

Worldwide Satellite Magazine

June 2011

SatMagazine

REFLECTIONS ON ASIA



Yau Chyong Lim
MEASAT

Andrew Jordan
GE-Satellite

Yen Chen
Integral Systems

Mike Antonovich
Global Crossings
Genesis Solutions

William Wade
AsiaSat

Steve Collar
O3b Networks



SatMagazine
Vol. 4, No. 4 — June 2011

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

Authors

Thomas C. Coyle
Ebrahim K. Ebrahim
Ellen Ferrante
Rich Harvey
Hartley Lesser
Paul Sims
Pattie Waldt

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

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

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

SatMagazine — June 2011 — Payload

Focus on Asia Pacific: Intro

William Wade, AsiaSat	12
Andrew Jordan, GE-Satellite	15
Mike Antonovich, Global Crossing Genesis Solutions	18
Yen Chen, Asian Operations, Integral Systems	20
Yau Chyong Lim, MEASAT	24
Japanese Disaster Report, Newtec's Moubic	26
Steve Collor, O3b Networks	30
Steffen Holzt, Pactel International	32
Enabling India, <i>by Paul Sims</i>	38
SatCom Potential In Asia, <i>by Ebrahim K, Ebrahim</i>	40

InSight

Inmarsat's Global Xpress Strategy-A Call To Arms <i>by Alan Gottlieb</i>	44
The Causes of Space-Based Weather Disruptions <i>by Ellen Ferrante</i>	52

08 | A Case In Point

World-Class, Reliable Wireless Monitoring	48
Launching Bharti Airtel Into DTH <i>by Thomas C. Coyle</i>	70

Executive Spotlight

Dr. Sean Faulkner, Sky Wave	56
-----------------------------	----

Focus

The Shocking Truth About Satellite Transportation	64
---	----

Executive Summary

The Space Report	74
------------------	----

SatBroadcasting™: Tech Talk

Preserving 4:2:0 Chroma Fidelity <i>by Rich Harvey</i>	84
---	----

SatMagazine — June 2011 — Advertiser Index

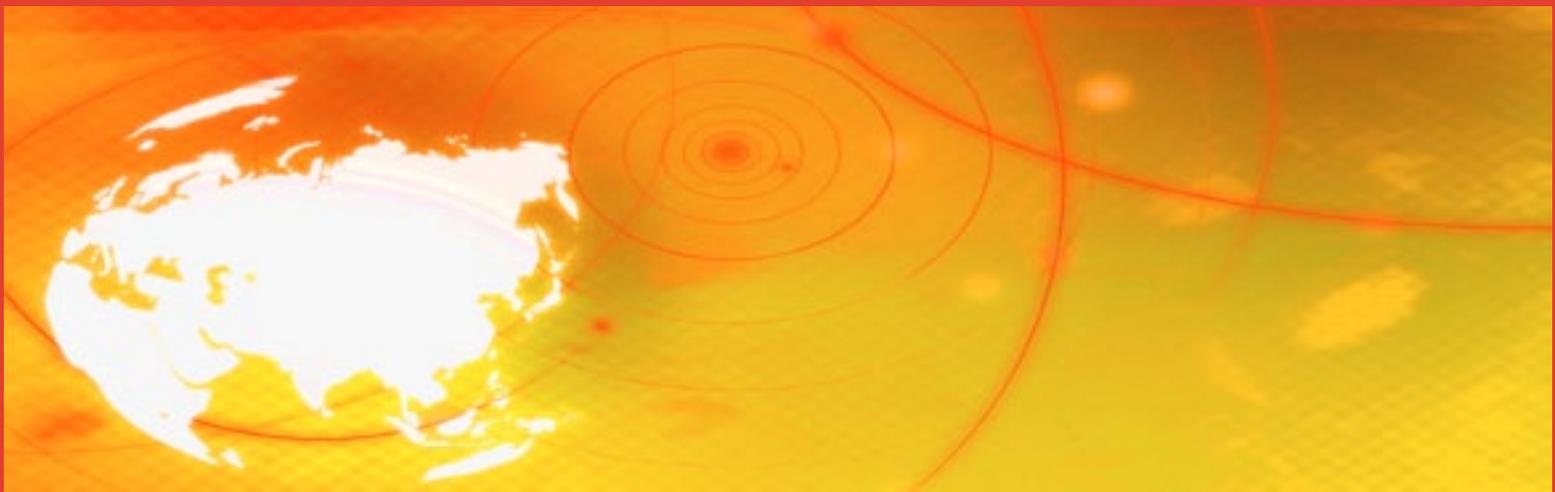
AAE Systems	57	Gottlieb International Group	45
Advantech Wireless	back cover	iDirect	73
Asia Broadcast Satellite (ABS)	29	Integral Systems	23
AMOS by Spacecom	17	Intelsat General	cover + 07
AnaCom, Inc.	71	MANSAT	83
APSCC Asia-Pacific Satellite	67	MITEQ / MCL	Inside front cover
Arabsat	69	Newpoint Technologies	13
AVL Technologies	75	NewSat	05
Azure Shine International	51	Newtec CY	07
Bridge Technologies	06	O3b Networks	03
Brüel & Kjær	65	Pacific Telecommunications	63
C-COM Satellite Systems	53	RT Logic	33
Comtech EF Data	08	Skyware Global	35
Comtech Xicom Technology	59	Space Foundation	81
CPI Wireless Solutions-SATCOM	27	Teledyne Paradise Datacomm	Inside Back Cover
GE-Satellite	15	Wavestream	47
Global Link Productions	41	WORK Microwave	11

Focus On Asia–Pacific

According to leading research firm Futron Corporation — who prepared an outstanding *Space Foundation Space Report 2011* (an executive summary of which appears later in this issue) — 105 satellites were launched during 2010, bringing in approximately \$10.55 billion in revenue. Companies are working diligently to offer SatCom and launch services to an increasingly hungry Asia-Pacific customer base. From satellite broadcasting to Earth Observation to navigation to government and military needs, this market segment is not only viable, but one that represents a great deal of growth potential for those involved in this segment.

As far as estimated spending is concerned, one needs but to view Exhibit 21 in The Space Report to see that Asian-Pacific government budgets were impressive in the billions of dollars: China = \$2.24, India = \$1.25, Japan = \$3.3, Korea = \$0.21. A number of emerging nations in the Asia-Pacific region are also committing substantial dollars to spatial involvement, which requires a major slice of their GNP — these countries include Australia, Indonesia, Malaysia, Taiwan and Thailand, to name but five.

This issue of *SatMagazine* focuses on this active market through a variety of interviews with company leaders as well as examining some of the ongoing projects and challenges presented by the Asia-Pacific market.



Focus On Asia-Pacific

William Wade, President & CEO, AsiaSat

William Wade was appointed as Chief Executive Officer on August 1, 2010, to lead AsiaSat, and as of January 1, 2011, his title changed to President and Chief Executive Officer. Prior to assuming his new role as Chief Executive Officer, Mr. Wade had served as AsiaSat's Deputy Chief Executive Officer for 16 years. Mr. Wade has over 25 years' experience in the satellite and cable television industry. Prior to joining AsiaSat in April 1994, he was with Hutchison Whampoa, as Director of Business Development for Pan Asian Systems, and was in charge of all sales and regional operations. Mr. Wade also served as Executive Director for Echosphere International (Echostar), where he established Echosphere's permanent Asian operations in Singapore while managing the company's activities in Asia and the Middle East.



SatMagazine (SM)

Would you please explain to our readers what your Company's presence is within the Asia-Pacific satellite communications and ancillary markets?

William Wade

Since our inception in 1988 and the launch of our first satellite, AsiaSat 1 in 1990, AsiaSat has been providing regional satellite services to the Asia-Pacific region serving hundreds of clients from around the world, and millions of their customers across 50 countries. We have evolved from a single satellite company offering simple transponder capacity to a fleet of three very powerful in-orbit satellites, with one more under construction and planned for launch in the fourth quarter of this year. From our world-class ground facilities at the Tai Po Earth Station in Hong Kong, we are serving customers with an expanding range of transmission services including MCPC platforms and uplink services. Through our wholly-owned subsidiary SpeedCast we are offering satellite-based services such as two-way broadband access, mobile television and maritime services; and our latest DTH joint venture DishHD enables us to make a bigger push into the growing DTH market in Asia.



AsiaSat-3S, artistic rendition courtesy of Boeing

Focus On Asia–Pacific

SM

Why did your Company enter this market?

William Wade

Asia is a diverse and fragmented market and is home to some of the world's fastest growing economies. Our strategically positioned satellites over the Asia region have benefited us in serving these developing markets. With developing technologies, increasing consumer demand for more quality content and changing government legislation to introduce market competition, we see exciting expansion opportunities for AsiaSat in the years to come.

SM

Are you focused on any particular segments, due to their growth potential? (i.e., launch, manufacturing, teleport, security, milsatcom, imagery, satellite broadcast, and others) What market segments do you believe are the most promising for your Company?

William Wade

We will continue to focus on our core business of transponder capacity leasing through expanding our satellite fleet and teleport facilities to diversify our service offerings and support the operations of our subsidiary companies. We are also looking to make acquisitions that enable us to access new geographical markets and expand into applications that complement our existing services.

SM

What have been among your most successful projects for this market? Why?

William Wade

As Asia's first privately owned regional satellite operator, AsiaSat has been playing a significant role in the development of Asia Pacific's satellite communications since 1990. AsiaSat

pioneered the Asian satellite television with the launch of AsiaSat 1 and changed the way millions of people watched television. The launch of our second satellite AsiaSat 2 in 1995 marked another milestone for regional satellite broadcasting by introducing to the region its first digital TV service. The launch of AsiaSat 3S, AsiaSat 4 and AsiaSat 5 in 1999, 2003 and 2009 respectively with their larger capacity payload allowed us to continue to extend our services to meet the rapidly growing market demand in Asia, and to move into new business ventures. The commencement of our Tai Po Earth Station in 2004 and its expansion project started this

Focus On Asia-Pacific

year, enabled us to offer more services as well as provide a fully redundant satellite control facility to assure our customers of a high level of service reliability. Our next exciting project will be the launch of our new satellite AsiaSat 7 planned for the fourth quarter of this year.

SM

The challenges are numerous for entry into, and for business sustinment within, this area of the world. What do you see as among the most formidable challenges to surmount?

William Wade

We had a very successful year in 2010 with record results in both turnover and profit, and improved satellite utilization and an expanding high quality customer portfolio. Our biggest challenge this year is to maintain growth though we see market competition intensifying across the region.

SM

Given the state of the global economy, how do you rate the Asia-Pacific market as far as its viability for income generation and growth over the next year or two?

William Wade

Despite the economic uncertainty that continues to impact many parts of the world, the Asian satellite industry generally has stabilized and is making good progress. We expect to see continued healthy expansion for the Asian market, driven by growing regional demand for HDTV, the exponential development of pay TV platforms across Asia, and the continued growth of telecommunications services for mobile and Internet connectivity.

SM

Have you offered any guidance to your business teams and/or shareholders as to how you project your Company's quarterly earnings for this market and for the global market overall?

William Wade

As reported in our 2010 annual results, AsiaSat achieved solid increases in all areas of our business over the past year and we see this momentum carrying into 2011. As we are experiencing demand for more capacity from existing and new customers, we remain optimistic towards the future prospects for growth.

SM

How do you believe the Asia-Pacific market will impact global, as well as your Company's business opportunities?

William Wade

Some of the world's fastest growing economies are still in the Asia Pacific, for example, India and China in terms of their market size, and Vietnam in terms of its changes in regulation. We see great opportunities for AsiaSat in these markets, whether it's for video or telecom services.



AsiaSat's Tai Po Earth Station in Hong Kong

Focus On Asia–Pacific

*Andrew Jordan, President & CEO,
GE-Satellite*

Andrew is the President and CEO of GE-Satellite. He has more than 20 years of experience in the management and development of new markets and products throughout Asia. He graduated from the School of Oriental & African Studies in London and started his career in sales, progressing into executive management roles in media and satellite businesses in Asia. Former roles include: Marketing General Manager (AsiaSat), Senior VP (PanAmSat) and Executive Director (Measat). Before joining GE-Satellite Andrew founded Loft Communications, as Managing Director, providing consultancy services to the Satellite, Television and Telecommunications industries.



Focus On Asia-Pacific

SatMagazine (SM)

Would you please explain to our readers what your Company's presence is within the Asia-Pacific satellite communications and ancillary markets?

Andrew Jordan

GE - Satellite, the only U.S. based operator to provide international fixed satellite services, offers capacity on the GE-23 satellite. GE-23 is positioned at 172E, directly over the region with broad C-band coverage as well as unique Ku-band coverage. The Ku- array serves the entire pacific with interconnected spot beams from L.A. to Beijing and Alaska to Perth.

SM

Are you focused on any particular segments, due to their growth potential? (i.e., launch, manufacturing, teleport, security, milsatcom, imagery, satellite broadcast, and others) What market segments do you believe are the most promising for your Company?

Andrew Jordan

U.S. Government: Increased use of Netcentric and Communications on the Move (COTM) applications have driven demand, at a time when cancellations or delays of Government-owned satellites have resulted in more overall reliance on commercial satellite providers. We expect continued demand for our unique services supporting remote operations, maritime and Aeronautical applications in key Asian theaters of operation across the POR.

Cellular Backhaul (Telecommunications): The expansion of mobile phone usage in developing nations continues to generate demand. Satellite's ability to provide 'instant' infrastructure resulted in strong growth in this application area. Among regions seeing significant expansion of cellular services, Indonesia emerged as an important market for GE - Satellite. We expect competition from fiber is at least five years away and unlikely to replace satellite totally in more geographically challenging markets. In addition, we expect continued growth in VSAT applications in capacity constrained areas such as Australia, Russia and underserved areas in the Pacific rim

Maritime and Aeronautical Broadband (Mobile Platforms): The insatiable need for ubiquitous, Internet connectivity continues to be a key driver for broadband demand in the Maritime and Aeronautical sectors in the major transpacific airline and shipping routes.

SM

The challenges are numerous for entry into, and for business sustainment within, this area of the world. What do you see as among the most formidable challenges to surmount?

Andrew Jordan

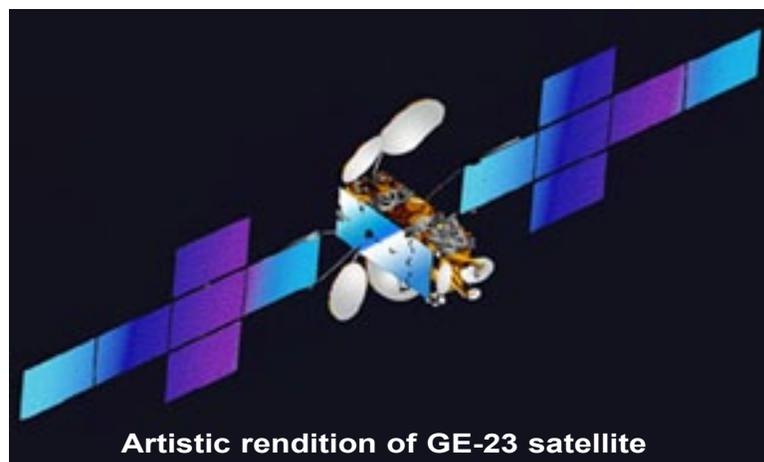
Challenges for new entrants into this market would include orbital slot and spectrum availability, as well as funding the considerable investment needed to build and launch a satellite. Plus, as demand continues to increase at a rapid pace, the biggest challenge is to find ways to make efficient use of available capacity.

SM

Given the state of the global economy, how do you rate the Asia-Pacific market as far as its viability for income generation and growth over the next year or two?

Andrew Jordan

Looking ahead, we expect to see continued growth in 2011 and beyond.



Artistic rendition of GE-23 satellite

Focus On Asia–Pacific

Mike Antonovich

Managing Director, Global Crossing Genesis Solutions

Mike is responsible for serving the high-performance, rich-media, video-based needs of the world's major broadcasters, programmers, producers and aggregators of the world's global television and media business. He was named managing director in November 2010, when the company acquired Genesis Networks, where he had previously served as the company's president and chief executive officer.



Mr. Antonovich brings more than 30 years of broadcast and satellite industry sales, marketing, operations and executive experience to his position. Prior to joining Genesis Networks, he was president and chief executive officer of The SPACECONNECTION Inc., a wholly owned subsidiary of Telesat Canada, and the industry's largest bandwidth reseller of satellite capacity. Before that, he was executive vice president, Global Sales and Marketing, and corporate officer of PanAmSat, the world's first privately-owned satellite system and leader in the development of global television contribution and distribution solutions via satellite. He also served ten years in a variety of broadcast operations and satellite engineering positions with the ESPN sports network and with Group W Satellite Communications.

Focus On Asia-Pacific

SatMagazine (SM)

Would you please explain to our readers what your Company's presence is within the Asia-Pacific satellite communications and ancillary markets?

Mike Antonovich

Genesis Networks serves a few critical functions within the Asia-Pacific region. One, we provide dedicated connectivity from programmers around the world into a number of DTH, Cable and Broadband platforms. Roughly 70 percent of what we do is deliver full-time channels from programmers to their distribution partners around the world. While we do compete quite effectively and win a significant amount of live sports origination that is "takeaway" business from satellite, when it comes to full-time transport to the region, we are very "satellite friendly!"

SM

Why did your Company enter this market?

Mike Antonovich

For nearly 10 years now, Genesis Networks has been keenly focused on the international video transport business complemented by a presence in Asia for roughly the past five years. Our video network extends into a dozen key cities across the Asia-Pacific, and we're growing rapidly in both the number of points on the network and in the aggregate bandwidth consumed across the region.

SM

What market segments do you believe are the most promising and what have been your most successful for this market?

Mike Antonovich

We cater specifically to media and broadcast clients around the globe for the movement of live news, sport and full-time video services. It a very "high touch" market, with broadcasters and programmers entrusting us with the world's most valuable video content. And, yes, it's also a very high-growth market. We have become a leading supplier of marquee sporting events, everything from delivering programming to millions of rugby enthusiasts across Asia to Grand Slam tennis, major golf events, motorcar racing, soccer and a host of other events. What has differentiated us from other suppliers is the creativity and flexibility of our service offerings, our on-site support, and the backup of a truly global network.

SM

The challenges are numerous for entry into and for business sustainment within this area of the world. What do you see as among the most formidable challenges to surmount?

Mike Antonovich

Well, from our perspective, Asia doesn't pose any more specific challenges to us other than the extended time zones and distances between destinations. But we've cultivated a great team in Asia that knows how to get things done.

SM

Given the state of the global economy, how do you rate the Asia-Pacific market as far as its viability for income generation and growth over the next year or two?

Mike Antonovich

The Asia-Pacific marketplace is probably the highest growth market for us as both an "exporter" of content to the Rest of World and as an "importer" of high-value sports broadcasts back into the region. There are still tremendous growth prospects for us as we continue to extend our reach across the entire Asia-Pacific region.

Globally, in fact, the market for these services is growing. For instance, industry research firm Infonetics Research forecasts that worldwide revenue for video services, including IPTV, cable video and satellite video services, will top \$250 billion in 2014. And, according to the Visual Networking Index (VNI), an industry benchmark report produced by Cisco, 3D and HD Internet video will comprise 46 percent of consumer Internet video traffic by 2014.

SM

How do you believe the Asia-Pacific market will impact global, as well as your Company's, business opportunities?

Mike Antonovich

The Asia-Pacific market has very high growth prospects, both from the growing number of international channels coming to market and from the continuing transitions from Standard Definition to High Definition broadcasting. Content distribution for a wide variety of ethnic and cultural channels gets more global every day, and Genesis Networks is there to help our clients move content around the world.



Focus On Asia-Pacific

Yen Chen, Vice President of Asian Operations, Integral Systems

Yen-Wu Chen is the Vice President of Asian Operations at Integral Systems, Inc. of Columbia, Maryland U.S.A. He is responsible for developing Integral Systems' Asian business. Mr. Chen has more than 30 years IT experience and has worked at Integral Systems for over 20 years. He can be reached at yen@integ.com.



SatMagazine (SM)

Would you please explain to our readers what your Company's presence is within the Asia-Pacific satellite communications and ancillary markets?

Yen Chen

For nearly two decades, Integral Systems has been working closely with satellite operators and service providers in Asia-Pacific. We consistently hear the same thing from them in terms of what they are looking for from companies such as Integral Systems who provides complete ground segment solutions.

Satellite operators are working hard to consolidate operations across *Telemetry Tracking and Control* (TT&C) sites for their satellites by centralizing the management and control of their space and ground assets into a single system. Previously, the satellite manufacturer provided the *Satellite Control Systems* (SCS) and antenna vendors provided the *Monitor and Control* (M&C) software for the ground equipment. Far too often, operators have been left to deal with a number of different proprietary systems that are overly complex, difficult to manage and costly or impossible to maintain.

Today, satellite operators are gaining efficiencies and reducing training costs by standardizing on a single, integrated, commercial-based solution like the ones we provide to many customers worldwide. Our solution is based on the **EPOCH Integrated Product Suite** (IPS) from Integral Systems for the SCS and satellite fleet management, **Monics**® with SAT-DSP for carrier monitoring and interference detection from SAT Corporation, **satID**® geolocation system to quickly and accurately locate ground-to-satellite transmission sources from RT Logic, and **COMPASS Network Management System** (NMS) for M&C

from Newpoint Technologies. (SAT Corporation, RT Logic and Newpoint Technologies are all wholly-owned subsidiary of Integral Systems.)

Service providers have a similar problem. They need to remain competitive in a fast growing, hotly contested market that is demanding better *Quality of Service* (QoS). They face the additional challenge of providing coverage over a large geographical area where many sites are expensive and difficult to access. Unlike satellite operators who have one or two teleports that have a large number of antennas to manage, service providers have 50 to 500 remote sites that are geographically dispersed often times in extremely remote locations. Clearly, it's cost prohibitive to man them all. Network management solutions like COMPASS and remote site management systems like Mercury are being used to centrally monitor the network and provide important alarm information on the sites. In many cases, sites can be recovered without having to send a technician, which is costly and time consuming. Worst case, network administrators are able to identify the problem at the site, so the technician dispatched has the right equipment to recover the site the first time without having to make potentially expensive return trips.

SM

Are you focused on any particular segments, due to their growth potential? (i.e., launch, manufacturing, teleport, security, MilSatCom, imagery, satellite broadcast, and others.) What market segments do you believe are the most promising for your Company?

Focus On Asia-Pacific

Yen Chen

The growing problem of satellite and signal interference will continue to plague the industry on a global scale. The number of satellites and ground transmitters are growing rapidly, increasing the number of interference events and the effects of interference. Euroconsult recently reported that roughly 1,185 satellites will be built and launched from 2009 to 2018, a roughly 50 percent increase from the previous decade. Another leading industry group estimates that satellite operators with small-to-large fleets of geostationary satellites positioned in the Atlantic, Pacific and Indian Ocean regions lose hundreds of thousands, if not millions, of dollars in revenue per year due to RF interference. The financial impact manifests itself in lost revenue from the actual outage time and the man-hour costs spent locating the source of the interference and mitigating the issue. The secondary impact of RF interference is potential damage to the reputation of the service provider. It is difficult to place a dollar value on this secondary impact, but given the competitiveness of the market, customer satisfaction is critical.

