Polarcus, the Dubai-based marine geophysical company selected Marlink to provide customized VSAT connectivity services based on C-band. The company signed for our **Sealink** service on two brand new seismic vessels. They also extended the use of the same services that have already been fully customized to provide connectivity aboard five existing Polarcus X-bow design seismic vessels for an additional three

YEAR IN REVIEW: ND SatCom

by Julian Bott, Managing Director



What successes did ND SatCom enjoy over the past year?

ND SatCom recognizes the growing importance of COTM applications in the broadcast, military and government satellite solutions markets. In order to further leverage its established position in these markets, the company

has developed a new version of its successful SKYWAN satellite router with targeted capabilities for communication on the move applications. The new SKYWAN has been lab tested to cope with Doppler Shift effects up to speeds beyond 2000 (two thousand) km/h. Also Eutelsat certification tests have been performed for this solution.

In addition, ND SatCom recently demonstrated at the IBC exhibition in Amsterdam a seamlessly integrated COTP/COTM solution based on its **SkyRAY** antenna system installed on an award winning all terrain SNG vehicle. Another major 2012 milestone for the company was the successful final delivery of all VSAT terminals to the German Armed Forces. ND SatCom is the German Army's supplier of choice for their entire satellite communication ground system solution.

Together with the release of a new network management system facilitating ease-of-use in the installation and operation of enterprise VSAT networks, these are but a few examples of ND SatCom's strategy to become a leading solutions provider in key markets, such as broadcast, military/government and commercial VSAT networks. This strategy has allowed ND SatCom to enjoy a healthy order intake in 2012.



SKYWAN IDU 7000 SERIES
SKYWAN IDU 7000

What challenges did ND SatCom need to overcome over the past year?

One of our main challenges in 2012 has been overcoming slowing market demand in the traditionally strong North American and European VSAT markets. These markets are approaching saturation in terms of number of satellite service providers and it is getting increasingly difficult for these providers to maintain a competitive advantage and differentiate their service offering from competitors. Cost efficient operation and ability to differentiate service are therefore key factors in any operator decision to invest in new VSAT technology.

ND SatCom **SKYWAN** satellite router solutions enable service providers to deploy highly flexible and thus, differentiated, VSAT network topologies in a cost-effective manner with ROI periods as low as nine months and bandwidth savings averaging several hundred thousand dollars per year.

A major change on the horizon for the satellite industry is the significant increase of low cost *High Throughput Satellite (HTS)* capacity that will become available in a number of coverage regions in the next few years.

Massively available and further increasing bandwidth in the sky will eventually find its market on the ground, predominantly through pricing models and throughput performance increases where even cautious Ku-band users will eventually switch to Ka-band.

ND SatCom is well positioned for this eventual transition and is investing heavily in development of new SKYWAN router and SkyRAY antenna technologies that will allow our customer base in both the broadcast and VSAT markets to maximize on the benefits of HTS satellite technology.

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

In order to further enhance our position in more mature markets such as Europe and North America, ND SatCom will continue to focus on enhancing its SKYWAN satellite router product line. Our goal is to offer our broadcast and VSAT customer base a high-value solution with minimal total cost of ownership, industry leading flexibility, maximum bandwidth efficiencies and increasing throughput performance.



ND SatCom's SkyRAY: left, closed—right, open

2013 is expected to provide ND SatCom with the opportunity to continue growing its order intake. One element of this growth will be a strategic focus on delivering end-to-end satellite solutions to customers in emerging markets such as Latin America, Asia, the Middle East and Sub-Saharan Africa.

YEAR IN REVIEW: NewSat Limited

by Adrian Ballintine, Founder + Chief Executive Officer

NewSat had another busy year in 2012 achieving major milestones and delivering record revenue growth. Over the past 12 months, NewSat has not only continued to grow its core teleport business, but it has also taken a big step closer to the launch of NewSat's first satellite, Jabiru-1. While the Jabiru Satellite Program continued to achieve significant launch milestones for the Jabiru-1 satellite project, NewSat signed a record high number of pre-launch contracts for Jabiru satellite capacity.

It is a very exciting time for NewSat as it transforms and vertically integrates from a teleport operator into a global satellite operator. With eight premium orbital slots which are serving as the growth engine for the future and with Jabiru-1 in its final stages, NewSat is closer than ever to realizing its long term vision of becoming a global satellite network operator.

JABIRU-1

The Jabiru Satellite Program is well underway driven by high demand for satellite capacity. To date NewSat has signed US\$601 million in binding pre-launch contracts for Jabiru satellite capacity, including customer contracts with MEASAT and TrustComm.

Funding for the Jabiru-1 satellite project continues to progress favorably, as NewSat has secured approximately two thirds of the funding, \$US380 million, via export credit agency debt funding from the **US Ex-Im Bank** and **COFACE**. **Lockheed Martin** is more than 10 months into the Jabiru-1 satellite build and recently achieved a significant construction milestone with the completion of the Preliminary Design Review. **Arianespace**, the world's leading launch service company, will launch Jabiru-1 in 2014 from the **Guiana Space Centre** in French Guiana.

JABIRU-2 + Beyond

NewSat also finalized the **Jabiru-2** satellite venture with **MEASAT**, which will provide much needed satellite capacity over Papua New Guinea, Timor Leste, remote parts of Western Australia and far north Queensland. The satellite is scheduled to launch in 2013.

NewSat has rights to eight premium orbital slots and continues to progress on the **Jabiru-3** and **Jabiru-4** satellites. The Jabiru Satellite Program will launch a fleet of next generation geostationary satellites that will provide high-powered global coverage and unlock bandwidth capacity that is unavailable today.

Teleports

It has been another successful year for NewSat's world acclaimed teleports in Western Australia and South Australia, with significant, positive improvements across all financial metrics. In particular, NewSat's core teleport business achieved record monthly recurring revenues which were up 24 percent from the previous financial year, with significant growth across the Middle East and Asia. The business also secured 306 new enterprise-grade contracts across the oil, gas, mining, maritime, construction and government markets both domestically and internationally.

This year, NewSat's teleports were also rated Top 3 in the world at the **World Teleport Association's 2012 Awards for Excellence** during **SATELLITE 2012**. NewSat was the only Australasian company to feature in the awards.

"It's a significant achievement for NewSat to be named as a top three independent teleport operator because it means that we are recognised by the industry and our customers as providing extraordinary service levels. Considering there are over a thousand teleports in the world, it speaks volumes to be named in the top three; especially for the people who run our teleports, as well as for the way we maintain our teleports," said NewSat's Ballintine.

High Value Customers

NewSat has a broad and loyal customer base within global industries, such as mining, oil and gas, defence, government, construction, maritime, media and carrier-grade telecommunications. Through the course of the year, teleport up-time for the period was 100 percent, a metric that is a key factor in NewSat's high customer retention rate, with the top 30 customers remaining with NewSat during the year.

NewSat is supported by the best technology and security and is committed to providing the highest levels of quality and service. This has given NewSat a strong reputation among national and international customers, resulting in a long-term, loyal customer base. Currently, customers are located in Australia, Asia, Europe, the Middle East, Africa and the USA.