To combat interference issues, vendors are providing products that automatically detect interference and geolocate the source. Integral Systems has been at the forefront of developing and offering innovative signal interference detection and Geolocation products and services. In fact, our Monics interference detection and satID geolocation systems are the most widely used products in the industry, providing accurate detection within minutes and the ability to locate the source of interference within a few kilometers. In addition to providing these industry-leading, product-based solutions to our customers to own and operate, we have recently launched our services organization, Integral Systems Service Solutions (IS3). IS3 gives us the ability to provide these same capabilities on a subscription service basis. The service based model is attractive to many of our customers who do not wish to own and operate their own infrastructure, or are looking for a means to augment their infrastructure with coverage in areas where they do not have their own systems.

Another issue facing Asia-Pacific is the major increase in the use of mobile devices. Industry groups project that the number of smartphones and PDAs in the region now exceed the number of laptops and will be five to 12 times more prevalent in three to four years. Furthermore, these devices push 50 to 100 times the amount of data as mobile phones. Since many carriers in Asia-

Pacific use satellite as backhaul to cell towers, this exponential growth of data will strain the capacity of satellite networks. This is especially true in emerging economies where terrestrial backhaul is not an option.

The insatiable demand for bandwidth will force operators to more efficiently use the assets that they have. Integral Systems' commercial-based Command and Control, RF mitigation, signal processing and network management products, solutions and services, enables operators to optimize their network.

SM

What have been among your most successful projects for this market? And why?

Yen Chen

Integral Systems has provided hundreds of ground segment systems to satellite operators and service providers worldwide. For many of the reasons mentioned earlier, we have been successful in Asia with our integrated solutions. We have recently deployed three integrated solutions for satellite command and control, are in the process of deploying two others, and anticipate several other by the end of the year. Our EPOCH IPS Command and Control and Satellite Fleet Management solution has been selected by many leading broadcasters and providers in the region, including, but not limited to, AsiaSat, B-SAT, Chunghwa Telecom, Indovision, KT Corporation, SingTel/Optus, SKY Perfect JSAT and Vietnam Posts and Telecommunications Group (VNPT). China SatCom, SingTel, Chunghwa Telecom and several other regional satellite operators are using Monics to automatically detect, characterize and display interfering signals. Two major satellite operators in Asia rely on COMPASS NMS to centrally manage all ground segment antennas from a single system. In addition, COMPASS NMS is being used as a part of to major military programs in Asia and Australia to manage multiple, large teleports from a number of geographically-diverse *Network Operations Centers* (NOCs).

Our success is directly related to the partnerships we build with our customers. The Integral Systems' culture — something we call “The Integral Difference” — focuses on listening to our customers and delivering innovative products that solve their most complex problems. The approach ensures that we will continue to develop and provide commercial product-based solutions that are open and flexible, incorporating both new technologies and the ability to

Focus On Asia-Pacific

integrate with legacy systems that is required to provide longevity and return on investment and lower total cost of ownership.

SM

Given the state of the global economy, what is Integral Systems doing to meet the challenges of the satellite industry in the Asia-Pacific market?

Yen Chen

While Asia has weathered the global recession better than some of the other regions in the world, satellite operators and service providers are still faced with the challenge of offering services that are cheaper, faster and more reliable than their competitors. As margins shrink due to the hyper-competitive environment, operators — especially mid-sized and small providers — are finding it difficult to secure reasonable financing, or find the cash, to invest in new systems. For many of these companies, SatCom Systems are cost prohibitive, so they try to live without them. However, the need for these systems is more critical to maximize revenue, increase Quality of Service (QoS) and to meet Service Level Agreements (SLAs). Our commercial product-based approach is particularly relevant here as satellite operators, service providers and broadcasters are able to lower costs, increase margins, enforce SLAs, enhance QoS and quickly and easily upgrade their systems with the latest technology.

As I mentioned earlier, we are also able to meet the needs of smaller organizations and others, who choose to outsource their NetOps requirements with our services organization IS3. As IS3 can realize significant economies of scale by serving many customers, we are able to pass those savings along to our customers in the way of a cost-effective subscription service.

SM

Looking forward, how do future prospects appear for Integral Systems Asia? Are there any new projects in the pipeline you are able to discuss? What are the most significant challenges to overcome?

Yen Chen

We, of course, see Asia as a major growth area for the company, especially as the region continues to expand as an economic power. History has taught us that with growth comes greater complexity. From the ground segment perspective, Integral Systems, as a provider of commercial, product-based systems and solutions, is

uniquely positioned to help satellite operators and service providers manage the transition.

As satellite operators increase the number of satellites in their fleet, we will be able to provide them with a standards-based ground segment architecture that reduces development and ongoing management costs, increases operational efficiencies, enables access to real-time, actionable data and facilitates interoperability across multiple systems. Integral Systems' new web-based integrated client **Webic™** provides instant access to critical, real-time data from multiple sources in a single integrated operations environment. Webic™ provides comprehensive *Situational Awareness* (SA) offering real-time insight into both ground segment and space components, not just for the products and systems that we provide, but across the customer's entire enterprise through the inherent interoperability of this new product. Our integrated architecture also reduces acquisition development costs by eliminating multiple independent and disparate systems, enabling operationally responsive integration of new missions and facilitating modernization of outdated components and systems.

We are also seeing an increase in cooperative relationships among satellite operators. Commercial satellites are so large and powerful these days that the condo-sat approach is very attractive because it can offer the partners plenty of bandwidth to serve their customers, but their costs are defrayed through the partnership. In these partnership arrangements, Integral Systems can offer significant benefits to our customers. As our ground system solutions are so widely used, the chances are that one or both of the partners will have our system and that can make the integration of the ground systems much easier for our customers. Another area we are focusing on is the RF Amplifier market. Integral Systems has significantly expanded our line of *Solid State Power Amplifiers* (SSPA) to include 200 and 100 Watt systems. The new SSPAs are a significant step forward in size, weight, power and cost, and match the efficiency and power of vacuum-based *Traveling Wave Tube Amplifiers* (TWTA). The compact size, low weight, high efficiency and low cost make them the ideal choice for customers looking to replace or retrofit Traveling Wave Tube Amplifiers (TWTA). In addition, our SSPAs reduce initial capital costs — as much as 40 percent, depending on system requirements — as well as ongoing operating costs by eliminating expensive tube replacements.

Focus On Asia-Pacific

SM

Given your years of IT experience, you have witnessed a great many changes in the world of communications. How did you decide to become involved in the SatCom environment? Looking back, what would you say are the projects you've completed that bring you the most satisfaction?

Yen Chen

You are correct, communications has revolutionized the way we live and do business, and we have only scratched the surface.

Advances in technology and the proliferation of communications to remote regions of the world will increase collaboration and productivity. It's an exciting time to be in the satellite communications business.

More than 20 years ago, I joined Integral Systems as an engineer. In fact, I was part of the original design team that produced the first version of EPOCH IPS. Later, I migrated to a management and business development role and immersed myself in the SatCom world. Things have changed quite a bit since then. I can still remember how happy I was to hook up a 9600 baud modem to my computer to connect to the office and Internet. Now people just take for granted instant access to the massive amounts of information available at their fingertips.

In looking back at the projects we have done over the years, we have successfully provided our Command and Control, satellite fleet management and ground segment solutions to numerous customers in the region. I'm extremely proud that we have been able to meet and often exceed our customer's expectations. It's a direct result of our customer-focused culture we live by at Integral Systems.

An overwhelming majority of operators in Asia-Pacific have adopted our systems and have seen the benefit and value we bring to them. The trust and the long-term relationships we have built, gives me the greatest satisfaction. We value those relationships very much and appreciate our customers viewing us as a partner and a friend there to help solve their problems, not just a vendor trying to earn a profit.



Focus On Asia-Pacific

Yau Chyong Lim, Senior Director, Sales + Marketing **MEASAT**

SatMagazine (SM)

Mr. Yau, would you please take the time to explain to our readers what your Company's presence is within the Asia-Pacific satellite communications and ancillary markets?



Mr. Yau

MEASAT is an emerging market satellite operator. Today we operate a fleet of C- / Ku-Band satellites to provide a range of satellite services to broadcasters, DTH platforms and telecom operators across Asia, the Middle East and most recently Africa. We provide basic satellite capacity and, working with a small number of strategic partners, to provide video and telecommunication solutions to end users.

SM

Why did your Company enter this market?

Mr. Yau

MEASAT has been in the market for more than 15 years. Whilst the company was initially focused on the South East Asian market, supporting the telecommunication requirements of Malaysia, through continued investments we have now expanded our footprint and customer base to evolve into a strong regional player focused on a small number of strategic customers segments.

SM

Are you focused on any particular segments, due to their growth potential? (i.e., launch, manufacturing, teleport, security, milsatcom, imagery, satellite broadcast, and others.) What market segments do you believe are the most promising for your Company?

Mr. Yau

MEASAT focuses on a number of key markets where we believe we can provide a distinctive customer solution. A core part of our business is video, both in terms of DTH and video distribution services. We support four DTH customers across India,

Indonesia and Malaysia, and a strong C-band video distribution neighborhood. We continue to see significant potential for these segments in the region supported by the growth of pay-TV platforms (DTH, IPTV and cable TV); demand for a broad range of linear and on-demand content; the availability of localized channels; and, the movement from Standard Definition (SD) channels to High Definition (HD) content. DTH is booming in the region. As an example, India is predicted to overtake the U.S. as the largest DTH market in 2012. We also see significant potential in Indonesia.

SM

What have been among your most successful projects for this market, and why?

Mr. Yau

One of the segments we have been particularly focused on over the last three (3) years is the HD distribution segment. Recognizing the potential of the segment in the region, we worked with players across the region to help create the right environment for successful HD adoption. From carrying the first regional HD TV Channel in 2007, we now support the regional distribution of 18 HD channels via our C-band platforms, a number that is growing monthly.

Being a very complex market, fragmented in terms of culture and language, we see more and more international channels in Asia developing country specific HD content to become more relevant for the local market. Local broadcasters are also looking to launch their vernacular channels in HD.

SM

The challenges are numerous for entry into, and for business sustainment within, this area of the world. What do you see as among the most formidable challenges to surmount?

Mr. Yau

As an industry, the satellite industry is incredibly challenging. A single satellite costs anywhere from US\$200 to US\$400m. It takes two to three three years to build, and includes a business

Focus On Asia-Pacific



MEASAT-3a

case which stretches more than 15 years. In this type of industry, you need stability in your customer base to support the investment cycles needed. Adopting a very pragmatic approach, starting with a very focused way and then building on the

success, MEASAT has managed to develop and build the stability required to allow us to continually support our customers.

As an example, from operating a single satellite at 91.5 degrees East providing four (4) DTH transponders to one market in 2000, we now operate two (2) satellites at the same orbital slot providing 36 DTH transponders to four (4) platforms. With the strength of this customer base, we are able to justify investments to support those customers in terms of both increasing number of transponders and increasing levels of in-orbit redundancy (critical for a DTH operation). We are currently in the process of securing a MEASAT-3b spacecraft to provide additional capacity to 91.5 degrees East. We see a strong demand for capacity on MEASAT-3b and expect it will be predominantly leased out before it is launched. As such, we're also evaluating the need for a MEASAT-3c satellite and will be addressing this possibility over the next six months.

SM

Given the state of the global economy, how do you rate the Asia-Pacific market as far as its viability for income generation and growth over the next year or two?

Mr. Yau

Given the long length of our contracts and the nature of our business, the industry tends to remain isolated from short term issues. Combine this with the continual growth of the Asian economy, the impact of the global credit crisis in the Asian industry has been limited. We have continued seeing very strong growth across all key market segments such as video distribution, DTH and Telco/VSAT in the Asia-Pacific region. We don't think there will be an impact in the short term period.

SM

How do you believe the Asia-Pacific market will impact global, as well as your Company's, business opportunities?

Mr. Yau

The Asian market is an exciting place to be. The long term prospects continue to be encouraging with continued growth of the television and mobile sectors and continuity of telecom/broadcasting deregulation.



Focus On Asia–Pacific

Newtec’s Moubic Mounts Japanese Tsunami Assistance

The events of the afternoon of March 11, 2011, will remain in the hearts and minds of people everywhere for a long time. The earthquake, which registered 9.1 on the Richter scale, set in motion a turn of events that resulted in a 10 meter tsunami hitting the shores of Sendai in the Myagi Prefecture of Japan which, in turn, caused a nuclear disaster at the Fukushima power plant. Currently, more than 27,000 people are dead or missing. Infrastructure in the northeastern part of Japan has been completely destroyed, and the road to recovery is set to be long and hard for the Japanese people.

Anver Anderson, VP Asia of Newtec, and Richard Walshe, Business Development Manager of Newtec, were in Tokyo on that eventful day with Makoto Ozawa, Moubic’s President, with Tomohiro “Tommy” Asahina, and Masaru “Masi” Suzuki, Moubic’s Divisional Sales Managers — they had planned to conduct an ordinary series of business development meetings.

Shortly after the disaster occurred, it was clear from the outset the telecommunications networks were strained beyond their normal maximum limits. The emergency services secured most of the available telephone bandwidth for proper control and coordination

purposes and, of course, the general populous used up what was left in their attempts to call or text their loved ones to give them — or to seek — reassurance.

It was not only the telecommunications infrastructure that was affected. Road, rail, and air services were drastically congested. This meant “just in time” deliveries of food, water, and supplies were greatly hampered. The telecommunication networks had to be restored to enable all of these “normal” daily activities to return to operational status. It was also essential to get the story out to



Focus On Asia–Pacific

the rest of the world to galvanize governments, aid agencies, and the populations of the world, to assist Japan to cope and recover from these disasters.

It was impossible to do anything for the first day or so. Many roads leading to the stricken area were damaged beyond immediate repair, so that we were unable to drive available SNG (satellite news gathering) equipment into the disaster zone. By March 16th, the Moubic SNG equipment was finally deployed on behalf of the European Broadcasting Union (EBU) in an office building parking area in Minato-Ku, Tokyo.

Moubic has several SNG rigs; two vehicle mounted Vislink Newswifts, and one Vislink (Advent) Mantis, each equipped with Newtec equipment. The vehicle, operated by Tommy Asahina, was positioned to allow reporting from the balcony of one of the surrounding buildings. Some technical and coordination difficulties were encountered due to the urgent nature of the deployment, and there were some delays in getting everything “up to speed”.

However, as all good field operators manage to do, all of the necessary elements were finally pulled together for the crucial transmissions. Booking and coordinating a satellite space segment was no simple task, either. The installation of a multiplexer SD-SDIx3, however, worked mercifully swift.

Transmissions were generally scheduled between 1900 hours and 0300 hours, which made for a tiring and gruelling schedule of operation that continued for six days. One telling problem was the lack of food and water in the local stores, as well as a lack of fuel for the vehicle. All of this had to be brought in from some distance away and in bulk, so it lasted for the period of the deployment.

On the 24th, the SNG van was redeployed to Ishinomaki City, Miyagi. This site was much closer to the disaster area, but the vehicle was positioned in a location that had remained untouched by the tsunami. Live reporting and tape play outs continued from the site, but the journey to this new location was severely hampered as the highway to Tohoku provided extremely limited access and authorized vehicles (such as police, fire services and rescue coordination as well as food and water delivery) were given first priority.

Focus On Asia-Pacific



Understanding the mandatory need to show the world what was happening, the police provided Moubic with a much-needed license to travel and operate.

Once again, without food, water or hotels, the crew had to ensure that sufficient provisions were taken with them — just as they had in Tokyo. EBU reporters were sleeping in tents, with Tommy sleeping in the SNG van as temperatures outside plummeted to -4C. “It felt like a winter camp,” he said. “The operation was relatively straight forward, but the conditions were so harsh.” Fortunately, there were toilet facilities in a refuge center, but that was some distance away.

In addition to all of this, the erstwhile team of operators and reporters were required to wear special masks and to take kalium iodide to protect them against the threat of nuclear radiation.



“It’s always a good thing when you have reliable equipment that you have been using for some time and are very familiar with operating,” said Makoto Ozawa, “but there were some logistics which were beyond ours, or anyone’s, control during the period.

These were terrible, the three (earthquake, tsunami and nuclear crisis) events we were covering for the EBU — such a multiple disaster had never been seen anywhere else in the world to date.”

Moubic continues to provide SNG and telecommunications services to its direct customers all over Japan and its teams of operators and logistics coordinators remain at the disposal of broadcasters, telecommunications operators, government agencies and disaster relief workers. In particular, Moubic is providing a vital service to help ensure a swift recovery from the turmoil that Japan continues to suffer through, and will, for some time to come.



Focus On Asia-Pacific

Steve Collar, CEO, O3b Networks

Mr. Collar joined O3b as CEO in February 2011. He joined from SES, where he served as SVP of Business and Market Development for SES WORLD SKIES and was charged with expanding the satellite and service portfolio, including the design of new spacecraft and products. He oversaw the company's long-range strategic planning activities, M&A, global development activities and was instrumental in SES' investment in O3b Networks. Steve originally joined satellite start-up New Skies Satellites (now SES WORLD SKIES) in 1999, where he designed their early satellites. He brings a wealth of experience in implementing and commercializing satellite networks from his tenure. Prior to New Skies Satellites, Mr. Collar worked at the satellite manufacturer Astrium for eight years in a variety of roles, including Payload Architect and Payload Program Manager.

SatMagazine (SM)

Would you please explain to our readers what your Company's presence is within the Asia-Pacific satellite communications and ancillary markets? Why did you enter this market?

Steve Collar

Asia Pacific is a strategic market for O3b. We are working closely with the region's mobile operators and Internet Service Providers to develop affordable Internet backbone connectivity solutions that will rely on our satellite constellation; we can deliver truly scalable capacity from the low Megabit to multiple Gigabits in any location within the region.

When you consider the fact that not all countries in the region have access to reliable terrestrial connectivity solutions, O3b's advantages become obvious. For example, the average data rates per user in Indonesia is half that of users in Thailand. Our system was after all, built around a business problem; how to deliver ubiquitous affordable bandwidth anywhere across over 150 countries in all emerging markets. O3b's technology will simply augment the fiber capacity mostly restricted to some of the wealthier countries, by continuing to provide fiber-like capacity beyond the practical and budget limitations of the less economically developed countries. Likewise, the mobile industry also presents a significant growth opportunity for O3b, as we will continue to launch more products aimed at serving 2G, 2.5G, 3G and BWA (Broadband Wireless Access) customers to increase the profitability of every mobile tower.

There are two reasons why O3b focuses on emerging and developing markets like Asia Pacific. The first is there's a real desire for cost-effective services. And secondly, there's an ethical imperative to bring those people into the economic opportunities that are currently enjoyed by the developed world and are not available to the emerging markets of the world.

SM

Are you focused on any particular segments, due to their growth potential? (i.e., launch, manufacturing, teleport, security, MilSatCom, imagery, satellite broadcast, and others.) What market segments do you believe are the most promising for your company?



Focus On Asia-Pacific

Steve Collar

The market segments we are focused on are telecom operators and ISPs, mobile network operators, satellite service providers, Enterprise customers in verticals such as Oil & Gas or Maritime and MilSatCom. For the Telcos, we offer IP Trunking and Fiber Resiliency and for the Mobile Network Operators, we offer Mobile Backhaul solutions.

SM

What are some of the challenges in delivering quality communications services to the region? How do you intend to address these challenges?

Steve Collar

Cost and quality remain the major barriers in delivering quality communications to Asia Pacific. The way that the digital economy arrived in countries like Hong Kong and Japan is that telecommunications companies dug up the whole country and put in very expensive fiber optic cables, which were in turn connected back to submarine cables for further connectivity into the Internet backbone. That is not a cost-effective solution for most parts of the Asia Pacific region. So the only way that those countries are going to be able to access the Internet and the global economy, within a reasonable and competitive timeframe is via satellite-based services. While satellites are generally easy to deploy, most satellites of today are geosynchronous satellites, which are far away from Earth and had too limited capacity to be able to provide similar services to those fiber optic networks. Our network will provide fiber-optic-like capacity at low cost for those countries that need it the most.

SM

What do you see as the challenges to surmount?

Steve Collar

We don't envision having to deal with any challenges that other satellite operators before us have had to deal with, in the past. This is why we choose to partner with licensed local service providers and systems integrators who know the markets and its challenges and have successful track records of overcoming them.

SM

How do you rate the Asia-Pacific market as far as its viability for income generation and growth over the next year or two?

Steve Collar

I believe there is a lot of potential in the region, even beyond the more developed countries. Internet adoption continues to be high across the region, and we are all aware of the positive impact of Internet adoption on economies. Social media is a high growth area with countries such as Indonesia having some of the highest number of Facebook and Twitter accounts, followed closely by the Philippines. These countries are committed to building a solid foundation for telecom infrastructure by building terrestrial networks. However, despite the advancement of the infrastructure in the densely populated urban centers, majority of the population still live in rural areas. The ability to connect them increases the economic potential of the entire region.

SM

What is unique about your technology?

Steve Collar

Fundamentally there are two types of satellite. There is the geosynchronous satellite, which sits in a stationary orbit above one point on the Earth. They are big, expensive, have lower capacity than our satellites. Our satellites are much closer to Earth, have much higher capacity and the signal doesn't take long to reach them. We can refresh web pages in less than a quarter of the time of a geosynchronous satellite. So our network has lower latency, higher capacity and a lower cost base than the geosynchronous satellite alternative.

SM

How do you believe the Asia-Pacific market will impact global, as well as your Company's, business opportunities?

Steve Collar

Improved connectivity in Asia Pacific will lead to productivity, business, high quality education, healthcare, entertainment, global awareness and general quality of life in the region. As more people gain access to information, they become more self-sufficient, which has a positive impact on the global economy. This is one of our objectives as O3b. To assist communities to become more productive, by increasing their access to information, thereby leveling the playing field between them and their peers in more developed markets.



Focus On Asia-Pacific

Steffen Holzt, Executive Director, Pactel International

Satellite continues to play a critical role in addressing Pacific Island's communication needs. With the growing demand for basic voice and data applications to remote Pacific Island communities and atolls, where terrestrial communication is often not possible, communication over satellite is becoming the only solution. We had the opportunity to discuss recent satellite industry trends with Mr. Steffen Holzt, the Executive Director of Pactel International, a leading satellite communication provider in the Pacific Islands.



SatMagazine (SM)

Good day, Mr. Holzt. Could you please tell us about the history of Pactel International — how did the Company originate?

Steffen Holzt

The company was formed in 2003 due to an immediate need of one of our customers to establish a POP in Sydney. This customer was an anchor client and this allowed us to develop our clientele in the Pacific region. The Pacific Islands were then served by the “big guys” with little respect for the specific needs of their customers.

All major providers offered long term contracts, poor service reactivity and rather expensive rates. We saw satellite market conditions of those days as an opportunity to form a company that could reach under-serviced markets in the Asia-Pacific region.

Since its official formation, Pactel has developed from a small startup business to a rather large player in the telecommunications industry in the Asia Pacific region. It has not only evolved in regard to figures; it has evolved technically and professionally into



Focus On Asia–Pacific

a company whose personal customer-based approach is followed by other players in the industry.

SM

Which market sectors/industry niches does Pactel cover?

Steffen Holzt

Pactel's key focus is providing satellite communication solutions to the rural communities and remote locations of the Pacific Islands. These range from basic voice and data services into the rural villages and island atolls to mission-critical applications of the military and resource sectors.

Pactel's additional prime market focus is on ISPs, broadcasters and other telecommunication carriers in the Pacific region. Throughout the years, Pactel has helped support their existing terrestrial infrastructure as well as further extend their services by establishing satellite links on more reliable and efficient platforms via our hubs in Australia and Hawaii.

SM

How do you think the telecommunication state in the Pacific Islands evolved during the last few years?

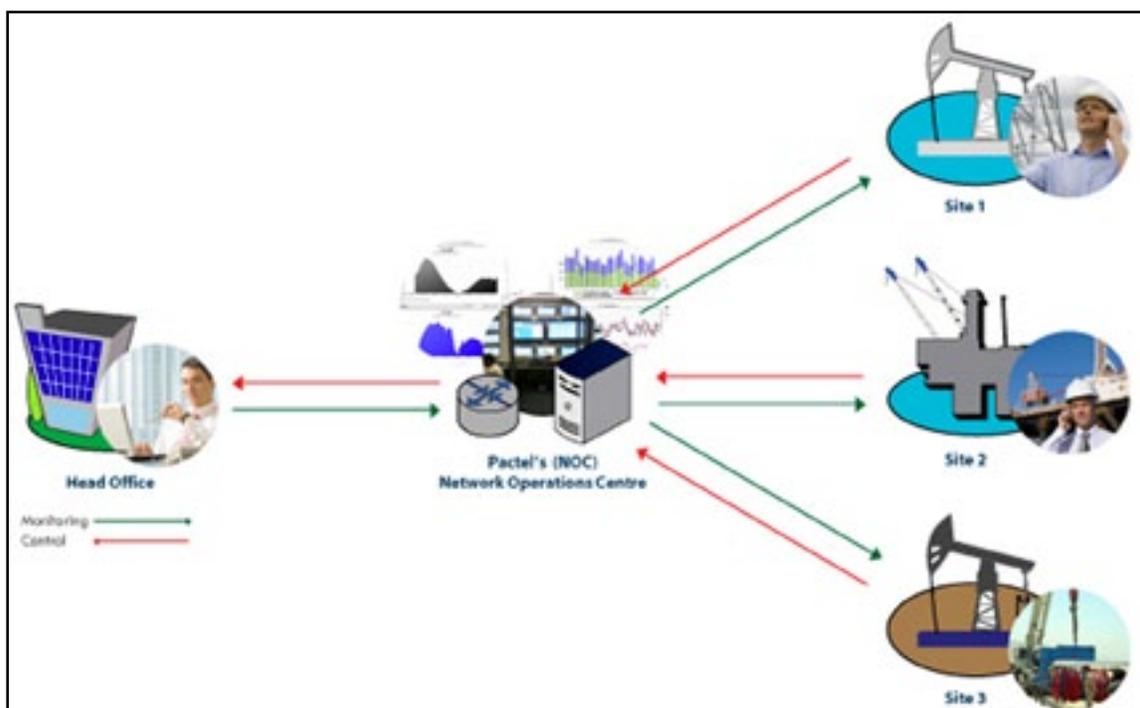
Steffen Holzt

During the past few years, the Pacific Islands saw a significant increase in the demand for satellite communications, with VSATs in particular. The advent of new applications on the Internet has significantly increased the bandwidth demand. *YouTube* and File sharing for example, have contributed an enormous amount to this increase.

Economic and social growth of the Pacific Islands communities over the last few years has also increased demand for IP bandwidth.

As rural villages and remote islands of the Pacific Region expand their educational, medical and entrepreneurial activities, the demand for basic voice, video and data communications in these areas is constantly increasing, making VSATs (Ku-band in particular) the most cost-effective and reliable solution. On the natural disaster recovery side of things, VSATs are capable of providing an instant (temporary or permanent) communication infrastructure recovery solution that whole communities can depend on.

Focus On Asia-Pacific



deployment by non-technical personnel in a matter of minutes.

Apart from quick deploy solutions, Pactel also offers a number of Satellite Redundancy Packages. This service is designed to minimize the impact of a temporary network failure on businesses' mission-critical applications by replacing any satellite or terrestrial connected networks. The service itself represents various options of dedicated links connected to a customer network from Pactel's backbone in Hawaii on the **GE-23** satellite, covering

SM

Please tell us more about Pactel's VSAT offering – RICS.

Steffen Holzt

RICS stands for *Rural Internet Connectivity System* and is the latest VSAT platform, designed to provide 2-way satellite broadband Internet connectivity to the Asia-Pacific region using a 1.2m or 1.8 Ku-band antenna. It is based on the SHIRON DVB-S2 ACM **Intersky** system, using the latest modulation techniques to ensure reliability, availability and throughput. Pactel's RICS allows for dynamic allocation of bandwidth between multiple sites, supports the majority of voice and data applications and offers a number of service plans to match almost every budget.

SM

You have previously mentioned Disaster Recovery Solutions. Can you tell us how Pactel addresses the issue of providing seamless communication infrastructure in case of a natural disaster/emergency?

Steffen Holzt

Pactel International currently offers a number of emergency deploy solutions, that are capable of instantly providing secure, easy to operate, bandwidth-on-demand Voice, Video, and Data applications into every part of the Pacific region. Our solutions support various types of quick-deploy, portable antenna systems, such as flyaway, fly and drive, SNG and Communications on the Move (COTM). All of our emergency response platforms are designed for rapid

most of the Asia-Pacific region. This solution will allow for essential communications for market sectors such as government, airlines, banking and telephony whilst the main capacity is being repaired.

SM

How do you perceive the importance of monitoring and technical support in the telecommunications arena?

Steffen Holzt

Whether we are talking about a telecommunications provider looking at monitoring their voice traffic and developing new revenue streams; a Government organization requiring availability of 24/7 network support for their mission-critical applications; or a resource company in need of constant monitoring of their remote sites, remote network monitoring and quality technical support are absolutely vital in any telecommunications scene. It is also essential for companies to have access to an online customer network management system, which allows users to remotely log-in and monitor their sites on a continuous basis.

SM

How does Pactel International meet the market demand for remote network applications?

Focus On Asia-Pacific

Steffen Holz

Pactel International uses its Network Operations Centre (NOC) to provide real-time monitoring of individual sites 24x7. By implementing our latest network monitoring software, we are able to provide full service monitoring, control and fault management as a one-stop solution. The majority of sites included in our network (such as remote islands, Mining, Oil & Gas) are located in rural or remote locations, with significant distances from the nearest town. A key feature of the Pactel NOC is the customer accessible on-line network status information and operational data, which is capable of providing information such as:

- Up-time/Down-time events
- Latency
- Jitter
- Throughput
- Packet Loss
- Financial analysis for businesses/telecommunication carriers
- Equipment monitoring (temperature, power levels, error rates, and so on.)



All issues or network queries raised with Pactel are assigned a ticket which allows the job to be tracked in real-time on the client portal.

SM

You have been a member of PITA for a number of years. Please tell us about your role in it and how have you contributed to the organization?

Steffen Holz

Pactel has contributed its technical advice to the members of PITA in many instances, mostly without charge. We have been a core member of the PITA community for several years offering ideas and solutions to make the job of communications easier and most cost effective for the members.

SM

Thank you, Mr. Holz — a final question for you — what are your predictions for the satellite markets in the Pacific Islands over the next few years?

Steffen Holz

As advanced IP and other communication-related applications such as eLearning, Telemedicine, Mobile Video Networks, Multimedia Multicasting and Real-data information sharing are becoming increasingly common in the Pacific, I perceive the role of satellite-based communications as critical when speaking about Pacific Islands' further social, economic and political development. With the growing demand for these applications, and even with the deployment of submarine cables systems, more satellite links will be required into the remote parts of the region.

I also foresee more satellite networks complementing existing terrestrial and fiber systems to provide seamless global connectivity, erasing geographic, technical and political barriers between the Pacific Islands and the rest of the world.



Focus On Asia-Pacific

Enabling India

by Paul Sims

India's insatiable appetite for content and connectivity is nothing short of amazing. And SES WORLD SKIES satellites are enabling operators to deliver DTH, mobile connectivity and corporate networks in unprecedented numbers and in record time.

India is adding an average of one million DTH subscribers per month, with October seeing the addition of 1.4 million additional subscribers and November 1.7 million subscribers.

"The numbers and the opportunities they represent for SES WORLD SKIES and our global fleet is mind boggling," said Deepak Mathur, the Vice President of Sales for South Asia and the Middle East for SES WORLD SKIES. "In most countries, the addition of a million new DTH customers is considered solid growth over the course of a year. India is rewriting the benchmarks and making telecom history as we speak," he added, noting India is expected to surpass the U.S. in DTH subscribers in the next year.

India has seven DTH providers already serving a market of 30 million subs, and projections call for that number to leap past 40 million by 2015. The country's largest DTH operator, "Collaborating closely with ISRO (*India Space Research Organization*) and its commercial arm ANTRIX, SES WORLD SKIES is aggressively expanding strategic satellite capacity over the region," Mathur detailed. "We see the tremendous opportunities and look forward to continuing to partner with ISRO and ANTRIX to help India meet the demand for the reliable delivery of video, voice and data." A key challenge is to provide co-located expansion capacity for neighborhood sensitive applications such as DTH, VSAT and video contribution and distribution services..

Vast VSAT Growth

India is also experiencing tremendous growth in VSAT deployments, as e-governance initiatives, corporate networks and rural demand for broadband, television and mobile phone services are booming at a brisk pace.

"We have six VSAT operators running in excess of 100,000 VSAT terminals on our NSS-11 and NSS-12 satellites," said *Mathur*.

"Nowhere else have we seen that level of VSAT deployment," he added, noting SES WORLD SKIES currently serves India with four advanced satellites — *NSS-6*, *NSS-11*, *NSS-12* and *SES-7* — that provide Ku-band capacity over India. *SES-7* is the former *Protostar 2* spacecraft acquired by SES as part of a strategic effort to meet the increasing demand for additional capacity throughout the region.

By enabling major telecommunications providers such as Bharti, Hughes and Tata to connect and empower everyone from big companies to remote farmers in rural towns and villages, SES WORLD SKIES is contributing to the transformation of an entire country.

Corporate VSAT networks have become increasingly vital across India, as companies and their metropolitan and rural workforces depend on reliable and scalable connectivity for everything from email, Internet and Intranet access.

"Everyone in the major cities has at least one mobile phone, and in some cases two," *Mathur* explained. "What's happening now is India operators are starting to use satellite-delivered GSM backhaul to expand their reach further and further into rural markets."

Less densely populated areas in the Himalayas and Northeast India are so remote, *Mathur* said, that satellite is the only economically viable way to bring capacity to connect the un- and under-connected. With the recent auctions of 3G licenses, and the roll-out of high through-put data services across the networks, backhaul demand is likely to see exponential growth.

India's large agricultural communities rely on satellite-delivered broadband for access to the Internet, email, and farming information portals. For example, ITC's e-choupal offers real-time

Focus On Asia-Pacific

weather reports, crop analysis and other vital insight never before available along the back roads and remote stretches of the world's seventh largest country.

"SES WORLD SKIES satellites are enabling operators to bring a whole new world of information, not to mention a newfound competitive edge, to farmers and farm operations across India," said *Mathur*. "As a result, remote villages are more prosperous and productive than ever before."

Rising rural demand is just one in a swarm of market activities driving India's capacity craving. The hyper-competitive DTH market has led to the introduction of price-points on the hardware and subscription side that are facilitating mass adoption of a technology that, just a few years ago, was considered a niche product offering. The recent introduction of HD is a glimpse of things to come – bigger HD channel lineups lighting up TV screens across India. E-governance programs are gaining traction as well, and cell phone use continues to breakthrough unimaginable milestones.

The Future Looks Bright

Even at the bottom of India's recession, the country's financial growth rate fell from 9 percent to 6.9 percent. "That's not bad at all, considering the far smaller growth rates in other markets and regions of the world," said *Mathur*. While India is certainly not immune from the global environment, the internal demand that comes from its young population keeps the country less vulnerable to pressures affecting many other economies. "As the Indian economy climbs out of the recession, the growth rate is at 8.8 percent and rising. The expectation is that India's economy will grow in the 8-10 percent range over the next few years. That will inevitably fuel the already explosive growth in telecom and television services."

SES WORLD SKIES is certain to continue its collaborative work with ISRO, a multi-faceted, integrated space agency that is a satellite manufacturer, fleet operator, regulator and partner to international satellite companies. SES WORLD SKIES is keenly focused on providing much needed capacity and connectivity to the region.

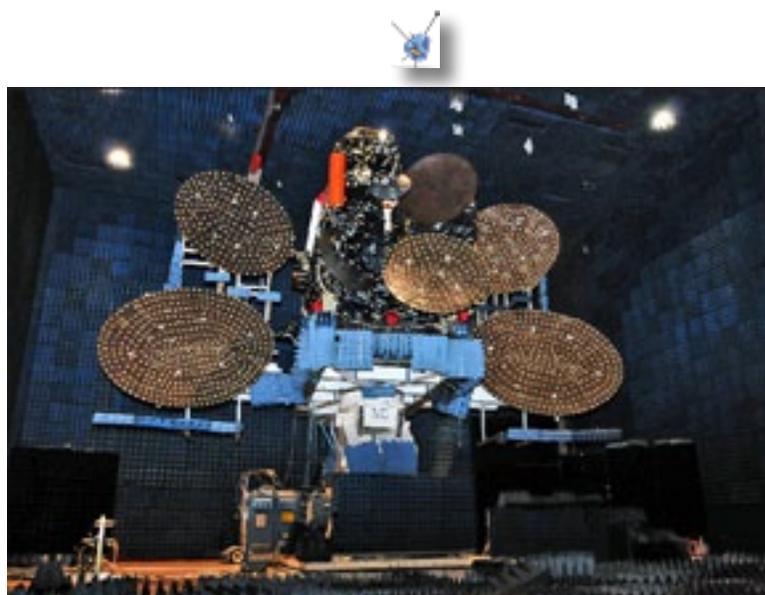
"For example, India's wired infrastructure is not able to deliver broadband to meet the stated objectives of the Government of India. One possible avenue to leapfrog the ground infrastructure bottleneck is for the DTH providers to make the connection. Tiering on a broadband product offering via satellite and serving part of the captive audience of 40 million-plus subscribers by the year 2015 is clearly one major avenue of growth and an important path to raising the low ARPU's in the marketplace. While two-way satellite broadband is unlikely to be a mass product offering, it can definitely add value to a sizeable niche of DTH subscribers," *Mathur* said.

"Satellite-delivered broadband is a very exciting opportunity in India for SES WORLD SKIES," he added, citing India's current broadband penetration of just 3 percent.

"India is one of the most dynamic economies on Earth today," said *Mathur*. "And SES WORLD SKIES people, satellites and expertise are certainly playing an integral role enabling our customers to deliver the services needed to help realize India's bright future."

About the author

Paul Sims is a freelancer writer based in Atlanta, Georgia. He may be reached at <http://www.simscomm.com>.



NSS-12 deployed in compact antenna test range. Photo courtesy of Space Systems/Loral.

Focus On Asia–Pacific

SatCom Potential In Asia

by Ebrahim K. Ebrahim, Vice President, Corporate & Marketing Communications, Thuraya



Asia Pacific is a fascinating telecoms landscape. The region is renowned for having the highest GSM subscriptions in the world with an average annual growth of 30 percent. Currently, there are over 2 billion mobile phone subscribers in Asia Pacific accounting for about 46 percent of global subscriptions, the majority of which originate from China with over 710 million subscribers. Research predictions forecast that the region's consumer spending on communications will reach US\$815 billion by 2015 amounting to approximately 3.1 billion users.

Focus On Asia–Pacific

Smartphones are highly popular in Asia-Pacific. Analysts believe that users will reach 347 million by 2015. The smartphone market is expected to double by 2016 and account for 32 percent of all mobile phones in the region, with projected figures of 653 million users within five years.

Nonetheless, despite these significantly large numbers, there is still immense room for telecom expansion as penetration rates remain below average in comparison to the Americas and Europe. Growth in the telecom scene in Asia is predicted to result from strong economic growth, boosted urbanization, government investments, and infrastructure building. It is predicted, however, that more than \$1 trillion investment is required in new infrastructure to meet Asia's market needs.

In addition to mobile phones, broadband has been growing rapidly. The social media revolution and web have created lucrative opportunities for the Asia-Pacific broadband market. But the regional household broadband penetration is less than 20 percent, defining the market as still growing. Concurrently, Asia-Pacific is estimated to be the top region for video consumption through broadband wireless access and, by 2017, the region is expected to contribute more than 53 percent of all global traffic.

The MSS Situation

Similar to the Asian GSM world, the MSS sector will also witness accelerated growth over the coming years. Despite the unprecedented boom in terrestrial networks and expansion in the region, there is still demand for MSS communications in areas that are still underdeveloped, remote, or that cannot



Thuraya IP

be covered by terrestrial networks, such as the significant water areas. The high CAPEX funding requirements for full development of new telecom infrastructures in Asia-Pacific allows for significant potential for MSS operators with satellites currently covering the area.

Analysts project that the number of MSS terminals deployed in the region will increase at a CAGR of 20 percent from today until 2018, resulting in 1.4 million terminals in the market. Driving the MSS growth in Asia-Pacific will primarily be the maritime sector, due to an increase in maritime trade on the back of solid economic development and the presence of major ports. The number of maritime terminals is expected to grow to over 123,000 units and the annual wholesale revenue are forecasted to reach US\$212 million in 2018.

Another major growth driver will be the broadband sector, which is showing projected figures of CAGR at 20 percent, resulting in 48,000 terminals and wholesale revenue of US\$191 million in 2018.

The satellite handheld market in Asia is predicted to continue increasing, especially between 2013 and 2018, and will account for more than 21 percent of the global market. The number of terminals used in the region is expected to reach 202,000 by 2018.

Thuraya's Seamless Position In Asia

Thuraya launched its third satellite in 2008 to cater to the increasing demand for SatCom services in the region. With a state-of-the-art network that offers strong capacity over Asia, the ability to support data, maritime and land services, Thuraya is well poised to meet the full communications needs of the region. With a vast coverage area that is uninhibited by borders, Thuraya addresses the basic requirement for seamless mobility through a diverse portfolio of communication products.

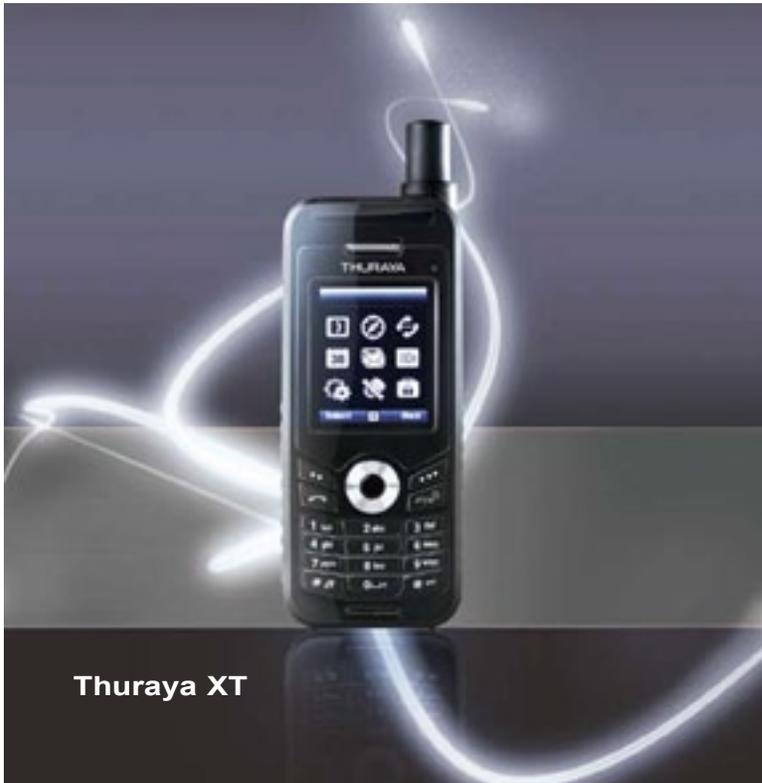
Moving in line with current market trends, Thuraya has developed product offerings that match the growth drivers of the Asia-Pacific market. For low- to high-end maritime segments, the Company offers three specialized maritime products:

- Thuraya Marine
- Seagull 5000i
- The soon to be launched MarineNet Pro terminal

These tailor-made solutions are designed with the knowledge that the region is composed of a multitude of islands and prominent trade routes that can only access communications via satellite. In keeping with international regulations, the **Seagull 5000i** terminal has *Long Range International Tracking* (LRIT) functionality, which is becoming a mandatory requirement by many maritime and fishery bodies.

For the satellite high-speed data market, Thuraya pioneered the world's smallest satellite broadband solution that supports 384 Kbps streaming — the **Thuraya IP**. This terminal was used most recently in the Asia-Pacific region by government agencies for search and rescue operations following the devastating earthquake that struck Japan in March of this year. The rapidly deployable solution was provided in coordination with the *International Telecommunications Union* to provide high-speed data

Focus On Asia-Pacific



As smartphones are an important telecom component in the Asia-Pacific region, (in South Asia, more people own a smartphone than a PC), Thuraya's XT, which provides the fastest satellite data service via a handheld terminal in the market, attracts consumers who need reliable and quick access to the Internet and email, especially when out of GSM reach.

To ensure market reach of Thuraya products in the Asia-Pacific region, Thuraya has built a strong distribution network of partners in several markets. In Korea, Thuraya launched service with Asia-Pacific Systems Inc. (APSI). The Malaysian market is being served by Tekknikom, while Thuraya's partners in Australia are Optus and Indigo Telecom. Thuraya acquired the license for Indonesia through PT SOG and Taiwan is managed in cooperation with Chunghwa Telecom. This is in addition to International Service Providers such as Vizada, AST, IEC and SatCom Distribution that house regional offices in Asia. Through these commercial relationships, Thuraya has begun the steady journey of offering its services in the relevant market segments.

communications, which was otherwise impossible via terrestrial networks as they have been destroyed during the natural disaster.

Similarly, Thuraya's rugged handheld phone, the *XT* (which is also known as the world's toughest satellite phone) was also deployed in Japan during the humanitarian operations following the quake and tsunami. Last year, Thuraya XT was selected by Taiwan's *National Fire Agency* as a main component of its emergency communications suite of products. The phone was selected following thorough testing by the Agency that required a satellite handheld able to provide reliable service and one that could withstand challenging conditions. As the phone is the only satellite handheld to be both IP54, and certified making it dust, splash water and shock proof, the device is definitively operable in enduring conditions.

This is certainly not the first time Thuraya has played a major role in providing communications during disasters in the region. The Company's CSR efforts have formerly extended in Samoa, Pakistan, Indonesia, China, Myanmar and Taiwan. Asia-Pacific is a belt that has a history of exposure to natural disasters and Thuraya's SatCom solutions have proven to be a valuable asset in the coordination of relief management and in saving lives.

Thuraya's broad portfolio of products, be it data, maritime or voice ensures that as an MSS operator the Company meets the needs of vital sectors that depend on satellite communications in the Asia-Pacific region. With its depth and history of experience in providing communications during natural disasters, Thuraya will continue its pivotal role in supporting humanitarian agencies through its Thuraya IP and handheld terminals. As Asia-Pacific is a strong maritime market, Thuraya will be gearing its focus to ensuring that all the segments of this diverse industry, be it fishing, medium-sized vessels, leisure, or merchant ships, are well-equipped with the company's products.