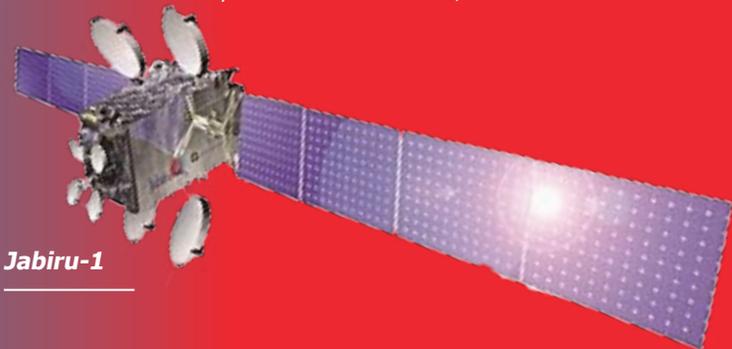
As NewSat continues to grow its teleport customer base across high value and growth markets, it is simultaneously building a customer-platform for Jabiru, with its teleport customers set to become Jabiru customers in the future.

2013 Outlook

In 2002, NewSat was a satellite "solutions provider", generating customer acquisition and retention skills, along with solution design and delivery expertise. Today, NewSat is Australia's largest pure satellite communications company on the verge of realizing its long-term vision of becoming a global satellite network operator.

The Jabiru Satellite Program will launch a fleet of next generation Ka-band geostationary satellites that will provide high-powered global coverage and unlock bandwidth capacity that is otherwise unavailable today. The Jabiru satellites will target high growth markets and high value government and enterprise customers, many of which are already customers of NewSat through the existing teleport business.

"The NewSat business is in a strong position. We have a profitable and award winning core teleport business that generates growing monthly recurring revenues and kick-started the 2013 financial year with the largest ever single contract for the Wheatstone Project. Demand for satellite communications continues its resilient global growth and NewSat's first satellite, Jabiru-1, is expected to generate more than US\$3 billion over the 15-year life of the satellite," said Mr. Ballintine.



Jabiru-1

by Serge Van Herck, Chief Executive Officer



To meet and exceed customer demand for higher speeds and increasing bandwidth efficiency, we have launched a new modem portfolio. These products all surpass current DVB-S2 standards and will be capable of accommodating the upcoming set for S2 Extensions

- **MDM2200:** Consumer and SME IP satellite modem (22Mbps/3.5Mbps)
- **MDM3100:** IP satellite modem for high throughput B2B applications capable of 45/5Mbps, with a future release operating at 45/10 Mbps
- **MDM6000:** High speed satellite modem, 2 x 380 Mbps, with the S2-extensions offering an increase of 15 to 37 percent on top of DVB-S2

During tests of our new high speed modem, our engineering team was able to smash the previously unthinkable 500Mbps satellite throughput barrier on a 72MHz transponder. Three of the world's leading satellite operators tested the modem: **Eutelsat**, **Intelsat** and **Yahsat**. During this testing, conducted at Eutelsat's **Rambouillet** teleport, 506Mbps was achieved. The test combined **Newtec's Bandwidth Canceller** and **MDM6000** modem, along with the candidate DVB S2-extension technologies. As a result of the tests, we have received authorization from Intelsat for use of our **Clean Channel Technology™ (CCT)** on **Intelsat** satellites. We are now taking aim at breaking through the 1Gbps barrier.

During 2012, we launched the new **M6100 Broadcast Satellite Modulator** at NAB2012, the latest in the nexgen DVB-S2, DVB-DSNG and DVB-S modulator range. The modulator is designed specifically for multimedia contribution, broadcast DTH and primary distribution to cable headends and towers. In a deal with **PBS**, the largest public sector media enterprise in the U.S., Newtec has provided a large set of M6100 modulators to carry content to nearly 124 million people each month. Built into the M6100 is the all-important **Carrier ID** technology.

Viewers in the Middle East and North Africa were able to watch, for the first time, the **London 2012 Olympics** in full HD. This was possible through our partnership with the **Arab States Broadcasting Union (ASBU)** which enabled an upgrade to the member's infrastructure to allow them to receive live Olympic multilateral feeds and news channels.

We also took to the skies this year as our IP traffic enhancement and shaping technology has been implemented in the flagship **EURO HAWK® Unmanned Aerial System (UAS)**. The Newtec technology is required to secure the downlink via satellite. In addition, our broadcast equipment was taken to the darkest part of the ocean during **James Cameron's** deep sea dive to the bottom of the **Mariana Trench**, located in the Pacific Ocean. The equipment allowed the project to transport simultaneous live broadcasting and data over the satellite link in the same carrier.



We also provided fans of **Indy** car racing front and center seat views of the Indianapolis 500. **Adtec's** and Newtec's combined strengths in digital compression, multiplexing, **DVB-S2** and **S2 Extensions** transmitted spectacular pictures from the largest spectator sporting facility in the world. Images from 12 unique drivers-seat angles were beamed around the world enabling an astounding level of throughput.

We have also supplied a VSAT system and IP satellite modems to the country of **Burkina Faso**, enabling flexible satellite connectivity for the municipal and legislative elections which occurred on December 2, 2012. The equipment facilitated *always on* connectivity between 45 remote electoral district offices which serve as the hubs for 14,698 polling stations across the West African country and the central election office in the capital, **Ouagadougou**. The system was used for video conferencing and surveillance, Internet access and fast and secure communication of ballots.

This year we welcomed the former CEO of Eutelsat, **Giuliano Berretta**, to Newtec's **Strategic Committee**. He brings enormous industry experience with him and is the third external member of the Strategic Committee, with **Brigitte Boone**, formerly the CEO of the **Merchant Banking** division of **Fortis Bank**, and **Martin De Prycker**, the former CEO of **Barco**, joining in 2010 and 2009, respectively.

There is a clear trend towards Ka-band. Several satellite launches were successful this year and we are now shipping Ka-band equipment for consumer broadband and IP trunking for various customers. **SES** successfully tested our high-speed Ka-band technology for **SES Broadband** (previously called **ASTRA2Connect**). **Yahsat** also implemented our technology to offer high-speed, Ka-band IP trunking service under their brand **YahCarrier**, which is set to be the region's first Ka-band IP trunking service.

They say knowledge is power and, to that end, our **Customer Service Training Center** offers a wide variety of training courses. This year more than one hundred individuals were trained by more than 20 experts and five training partners. We are proud that our customer service also reached an all time high, with the Newtec engineers receiving a rating of 9.5 out of 10 for the year.

Where is the industry going?

Bandwidth efficiency is still a top level priority for service providers and manufacturers. The industry will also be talking about **High Throughput Satellites (HTS)**, perhaps even more so than Ka-band itself. HTS will broaden industry action, with HTS and the mix of Ku-, Ka- and C-band becoming more important, from how the satellites are positioned and laid out, the services they will carry, and how the cells will be positioned on the ground. Providers will certainly need to diversify their service offering to speed up their satellite fill ratio.

Television is no longer a purely linear technology. Satellite broadcasters will need to possess new open-mindedness in how broadcast networks will be implemented, from sports contribution and distribution, to news gathering and the distribution of content in general.

No matter the direction you look, satellite technology—though finite in nature—is growing in demand. In hot demand are bandwidth efficiency and improved workflow technologies. The coming year will be another great year for satellites, and **Newtec** is glad to be helping to shape this industry's future prosperity.

YEAR IN REVIEW: Norsat International Inc.

by Dr. Aimee Chan, President + Chief Executive Officer

2012 has been a year of continued financial and market success for Norsat through a wave of new product development, and diversification into new markets.