Inmarsat's Global Xpress Strategy... A Call To Arms

by Alan Gottlieb, General Manager, Gottlieb International Group

In its struggle to regain its position as the leader of the maritime broadband market, Inmarsat has introduced Global Xpress now taking a second high-risk step forward through its acquisition of Ship Equip AS, the second largest supplier of VSAT to the world's shipping industry. With the acquisition, it adds significant momentum in its attempt to thwart the onslaught of competitors that have threatened its future.



However, brilliant as the move may seem, it is a strategy that trades one set of risks for another and holds with it the potential for a unified competitive threat from the existing Ku- providers and operators — assuming they choose to act. Essentially, it positions Inmarsat in head-to-head competition with its most important potential distribution channel, the current community of maritime Ku- VSAT vendors, a community it desperately needs to generate enough sales volume to make Global Xpress economical. Should these vendors act and join forces to counter Inmarsat, the battle to come would be a significant one with the domination of maritime, as well as other mobility markets, as the ultimate prize.

Simply put, there is no way Ship Equip alone could sell enough Global Xpress to make the new service a success and, by acquiring the Ship Equip sales channel, Inmarsat has created what satellite operators have long considered an unpardonable sin: channel conflict. In essence, the Company will now be competing with the very vendors it needs to distribute Global Xpress.

While channel conflict through Inmarsat's acquisition of Stratos and Segovia has existed in the past, it was largely focused on the sale of L-Band services that Inmarsat competitors have sold for years and are relatively unique in their market. Even Ku- services require the use of *Fleet Broadband* as a backup and consequently, many of the Ku- VSAT vendors re-sell it. Global Xpress is different. It is designed to displace well-established Ku- services thereby threatening an established and lucrative revenue stream. What, one might ask, would motivate them to take such a risk? Could they believe that with their formidable marketing power they can generate so much demand for Global Xpress that the existing Ku- vendors would be forced to sell it — regardless of this new and blatant channel conflict?

If that is the case, and they are right, and if Global Xpress performs satisfactorily in the extensive trials required to prove its viability in the high end, commercial user market, Inmarsat stands to emerge as the unchallenged provider of broadband services to maritime and, perhaps, to all of mobility. If they are wrong, they



about VSAT, they are relatively uninformed on the differences between Ku-, C- and L-band and tend to believe what they are told, especially when exposed to a hard hitting marketing campaign from a well established vendor.

Coming... A Decline in Ku- Service Sales...

Almost certainly, lack of action from the competitor community will make declining sales of Ku-VSAT over the next three years inevitable. By the time Global Xpress does arrive, Inmarsat's marketing will have made the

face an inglorious decline into the ranks of companies, who, in their own arrogance, underestimated the will and power of their competitors and overestimated their own technology.

Off + Running

There is little doubt that Inmarsat's marketing prowess currently far exceeds that of the competing Ku- VSAT vendors, and unchecked, their marketing efforts are likely to sway the majority of maritime buyers to the conclusion that they should hold off with their purchases of Ku- VSAT and wait for Global Xpress.

Using their vast database of customers, extensive advertising and their near dominant position at the Digital Ship Conferences along with Ship Equip's sales force, Inmarsat can carry their marketing message forward with ease. Despite the fact that many technical and pricing questions regarding Global Xpress remain unanswered, Inmarsat has cleverly capitalized on the notion that it is too early to pose serious questions.

While defusing its critics with a promise that all technical issues will eventually be solved, they continue to vigorously promote the "revolutionary" nature of Global Xpress, dangling its 50 Mbps promise in front of the dazed eyes of its competitors. One has to wonder if the opposing vendors have recognized this cleverly evasive tactic since they have yet to raise a whimper of dissenting voice. While ship owners tend to know more recently

Inmarsat "50 Mbps" message a believable reality. Channel conflict will have become irrelevant and competitors will be forced to sell the new service (assuming, of course, Global Xpress is proven technically feasible in extensive trials) and compete head to head with Inmarsat at reduced margins, a situation which could well drive them from the market — or make them easy, low cost acquisition targets.

Essentially then, Inmarsat could then acquire them and their customer bases and secure its total domination of the market. As a near monopoly, it would then be in a position to raise prices, much to the detriment of the shipping industry.

From Defense To Offense... A Ku- Battle Plan

Understanding Inmarsat's competitive strategy is the first step in thwarting their ambitions. To defeat it, strategies must be developed to undermine the fundamental assumptions on which it is based:

- They have the most effective marketing in the industry
- The majority of shipping owners remain relatively unfamiliar with the technical aspects of VSAT and, in particular the differences between L-, C-, Ku- and Ka- VSAT and will, therefore, be receptive to a vigorous onslaught of marketing propaganda claiming that Global Xpress is revolutionary

- The Ku- VSAT competitors remain disorganized, lack aggressiveness, marketing savvy and are, therefore, unlikely to generate enough awareness of the possible shortcomings of Global Xpress to seriously negate the perception that it is a “revolutionary” service

To counter Inmarsat, the Ku- VSAT competitors must:

- Work together to create a unified marketing approach designed to challenge Inmarsat’s claim that Global Xpress is truly a remarkable advancement in broadband maritime communication
- Position Ku- as a superior service for high-end, commercial service applications
- Support conferences where potential shortcomings of the proposed Inmarsat service can be voiced objectively and where independent experts can speak
- Promote and brand new and innovative products such as Ku-/C- band services that offer full-time fixed price connectivity to the high-end shipping market, and are truly new and revolutionary in nature, and obviate the need for Inmarsat Fleet Broadband backup

Above all, both the Ku- VSAT vendors need to understand that just as they were intent on pushing Inmarsat out of the market, Inmarsat is just as intent on re-claiming it. Competitors must realize that the battle for the market has already begun. Shots have been fired, the enemy is moving aggressively forward, and it is time for the competitors to heed the call for a common and aggressive offense.



About the author

Mr. Gottlieb is Managing Director of Gottlieb International Group Inc. Established in 2001, his firm specializes in the application of VSAT Technology in Maritime and Oil and Gas Markets. Gottlieb International’s mission is to provide vendors with the “hands on” information and contacts they need to structure product and service offerings and to assist Maritime VSAT buyers in choosing the appropriate service and vendor. The firm also supports Satellite related Private Equity Merger and Acquisition activities in the Maritime, Oil And Gas and Mobility sectors.



A Case In Point

World Class, Reliable, Wireless Remote Monitoring

The challenge is to deliver a real-time, reliable wireless monitoring solution, while reducing the expenses associated with using traditional, auto-dialers to mitigate risk to wastewater management companies.

The solution encompassed M2M Data Corporation's *Aquavx* wireless remote-monitoring solution, powered by the KORE network for superior coverage, data speeds and connectivity.

By deploying this cellular-based monitoring solution, East Richland County in South Carolina achieved real-time access to data, ensuring waste water systems are operating properly; obtained more detailed information than available using traditional landline-based auto-dialing systems; garnered increased efficiency and lower costs; and obtained greater early warning detection capabilities.



A Case In Point

The capital and operational expenses associated with implementing a full SCADA solution can be prohibitively high — and for small- to mid-size municipalities, the costs of SCADA may outweigh the benefits. *Aquavx*, an advanced remote monitoring solution from M2M Data Corporation, was designed as a cost-effective solution removing primary capital expenditures including the buildout of a private radio network, software licenses for the polling server and HMI, and consulting services to configure the software for specific applications.

Jack Morin, assistant supervisor for East Richland County in South Carolina, determined that the water utility should use *Aquavx* to monitor its lift stations. *Aquavx* provides SCADA functionality at roughly the same monthly cost as the utility's existing auto-dialer using traditional landlines and at a fraction of the initial capital expenditure. It elevates East Richland's operations to the next level of efficiency and security.

By using a wireless monitoring system to remotely obtain data, waste water management municipalities are able to prioritize and disperse crews on an as-needed basis, enabling personnel to visit only the equipment/stations needing attention, while leaving normally-operating sites alone. This automation and wireless connectivity gives them the ability to remotely monitor the health and security of their tanks and wells in real-time.

Solution Overview

Aquavx is a flexible, efficient, wireless SCADA alternative that can be implemented for virtually the same cost as a traditional auto-dialing solution. *Aquavx* monitors dispersed water and wastewater asset sites, such as tanks, wells, lift stations and sanitation plants — with absolute precision and streamlines operations with significantly fewer resources.

Installing advanced remote monitoring devices ensures the right data is delivered at the right time to the people who need it — providing a local user interface in the field, and promising



A Case In Point



to perform regulatory filings and reports, as well as aids with planning for the future needs of the system. By receiving more detailed information than the traditional auto dialer options, East Richland can more quickly and accurately respond to the data they receive. Perhaps the most impressive result comes simply by the fact that they were able to increase overall efficiency while at the same time reducing risk and operating costs.



“handshake” reliability when it comes to two-way delivery confirmation over the KORE cellular network.

As a web-based solution, East Richland’s advanced remote monitoring software is hosted remotely on Aquavx’s servers, so there’s no software to install or maintain. East Richland’s SCADA controlled assets are only as far away as the nearest Internet connection and data from the field is transmitted via the cellular network in real-time. Plus, the Aquavx hardware systems deployed in the field are easy to access, use, and upgrade.

Key Results

Advanced remote monitoring offers 90 percent of the SCADA analytical capabilities at a fraction of the cost. By leveraging the KORE Network, Aquavx — which is built on 35 years of combined experience in the water/wastewater industry and hosted communications/monitoring technology market — reliably and securely delivers critical information to East Richland County in real-time.

“The benefits we’re getting from advanced wireless remote monitoring at about the same monthly cost as traditional landline solutions easily make up for any upfront expenditures”, said *Morin*. “With Aquavx and KORE, we have so much more than the simple alarm-dialers we were using. Now, in real-time, we have information we can use to streamline our pump operations before sending someone to the site.”

East Richland receives instant notification of high wet-well alarms from its lift stations, which helps to prevent spills that lead to costly EPA fines. The aggregation of their data makes it easier

About Aquavx

Aquavx is the advanced remote monitoring solution for water and wastewater utilities and operators. Offered at the cost of an auto-dialer, Aquavx is a SCADA alternative that enables customers to accurately monitor and control their equipment and streamline operations with increasingly fewer resources. Through a partnership between Antix and M2M Data Corporation, Aquavx is built on 35 years of combined experience in the water/wastewater industry and hosted communications and monitoring technology market. Unmatched in its service features and the added value it brings to customers, Aquavx is the trusted brand in water asset management services. For more information, visit www.aquavx.com.

About KORE Telematics

KORE Telematics is the world’s largest wireless network provider focused exclusively on the machine-to-machine (M2M) communications market. Companies in virtually every industry are implementing M2M solutions to achieve productivity gains, cost management, environmental improvement, and to expand customer services. KORE delivers GSM and CDMA services to ensure the greatest possible reliability and coverage as well as valuable tools that enable our customers to effectively manage their daily operations. To learn more about what KORE can do for your M2M business needs, please visit www.koretelematics.com.

Tracking the Causes of Space-Based Weather Disruptions

by Ellen Ferrante, National Science Foundation

Scientists are using the innovative *Radio Aurora Explorer* satellite to discover conditions that cause disruptions in space-based communication and navigation signals.

Space weather-based disturbances in the Earth's upper atmosphere cause disruptions that affect space-based communication and navigation signals, such as GPS and radio signals. *Radio Aurora Explorer* (RAX) is a space weather research satellite that is designed to investigate the causes of these weather disturbances.

The photo below shows an NSF-funded ISR radar in Resolute Bay, Nunavut, Canada, which is similar to the ISR used in this study. An ISR is a tool used for upper atmospheric and space physics research that takes measurements of the Earth's upper atmospheric and space regions from 60 km up to 1000 km. The ISR takes measurements such as; ionospheric electron density, ion composition, plasma temperatures and electric fields.

Photo credit: Craig Heinsleman



Insight

RAX is the first satellite constructed under the National Science Foundation (NSF) CubeSat-based Space Weather and Atmospheric Research Program. Since September 2008, the project has been carried out jointly by SRI International, an independent, nonprofit research institute headquartered in Menlo Park, California, and the University of Michigan in Ann Arbor, Michigan.

About 40 students worked on various satellite subsystems at different stages of the project, the majority of them from the University of Michigan. Three students from Worcester Polytechnic Institute visited SRI and worked on the radar.

“RAX demonstrates that low-cost cubesat missions that are mainly designed, built and operated by students as part of their university education and training can provide key measurements for space weather research and monitoring,” said *Therese Moretto Jorgensen*,

a program director in the *Division of Atmospheric and Geospace Sciences* at NSF.

Professional team members include principal investigators *Hasan Bahcivan* of SRI and *James Cutler* from the University of Michigan, as well as approximately 10 project managers and engineers.

“Space weather terminology took a hold in the last decade or so with the increasing public use of satellite technology and the vulnerability of spacecraft and space-based technology to solar and geomagnetic activity,” said *Bahcivan*. “Among many adverse effects of space weather is the degradation, or disruption, of space-based communication and navigation signals, for example, the Global Positioning System signals.”



University of Michigan students at work on the RAX nanosatellite

These degradations occur in the upper part of Earth's atmosphere between altitudes of 100-500 kilometers (62-310 miles) and are caused by geomagnetic storms. A geomagnetic storm

is a disturbance of the Earth's magnetosphere, or the region in space where the Earth's magnetic field controls the motion of charged particles, in response to solar activity such as coronal mass ejections or solar flares.

"The effects of a geomagnetic storm include an increased population of radiation belt electrons, energetic particle precipitation into the Earth's upper atmosphere, auroras (northern lights) and strong electric currents in the ionosphere [a portion of the upper part of the Earth's atmosphere that is ionized by solar radiation]," said *Bahcivan*. "Space-based technologies, and in extreme cases, electric power grids on the ground become vulnerable during a geomagnetic storm."

Consequently, the effects of the disturbances include signal fading and phase distortions. For example, one type of distortion called *scintillation*, which is conceptually similar to the twinkling of the stars, can make GPS signals unusable.

To seek answers to where these disruptions occur and under what conditions, the RAX was launched on November 21, 2010, via the *Space Test Program* aboard a *Minotaur-4* vehicle in Kodiak, Alaska. According to *Bahcivan*, after a three-week period, the researchers conducted their first radar experiment using the *Poker Flat Incoherent Scatter Radar*, which is operated by SRI International under a cooperative agreement with NSF.

"Overall, the experiment showed that the radar system is working nicely," said *Bahcivan*. "Although background interference existed sporadically, it was manageable."

Bahcivan explained that RAX experiments must be conducted in coordination with ground-based radars. A typical experiment is conducted by illuminating a turbulent ionospheric region using a powerful ground-based *incoherent scatter radar*, or ISR.

An ISR is a scientific tool used for upper atmospheric and space physics research that takes measurements of the Earth's upper atmospheric and space regions from 60 kilometers (37 miles) up to 1000 kilometers (621 miles). Measurements taken by ISRs include ionospheric electron density, ion composition, plasma temperatures and electric fields.

In addition to the Poker Flat ISR, NSF supports other ISRs, including Sondrestrom in Greenland, Millstone Hill in Massachusetts, Resolute Bay in Canada, Arecibo in Puerto Rico and Jicamarca in Peru.

The RAX radar receives scattered signals from ISRs in space. However, some of the scattered signals arrive back at the ISR. These scattered signals contain information about the background properties of the particular region being tested.

By measuring plasma properties using non-turbulent background signals, scientists can determine which conditions give rise to plasma turbulence that cause degradation and irregularities in space-based signals. Scientists also can measure the electric field of the region, which provides critical information about plasma turbulence. "Therefore, the goal of the RAX science mission is to determine which ionospheric conditions give rise to plasma turbulence," said *Bahcivan*.

"RAX helps provide better knowledge of fundamental physical parameters related to ionospheric irregularities," said *Jorgenson*. "This will lead to improved space weather models of the ionosphere that can predict the occurrence of irregularities and thereby help mitigate their adverse affect on systems that rely on trans-ionospheric radio waves, such as GPS."

Bahcivan explained that the RAX mission adds to ongoing efforts by measuring the irregularities with much higher spatial resolution and higher angular resolution with respect to the Earth's magnetic field, enabling a powerful diagnostic capability for ionospheric plasma turbulence.



Executive Spotlight

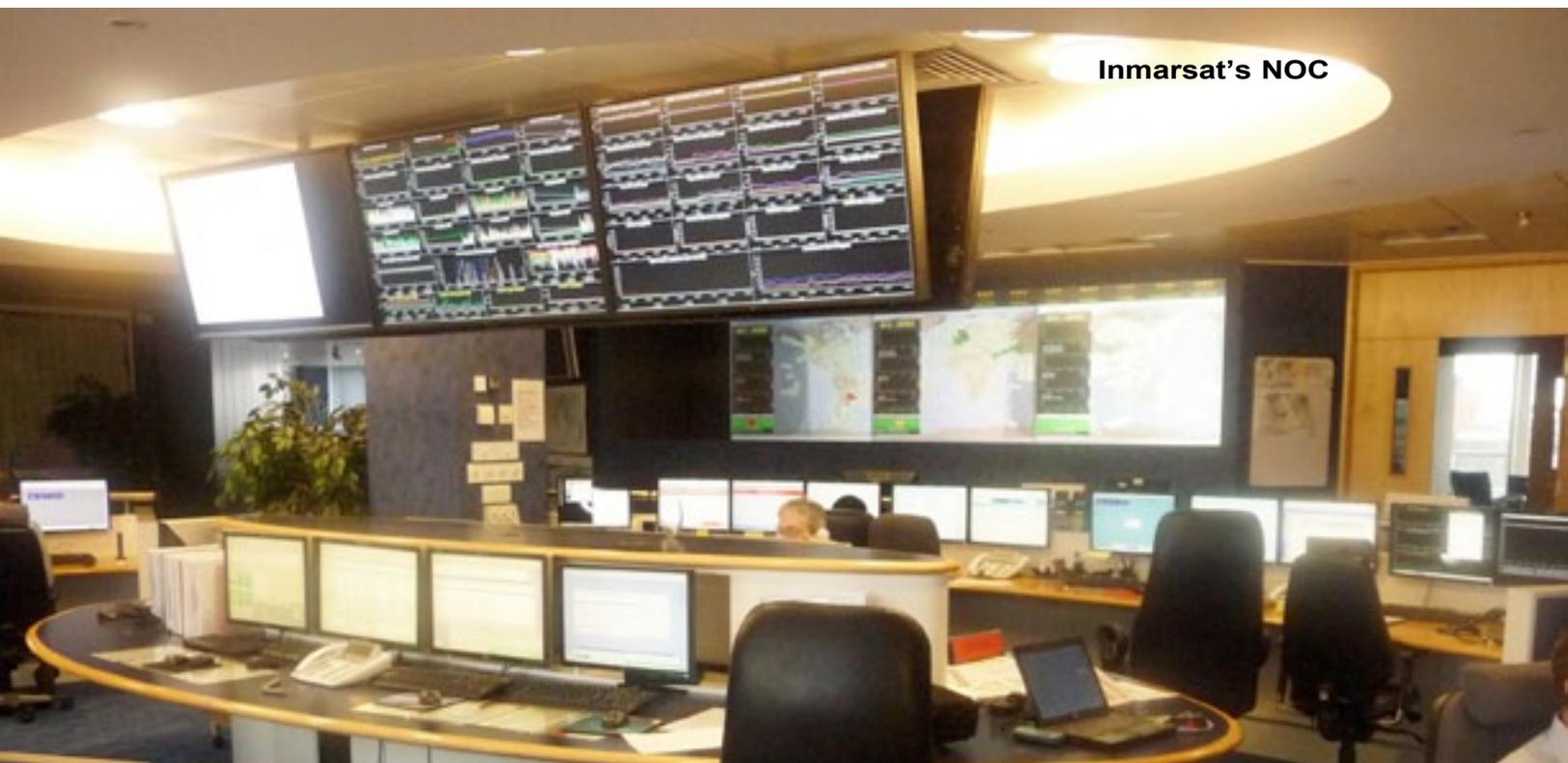
Dr. Sean Faulkner, Vice President, SkyWave

Dr. Sean Faulkner is a 25 plus year veteran in the wireless and satellite communications market. He began his career with service as a Canadian Air Force officer working in satellite communications electronic research and later in flight test instrumentation and telemetry systems.



After his service in the military, Sean worked at Vistar as part of the team that delivered the GlobalWave trailer tracking products. His team also developed the mobile data communication terminal which was the basis of the U.S. DoD ***Movement Tracking System*** (MTS) and ***Blue Force Tracking*** (BFT) services over the past decade. After Vistar was acquired by TransCore and became the GlobalWave business, Sean was the vice president responsible for software and systems engineering including network operations and customer service for retail operations with over 600 firms in the U.S. trucking market.

After SkyWave acquired the GlobalWave business, Sean took his current position as the vice president responsible for the technical development and commercial preparations for delivery of SkyWave and Inmarsat's newest global satellite data service for ***machine-to-machine*** (M2M) applications. Called ***IsatData Pro*** and slated for introduction later in Q3 2011, this service promises to open up new opportunities for M2M providers looking to send more data, more quickly from anywhere in the world.



Executive Spotlight

SatMagazine (SM)

Dr. Faulkner, when you were with the Canadian Air Force, what were your duties and responsibilities? Why did you transition into “civilian” roles?

Dr. Faulkner

During my service in the Air Force, I primed the development of instrumentation and communication systems to support flight tests of CF-18 aircraft and CH-146 helicopters. I also worked with a team of engineers that performed spread spectrum satellite signal analysis for future radio communication systems.

This technology experience provided a really solid foundation for my early “civilian” work where I leveraged and adapted the knowledge I had acquired in the military to design solutions for large scale applications. This included the design of the award-winning *MT2000* terminal which was used to support solutions for monitoring and control of refrigeration units in the transport of temperature-sensitive goods, as well as trailer tracking and in-cab dispatch solutions.

SM

Would you offer us some history of SkyWave’s origins, competencies, and future plans?

Dr. Faulkner

SkyWave has been a pioneer of the satellite M2M (*Machine-to-Machine*) industry for the past 14 years. We first began by developing and launching the *Inmarsat D+* service, which included the satellite service, the hardware devices and the network infrastructure to deliver messages between the hardware and the software application used by end-users.

In 2007, SkyWave launched the *Inmarsat IsatM2M* service which was an enhancement to the D+ service and provided faster data forwarding rates, quicker responses to polling requests, and shorter time to first transmission. SkyWave also now operates the *GlobalWave* satellite network, which has been in operation since 1999 and is being used in various markets including the satellite trailer tracking market.

Our experience in developing and launching three satellite services has positioned SkyWave to be very successful in the launch of Inmarsat’s latest service, *IsatData Pro*.

Executive Spotlight



Top: SkyWave's IsatDataPro land modem
Bottom: SkyWave's IsatData Pro maritime modem

transportation sector and added terminals to our existing portfolio of products. It was also a launch point in the development of the IsatData Pro service.

SM

Would you tell us about the coming IsatData Pro product family and its differentiation from other services for the M2M market segment, especially regarding latency expectations? Is the service launch still on track for Q3 of this year?