In the first six months of 2012, we have delivered excellent revenues from our Microwave and RF Antenna (**Sinclair**) divisions, enabling us to record revenues which were up 21 percent and EBIDTA up 18 percent over the same period the previous year. In fact, **Norsat** has posted positive EBIDTA for 23 consecutive quarters. These financial results represent our strength in winning large contracts, including recent wins with the U.S. Army, U.S. Navy, U.S. Marines, U.S. Air Force, NATO, and other worldwide military customers.

A further military win in 2012 was the granting of *Final System Acceptance* (FSA) for the custom designed **NATO DART+** (*Dual-band Auto-acquisition Rapid-deployable Terminal*) and the subsequent product launch. This auto-acquire dual X-/Ku-band **IATA** compliant flyaway has already been successfully deployed in combat areas, providing data, voice and telecommunications to and from behind the lines, and is now available for other military customers around the world.

We have supported these strong revenues by successfully implementing Lean Manufacturing in our Richmond, BC, facility this year. Lean has enabled us to reduce waste and operating costs, while optimizing our standard procedures and is now in use throughout all Norsat departments.

Customer focused product development has been a key motivator and this year as we responded to customer feedback with the introduction of a newer, more feature-rich version of our popular **GLOBETrekker** fly-away terminal. The new product now enables users to switch frequency bands easily in the field, and provides a simple two button interface. We've responded to industry pressures by maintaining the terminal's rugged design while introducing cost reductions, and improving auto-acquisition algorithms. The GLOBETrekker continues to ship with our intuitive LinkControl software, which offers a simple way for users to control transmission as well as advanced tools for more sophisticated users.



To better serve satellite technicians, we have also introduced new accessory options including a new *Satellite Acquisition Assistant (SAA)*. The SAA is a complete tool kit for satellite professionals to easily get a satellite lock through the use of one convenient product. Designed to be the only tool required for satellite acquisition in the field, the SAA can be used on Norsat or other satellite terminals.

With the launch of the **Satellite Locator** application, this year marked our first venture into the world of smartphone application development. The App, available as a free download for both *iPhone* and *Android*, was designed in response to a common customer support request for assistance in satellite pointing, and enables users to locate satellites, assess obstructions and point terminals. The app has already been downloaded more than 10,000 times and we're pleased with the response to our first foray into this new technology. The integration of smartphones into our existing products will become a greater focus in the future, as mobile coverage becomes more global and customer use of smartphone technology increases.

Although we continue to design military grade products, the uncertainty in military spending due to the upcoming withdrawal of troops from Afghanistan has led us to pursue a market diversification strategy. Our new **M2M** equipment and services solution is designed to provide monitoring and control of remote equipment. This new application is an ideal fit for our remote communications expertise and will provide an elegant solution to a challenging problem.

A further step in our market diversification in the coming year will be an increased focus on industrial and commercial grade terminals for heavy duty applications. These products, including the newly launched auto-acquire **Wayfarer**, are designed for rugged use, but are offered at much more sensitive price points. The introduction of this more cost effective line of products will enable us to reach more commercial customers in the future and is a strategic move to further meet the increasing needs of our non-military customers seeking high value solutions.

After the acquisition of **Sinclair Technologies** in 2011, we are pleased to note that company integration was very successful in 2012. Sinclair has now been completely integrated into the Norsat organization and management structure and continues to operate with strong revenues. With several major contract wins within the transportation and resource sectors this year, and over 60 years of market experience, the acquisition and integration of Sinclair has been a great success story for Norsat.

The coming year will be a time of continued growth for Norsat as we enter new markets with new products. Our focus on customer and market needs has led us to develop products that solve real world customer problems, and we've been gratified to see some of these products, like the DART+, already operating successfully in the field this year. We look forward to achieving this same success in existing and new markets in 2013.

YEAR IN REVIEW: ORBIT Communication Systems

by Ofer Greenberger, Chief Executive Officer



What successes did ORBIT enjoy over the past year?

ORBIT experienced several noteworthy business and technological accomplishments over the past year. We have expanded our sales and service operations in several regions around the world, and these efforts are bearing fruit both in

terms of new orders and customers.

In the *Maritime SATCOM* space, **ORBIT** has become involved in the highly touted Ka-band services market, investing major development efforts in making its VSAT systems *Ka-ready*. Ka- services are expected to grow dramatically in the coming years in order to support the ever increasing high-speed, two-way broadband communications needs of the maritime market. In mid-2013, ORBIT plans to release versions of its SATCOM VSAT systems that operate at Ka-band.

Another major success in 2012 was the in-house development of high performance multi-band feeds to support *Earth Observation (EO)* and *Remote Sensing* applications, along with support of tracking antennas up to 10m in diameter. Based on these capabilities, ORBIT has substantially bolstered its presence as an EO solution provider in Eastern and Western Europe over the past year. Its customers in this segment include mainly military organizations and government agencies.

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

The global economic slowdown has created major challenges in both of our main markets—commercial and defense/homeland security. Due to the economic crisis, both governments and private companies have become sensitive to cost/budget issues. Particularly with respect to government contracts, shrinking defense budgets have also had an effect on the pace of procurement.

The key business challenge in the Maritime SATCOM market remains finding the “killer” application that will drive widespread adoption of broadband communication. Such an application may turn out to be an aggregation of several applications that, together, will require broadband communication.

Today, broadband is still considered by many as *cost critical*. Particularly in today’s economic climate, the challenge is to identify the data-hungry applications that both perform mission-critical functions and reduce costs. Such applications could increase operational effectiveness or enhance efficiency via intelligent analytics.

In freight shipping, for example, monitoring of refrigerated containers could be the next killer application. In cruise ships, a proven killer application is the sale of Internet connectivity to passengers. There is no doubt that many other innovative broadband applications

are on the way, such as ship security/surveillance against piracy, regulations and insurance procedures, etc. All of these applications will need to be supported by robust and reliable satellite communications solutions, and we are confident that ORBIT is uniquely positioned to meet this growing need.

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

ORBIT offers a diverse portfolio of advanced satellite communications solutions for maritime and land-based applications. ORBIT’s systems are installed on more than 3,500 marine platforms—from naval vessels to cargo ships, ocean liners and oil rigs—enabling TV reception and broadband IP connectivity for always-on applications such as Internet, video, telephony and other data-hungry applications.

The **OrSat™ 300** is the latest innovation in ORBIT’s expanding line of next-generation VSAT solutions. This inherently flexible maritime stabilized VSAT system is tailored to meet the high-speed, two-way broadband communications needs of the maritime market.

Designed as “Ka-ready” and leveraging its unique stabilization control, OrSat™ 300 ensures smooth migration to future Ka services. The 1.15m (45-inch) system is built to support a wide range of configurations with different RF packages (Ku- or Ka- or X-) and BUC power levels, and complies with the most stringent environmental standards. The Ka-version of the OrSat™ 300 is planned for release in mid 2013.

In addition, we continue to develop the **OrBand™** system which was initially released in mid 2011. OrBand™ is a compact maritime VSAT system that was built specifically to overcome the drawbacks of traditional and bulky C-band systems. In addition to the C-band configuration, ORBIT has already released a Ku-band version of the system and a Ka-band version is planned for release in mid-2013.

OrBand™ is differentiated from competing solutions by its extraordinarily small footprint, outstanding RF performance, strict regulatory and support of multiple optional RF feeds. Backed by EutelSat’s standard-M characterization and **ANATEL**’s homologation certificates, OrBand™ features a 2.2m/87-inch dish and a 2.7m/106-inch radome, which takes up 40 percent less deck space than industry-standard 2.4m/95-inch dish and 3.8m/150-inch radome systems. Moreover, OrBand™ is designed for quick and simple single-day installation, and is small enough to be shipped as a single, fully assembled and tested unit in a standard 20-foot container. This means that OrBand™ can be installed while ships are on routine port calls, substantially driving down operational costs and eliminating the need for vessels to await dry dock.

OrBand™ and OrSat™ 300 are based on a proven modular design which delivers the highest overall value to customers by using many of the same *Field Replaceable Units*, as well as sharing a common system architecture, tracking concept and software



YEAR IN REVIEW: Pactel International

by Andrew Taylor, Chief Executive Officer

Increased market share in the Papua New Guinea (PNG) region of the world, higher penetration into the resources and utilities sectors as well as the development of niche products have made 2012 the most successful year for the Company in terms of global expansion and revenue growth.

The highlight of the year was the development of multiple partnerships and distribution channels in the PNG region. In January 2012, **Pactel International**, in conjunction with the local service provider **Remington Communications**, successfully launched a new **Shiron DVB-S2 ACM** system hub in *Port Moresby*. The new hub now provides domestic corporate communication services to PNG, enabling direct connectivity between Port Moresby and the remote provinces of the country. As a result, hundreds of businesses in remote PNG now have access to fast and reliable Internet connectivity and competitively priced voice calls. We are proud to have supplied infrastructure that plays such an important role in delivering reliable communications to remote locations of the country.

To support growing demands for services in the *Indian Ocean Region*, Pactel International has deployed a carrier-grade C-band HUB, which operates via the **Intelsat IS-904** and provides extended coverage into the African and Middle-Eastern regions. Using the new hub, Pactel International can offer its customers large-scale links into regions experiencing high demand for satellite communications.

Initially, Pactel will provide deployment services into the Middle East, with plans to expand into the African market. At Pactel international, it is our corporate mission to expand and evolve together with our stakeholders and by deploying the platform, we are able to further optimize bandwidth and pass the savings onto our customers, whilst still maintaining the highest quality in a market where demand for bandwidth is high.

Domestically, we introduced a number of new fit-for-purpose offerings for the *Mining, Oil and Gas* sector. We can now easily integrate worker entertainment into our communication network to improve the quality of life for employees in remote locations, as well as provide a one-stop corporate and welfare solution. In addition, we have introduced satellite-based cloud technology, which allows companies to duplicate and secure their corporate data into the satellite cloud, so it can be securely accessed across multiple remote locations. The unique design of our satellite cloud solution provides our customers with an end-to-end secure private network, which is cost-effective by maintaining a single server infrastructure in a centralised location.

To further enhance our offerings, Pactel International expanded its Ku-band coverage across Australia, PNG and East Timor, all via the new **NSS-6** platform. Deployed at the company's Sydney facilities, the new Ku-band Hub supports voice, video and data applications, enabling usage of more portable and cost-effective equipment. Ku-Band services are readily accessible due to lower equipment prices and convenience of transportation.

The resource sector's unique requirements prompted Pactel International to design a **Remote Office Communications Kit (ROCK)** solution with a set of options specific to temporary network deployment at mining, exploration and construction sites.

Although, the solution can be standardized, the customer has an option of choosing their desired hardware, service and the antenna type.

The equipment and antenna were designed for rapid and simple deployment with training for self-install and commissioning. The solution enables companies to save time and costs associated with logistics and equipment operation. Combined with the recently launched Ku-band platform in Australia, Pactel's ROCK is bringing an affordable rapid deployment solution to the currently underserved resources and utilities markets.

In October of this year, Pactel International was appointed by **CenpacNet** Inc to establish communications infrastructure for Australian government facilities in *Nauru*. Within a lead-time of one week, Pactel International designed and commissioned a network which now provides Internet and VoIP access to the first group of asylum seekers who arrived at the island. Access to communication facilities allowed refugees to communicate with their families and also place requests for assistance—Pactel will ensure our service satisfies these critical needs.

Moving forward, Pactel International will continue to shape the future of reliable communications through a cutting-edge innovation strategy across all business units, all the while expanding our geographical locations and market share.

And, finally, to all of our valued customers and partners...as we rapidly approach the close of 2012, we would like to take this opportunity to thank each and every one of you for your loyalty and ongoing support. Due to the opportunities presented to us, and your timely feedback, the Company has been able to grow, prosper and successfully diversify its services.

In 2013, you will continue to see Pactel evolve and innovate through technology upgrades and the expansion of the range of services being offered to ensure all of your communication needs are being met. We look forward to continue serving you in 2013.



YEAR IN REVIEW: SkyWave Mobile Communications

by Dan Poirier, Senior Vice President of Operations



What successes did SkyWave enjoy over the past year?

In August 2011, SkyWave and Inmarsat launched the industry's most recent satellite service designed for machine-to-machine (M2M) applications. Called *IsatData Pro* (IDP), it has been gaining much traction in the commercial M2M space in 2012. In fact, as proof of the service's success, in October we announced with Inmarsat that 12,000 terminals have been sold, to date. This is a significant accomplishment for our channel.

To address the needs of our customer base, 2012 was the year that we introduced our next generation dual-mode satellite/cellular product. Called the **IDP-780**, this product is designed mainly for fleet management applications and allows our customers to expand from tracking and tracing vehicles to a broader coverage of monitoring and managing fleets. It will also allow customers to support workflow automation solutions that are particularly popular in the North American market.

Beyond fleet management applications, 2012 was the year that SkyWave gained more traction in new market segments such as utilities, mining, and environmental monitoring—sectors where it was previously assumed that in areas with no cellular or radio coverage, there were no low-cost satellite options to ensure connectivity. Applications that are particularly important in these new sectors include water metering, water level and quality monitoring, and feeding data into flood prevention initiatives.

In terms of new regions, in 2012 IsatData Pro secured regulatory authorization in Russia. We expect that now we will be able to leverage some of our past successes to help Russian energy companies gain the same operational efficiencies and cost savings enjoyed by other companies that have embraced satellite-based remote monitoring. Applications for this region include pipeline and wellhead monitoring as well as fleet management.

In 2012 we continued to develop our distribution channels including

our partnership with **Quake Global** for heavy equipment monitoring—a very important initiative for the mining and construction industry. All this work by the SkyWave team and our channel has led to industry recognition including *2011 Satellite Spotlight of the Year*, *2011 M2M Evolution Product of the Year*, *CTIA E-Tech Award* and a position on *Deloitte's 2012 Technology Fast 500*.

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

In terms of challenges, while North American companies have readily adopted L-band messaging terminals for oil and gas applications, in other parts of the world many energy companies do not even realize that there is a cost-effective alternative to Ku-/C-band satellite products for remote telemetry applications. Our challenge is to bring the awareness that, for some applications, the ability to send critical operational data via short messages is all that is needed. Using the "right size terminal for the right size application" also has additional benefits like resistance to rain fade, greatly increased antenna pointing tolerance, low energy consumption, RTU-like capabilities and finally less strain on CAPEX and OPEX budgets.