Dr. Faulkner

IsatData Pro will be available in Q3 of 2011 and this service will revolutionize the satellite M2M space. Available globally, it will deliver a significant increase in payload capability compared to other satellite M2M services already in the market — up to 10,000 bytes to the device and up to 6,400 bytes from the device. This payload size will be useful for applications like sending emails, data from electronic forms, and workflow information — functions that increase business productivity.

In terms of latency, customers can expect 100 byte messages to be delivered in less than 15 seconds and 1,000 byte messages to be delivered in less than 45 seconds, a remarkable improvement when compared to other similar services. The service will also offer a number of other features including the ability to send messages to all terminals in the network (broadcast) and the ability to send messages to a selected number of terminals (multicast).

A satellite modem will be offered for those who would like to add satellite connectivity to their existing systems; however, we are really excited about our complete satellite terminals that will allow our Solution Providers to get to market quickly without the associated costs of creating their own terminal.

There will be a choice between either a land terminal or maritime terminal but both versions will have integrated GPS and digital and analog ports for connecting sensors. Most importantly GUI-based programming tools will be available enabling Solution Providers to quickly customize the operation of the terminals in order to offer unique solutions to the market.

SM

During the first half of 2009, what led to the Inmarsat investment into SkyWave? How was that monetary infusion used?

Dr. Faulkner

Our technical expertise with developing satellite services, along with several successes in partnering with Solution Providers to provide telemetry services around the globe, caught Inmarsat's eye. That expertise, combined with the projected growth of the M2M space, led to the Inmarsat investment in SkyWave. The investment was partially used to buy the GlobalWave business from TransCore, which further established our market position in the

Executive Spotlight

SM

As an executive team member with SkyWave, and the impetus of providing product for M2M applications and SatCom equipment, how was the decision made to implement an Inmarsat product?

Dr. Faulkner

Deciding to implement IsatData Pro on the Inmarsat network was an easy decision. Their satellite constellation is the newest and most reliable. The financial stability of the company along with their proven performance in mission and life-critical applications, were two other reasons why Inmarsat was the choice for us.

From Inmarsat's perspective, satellite spectrum is a valuable resource so they needed a service that would effectively use this resource but still provide the payload capacity, latency and scalability that customers need to be successful. SkyWave with its experience in developing satellite services was able to offer that know-how.

The spectral efficiencies that we have been able to implement in IsatData Pro allow SkyWave to meet growing bandwidth demand for location-based services as well as to offer the service at a cost per byte that our Solution Providers have sighted as a requirement to be successful in this market.

SM

What are your target markets and the applications offered under the IsatData Pro umbrella?

Dr. Faulkner

Like IsatM2M, IsatData Pro is targeted at both mobile and fixed assets. We see a huge demand in the transportation sector where instead of focusing on tracking and monitoring vehicles, customers will use the service for functions not easily achieved once

the vehicle was on the road. This includes sending information for logistics forms, emails, text messages and billing signatures — applications that optimize driver and vehicle use, improve customer service and reduce the business transaction cycle time.

We are also seeing a demand from companies that work with Oil & Gas companies. Instead of sending status information from production equipment once every hour or day, customers now have the option to send more detailed log information providing a detailed view of what is happening between data transmissions.

Executive Spotlight

In the maritime market, IsatData Pro is ideal for boat owners who want higher connectivity to shore without the ongoing costs of broadband-styled equipment. We are also seeing much interest for IsatData Pro in China and Russia, two rapidly expanding geographic markets for M2M services.

SM

The design, manufacture and sales of terminals is one of SkyWave's important product offerings — how difficult was it to integrate the various GPS technologies into these units that are sold around the globe?

Dr. Faulkner

The expertise that we possess within our company, combined with 14 years of experience in building and manufacturing satellite terminals, has allowed us to remove the hardware development burden from our Solution Providers and allows them to focus on their core competencies, delivering industry-tailored, satellite-based tracking, monitoring and remote management solutions. When it comes to designing the terminals, we rely heavily on

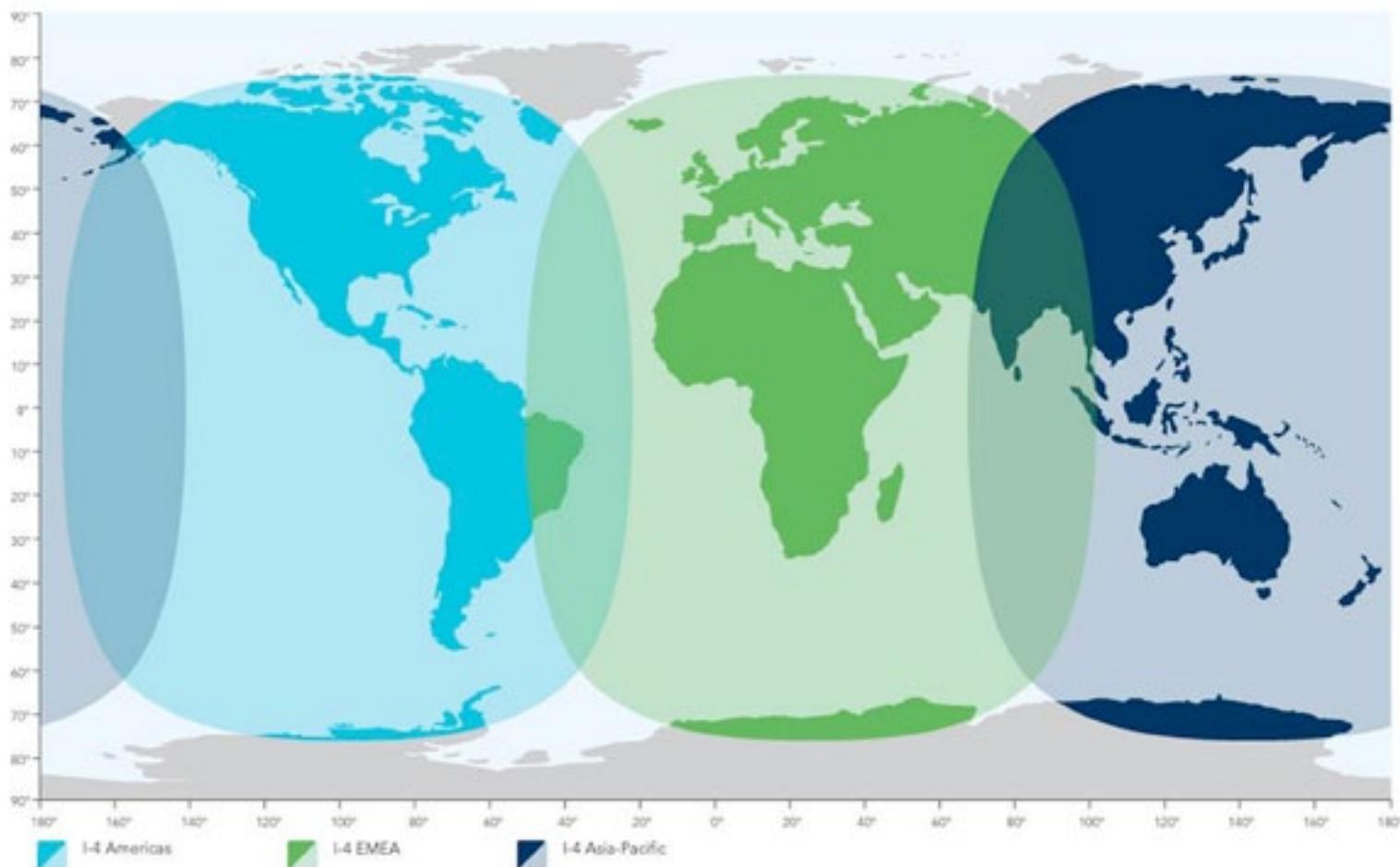
our Solution Providers to tell us what they need to be successful, industry trends and improvements that can be made to the product. All these factors drive us to design product lines that are and will be very successful in the market.

SM

Few really think about the movement of refrigerated goods and other commodities from supplier to wholesaler to the consumer... how does SatCom play its role in this vital effort?

Dr. Faulkner

Despite the proliferation of cellular technology, the demand for satellite communication is still growing. Customers are turning to satellite not only for remote applications where there is no cellular service but also for applications where assets are crossing cellular borders and customers don't want to pay roaming and network registration charges. Applications that require a guaranteed communication line or cannot operate on oversubscribed cellular networks are also turning to satellite.



IsatDataPro coverage map — Company info @ <http://www.skywave.com>

Executive Spotlight

In the example of refrigerated goods, companies that are shipping temperature-sensitive goods cross-country want to ensure that the product being transported is at the correct temperature and that they can control the air-conditioning unit. They cannot guarantee that they will have this visibility and control if they have a cellular-only product. In those cases, satellite provides the best level of service.

SM

What is planned for the IsatM2M network service, and how is such implemented?

Dr. Faulkner

IsatM2M is a two-way, global data packet messaging service that enables a wide range of M2M applications like tracking and monitoring fixed or mobile assets. SkyWave sees a huge demand for its IsatM2M product line. The small message packets offered by the service is just right for applications like cathodic protection, alarm monitoring and more. Best of all, our Solution Providers have been able to bundle IsatM2M into their service offering to create some innovative and low-cost solutions.

The introduction of IsatData Pro is designed to complement IsatM2M for applications where more value can be achieved if the users were able to send more data. Finally customers have a real technical and economical choice.

SM

Could you tell us about SkyWave's involvement in the various remote management arenas? Given the breadth of these areas, how does SkyWave ensure that Aeronautical, Heavy Equipment, Oil & Gas, Maritime, Mining, Transportation and Utilities sectors each receive product specifically tuned to their individual needs?

Dr. Faulkner

SkyWave focuses on the mobile devices and satellite air-time that is used in these various vertical markets. We credit the expertise and solutions provided by our Solution Providers to address the needs of the transportation, oil & gas, maritime, mining, etc. markets. We work very closely with our Solution Providers to understand what is happening in their market and jointly develop solutions that will allow them to successfully compete.



Executive Spotlight

SM

How are SkyWave products used with law enforcement, emergency service providers, and NGOs?

Dr. Faulkner

Within the government sector, our products are used in a number of applications — tracking location of vehicles and trailers; monitoring container doors to detect theft and ensuring cargo is secure from origin to destination; tracking location, travel routes and estimated arrival times of supply vehicles.

Non-Government Organizations (NGOs) are also starting to use SkyWave-based solutions for safety and logistics services, specifically looking to decrease fuel consumption, optimize fleet usage and reduce maintenance costs and accidents. One NGO wanted to ensure that vehicles were not being used outside of pre-authorized times, that only trained drivers were using vehicles and driving at acceptable speeds, and finally monitor fleet usage to ensure that all vehicles were being equally used to spread wear and reduce maintenance costs. This particular NGO found that they were able to save hundreds of dollars per month per vehicle, reduce their fleet size and redirect the savings for in country projects. This is a powerful tool when every dollar not used for operating a business can be used to helping people.

SM

With your military and private industry experience, would you say one plays off the other as far as designing and moving product into both environments for SkyWave? Are there plans afoot by the Company to develop additional LBS products for military and government uses?

Dr. Faulkner

There is definitely cross-pollination between the military and private industry. As we all know, GPS was originally developed for military applications and then adapted for commercial and private applications. Similarly government agencies have begun relying on civilian COTS (*commercial off-the-shelf*) systems to meet their business needs globally.

When we were designing the IsatData Pro terminals, we leveraged our experience with *Blue Force Tracking* (BFT) and *Movement Tracking System* (MTS) to build in some of the features that is required by agencies. This means that the IsatData Pro hardware that we are building today can be used for commercial, military government applications.

SM

How does SkyWave handle customer training on its products? And is customer support always available, regardless of the region of the world where needed?

Dr. Faulkner

SkyWave offers web-based training as well as in-class regional training sessions to all our Solution Providers. Customers also have the option to work with our Field Application Engineering team who has extensive experience helping develop solutions for various sectors and applications.

Inmarsat, which for the past 30 years has had experience maintaining a satellite network for life-critical applications such as *Global Maritime Distress Safety System* (GMDSS), is our partner in ensuring that our network is available 24 hours a day, 7 days a week. We are ready to respond if customers have any emergency concerns.

SM

Where do you see SkyWave's success, and what will be the Company's challenges, over the next couple of years?

Dr. Faulkner

The introduction of IsatData Pro is a game changer and we expect that its introduction will open up new markets and applications that could not be easily addressed with existing satellite services. We know that after the introduction of IsatData Pro satellite service and hardware in Q3 2011, we will be introducing a dual-mode cellular/satellite IsatData Pro terminal that will leverage the strengths of both communication systems in a single box. The product will offer a number of features and ports that will make it ideal for the transportation sector.

Looking ahead we will continue evolving our product lines based on the feedback from Solution Providers who will be in the front-line developing customer and vertical market focused solutions. It is going to be an exciting ride.



Focus

The Shocking Truth About Satellite Transportation

by Noel Brown, Aerospace Manager, Brüel & Kjær Sound & Vibration A/S

Satellite manufacturers need to monitor the transport of very delicate objects and parts, and whenever they move satellites they need to record the shocks that they are subjected to — or else risk launching an unknown quantity.

When satellites are safely floating around the weightless realm of space there is little to affect their reliability, which is just as well given the complications involved with repairing them. The most critical period affecting the reliability of satellites is thus the dangerous part of their lifecycles where gravity and its associated effects conspire to render these frighteningly expensive and fragile objects into useless pieces of spacejunk. And the real nightmare comes from the fact that engineers may not know about any damage until it is too late.

Standalone data recorders like the one seen here on a motorbike allow detailed monitoring throughout the transportation phase.



Focus

Satellites have three vulnerable stages in their lifetimes, and none of them take place in the primary environment for which they're designed. First comes the construction and reliability testing phase, then they're shipped around the Earth, and finally comes the dramatic transport into space.

The enormous stresses encountered by a satellite during launch are insured against through durability shaker tests and by blasting high level acoustic waves at them to excite structural resonances. These are dramatic enough that they generally can't be repeated due to the high risk of damage. They also require large mechanical shaker configurations and careful monitoring throughout the entire testing process.

Satellite testing is an exact science and is performed according to *Finite Element Models* (FEM) that use computer programs to simulate the stresses likely to be encountered. These models take acoustic and vibration telemetry data from previous launches, as well as vibration data from actual structural tests, to create a faithful reproduction to accurately ensure the satellite(s) can endure the necessary strains.

With satellite projects frequently stretching into the billions of dollars, however, even this leaves too much room for error. Computer modelling is all very well, but ultimately there's no substitute for strapping a satellite to a shaker and testing it to the limit. These durability tests involve far larger shaker systems, often in combinations, to input the necessary force on the necessary payload. This presents the problem that the test article will have subsequently surpassed the acceptable limit beyond which its life expectancy is deemed to have been critically degraded.

Typically, though, manufacturers will create two identical satellites, one of which will never slip the bonds of gravity. This unlucky twin or 'engineering model' is instead fastened to a vibration test system and subjected to vibration levels that may even surpass its design tolerances. Then the genuine 'flight model' is also subjected to vibration testing and modal analysis at the same facility — though at a far gentler magnitude. Nevertheless, the data gathered is enough to be able to compare the dynamic performance of the two identical satellites, which, all being well, should also be identical in relative terms.

These qualification tests occur in a test cell that is normally separate from the manufacturer's location, necessitating a perilous journey to get there. Satellites on the ground are out of their element, and need to be treated very carefully throughout the journey from construction facility to test lab, to space vehicle. Like a vulnerable patient, constant care can ensure the satellite's health is carefully maintained.

While monitoring the journey to the test cell is less critical than the subsequent one to the launch pad, it is nevertheless imperative that no unknown effects influence the comparability of the two models. Once certified at the test cell, the flight model must not undergo any stresses that will infringe upon the 'quota' it is designated to endure. Such strains could render the entire qualification process pointless, and consequently must be painstakingly monitored.



Once the ground transport has been safely completed, shock response analysis can be performed on the raw recorded data.

Earthy Transportation — A Dangerous Undertaking

To borrow a concept from *Donald Rumsfeld*, in contrast to the ‘known known’ of the launch stresses, the transportation phase is a ‘known unknown’ that is potentially open to greater unforeseen inputs and accidental effects. While inputs to the satellite are controlled as much as possible, the potential for unplanned events like shocks remains ever present.

Put another way, once the satellite is in the rocket, it’s going to go upwards, and it’s going to shake a lot before it does so. Before it goes onwards and upwards, it’s going to travel through the realm where the effects of gravity conspire on its journey with elements such as roads, vehicles and cranes.

Accidental events in this phase are inherently unknowable, and often multi-dimensional. Consequently, aside from doing everything possible to ensure such things don’t occur in the first place, there are no definite preventative measures. There is still plenty that can be done to ensure the launch of a fully functioning satellite. If anything occurs during transport that might feasibly affect the performance of a satellite once it has been put into orbit, the operator needs to know about it in detail.

By closely recording the forces that a satellite is subjected to on the way to launch, this dangerous phase can be quantified and assessed. This leaves far less to chance. For example, when moving from the ‘hangar’ to the launch pad, any jolts or impacts that might affect the reliability of the satellite can be recorded and thoroughly investigated. Once safely in place as a space vehicle’s payload, the recorded data can be quickly post-processed and assessed against the design’s limitations to identify any extreme events, and their duration.

For effective transportation monitoring, manufacturers need highly mobile and scalable vibration data recording systems. With a typical multi-channel setup, several accelerometers are mounted on the satellite and are able to record the forces acting on the structure for the entire duration of the transportation.

Data acquisition systems must be highly portable and flexible, with the ability to operate on battery power for extended periods. Modular systems with minimal cabling are ideal, being attached unobtrusively to the satellite and staying there throughout the transportation process — inside the considerable protective packaging.



No matter how meticulous the construction and testing, it’s all for nothing if the seemingly simple shipping operation doesn’t go according to plan.

Correct The First Time

With any one-time-only measurement such as these, capturing the data correctly the first time is of paramount importance.

Traditional challenges faced by data acquisition setups — such as selecting the correct input range — present a significant hurdle to effective monitoring.

In the past, if any overload (such as from an unforeseen shock) occurred outside the pre-defined measurement band of interest, the signal would be clipped. Worse, with classic analyzer technology, the user was not necessarily notified about the overload. This could result in there being frequency components in the analysis spectrum which didn't actually exist in the real world, and could damage the real data that was captured.

Now, Brüel & Kjær's *Dyn-X* technology allows a single analysis range that captures data from the smallest rattle to the largest knock. This means there is no need for trial runs to ensure correct input ranges for the various input channels, so the certainty of getting the measurements correct the first time is significantly increased.

It's particularly useful in situations such as satellite transport where unknown inputs (that are impossible to range) are anticipated, and gives operators the guarantee that the entire measurement and analysis chain consequently matches, or outperforms, the range of the actual transducer used for the measurement. With no setting of input ranges, and no need to be concerned about overloads, under-range measurements, or measurement accuracy, the safety of recordings is dramatically increased. When the analysis of the data could potentially decide the space-worthiness of a satellite, there is no margin for error.

During transport, event marking capabilities enable an operator to electronically note any particular shocks or events in the time data, helping easy identification later on. This allows significant events to be quickly located and replayed to ensure the satellite's compliance with designated shock limits once it's safely installed for its final, turbulent journey.



All wrapped up: There are vital components hidden under that wrapping – awaiting qualification testing on one of Brüel & Kjær’s LDS shakers

Feedback Into The System

Recording the raw data from ground transportation gives a valuable, full picture of the journey that can later be fully analyzed at leisure using specialized software tools such as Shock Response

Analysis, as provided with Brüel & Kjær’s *PULSE Reflex* post-processing software. The entire journey – including data from significant events – can then be fed back into the FEM, allowing stresses from the ground transport phase to be considered and taken into account in future design and modelling situations.



All satellite photos are courtesy of **RAL Space**

Author bio
Noel Brown is the aerospace project manager at Brüel & Kjær Sound & Vibration A/S, Denmark



A Case In Point

Launching Bharti Airtel Into DTH

by Thomas C. Coyle, Senior Vice President + General Manager, Globecom Systems Inc.

India may be the hottest direct-to-home (DTH) television market in the world. At the end of 2007, there were fewer than 5 million DTH subscribers in India, a tiny percentage of the nation's 112 million TV households. Forecasters expect that will expand to between 25 and 30 million by 2015, and incumbents are seeing +50 percent quarterly growth in subscribers, driven by strong competition among multiple players. India is one of the most competitive markets in the world, where subscribers pay the equivalent of US\$10 for a vast bouquet of channels and volume is the key to profitability.



A Case In Point

Airtel is India's largest mobile carrier, with a 25 percent share of the national market. In considering the DTH business, the company saw immense opportunity. With a competitive DTH service in place, Bharti could go to market through 21,000 retail outlets in 62 cities as well as by texting sales offers to nearly 80 million mobile subscribers.

In addition to the immediate DTH opportunity, Bharti was also thinking long-term. The consumption of video entertainment is undergoing a revolution, and the company wanted to position itself to enter emerging markets for video-on-demand, IPTV and mobile video with an economical and future-proof solution.

When all the requirements were considered, there were few companies that could deliver the combination of leading-edge systems, integration expertise and the ability to ensure that never-done-it-before solutions would work. The final result of the bidding process showed that, in Bharti's view, there was only one: Globecom Systems.

Balancing Opportunity + Cost

"This project was all about balancing tomorrow's opportunity and today's cost," says *Dov Cydulkin*, Globecom vice president for the Asia-Pacific. "Because it is so vast and growing so fast, the Indian market offers opportunities never commercially feasible before. But it imposes some of the most stringent cost constraints I have ever seen. Striking that balance took a tremendous amount of creative collaboration between Bharti and Globecom."

Globecom began by designing and installing the DTH program acquisition and uplink center, a task to which the company brought years of experience. Globecom has built uplink facilities for the world's leading satellite television networks, from Sky and DirecTV to ASTRO and Star TV. The Bharti acquisition and uplink center featured two 11.3m Ku-band antennas, 18 4.5m receive-only antennas and Globecom's *AxxSys* monitor and control system.

A Case In Point

When it came time to design the broadcast center, however, there was no proven template to follow. “On a block diagram,” says program director *Roy Schumacher*, “nothing about the system looked unique. But it involved a combination of technologies that nobody had brought together before on this scale.”

Globecomm Innovations

The first technology was MPEG-4 compression. Though it offers a 25 percent bandwidth savings, the higher cost of MPEG-4 chipsets compared with MPEG-2 has held back commercial adoption for years. In 2006, for example, an MPEG-4 *set-top box* (STB) was twice the price of an MPEG-2 STB. Multiply that by a million customers, and a DTH provider was faced with US\$60 million in additional upfront cost. However, the vast size and growth potential of the Indian market allowed Bharti to commit to STB quantities that drove down the cost of MPEG-4 STBs to MPEG-2 levels.

The second innovation was the comprehensive use of Internet Protocol inside the broadcast center. Bharti wanted every bit of content entering the broadcast center to be encoded as IP, despite the fact that it would be converted to DVB-S2 and multiplexed before going up onto the satellite.

“Making the facility IP-centric is the key to the future for Bharti,” says *Dov Cydulkin*. “Working with them, we actually evolved a new architecture that we call the Media Processing Center (MPC). Because we encode everything as IP upon ingest, the MPC ‘speaks IP’ as its native format. Today, Bharti is focusing on the DTH market. But the MPC architecture allows them to introduce IPTV with few modifications in the future and to provide a platform for other video services, including IP-based mobile TV.”