At the same time, IsatData Pro continues to gain traction in the transportation sector, where we are getting more and more requests for a container/trailer tracking solution with a very slim form factor, an integrated battery and all the benefits of IsatData Pro satellite service. A product like that would have many applications in the cargo transportation market, and also satisfy a need in the maritime market, where it can be used to track fishing vessels in vessel monitoring systems (VMS), especially those with hard-to-reach or no power sources.

Finally, we will be continuing our market awareness campaigns for sectors such as water, waste water, environmental and emergency management sectors. As hurricane Sandy recently reminded us, terrestrial services are highly susceptible to storms of the year and organizations need to know that there is a low-cost satellite option to keep communication lines open and critical operations moving.

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

We have many upcoming projects and announcements for 2013. To address the requests from our transportation customers, we will be launching an IDP communication terminal that includes an integrated battery in the first half of 2013. We will be leveraging our extensive experience in designing low-power terminals to create a new model that will offer multi-year operation using off the shelf AA batteries. The terminal will have the capability to use both non-rechargeable and rechargeable batteries, with the option to use the vehicle's power to keep rechargeable batteries charged. As mentioned earlier, the terminal will target applications where power availability is a challenge, such as trailer, container, railcar and fishing vessel tracking applications.

We also have several major projects in our traditional sectors that are in the installation phase right now and we will be announcing these wins over the next year. Finally, we have many pilot projects for some new emerging sectors that we will release next year.

Overall, SkyWave is positioned to do extremely well in the rapidly growing satellite M2M space.



Top: SkyWave's IDP-780a terminal
Bottom: Remote satellite antenna

YEAR IN REVIEW: Space Systems/Loral (SS/L)

by Arnold Friedman, Senior Vice President, Marketing and Sales

What successes did SS/L enjoy over the past year?

This has been a positive year for SS/L with six satellites launched as of early November and several currently waiting for launch vehicles with launches scheduled before the end of the year. We have won contracts totaling approximately \$1B, and have added two new customers: Star One and NBN Co.

We continued our well-established broadband leadership with the successful launch in July of **EchoStar XVII**, a high-throughput satellite built for **Hughes Network Systems, LLC.**, that will deliver broadband satellite services to consumers, businesses, and government customers across North America. In addition, we were awarded a contract for the space segment of Australia's **National Broadband Network**, and are designing and building the two satellites, **NBN Co 1A** and **1B**. This initiative will ensure all Australians have equal access to high-speed broadband, even in the remotest sections of the country.

During 2012, we saw the U.S. Government begin to take action to leverage the value of the commercial sector and we were pleased to be awarded contracts from several different agencies. Our high-production capabilities and technical expertise will help bring affordability to U.S. Government programs.

Hosted payloads have been an important topic of discussion during the year. In April, we were awarded a contract from **NASA Goddard Space Flight Center** to host a **Laser Communications Relay Demonstration (LCRD)** on a commercial satellite. SS/L was also selected by the **Defense Advanced Research Projects Agency (DARPA)** to develop a hosted payload concept for its **Phoenix Project**, which is focused on developing and demonstrating technologies to cooperatively harvest and re-use valuable components from retired, non-working satellites in GEO.

Our company's third U.S. Government contract award for the year came from the **U.S. Air Force Space and Missile Systems Center's (SMC)**. The company was selected to develop affordable design concepts for the next generation *Protected Military Satellite Communications* (MILSATCOM).

What challenges did SS/L need to overcome over the past year?

Worldwide, evolving infrastructure means more competition in the telecommunications industry. In countries that have mature, well-established telecommunications networks, satellite growth may be limited. Therefore, the challenge for satellite manufacturers, especially those in the commercial sector, is to identify the markets with the largest growth potential.

In regions where terrestrial services don't meet the needs of the user or are not economically, or logistically feasible, demand for satellite service is increasing. These geographical locations are becoming favorable markets with areas of opportunity for satellite operators. For example, parts of Latin America, such as Brazil, are showing high demand for satellite services.

However, there remain numerous applications that continue to drive market growth and the sheer amount of digital data that proliferates each year continues to expand.

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

We have three key initiatives for the next year.

First, SS/L is focused on *increasing on-orbit capacity*, for television—especially HD and ultra HD—and for broadband. Our SS/L **1300** satellite platform has the power to maximize the amount of HDTV channels that can be broadcast from a single satellite, and has also been shown to support the complexity of the world's highest capacity broadband satellites. Our advanced use of spot beam designs and frequency

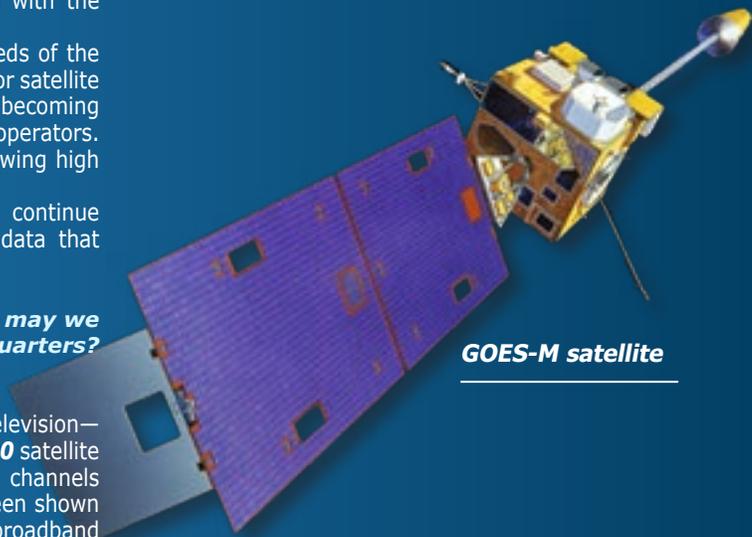
reuse is enabling unprecedented capability and we now have more commercial capacity on orbit than any other manufacturer.

Second, SS/L has continued its work with *electric propulsion* throughout 2012. We have an outstanding track record with the technology. Our electric propulsion system, which we refer to as *Stationary Plasma Thrusters (SPTs)*, was first used on satellites launched in 2004 and 2005 and has had more than 20,000 hours of on-orbit operation without a single failure. Currently, 12 SS/L-built satellites on orbit have electric thrusters, with 10 more in backlog. We expect that number to continue to grow as demand for the technology increases.

Our next-generation electric thruster, which we have continued to develop, is based on the same design and is available for orbit raising today. Depending on the mass of the satellite, it can deliver a GEO to orbit in as little as 30 days and enables a 30 to 40 percent increase in dry mass per launch. We can also provide hybrid electric propulsion and bipropellant systems for orbit raising, which have the benefit of reducing mass but also getting to orbit faster than the all-electric solution.

Finally, we continue to leverage our experience with *hosted payloads*, to help bring disaggregation and affordability to U.S. government programs. As founding members of the **Hosted Payload Alliance**, Space Systems/Loral is working with others in the industry to expand the opportunities for government payloads on commercial satellites. Our experience with hosted payloads began more than a dozen years ago with solar x-ray imagers for NASA on the **GOES 11** and **12** spacecraft. Additional SS/L-flown hosted payloads include the **Cisco Internet Router In Space (IRIS)**, which flew on SS/L-built **Intelsat 14**; CCD cameras on **EchoStar XI** and **DBSD (ICO G1)**; and the **European GPS Navigation Overlay System (EGNOS)** on **SES-5**.