The MPC architecture requires that every piece of equipment in the facility be selected with the future in mind. “The conditional access system has the ability, with upgrades, to control IPTV streams and mobile TV streams,” said *Roy Schumacher*. “And we’re talking about over 190 channels with basic, premium and pay-per-view movie channels. We demanded that the encoder and multiplexer vendor make sure that the advanced compression would work across all of the potential platforms. Then there was the matter of tying all the systems together. We came up with a highly distributed solution that provides better reliability and avoids single points of failure. Bharti really liked it, because the Globecomm best-of-breed solution was more innovative than they could get from any single technology vendor.”

Globecomm also designed and built the *Network Operations Center* for the broadcast center. In addition to the usual confidence monitoring system with its “video wall,” Indian law required the development of a compliance monitoring system that recorded and stored all broadcast content for 90 days.

Low Cost, High Performance

Bharti Airtel’s new DTH service was launched to rave reviews. The company conducted picture quality analyses at locations around the country and found that the quality of their video was superior to competitors from the first day of service. It was a remarkable achievement for a system that broke the mold in so many ways.

“From the beginning, Globecomm has worked with top media companies around the world,” says Globecomm Chairman and CEO *David Hershberg*. “Some of the world’s most innovative and exciting applications of technology are happening in markets like India, and we feel privileged to be part of them and to learn from clients like Bharti Airtel.”



About the author

Thomas Coyle has more than 30 years of experience in the design, implementation and management of Satellite Communication Networks and other sophisticated electronic systems. Mr. Coyle’s current role at Globecomm is the General Management of the Globecomm Systems business, which includes design, provisioning, and management of complex, satellite based, communication networks and end-to-end service solutions.



Executive Summary: The Space Report

Space continues to capture the imagination, providing opportunities for learning, exploring, and dreaming about the future. At the same time, space systems are used for everyday purposes such as weather forecasts, driving directions, and international telephone calls.

There is an increasing awareness of the value of space as an economic market with bearing on many other economic sectors, as well as a critical enabler of national and social benefits.

Leaders in government and industry perceive that the business of space requires concerted policies, regulations, and investment structures that build on partnership, whether among governments or between industry and government. The rapid evolution of satellite navigation products and applications illustrates the tremendous and often unforeseen spinoffs from space investments.

In 2010, as the global economy recovered from a damaging recession, the space industry not only maintained its growth but even gathered momentum.

Despite reductions in spending by several major spacefaring nations, the commercial sector flourished, adding billions of dollars to the economy. The commercial sector has long been involved in national space programs, primarily as contractors. This role is expanding due to new government policies that encourage greater reliance on commercial providers, particularly in the United States. These policies provide opportunities that have generated significant interest among traditional aerospace companies, as well as newer space

actors, as the commercial sector seeks resources to develop its technological capabilities.

Executive Summary: The Space Report

Additionally, more countries are becoming involved in space or are revitalizing dormant space programs, with Australia, South Africa, and Iran as recent examples. In many cases, emerging space actors are incorporating a commercial element into their space programs that targets economic development and technology creation. These large shifts toward a greater commercial focus will occur over time, and not without disruptions or setbacks. As space business evolves, whether it is focused on commercial human spaceflight or the latest satellite navigation applications, it offers the potential for new investments, technology development, economic efficiencies, and an increase in the economic and social value of space to people around the world.

The role of civil society in space activity is also evolving. Space enthusiast communities are not mere observers, but are increasingly building their own in-space technologies through amateur or university satellite development programs. The emergence of smallsats and cubesats is lowering costs and barriers to entry, offering civil society actors new avenues to engage in space activity. When smallsats are networked, either in constellations or flying in formation, the opportunities for new science and commercial applications can grow exponentially. Commercial human spaceflight also opens an avenue for people to experience space on a personal level, and it furthers public interest in space activity even for those who do not leave the ground. The growing engagement of civil society in space pursuits not only stirs our imagination, but also brings us closer together—researchers, scientists, business professionals, and government officials—to explore the practically limitless opportunities that space promises.

Space Products + Services

Space products and services are an integral part of daily life, expanding each year into new areas of human activity. In one dramatic example, space technology and expertise helped to ensure the survival and rescue of a group of Chilean miners trapped underground. This experience was but a single instance of how the knowledge gained from human activity in the challenging environment of space can be applied to life on Earth. In more commonplace situations, new space applications are helping people communicate with each other and access entertainment as they travel by ground, sea, or air. Satellite-enabled internet connections are becoming commonplace as airlines outfit their fleets with the latest equipment. Navigation applications for cell phones can combine input from built-in cameras and GPS chips,

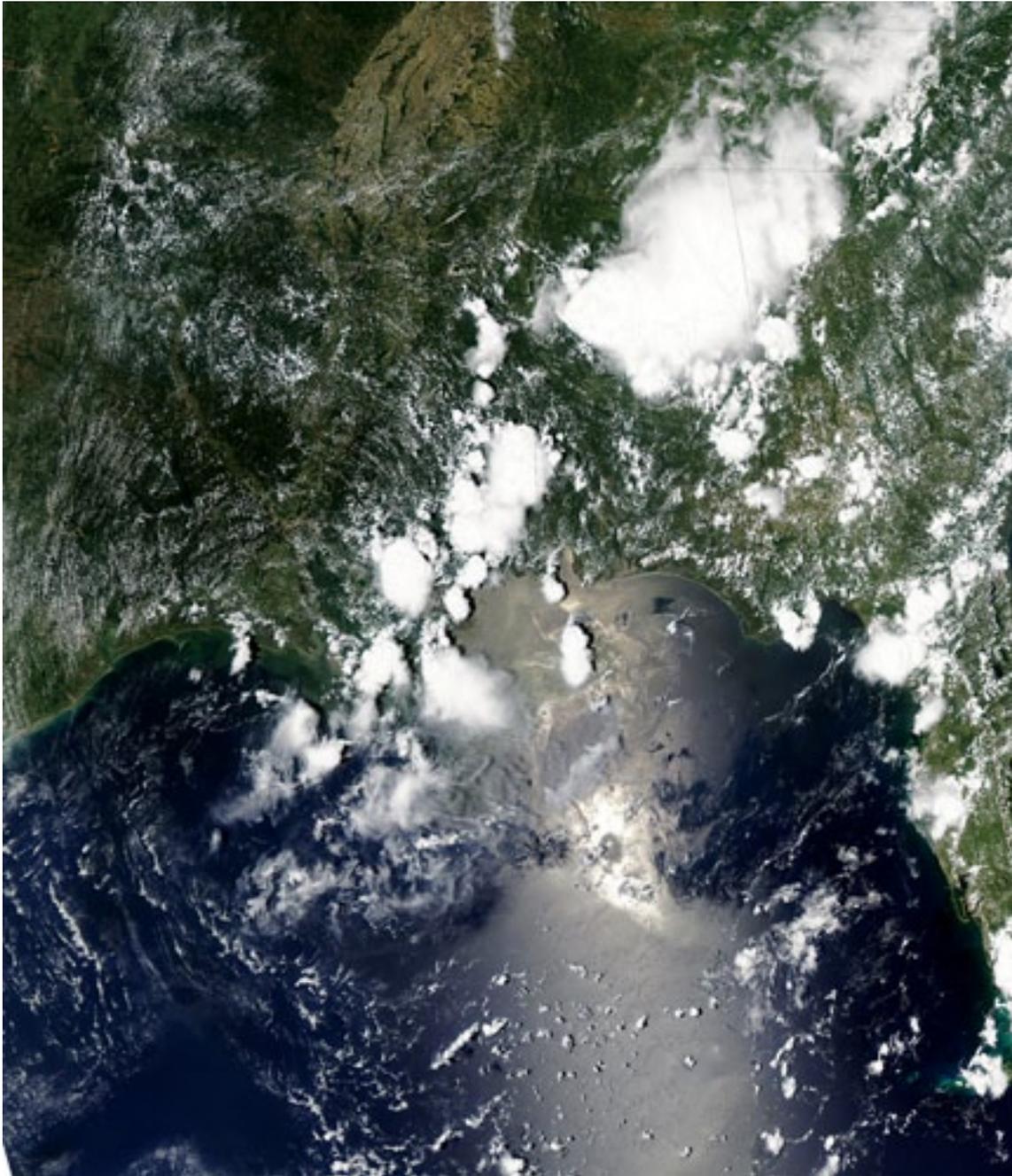
Executive Summary: The Space Report

enabling users to view directions as an overlay on an image of their surroundings. GPS tracking systems installed on race cars allow people playing computer games to participate in virtual competitions against professional drivers during real-world racing events. Whether during work or leisure hours, most people reap the benefits of space systems and technology on a regular basis.

The commercial sector continues to incorporate space technology both in its manufacturing processes and in its products. The glass manufacturing industry is incorporating techniques used in the analysis of data from the *Hubble Space Telescope*, and the semiconductor industry is creating more powerful microchips using technology developed for building ESA's *XMM-Newton* X-ray observatory. Consumers can purchase clothing made from

textiles originally developed for use by astronauts or have their hair styled with tools that smooth and soften hair using nanoceramic technology developed by NASA. Not only does space contribute to the wealth of products available to consumers, it also enables companies to estimate consumer activity by observing the ebb and flow of customer traffic in the parking lots of retailers such as Walmart by means of satellite imagery.

On a more global scale, satellites offer a unique perspective that helps to explain the human relationship with the environment. From enabling forestry managers to track the spread of tree-destroying Rocky Mountain pine beetles to helping coordinate cleanup efforts after the Gulf of Mexico oil spill, satellite data is critical to managing natural resources and the response to manmade disasters. It is almost unthinkable now to consider the prospect of facing a natural disaster without the communications and imaging capabilities provided by space systems.

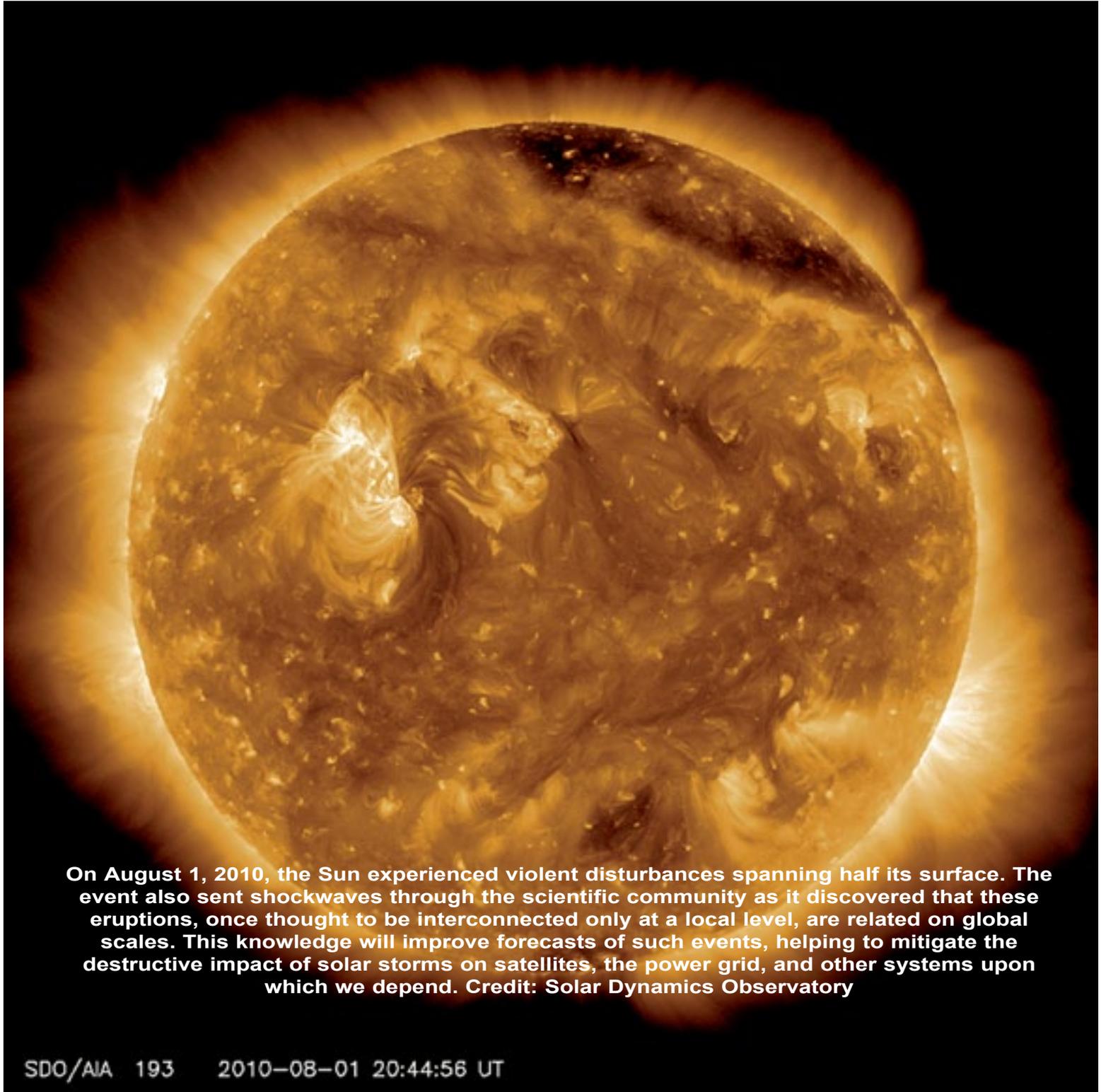


During the 2010 Gulf of Mexico oil spill, satellite imagery helped cleanup crews to chart the size of the slick, forecast its movement, and identify shorelines threatened by the spill. In this image from the MODIS instrument aboard NASA's Aqua satellite, ribbons of silvery oil can be seen branching out from the site of the spill and threatening the coast. Credit: NASA/MODIS Rapid Response Team

Executive Summary: The Space Report

Individuals, companies, and nations continue to create new space-related products and services, capitalizing on the intellectual and financial investments made in space technology. Many governments have realized the benefits of using space technology as a tool for carrying out their responsibilities and as a means of generating economic growth. These governments play an important role in developing new space technology, with methods

such as financing commercial companies, transferring government technology to the commercial sector, and creating a supportive regulatory regime. Regardless of the exact measures undertaken, it is clear that governments recognize the need for further growth of space capabilities.



On August 1, 2010, the Sun experienced violent disturbances spanning half its surface. The event also sent shockwaves through the scientific community as it discovered that these eruptions, once thought to be interconnected only at a local level, are related on global scales. This knowledge will improve forecasts of such events, helping to mitigate the destructive impact of solar storms on satellites, the power grid, and other systems upon which we depend. Credit: Solar Dynamics Observatory

SDO/AIA 193 2010-08-01 20:44:56 UT

Executive Summary: The Space Report

The Space Economy

The space economy continued to grow for the fifth year in a row, seemingly unaffected by the economic turmoil that brought losses to many other industries during the height of the recession. The space economy increased by 7.7 percent in 2010, accelerating from annual growth rates of approximately 5 percent that were observed in 2008 and 2009. The space economy increased by nearly \$20 billion during 2010, reaching an estimated total of \$276.52 billion. Some of this growth came from increases in government spending, but the vast majority occurred in the commercial sector.

Revenue from commercial infrastructure and support industries increased by 13 percent in 2010, reaching a total of \$87.39 billion. The majority of this growth came from ground stations and equipment, including personal navigation devices, which added nearly \$11 billion in value, a 16 percent annual increase. The

commercial space products and services market expanded by 9 percent, adding \$8.55 billion in revenue for a total of \$102 billion.

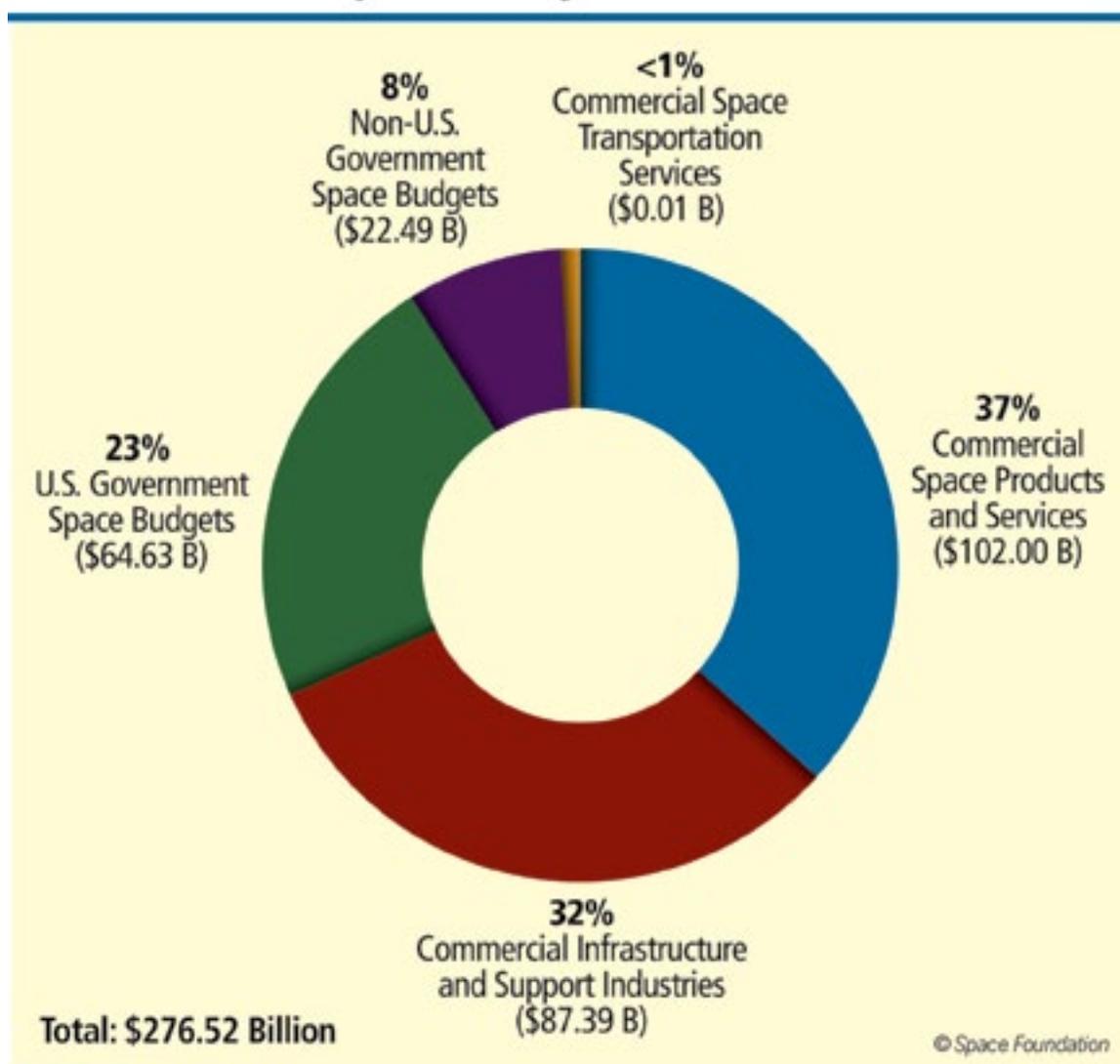
A large part of this increase is tied to direct-to-home (DTH) broadcasting, which grew by 10 percent, adding more than \$7 billion. The commercial space transportation services sector declined by 88 percent in 2010, as there were no seats available for purchase by private individuals who wished to travel into orbit. However, companies working to provide suborbital travel options continued to collect deposits for flights expected to take place starting in the next several years.

Government space spending increased to \$87.12 billion in 2010, a 1 percent increase from 2009. The U.S. space budget, which accounted for 74 percent of all worldwide governmental space spending, remained steady at \$64.63 billion. Meanwhile, the budgets of other

governments that were counted in both 2009 and 2010 increased by 0.3 percent. With the addition of eight national budgets counted for the first time this year, non-U.S. government expenditures reached \$22.49 billion. Although government spending on space grew in aggregate terms, fiscal concerns meant that some major spacefaring nations decreased or made no change to their spending.

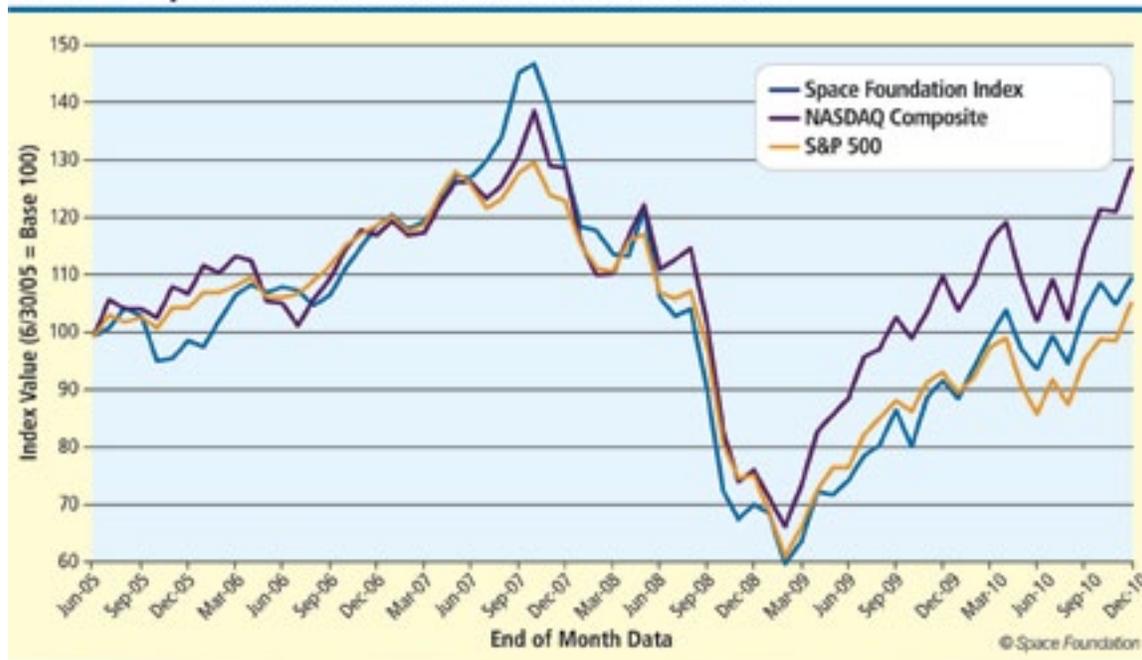
During 2010, major new space policies or planning documents were announced in numerous countries, including Canada, Germany, Israel, Japan, and the United States. As these policies cascade into budgets and program activities, they are likely to affect the amount of total governmental spending on space as well as the specific areas of programmatic activity.

EXHIBIT ES1. Global Space Activity, 2010



Executive Summary: The Space Report

EXHIBIT ES2. Space Foundation Index vs. Other Market Indexes



the U.S. space program. There is growing interest in developing commercial crew vehicles, with several companies putting forward proposals to provide access to the International Space Station (ISS) and other planned space stations. Work has continued on both new and upgraded spaceports, including the completion of the runway at Spaceport America in New Mexico and the final stages of construction of the Soyuz launch complex in Kourou, French Guiana.