Going forward, we hope to continue to apply our experience to help government agencies identify programs that are appropriate for hosted payload missions, and to work with satellite operators to find commercial missions that are appropriate hosts. In doing this, we can help bring economic benefit to both the government and the commercial customer.



GOES-M satellite

YEAR IN REVIEW: Telespazio VEGA UK

by Graham Hart-Ives, Head Of Network + Connectivity

What successes did Telespazio enjoy over the past year?

During 2012, we introduced four new product lines into the UK, dramatically expanding the portfolio of products offered from world class MSS solutions

to fixed and mobile VSAT, backhauling and TV Broadcast services.

We are now generating interest from a much wider portfolio of clients and are able to offer existing clients a richer product set from which to select. This wider portfolio has meant we have had particular success this year in recruiting new distribution channels and opening new markets, such as M2M and construction.

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

At the start of the year, we were faced with challenges in maintaining margins in a market that is mature and has many large players. We responded by broadening the portfolio and consolidating key functions into head office operations. This gave us the freedom to focus on the customers with whom we had the strongest relationships, and with whom we felt we could generate long lasting partnerships.

I think that in the medium term, Ka-band represents a double edged sword. For those unprepared for the revenue and margin falls that it's introduction are already bringing to the market, many will see their business diminish unless they have high-quality, value-added services to offer customers that can take advantage of this technology—firms without these capabilities will undoubtedly suffer.

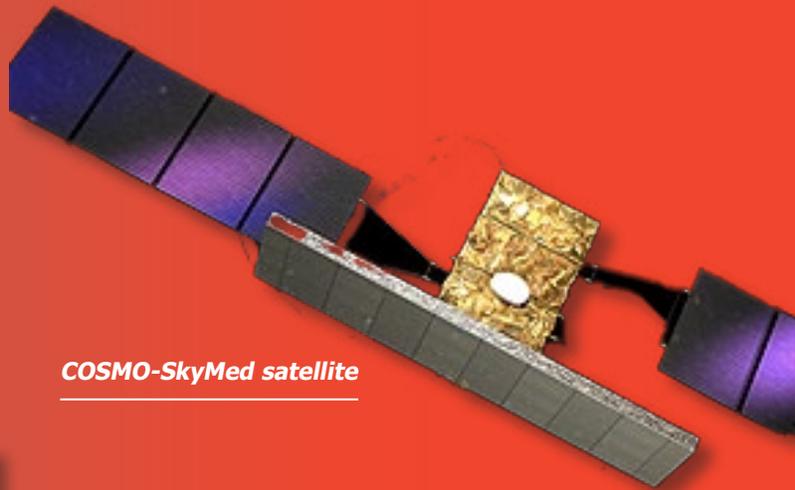
The other edge, of course, encompasses the new opportunities that these low prices will offer to the end-user. Such is already presenting new uses and new markets are opening. The key challenge is identifying and

building the correct solutions today to place an organization in the correct position in the value chain.

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

We are looking forward to some exciting announcements concerning distribution over the coming months. We have, recently, won some business that will enable us to take a step into a new market. This represents for us a key element in our future growth plans.

More specifically, we are developing our billing and customer self-management tool—**The Portal**—to bring enhanced flexibility to our channel. Plus, we are investing in the method whereby we interact with one of our key customers that will enable them to offer a more complete service to their end users—and that drives business for all of us.



COSMO-SkyMed satellite



Fucino Space Centre—Launch and Early Orbit Phase (LEOP) control room—image courtesy of Telespazio

YEAR IN REVIEW: Thermopylae Sciences + Technology

by AJ Clark, President

What successes did Thermopylae enjoy over the past year?

2012 was a very exciting year for Thermopylae Sciences and Technology (TST), where we saw tremendous growth and won multiple industry awards. For example, in October, we were honored to receive the **Star Workplace Award** for medium-sized workplace from **2012 Washington SmartCEO**.

In addition, we were selected as a **2012 GovCon Award Finalist** for small business under \$25 million. Finally, we received a major award from the **C4ISR Journal**, which recognized our **Windshear** program as one of the **Biggest Breakthroughs of 2012**.

In addition to receiving multiple awards, we released new versions of all three of our core products. We also coordinated with our partners at **Google** to complete a massive enterprise licensing deal regarding its **Google Earth** software for the **Department of Defense**, which will effectively take place over the next five years. We also won a major contract with the **Defense Intelligence Agency (DIA)** to support future cloud and advanced analytic/geospatial interfaces.

What challenges did Thermopylae need to overcome over the past year?

It's no secret that funding for large **Intelligence Surveillance and Reconnaissance (ISR)** programs was less during 2012. Though we are seeing major changes in the satellite sector, which is being driven by major mergers of companies such as **GeoEye** and **DigiGlobe**. Their convergence is a positive environment for us, actually. Due to the resources both organizations bring to the combined company, they have the potential to invest in service delivery conduits to meet a much larger customer base.

At **TST**, we focus on getting tools and data in the hands of users that are part of a new *geo literate* community. This community had their eyes opened as to what they could do with satellite imagery when **Google** made **Google Earth** available. This resulted in hundreds of millions of people around the world downloading and using it.

As such, the convergence of these commercial providers allows us to focus our resources on supporting a collective effort around a single organization. Rather than building two content delivery systems and trying to make them work in a burgeoning market, we can pool

resources, as firms such as TST are engaged to support and create a better experience and business model for the new geo literate community of users. This new community might want to purchase smaller chunks of pixels, rather than customers purchasing historic large chunks such as the **National Geospatial Agency (NGA)**.

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

Through our partnership with Google, we are excited to be using new methods to deliver management tools for commercial satellite imagery to mobile smart phone users. We are currently providing select commercial and federal customers with the ability to load a miniature **Google Earth Server** that runs on a smartphone device. Such allows users to have beautiful imagery and maps—even if they don't have a network connection.

This capability removes bandwidth constraints that come from transferring a large map or image tiles. It's an incredible innovation and we are thrilled to be involved with this effort by delivering this technology in its early stages to end users. Over the next few quarters, we will also be rolling out this full capability.

In addition, during the next three to four quarters, TST is launching three major product upgrades. Our **iSpatial** product underwent a significant investment that combined all of the lessons learned from working with commercial satellite imagery and optimized the user interfaces for a higher degree of performance and leveraging emerging technology solutions. This will allow us to easily mature and grow with the latest browser-based technologies, while still supporting customers using legacy browsers that are part of their baseline of systems.

Finally, our **Ubiquity** products will be riding the wave of mobile adoption in the enterprise user space in the coming months.



YEAR IN REVIEW: ViaSat

by Bruce Rowe, Director, Public Relations



What successes did ViaSat enjoy over the past year?

The ultimate success was when our new high-capacity satellite system entered service in January. That included the rollout of our Exede Internet service at the end of March. We had planned for that to occur for many

years, starting with the design of our new system, including ViaSat-1, the satellite construction, building all the back office facilities and infrastructure for the network, and then the launch of the satellite in 2011. Consumer and media response to Exede Internet has been overwhelmingly positive and we've added more than 100,000 subscribers in the first six months.