The health of the space industry is reflected in the Space Foundation Indexes, which grew at rates of 10 percent to 43 percent during 2010. This upward trend continued the recovery that began in early 2009. The indexes track the performance of space infrastructure and services companies listed on U.S. stock exchanges. As the broader financial markets improved, the flow of capital into the space industry increased considerably. The aggregate value of mergers and acquisitions in 2010 was more than double that of 2009, even though the number of transactions remained steady. This was due to several high-value transactions in excess of \$500 million, indicating investors are interested in taking large stakes in the space industry.

Space Infrastructure

The space industrial base emerged as an important topic during the year, with much of the discourse surrounding structural changes to

The global launch industry carried out 74 orbital launches in 2010, compared to 78 launches during 2009. This 5 percent decrease is due in part to the 2009 bankruptcy of commercial launch provider Sea Launch, although the company plans to



A Soyuz spacecraft is rolled out to its pad at the Baikonur Cosmodrome in Kazakhstan in preparation for a launch in April 2010. The TMA-18 mission carried two Russian cosmonauts and one U.S. astronaut to the International Space Station. Credit: NASA/Bill Ingalls

Executive Summary: The Space Report

resume operations in 2011. In spite of the lower launch rate in 2010, more payloads were launched than in 2009; 118 payloads were carried into space in 2010, up from 111 the year before. Russia remains the world launch leader, conducting 31 launches in 2010, followed by the United States and China, each with 15. Two new vehicles, the Minotaur IV and the Falcon 9, were launched for the first time in 2010. With its Dragon capsule, the Falcon 9 is intended to provide cargo transportation for the ISS.

As of the end of 2010, there were an estimated 957 active satellites in orbit around Earth. One of the recent growth areas is the field of satellite-based broadband internet connectivity. Commercial operators are seeking to provide broadband internet to consumers in underserved areas, sometimes with support from government programs. Meanwhile, mobile satellite service providers are pressing ahead with the deployment of next-generation satellite constellations to replace those reaching the end of their lives. The rapid expansion in the number of devices that use satellite-based positioning, navigation, and timing services has provided additional impetus for countries to field their own satellite navigation systems or augmentation services. The coordination of these systems, as well as infrastructure to enhance the accuracy of navigation systems used by the aviation and transportation industries, has emerged as an important area for international cooperation.

Workforce + Education

Despite the recession, U.S. core space employment remained relatively stable at about 260,000 workers in 2009, the latest year for which data was available. Average U.S. space industry wages continue to be more than double the average U.S. private sector wage, suggesting that the demand for skilled employees remains high. It remains to be seen how these figures will be affected by the end of the Space Shuttle Program and the termination of the Constellation Program, which have resulted in the loss of more than 2,700 space jobs between October 2008 and March 2010. Further cutbacks are expected, such as the reduction of the Kennedy Space Center contractor workforce from 15,000 employees in 2009 to approximately 7,000 by the time the shuttle ceases operations. Various retraining programs have been set up to ease the transition of these workers into other jobs, and it is also hoped that commercial operators will create jobs as they seek to provide NASA with crew and cargo services. In the U.S. military space workforce, the number of space professionals declined by 6 percent, from 16,830 in 2008 to 15,791 in 2009.

The U.S. space industry is also facing demographic challenges as significant numbers of employees approach retirement. A plurality of the civil servant workforce at NASA is between 45 and 54 years of age, and the broader space workforce peaks at 50 to 59 years of age. To ensure that critical knowledge is handed on to the next generation, NASA is emphasizing the hiring of new science and engineering (S&E) employees “fresh out” of university programs, but there are questions about whether the supply of graduates is sufficient for a growing industry.

The European space industry continued to add jobs in 2009, increasing by 3 percent to reach a total of more than 31,000. In Japan, the space workforce grew by 22 percent in 2009, reaching a total of about 6,300 workers as it recovered from a sharp decline in 2008. Around the world, other regions continue to emerge as new centers of space-skilled workers. Nearly 1.7 million students receive their first degrees (equivalent to a bachelor’s degree) in space-relevant S&E fields worldwide per year, with considerable parity among the Americas, Asia, and Europe. China showed the most rapid growth between 2002 and 2006, more than doubling its number of first-degree S&E graduates from about 325,000 to 770,000. Emerging regions showed the highest ratios of gender equity in S&E first-degree graduation rates: 40 percent of Middle Eastern S&E first-degree earners were female, followed by 39 percent of African and South American S&E first-degree earners. Worldwide, one-third of bachelor’s-equivalent S&E degree earners are women.

Although the space industry faces challenges due to programmatic changes and demographic factors, the ingredients exist for future successes. New commercial ventures and national space programs have the potential to generate interest that will draw talented individuals into the space workforce. The nature of this workforce may well be more diverse than it has been in the past, requiring new management approaches to ensure that innovation continues to grow and flourish.

Outlook

As the space sector matures, alternative business models are increasingly used to gain better access to known markets and to enable unconventional new markets. This evolution includes government policies that promote new ways for the public sector to engage with private actors, as well as the increasing use of financial tools to encourage commercial development of key capabilities.

Successful examples include prize models, from the X PRIZE to the annual European Satellite Navigation Competition, as well as increased use of export credit agencies to support space projects. They also include innovative technical approaches, such as hosting government payloads aboard commercial satellites. Government-assisted programs to develop cubesats and micro-launchers could also alter the way space is utilized by reducing barriers to participation in space activity.

The number of countries participating in space activities continues to expand. By the end of 2010, more than 50 countries were operating a national satellite or planning to launch one by 2012. The broadening of the space community has been reflected in policy and programmatic reorganizations that focus on defining the future direction of international cooperation in space exploration, ISS utilization, and space applications. Many nations beginning to participate in space activity seek partnerships with more established nations or companies, particularly in immediately beneficial areas.

Earth observation remains a priority for government commitment, and it continues to develop as a key area for international cooperation and commercial sales. Space imagery and content are accessible by a broad base of civil and public sector users, allowing increased citizen participation in space exploration and science. With more than 1,000 Earth science instruments in orbit, a constant stream of information about the planet is now available. National and international organizations seek to ensure that these capabilities do not degrade over time as satellites are retired, and in some cases commercial companies are stepping in to provide new methods of gathering data for purposes such as weather forecasting.

Interest in space is a common feature of the human experience, from the early societies that named stars and constellations to the astronauts who walked on the Moon. As technology improves, access to space is available to an ever-widening group of people. University programs enable students to build small, very capable satellites that are then launched as secondary payloads when larger satellites go into space. Five such cubesats were launched in 2010, and at least seven more are scheduled for 2011. For those who prefer looking at the night sky, there are online participatory programs that invite space enthusiasts to sort and categorize the vast quantities of astronomical data produced by observatories.

Executive Summary: The Space Report



Elementary students in Washington, DC, take turns trying on a space suit glove during a meeting with an astronaut. Spacefaring countries are engaging in efforts to build excitement about space and related technical fields at an early age to ensure they will have the workforce necessary to meet the needs of the growing global space industry.

Credit: NASA/Carla Cioffi

Such efforts have produced results that go beyond the limitations of the small community of professional astronomers.

In the near future, a series of new spacecraft focused on planetary and cosmic exploration will study a number of interesting topics, such as searching for signs of life on Mars. New missions are planned to monitor the Sun's behavior and even to probe its atmosphere, with a view to better understanding life on Earth as influenced by solar activity and its impact on weather. Looking further afield, the search for Earth-like planets orbiting other stars

has already yielded several possible candidates and it is likely that even more will be found during the next several years. Each new discovery adds to our understanding of the universe and the planet on which we live.

The Space Report 2011 Data

The Space Report 2011 is the result of extensive research by the Space Foundation and an array of independent research organizations and individuals with expertise in space policy, financial markets, science, education, and technology. This combined effort involves identifying, gathering, analyzing, and synthesizing publicly available information from sources including government and corporate reports, congressional records, and data provided by trade

associations and private research firms. The report also draws upon articles in news, business, and industry publications. Illuminating the text of The Space Report 2011 are scores of exhibits tracking industry sector activity, major sources of industry revenue, trends in education and training, employment, government investment in space, and market performance of space industries. More information and ordering at: <http://thespacereport.org/>



SatBroadcasting™ : TechTalk

Preserving 4:2:0 Chroma Fidelity

by Rich Harvey, Fujitsu

Networking of digital television content has, for a long time, suffered adverse effects caused by multiple satellite, microwave and terrestrial links—these effects are referred to as “concatenation.” In legacy analog systems, demodulation and re-modulation of the signal at intermediate points in the network contributed to signal degradation, particularly signal-to-noise, which in many instances reduced the image at the point of delivery to less than that normally acceptable in broadcast television operations.

The transition to digital video has created new challenges in preserving the fidelity of content in concatenated links, where multiple encode-decode operations are necessary in digital turn-around over satellite, wireless and terrestrial links. One particular problem is maintaining the integrity of a 4:2:0 chroma component when a High Definition-Serial Digital Interface (HD-SDI) interconnect is used between concatenated decoders and encoders. This relates equally to MPEG-2 and MPEG-4 (H.264/AVC) codec standards.

HD-SDI is inherently a 4:2:2 interconnect, which requires a 4:2:0 signal to be up-sampled and down-sampled at each digital turn-around. Within as little as 4-5 concatenated links, this can result in visual blurring of the color image to the point where the picture fidelity and integrity of HD content can be severely compromised.

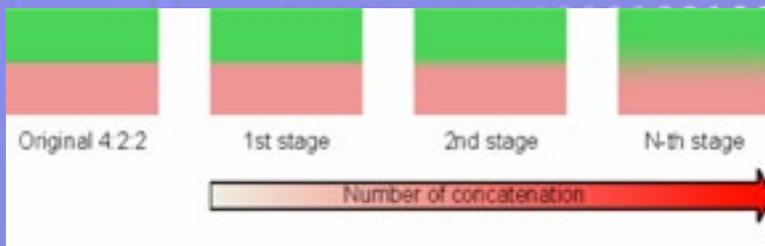


Figure 1. Degradation of a 4:2:0 chroma component in concatenated operations

SatBroadcasting™ : TechTalk

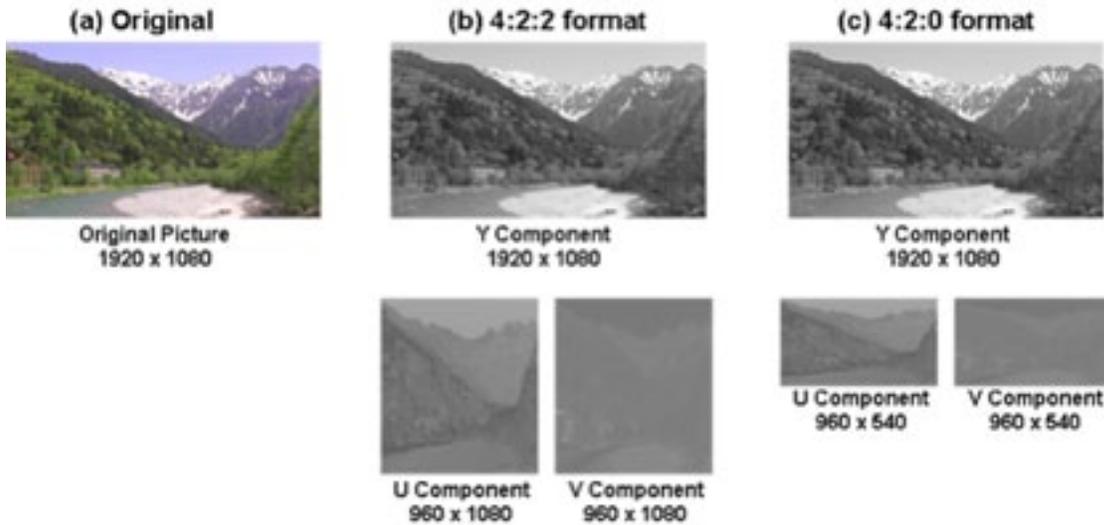


Figure 2. Comparison of 4:2:2 and 4:2:0 formats

The good news is organizations no longer need to make a choice due to work done by Dr. *Akira Nakagawa* and engineers at Fujitsu Laboratories in Japan.

Fujitsu engineers have developed a technology solution to chroma down-sampling and up-sampling using a *Perfect Reconstruction Filter*. This new filter technology has been integrated into Fujitsu MPEG-4 products, including the *IP-9500 HD-SD* encoder.



Fujitsu IP-9500 HD-SD encoder

This problem is of particular concern in *HD Electronic News Gathering* (HD-DENG) where the use low data rate encoding and 4:2:0 chroma sampling can provide operational and economic advantages. In HD-DENG, as many as 10 or more concatenated operations can take place before final delivery to network affiliates and others.

The two most widely used chroma encoding formats in broadcast television applications are 4:2:2 and 4:2:0 (see *Figure 2*).

In a 4:2:2 format, the two chroma components are down-sampled by a factor of two from the horizontal luminance component resulting in a pixel ratio of 960 x 1080; in the 4:2:0 format, the “U” and “V” chroma components are down-sampled by a factor of two in both the horizontal and vertical luminance component resulting in a pixel ratio of 960 x 540.

With the introduction of MPEG-4 *Advanced Video Coding* (AVC) encoding, it is generally accepted that lower encoded video data rates (those at or below 10Mbps) are sufficient for broadcast fidelity HD video, and that the use of 4:2:2 chroma sampling will not produce a significant improvement in performance over that of 4:2:0 at these lower encoded data rates. In addition, 4:2:0 requires approximately 20 percent less bandwidth than 4:2:2 encoded content.

This has traditionally represented a challenge for organizations: should they use 4:2:2 chroma sampling and accept the need for 20 percent more bandwidth, or should they use the more efficient 4:2:0 format and accept potential chroma degradation in concatenated links?

The Perfect Reconstruction filter is designed to accurately separate the chroma component of an original HD-SDI (4:2:2) video input and down-sample it by using a low pass filter and a 2:1 vertical sampler. The 4:2:0 output is then created by combining the down-sampled chroma with the luma component as shown in *Figure 3* on the next page.

The MPEG-4 (4:2:0) encoded output can then be carried efficiently over any digital communications link — satellite, wireless, telco, VPN or Internet — to an intermediate destination or digital turn-around point. Then, by using a decoder fitted with a Perfect Reconstruction filter, the 4:2:0 / 4:2:2 up-sampling process is performed to connect the second encoder in the concatenated link using the HD-SDI interconnect, at the same time preserving 4:2:0 chroma fidelity and integrity.

In a conventional H.264 4:2:0 encoder without the Perfect Reconstruction filter set, the chroma component will suffer loss of resolution at each concatenated operation using a HD-SDI interconnect. This degradation can be totally eliminated by fitting each encoder and decoder with the Perfect Reconstruction filter set as shown in *Figure 4*.

SatBroadcasting™ : TechTalk

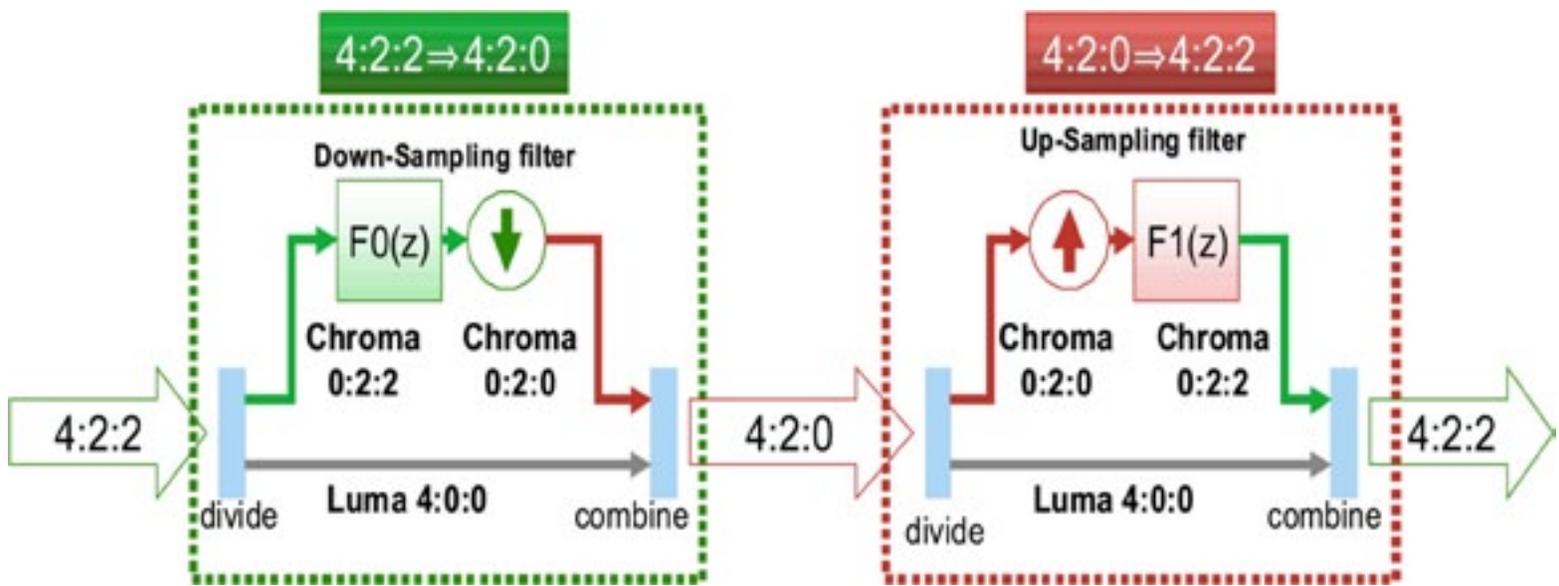


Figure 3. The Perfect Reconstruction Filter

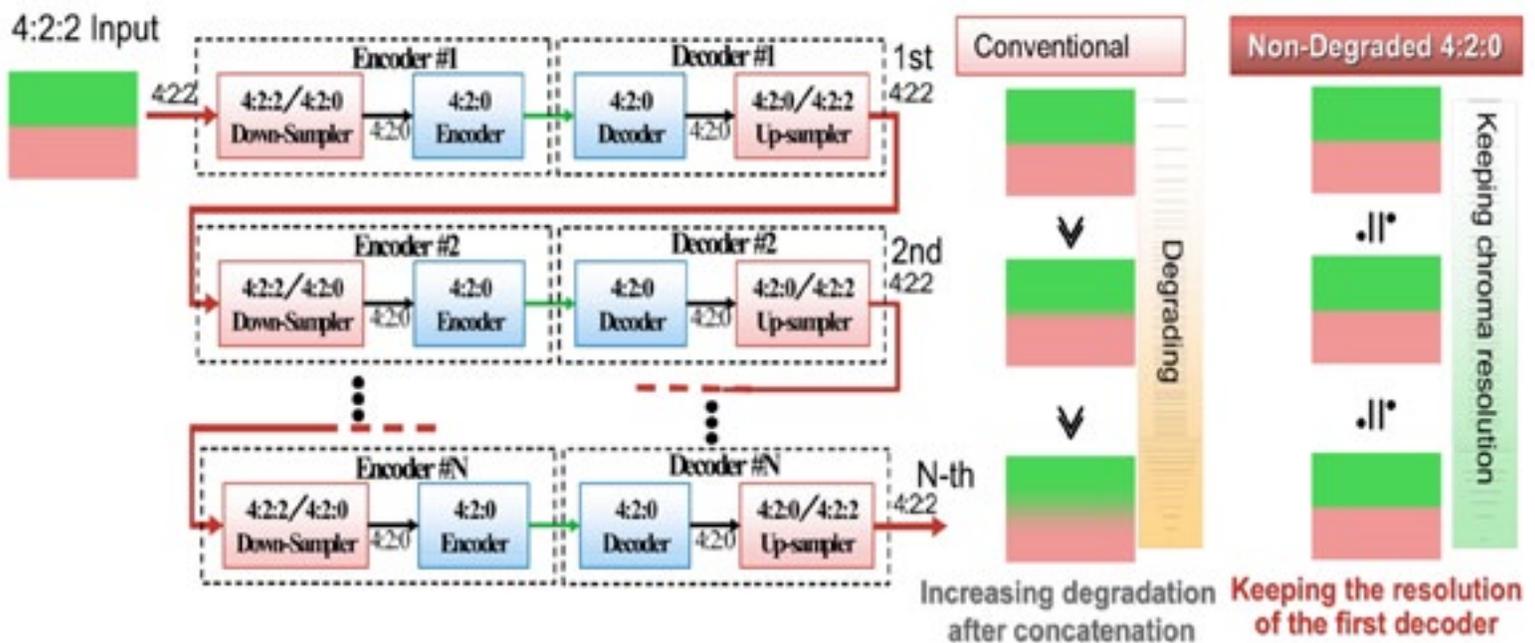


Figure 4. Conventional and Non-Degraded 4:2:0 concatenated links.

As many as sixteen (16) concatenations were conducted in testing without degradation of the 4:2:0 chroma component. In these tests, a comparison of the original chroma PSNR was made with that at the output of the 2nd; 4th; 8th and 16th concatenated decoders.

Test results (shown in Figure 5) clearly demonstrate the difference between chroma degradation in conventional concatenated operations and the protection provided by the non-degraded 4:2:0 solution, which maintained a peak signal-to-noise ratio (PSNR) close to that of the original 4:2:2 source.