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

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

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

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

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

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

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

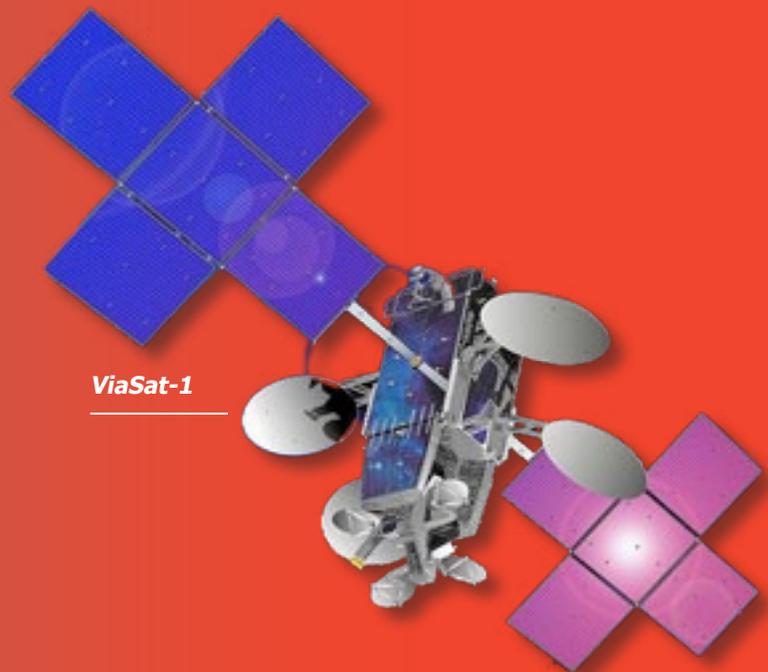
Certainly the government budget situation—sequestration and the *fiscal cliff*—are a challenge for all businesses, particularly for those of us who derive a major part of Company revenues from government contracts. The administration is promising to resolve the problem before it takes effect and we hope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

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

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

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

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



YEAR IN REVIEW: Vislink

by Michael Payne, Chief Executive Officer

In 2012, the Vislink SATCOM focus was on the launch of the world's smallest and lightest satellite data terminal, the Advent Mantis MSAT. The launch of the MSAT product has been successful and a testament to Vislink's ability to quickly respond to customer needs with market leading products.

At 27.5 lbs., MSAT is designed for a one-man operation in challenging operational environments. It is a rugged terminal, resistant to extreme environmental conditions, that is deployed from a single lightweight backpack. The MSAT is a versatile addition to the Vislink portfolio of solutions that includes satellite, microwave, IP and cellular technologies. In addition, the MSAT compliments a range of manned and unmanned solutions that Vislink already provides for land-, sea- and air-based communications and surveillance.

Initial military orders are now being filled and MSAT terminals are currently undergoing field trials for battlefield, command center and special operations implementations. MSAT meets the high-bandwidth connectivity requirements now demanded by forces around the world to address an increasingly difficult operating environment.

Vislink developed the military spec. MSAT to address demand from forces around the world that require a highly portable solution capable of delivering high bandwidth voice and data communications. Providing up to 5Mbps upstream data throughput, MSAT can be used to deliver high-definition video intelligence in addition to standard voice and data requirements. Even in the most hostile operating environments, the terminal can be unpacked and operational within five minutes.

MSAT meets the **MIL 810F** & **DEF-STAN** military specifications for shock, vibration, sand and rain and is provided as a *one box* solution incorporating antenna, modem and all electronics. A high performance parabolic antenna is coupled, according to customer requirements, with interchangeable modem and encoder options.

The latest development of the company's MSAT system is designed to address the emerging Ka-band satellite newsgathering requirements of broadcasters around the world.

The Mantis MSAT is an exciting departure for Vislink's **Advent Satellite** product portfolio. Never before have we had the combination of speed, flexibility and lightweight construction bundled into a single product. The combination is clearly the right one because our customers have made it the fastest-selling satellite terminal product in our 30-year history. The terminal is available to operate in X-, Ka- and Ku-bands.

Why Ka-Band?

- Rapid proliferation of Ka-band availability and capacity:
- 3650 x 36Mhz transponder equivalent bandwidth in 2011
- 4910.3 in 2012 (34.5 percent increase*)
- Note: Over 44 satellites with Ka-band payloads due to be in operation in 2012*
- Trend continues for the foreseeable future with a significant number of new Ka-band satellites under construction
- Proliferation of Ka-band equipment in parallel with increased capacity availability:
- New Ka-band interoperable or specific VSAT modems
- Additional ODU options (reflectors, transceivers, BUCs, LNBS)
- Additional Ka-band integrated terminals (manpack, vehicle mounted, maritime)

*Frost and Sullivan, Global Transponder Market, May 2012

The Trade-offs Between BGAN + Ka-Band

Recent launches of high-throughput Ka-band satellites are set to add another dimension to satellite news-gathering(SNG). The challenge was to provide a comprehensive Ka-band SatCom product with a form factor that delivers portability, ease of use, and superior performance in a variety of environments. To address the market needs, Vislink developed the **Advent MSAT**. A solitary reporter with an Advent MSAT

terminal can engage the unit's on-board GPS satellite finder, align and lock-on to a receiving satellite, acquire a network, set up a camera and prepare for a live shot in minutes. It uses readily available battery or mains power and supports all popular transmission modem options.

One of the major benefits in using Ka-band is the cost of use. Recent studies have shown that the use of Ka-band is up to 30 percent less expensive than BGAN transmission, which means that an MSAT system could pay for itself in one year. The expanding availability of Ka- segment space is what is making this possible. **Eutelsat, Yahsat, Avanti, ViaSat** and other satellite communications companies have recently launched satellites specifically for Ka-band use, so the Ka-band footprint is expanding rapidly. Europe, North America, the Middle East and Russia are already covered and initiatives are under way in Australia and Latin America.

Vislink is the only secure communications manufacturer to offer integrated solutions that include satellite, microwave and cellular technologies. Our research and development teams have been hard at work creating the next generation of solutions for the broadcast and surveillance markets.

In 2013, Vislink's innovation will continue as we unveil our most comprehensive set of video collection and distribution products enabling the customizable solutions our markets require. Vislink's core competencies of satellite, microwave, and cellular provide an uncommon leadership position by bringing these technologies together and offering the most competitive solutions for broadband connectivity. These ubiquitous communications solutions, regardless of the transmission method, will provide seamless user experiences.



Vislink's Mantis MSAT



YEAR IN REVIEW: WORK Microwave

by Kai Koppenburg, Sales and Marketing Director

What successes did WORK Microwave enjoy over the past year?

This year we developed many innovative new technologies and products to increase our worldwide customer base and build on the company's more than 25 years of

success designing satellite communications equipment.

Leveraging **DaVid** technology, our new **DVB-S2 Modem SK-DV** data and video modem simultaneously transport data (network connection) and live broadcast (video content) over a single satellite carrier, aggregating multiple **MPEG** transport streams and **IP** data into a unified **DVB-S2** multistream.

This is a significant development for the satellite communications industry because it provides operators with one device for managing **ASI** and **IP** inputs, making it easier to support hybrid infrastructures while optimizing bandwidth, increasing data-transport efficiency, and reducing operating expenses.

Another important advancement is the five percent *roll-off* feature recently added to our **DVB-S2** modem and modulator solutions. This means operators can achieve up to a 15 percent bandwidth gain on top of the **DVB-S2** standard, a significant improvement in bandwidth allocation as compared to the 20 to 35 percent roll-off provided by **DVB-S2**. This can dramatically lower a user's operational costs.

We have also optimized bandwidth use by introducing a new traffic shaping capability to our modem portfolio. Operators can now control the volume of traffic being sent over satellite and determine minimum/maximum data rates for each content type.

A recent partnership with **XipLink**, a leading developer of wireless bandwidth optimization products, further enhances our modem series by integrating **WORK Microwave's** **DVB-S2 IP-Modem ACM** functionality (**OptiACM**) with **XipLink's** traffic shaping **QoS/TCP** function into a single environment. This effectively eliminates issues associated with traditional bandwidth allocation and introduces new configuration parameters and options that were not previously possible.

Our next-generation **DVB-S/S2** modulator was highly successful in the broadcast and teleport markets. The flexible solution features multistream technology, *transport stream over IP* (**TSoIP**), and a powerful new user interface to increase cost savings on satellite bandwidth costs while minimizing rack space requirements.

Finally, we launched our next-generation **Frequency Converter Series**, which features a lower phase noise by far exceeding the recommended industry standard according to **Intelsat's IESS-308/309** phase noise specification.

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

Perhaps our greatest accomplishment this year was designing a frequency converter series that provides a competitively priced, highly scalable and customizable modular design while delivering lowest possible phase noise. Phase noise interference can be extremely harmful to a satellite operator's signal as it moves through the communications link and reduces the quality of that operator's service.

Given the growing demands of advanced modulation schemes, such as **16APSK** and **32APSK**, and higher operating frequencies, such as **Ka-band**, we understood the industry's need for an improvement in phase noise performance. To meet this need, we recently launched the fifth generation **Frequency Converter Series**, which reduces phase noise levels above and beyond the recommended industry specification to

achieve a phase noise level better than $-65\text{dBc}/\text{Hz}$ at 10Hz and $-97\text{dBc}/\text{Hz}$ at 10kHz for **Ku-band**, and better than $-58\text{dBc}/\text{Hz}$ at 10Hz and $-91\text{dBc}/\text{Hz}$ at 10kHz for **Ka-band**. We are particularly proud of our achievement in reducing phase noise within the **Ka-band**, due to the specific challenges presented by this frequency range.

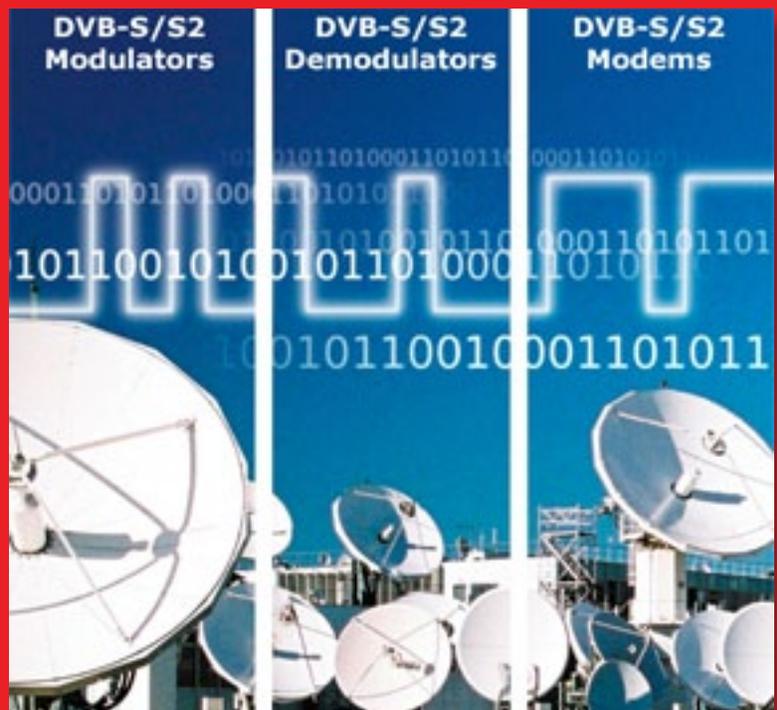
What upcoming projects are in the works and what may we expect to see from WORK Microwave over the next three to four quarters?

A trade-off of implementing a small (five percent) roll-off in our modem portfolio is pre-distortion on the transmission side. Our goal is to execute pre-distortion as well as make it accessible for any user, especially those who are not RF specialists. Dedicated measurements or programming the complete transponder characteristics are some of the initial approaches we are currently working on to optimize pre-distortion for the end user—we plan to roll out those enhancements in the near future.

Now that we have been able to demonstrate the dramatic improvements in performance and bandwidth allocation offered by our fifth generation frequency converter series, we are focused on securing new deployments in the Asian, African, and North American markets.

The most promising projects are **Ka-band** deployments, as it is challenging to achieve a low phase noise at higher frequencies. In digital broadcasting applications, it is especially important not to exceed the recommended level of phase noise according to **Intelsat's IESS-Norm-308/309** as a worse phase noise level causes digital signals in the demodulator to be decoded incorrectly, creating artifacts in the TV signal. **WORK Microwave** frequency converters enable satellite providers operating in the **Ka-band** to achieve a phase noise far better than the **Intelsat** industry recommendation; therefore, we expect growth in this area.

Finally, between introducing lower phase noise levels for our frequency converter series and bandwidth optimization technologies for our modem portfolio, we expect to not only maintain our primary broadcast customer base, but also address the needs of new and emerging market segments such as *Internet Service Providers*.



No Separation Anxiety

Sea Launch AG has successfully launched the EUTELSAT-70B satellite from the Equator on the ocean-based Launch Platform Odyssey, completing its second mission for Eutelsat and marking the completion of Sea Launch's third and final mission in 2012.

The Zenit-3SL rocket carrying the spacecraft lifted off at 12:43:59 Pacific Standard Time (PST) on Monday, December 3rd (20:43:59 UTC/GMT, 21:43:59 CET) from the launch platform, positioned at 154 degrees West longitude in the Pacific Ocean.

One hour and six minutes later, the Block DM-SL upper stage inserted the satellite, weighing 5,210 kilograms (11,485 lbs.) and built by Astrium, an EADS company, into geosynchronous transfer orbit, on its way to a final orbital position at 70.5 degrees East longitude. Eutelsat acquired the spacecraft's first signals from orbit shortly after spacecraft separation. All systems performed nominally throughout the launch mission.

Following acquisition of the spacecraft's signal, Kjell Karlsen, president of Sea Launch AG, congratulated Eutelsat and Astrium.

"We take great pride in having successfully delivered Eutelsat's spacecraft accurately into its designated transfer orbit. Once again, the Zenit-3SL/B has proven itself as a reliable and accurate launch system with an overall launch success rate of 95 percent." Karlsen continued, "To our colleagues at the launch site and around the world – well done! Your dedication to perfection reflects the best of what Sea Launch represents."

Michel de Rosen, Eutelsat CEO, added "The flexible EUTELSAT 70B satellite will further consolidate Eutelsat's commercial response to clients providing video, data and telecoms services in a vast footprint encompassing Europe, Africa, Asia and Australia. Our thanks go to Sea Launch AG, Energia Logistics and RSC Energia for this flawless launch and their professionalism throughout the campaign."

The EUTELSAT 70B satellite is based on the Astrium Eurostar E-3000 platform with a designed in-orbit lifetime exceeding 15 years. It will replace the EUTELSAT 70A spacecraft and more than double Eutelsat's resources at its 70.5° East longitude location to provide premium communications services for users in Europe, Africa, Asia and Australia.