SatBroadcasting™ : TechTalk

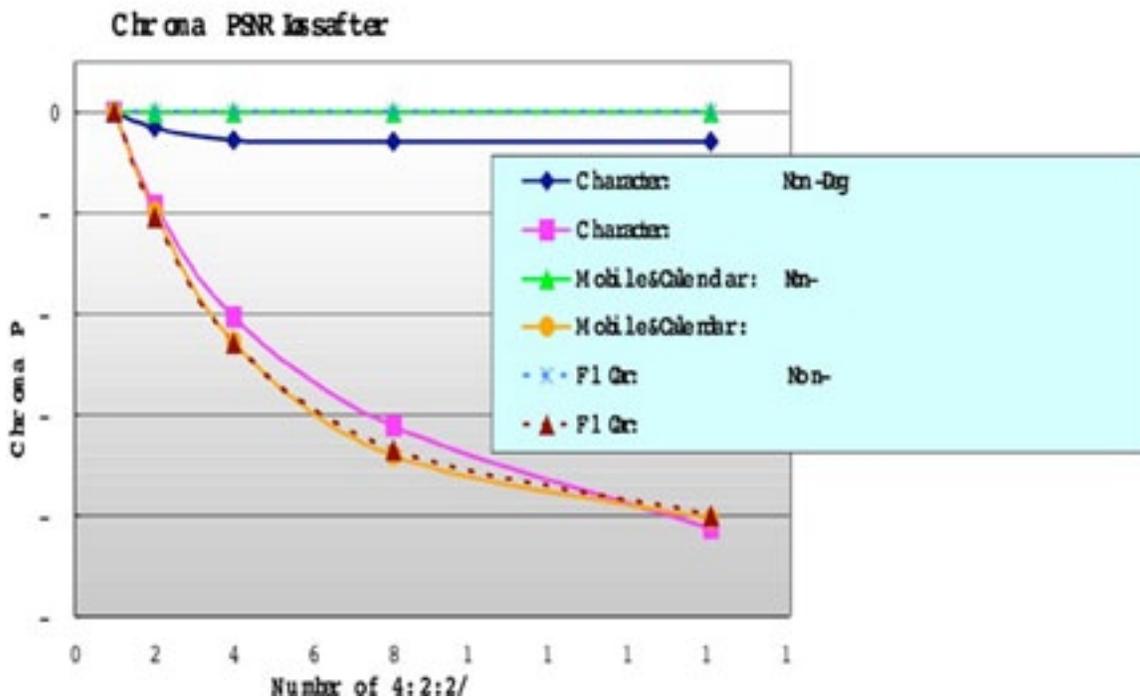


Figure 5. Chroma PSNR in conventional and non-degraded concatenation

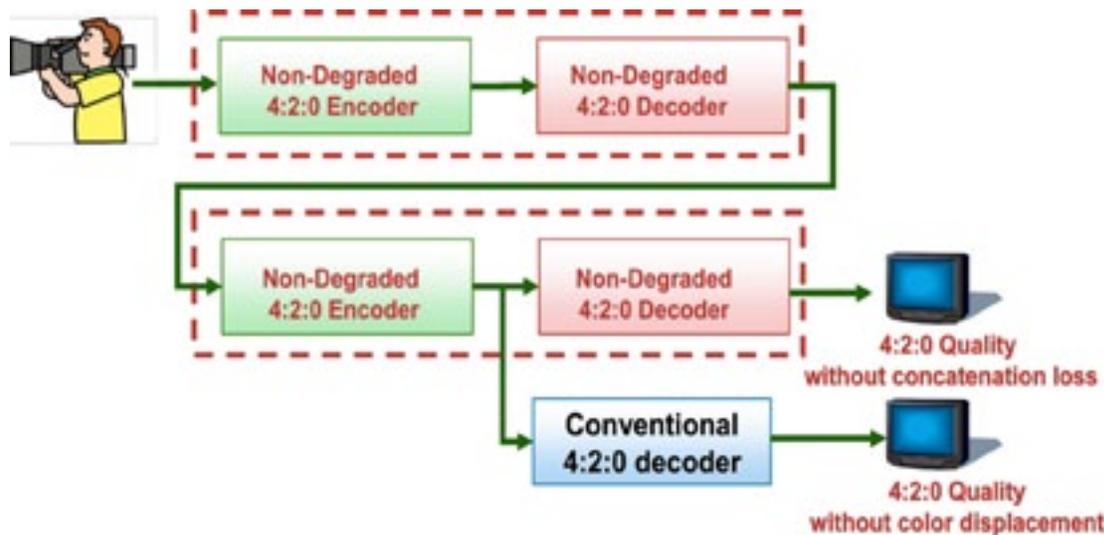


Figure 6. Compatibility with conventional MPEG-4 (4:2:0) decoders

The objective of maintaining compatibility with conventional MPEG-4 decoders has also been achieved, which enables a Fujitsu non-degraded 4:2:0 stream to be decoded without errors or color displacement by other manufacturers' conventional decoders, as shown in *Figure 6* on the next page.

The long-time problem posed by concatenated encode-decode operations is now a thing of the past. The Fujitsu Perfect Reconstruction filter helps preserve 4:2:0 chroma fidelity without creating any incompatibility within the MPEG-4 standard. In addition, it allows full interoperability with other manufacturers' decoders, although these will not provide protection of the 4:2:0 chroma integrity in concatenated operations as do those equipped with the Perfect Reconstruction filter technology.

It is generally recognized that down-sampling and up-sampling are more difficult for interlace than for progressive video largely because of non-linear phase characteristics. The generation of unwanted artifacts is also more pervasive. Both of these factors were considered in developing a solution equally valuable to either interlace or progressive video. The test sequence in *Figure 7* demonstrates protection of the chroma component in a concatenated operation employing non-degraded filter technology.

Another important test revealed the "V" chroma differential using conventional and non-degraded filter technology. *Figure 8* shows the differential between original 4:2:2 source and the sixteenth 4:2:2 / 4:2:0 conversion and concatenation—the differential using a conventional filter set is obvious, while almost no difference can be seen when the non-degraded 4:2:0 filter set is used.

The long-time problem posed by concatenated encode-

SatBroadcasting™ : TechTalk

Conventional technology



Original Source



4th Conversion



16th Conversion

Non-degraded technology



Original Source

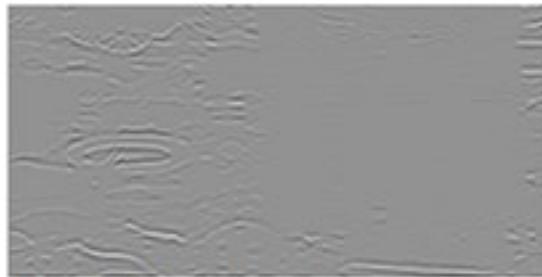


4th Conversion



16th Conversion

Figure 7. Character test sequence



Conventional technology



Non-degraded technology

Figure 8. "V" chroma component differential at the 16th concatenation.

For more information about this breakthrough in digital media technology and its implementation, please visit:

<http://us.fujitsu.com/video>.



About the author

Rich Harvey has more than 15 years of experience in the broadcast, satellite and video distribution industry, including the management of a Navy Broadcast Service (NBS) S.I.T.E system onboard the USS Suribachi (AE-21), as sales manager of the Asia Pacific Rim for a leading digital TV equipment manufacturer and as the video product manager for another industry leader.

Rich has been involved with some of the industry's digital milestones, including the Navy Broadcast Service's digital satellite broadcast tests in 1991, ABC's ATSC turn on, the first HD broadcast in Sydney, Australia, the first commercial ATSC broadcast in South Korea, the first MPEG-2 4:2:2 transmission over an ATM network, just to name a few.

Rich is a member of the Society of Broadcast Engineers (SBE) and the Society of Motion Picture Television Engineers (SMPTE).

STEM SUPPORT

republished from *Space Watch' A View From Here*, courtesy of Space Foundation — *Iain Probert, Space Foundation V.P. - Education*

At last month's National Space Symposium, attendees may have noticed a very strong underlying theme — education. Yes, science, technology, engineering and mathematics (STEM) and other education activities have always been a huge part of our Symposium program and, yes, education is a major plank in the Space Foundation's mission. This year, however, was a quantum leap forward.

Let's examine what went on in Colorado Springs — and then look at what's on the horizon.

Last month, we hosted almost 100 teachers from around the nation and over 1,800 students from Colorado's Front Range. The teachers, all members of our elite *Teacher Liaison* corps, participated in workshops, listened to former Space Shuttle Commanders and some even had a field trip to a Colorado Springs-based GPS company, **NAVSYS**. The younger students participated in audience with astronaut programs co-sponsored by ADD STAFF and *Mau Economic Development Board (MEDB)* — the high school students toured the **Boeing Exhibit Center**, making stops along their route at

destination booths, where they heard special presentations designed to spark their interest in space.

We hosted a special *Introduction to Chinese Culture and Space Activities* session to give a group of 140 local students who are studying the Mandarin language insight into the Chinese space program, as presented by a member of the Chinese delegation attending the Symposium.

The annual presentation of the *Alan Shepard Technology in Education Award* was especially meaningful to me because, this year, it was presented to a very good friend of the Space Foundation and an educator who believes as strongly as we do in the need to improve STEM education in this nation. **Charles County Public Schools (CCPS)** Superintendent *James E. Richmond's* innovative, hands-on space-themed education programs are excellent examples of how communities and schools can work together to inspire children to learn and achieve.

The Symposium's *Corporate Partnership* dinner, which is held to honor and recognize the Space Foundation's corporate members, had an education theme. It opened with a video chronicling extraordinary education programs sponsored and conducted by many of our partners and featured Dr. *Craig Barrett*, retired **Intel** CEO and chairman and well-respected

education advocate, as the keynote speaker. Dr. *Barrett* spoke about the very issues in education that the Space Foundation and its partners are trying to address.

On site, our partners stepped up even more. The **United Space Alliance** had planned on presenting a \$5,000 classroom grant during the 27th National Space Symposium to one of the attending Teacher Liaisons — based on a competition of innovative space-based classroom lessons and activities around the theme, *Human Space Travel in the Year 2020*. USA's plan didn't work out quite as they expected; they were so impressed with the applications, that they doubled their contribution on the spot, giving \$5,000 each to two teachers.

Another new activity at National Space Symposium this year was a student art contest co-sponsored by **ARES Corporation, Fisher Space Pen Company**. Space Foundation. Students in pre-kindergarten through 12th grade submitted original artwork depicting the same theme the teachers competed on, *Human Space Travel in the Year 2020*, resulting in entries from more than 150 students in 13 states. We recognized the winners at a special ceremony featuring two astronauts.

The atmosphere for education was so rich at the National Space Symposium that **NASA** also chose to recognize winners of

its national *2010 NASA OPTIMUS PRIME Spinoff Award* student video contest at the Symposium.

It was certainly gratifying to see education take on such an important role at an event that is essentially an industry and networking forum. And it makes it very clear that the entire space community shares our concerns about our nation's proficiency in STEM subjects and about our ability to build a competitive technology workforce for the future. And, it also underscores our belief -- also articulated quite strongly by Dr. Barrett -- that educational success in the country will require private sector commitment and involvement.

To that point, the Space Foundation has a year-round education commitment. In fact, despite what might appear to be our "big" season at the Symposium, those programs are just a sampling of the aggressive programs we have going on all year long and the intense activity we have planned for this summer.

We will open a long-planned and very special addition to the **Space Foundation Discovery Institute** in Colorado Springs, the **Mars Yard**. This simulated Martian terrain will incorporate the *Honeywell Mars Robotic Experience*, helping students to learn robotics while gaining a hands-on sense of exploring the red planet.

Space Foundation summer professional development courses — *Space Across the Curriculum* — will be offered

this summer in three locations: Colorado Springs and Pueblo, Colo., and Charles County, Md.



A Failsafe Option

It is widely acknowledged that during natural disasters, satellite technology plays a crucial role in re-establishing communication links, for both disaster victims and those involved in emergency response efforts.

Global Space and Satellite Forum

(**GSSF**) in Abu Dhabi hosted a *United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER)* of the *United Nations Office for Outer Space Affairs (UNOOSA)* during the three-day event that was held at **ADNEC** in Abu Dhabi on May 9th through the 11th. Leading experts discussed how satellite communications play an important role in disaster relief, particularly in areas where terrestrial lines and mobile telephone infrastructure are destroyed, as was the case for virtually the entire east coast of Japan after it was hit by the devastating tsunami recently.

"Recent events in Asia, in addition to the ongoing unrest in parts of the Middle East, have highlighted that access to communication links is a necessary requirement in targeting aid to the most urgent demands. In this regard, satellite

communication benefits not only those directly affected but also search and rescue missions by international aid organizations as well as civil and military response teams," said *Nick Webb*, Director, **Streamline Marketing Group**, the organizers of **GSSF 2011**.

Satellite phones, BGANs and VSATs enable the two-way relaying of voice communication as well as video and other data to the rest of the world. These products provide a temporary channel of communication to those affected, at least until the terrestrial telecommunications and mobile network infrastructure can be restored.

While landlines are often rendered unusable during natural disasters, public cellular lines are also often out of order, as they become overloaded during the critical hours of disasters. Satellite communications are frequently the only secure and reliable way to support emergency telecommunications.

The challenges faced by the oil and gas industry when it comes to disaster recovery are unique. Supplying the world's demand for fossil fuels and minerals has driven companies to explore more remote, geographically widespread and sometimes environmentally harsh and extreme areas. Satellite communication is deployed by the oil and gas industry for operations command and control and it is also the main communication when disasters strike. Recognizing the need

within the Middle East, UNOOSA's UN-SPIDER Program conducted a workshop during this event. At GSSF 2011, UN-SPIDER worked towards developing partnerships with space communication providers, including satellite operators, satellite phone companies and satellite broadband providers, coordinating the provision of robust emergency communications to the countries directly affected by disasters.

"We believe that the most robust, reliable emergency communication during the first response, search and rescue, and recovery phases of disaster management is crucial. Providing reliable, secure and timely communication among emergency responders, the members of specific teams, and between the teams themselves, is a key disaster management application of satellite communications," said Professor Yusuf S. Hascicek, senior expert, UN-SPIDER. UN-SPIDER ensures that all countries and international and regional organizations have access to, and develop the capacity to, use all types of space-based information to support the full disaster management cycle.

UN-SPIDER is achieving this goal by being a gateway to space-based information for disaster management support; serving as a bridge to interlink the disaster management and space communities and being a facilitator of capacity-building and institutional strengthening.

The UN-SPIDER core team is based in offices in Vienna-Austria, Bonn-Germany and Beijing-China and relies on a global network of regional support offices and national focal points. For additional information on GSSF, aim your browser at <http://www.gssforum.com/>.

For further details on UN-SPIDER, head over to <http://www.un-spider.org/>



A Proper Grounding

Key groundstation equipment has now been installed in support of existing — and future — U.K. space missions.

As part of the **Astrium**-led *Earth Observation (EO) Hub* project at the *International Space Innovation Centre (ISIC)* in Harwell, small satellite pioneer Surrey **Satellite Technology Ltd. (SSTL)** has completed the installation of key groundstation equipment.

This comprehensive new system provides everything needed to plan mission operations, communicate with the satellites and downlink the images and other information for a broad spectrum of missions. It will initially be used to operate the SSTL-built **TechDemoSat-1** satellite, which is being developed through a grant from the U.K.'s *Technology Strategy Board (TSB)*, and planned to be launched next year.

Satellites are tasked from the *Mission Operation Centre* using the *Mission Planning System (MPS)*. For example, for an imaging mission, a

user can program where and when an image should be acquired days — or even weeks — in advance. This "tasking" of the spacecraft and the subsequent image acquisition is highly automated helping to reduce the cost of the operations.

After the missions are planned, the *Spacecraft Operations Centre* will track the satellites as they orbit Earth, automatically managing each satellite as it passes. The highly automated systems orientate the antenna, download telemetry data and provide spacecraft control and analysis functions to operator workstations.

SSTL's *Ground Systems Group* integrated the SSTL heritage designed equipment with Astrium's hardware, and also to some existing **RAL Space** groundstation hardware, which included a fiber optic link to the 12m S-band antenna. An SSTL *Image Capture System (ICS)* is also installed and is ready to decode high speed data downloads from the satellite once the antenna is upgraded to support X-band communications. The ISIC groundstation has been qualified using both the **UK-DMC** and **UK-DMC2** satellites, validating the telemetry monitoring and spacecraft command capabilities of the system. Images from the UK-DMC have also been successfully downloaded and processed to extract valuable information on the Earth's environment.



Hubs Have Hold

Gilat Satellite Networks Ltd. has been selected by Optus Networks Pty Limited to provide a SkyEdge II Very Small Aperture Terminal (VSAT) network, installation, operation, and maintenance for the Australian Government's National Broadband Network Company's (NBN Co) Interim Satellite Service.

NBN Co has a commitment to offer connectivity to regional and rural locations via satellite technology where geographic location impedes the ability to provide either fiber or advanced wireless connectivity. The *Interim Satellite Service* is a first stage solution, planned to provide up to 6Mbps download and 1Mbps upload broadband services to eligible Australian households, small business and indigenous communities.

The agreement with **Optus** provides for an initial network of 11 *SkyEdge II* hubs and 20,000 *SkyEdge II* VSATs, expected to be deployed within as much as three years. The agreement stipulates a possible expansion of the network to include hubs and as many as 48,000 VSATs.

Gilat's new Australian subsidiary, **Gilat Satellite Networks Australia Pty Ltd.**, will undertake responsibility for end-to-end VSAT installation, as well as hub maintenance and operation in three geographical locations, for a period of five years. The agreement represents a potential value of up to \$120 million, subject to final design and implementation of the fully expanded network. The hubs are planned to be commissioned and VSAT service to commence operation in 2011. The satellite network will use Optus' existing Ku- capacity and **IPSTAR**'s multi-spotbeam capacity available over Australia.



Double Departure

On Friday, May 20, Arianespace orbited two communications satellites: ST-2 for the operator ST-2 Satellite Ventures Pte Ltd., a joint venture of Singapore Telecommunications Limited (SingTel) and Chunghwa Telecom Company Limited (Chunghwa), and GSAT-8 for the Indian Space Research Organization (ISRO).

This latest launch is the third in 2011 and the 58th launch of an Ariane 5 as well as being the 44th successful launch in a row. ST-2 is the second satellite launched by Arianespace for SingTel and Chunghwa, following the launch of ST-1 in 1998. GSAT-8

is the 14th ISRO satellite to be launched by Ariane. Since the launch of the Apple experimental satellite on Flight L03 in 1981, Arianespace has orbited 13 Indian satellites. The mission was carried out by an Ariane 5 ECA launcher from Europe's Spaceport in Kourou, French Guiana. Liftoff was on Friday, May 20 at 5:38 pm local time in Kourou (4:38 pm in Washington, D.C., 20:38 UT, 10:38 pm in Paris, and on Saturday, May 21 at 2:08 am in Bangalore and at 4:38 am in Taipei and Singapore).

The ST-2 satellite was built by Mitsubishi Electric Company (MELCO) of Japan, using a DS2000 platform, and weighed 5,090 kg at launch. Equipped with Ku- and C-band transponders, ST-2 will provide IP-based fixed and mobile, voice and data transmission satellite services to businesses, especially direct broadcast TV operators and maritime companies in Asia and the Middle East. It has a design life of 15 years.

GSAT-8, designed, assembled and integrated by the Indian Space Research Organization (ISRO) in Bangalore, southern India, weighed 3,100 kg at launch, and offers a design life exceeding 12 years. It is fitted with 24 Ku-band transponders, and will mainly provide direct-to-home TV broadcast and radio-navigation services. Its coverage zone includes the entire Indian subcontinent.



DAICHI Is Done

The Japan Aerospace Exploration Agency (JAXA) had been trying to communicate with the Advanced Land Observing Satellite DAICHI (ALOS) for about three weeks after the satellite developed a power generation anomaly.

JAXA has decided to complete the satellite's operations by sending a halt command at 10:50 a.m. on May 12th (Japan Standard Time) as it was impossible to recover communication with the satellite.

DAICHI, launched on January 24, 2006, (JST), had been operated for over five years, which was its target life and well beyond its design life of three years, and it achieved many fruitful results related to earth observations.

JAXA continues to investigate the causes of the power generation anomaly based on the data we have acquired from the satellite, and will report the result to the *Space Activities Commission* of the *Ministry of Education, Culture, Sports, Science and Technology*, Japan.



Trawler Tie-In

About 3,000 Vietnamese fishing vessels in 28 coastal provinces are to be equipped with satellite monitoring devices in

August, under a project of the Ministry of Agriculture and Rural Development aimed at helping them remain in contact with the mainland in the case of an emergency at sea.

"The devices will be vital to helping local authorities make timely search-and-rescue efforts for fishing vessels in distress at sea," said Nguyen Ngoc Phuong, deputy director of the southern province of Kien Giang's Department of Agriculture and Rural Development. "Via satellite, we will also be able to better supervise fishing operations in our province," Phuong said.

News about the device was welcomed by offshore fishermen, many of whom have never had such sophisticated navigation or tracking equipment. "It's useful, since it'll forecast the weather, too," said Khanh Hoa fishing boat owner Dao Van Nghia. "But I also wonder whether I will have to pay for the device. We don't know anything yet about how they will be installed." Fishermen would directly benefit from the project, but many still have no idea of the project's importance, said a spokesman of the port city of Hai Phong City's Department of Agriculture and Rural Development.

Chu Tien Vinh, deputy head of the Directorate of Fisheries, said a budget would be allocated to raising fishermen's awareness about installation of the devices, as well as training courses on how

to use and maintain them. Fishing vessels have, so far, maintained contact with the mainland mainly through walkie-talkies or short-wave radios and provincial radio stations. According to the Viet Nam Marine Administration, only 50 per cent of offshore fishing vessels were equipped with high-frequency radios, which do not work well in storms. About 15,500 vessels fish offshore daily out of about 98,000 vessels overall. The lack of communication devices, coupled with untrained and low-skilled crews, is blamed for about 500 accidents at sea every year, resulting in a loss of human life and property, according to the agriculture ministry. Increasingly complex weather and climate change have worsened the situation. In May 2006, nearly 300 fishermen were killed or went missing in Typhoon Chanchu, when local authorities failed to warn vessels about the storm.

The project, funded with 14 million euros (US\$20 million) from Collecte Localisation Satellites, an organization under the French Space Agency, will equip 1,500 fishing vessels with a capacity of over 90CV in the south, 1,200 in the central region, and 300 in the north, said Pham Quang Toan, deputy director of the project. The three-year project, which was launched early this month, is scheduled to be completed by late 2013.



Consolidation Completed

Global satellite operator SES S.A. has announced that the Company is now operating under a new and streamlined management structure.

The move is part of a strategy that brings the market facing entities — **SES ASTRA** and **SES WORLD SKIES** — under a streamlined management structure and consolidates its activities in order to meet the increasing needs of its customers around the world and help them grow their businesses, especially in the emerging markets.

In the context of the new organization, the SES Board of Directors has decided a new composition of the SES Executive Committee. Under the Chairmanship of *Romain Bausch*, it continues to be responsible for running the day-to-day operations as well as for preparing the decisions of the Board of Directors. The Committee will be composed of the following senior executives:

- ◇ **Romain Bausch, President and CEO**
- ◇ **Andrew Browne, Chief Financial Officer Martin Halliwell, Chief Technology Officer**
- ◇ **Ferdinand Kayser, Chief Commercial Officer**
- ◇ **Gerson Souto, Chief Development Officer**

◇ **Robert Bednarek, formerly President and CEO of SES WORLD SKIES, will assume a new role as strategic advisor to the SES President and CEO**

“We are excited to serve our customers with a single face to the market and with our global fleet. By adapting our organization, we expect to optimize the execution of our growth strategy and to maximize the potential for our satellites in emerging markets, to which the vast majority of our incremental upcoming capacity is dedicated,” said Romain Bausch, President and CEO of SES.



French Flair

Globalstar Europe Satellite Services Ltd., a wholly owned subsidiary of Globalstar, Inc. has signed an authorized distribution agreement with IEC Telecom, one of the leading providers of satellite-based voice and Internet services with offices in Paris, Dubai, Bristol, Singapore and Congo.

IEC Telecom will act as the National Distributor for **Globalstar’s** suite of duplex products to resellers, retailers and consumers within the French Mainland Territory. As part of the service agreement, IEC Telecom will roll out Globalstar’s current and future voice/data/tracking services within France.

The France-based IEC Telecom will provide Globalstar services to maritime (commercial, fishing, leisure and yachting) and enterprise customers such as UN/NGOs, oil and gas and other multinational companies or individuals, via their established re-seller channel.

The Globalstar second-generation (2G) constellation is designed to have a 15-year service life. The first six 2G satellites were launched in October of 2010 and are now operational, providing service throughout Europe. Globalstar expects to conduct three additional launches of six satellites per launch. The new constellation is expected to provide Globalstar customers with long-term, high quality and reliable satellite voice and data services.

“IEC Telecom Group is one of Europe’s leading suppliers of mobile satellite commercial market products and services,” said Jim Mandala, General Manager, Canada and Europe Sales. “As we prepare to launch and deploy our 2G constellation of satellites, we are very pleased that IEC Telecom has chosen to offer their customers Globalstar’s unique line-up of high quality MSS voice, duplex data, SPOT and Simplex asset tracking solutions.”



