

Worldwide Satellite Magazine

December 2010

SatMagazine

**YEAR IN REVIEW
2010**



A Letter From The Editors	08	Executive Spotlight: Cliff Cooke	44
In Memorium: Dean Olmstead	10	<i>The Editors</i>	
Wideband Radar + SATCOM Measurements	14	Insight: Solutions From Space	50
<i>by Greg Jue, Mike Flaherty, Thomas Dippon</i>		<i>by Mariel John</i>	
Event: Spotighting Asia Pacific SATCOM	20	SatBroadcasting™: Advantages In Coax	62
<i>by Timothy Logue</i>		<i>by Troy Brandon + Jon Inwanaga</i>	
Insight: Eutelsat's Ka-Sat Ambitions	24	Focus: A New Approach To Disaster Response	68
<i>by Chris Forrester</i>		<i>by Paul Krzystoszek</i>	
Beam: The Colem Identity	30	Insight: Geolocation—Past, Present + Future	72
<i>by Martin Coleman</i>		<i>by Dan Ojennes</i>	
Executive Spotlight: Walter Thygesen	34	Executive Spotlight: Mark A. Pieczynski	76
<i>The Editors</i>		<i>The Editors</i>	
Focus: Aircraft Emergency Monitoring Solution	38	A Case In Point: AlpacaComms	80



Asia Broadcast Satellite	84	ND SatCom	141
Advantech Wireless	85	NewCom International	142
Agilent Technologies	86	Newpoint Technologies	144
ASC Signal	87	Newtec	146
AsiaSat	89	O3b Networks	149
Bridge Technologies	91	Pactel International	150
CETel	92	Paradise Datacom	151
Codan Satcom	94	RRsat	153
Colem	95	SatLink	154
Comtech Aero Astro	96	SatStream	155
Comtech EF Data	98	SENCORE	156
EB (Electrobit)	100	Shiron SATCOM	158
EchoStar	101	Space Foundation	160
Europe Media Port	102	Spacecom	162
Euroconsult	103	Spacenet	163
GateHouse	104	Star Navigation	165
GATR	105	Stratos	166
GlobeCast	107	Thomson Video Networks	168
Globecomm	109	Thrane & Thrane	170
Glowlink	111	Thuraya	172
Gottlieb International Group	112	ViaSat	174
GTX Corporation	114	Vizada Networks	176
Haivision	115	XipLink	177
Hughes	117	Xtar	179
International Datacasting	121		
iDirect	123		
Integral Systems	125		
Intelsat	129		
Intelsat General	130		
Iridium	131		
KVH Industries	134		
Marlink	136		
Miteq	137		
MTN Satellite Communications	138		

A Letter From The Editors

Welcome to SatMagazine's 2010 Year In Review issue. This has been one heckuva year, with a variety of challenges which our industry has managed to surmount, some more successfully than others. We've witnessed acquisitions, mergers, and new partnerships as well as a broad range of market segment moves, new products and technological synergies that will require time to implement before determining their results — so stay tuned again next year for our Year in Review 2011.

Most of all, those of us who continue to be gainfully employed in the satellite and ancillary industries should thank our stars... however, these have not been easy times for the overall global economy, causing concerns for families, friends, and associated companies. One element that consistently seems to surface is that most are made stronger by embracing a professional work ethic enabling us to face these challenges and to stare them down. We are proud of what we do, and for good reason... the industry continues to grow to the satisfaction of clients, business associates and ourselves.

In addition to the feature articles in Part 1 of this issue, The Year In Review offers leading companies the opportunity to “speak” for themselves and to share their challenges and successes for 2010, with a peek toward 2011 and what we might expect in the not-too-distant future. These comments can be found in Part 2 of this issue and are in the companies' own words — self-engrandisement? Certainly... and why not? They have a great deal to be proud of and we're delighted to offer them a shared platform to expound upon their successes. We look forward to offering SatMagazine, MilsatMagazine, and SatNews as your source for industry news and information in 2011.

Merry Christmas, Seasons' Greetings, and a Great New Year Ahead!

All our best — The Editors

In Memorium

Dean Olmstead, president of **EchoStar Satellite Services L.L.C.**, passed away after a courageously fought battle with cancer.

Dean joined EchoStar shortly after the company's spin-off from DISH Network in January 2008, and was instrumental in building the foundation and guiding the strategic course for the company's then-nascent satellite operations.

"Dean will be remembered as a true legend in the satellite industry and will remain an eternal inspiration for our employees," said **Mike Dugan**, CEO and president of EchoStar Corporation. "Dean was a visionary who helped reshape the entire industry. His accomplishments at EchoStar and through his esteemed career have created the base upon which others will build for years to come."

Before joining the company in 2008, Dean contributed as an advisor to **Loral Space & Communications** on strategic and growth opportunities for its satellite service businesses and was a member of its board of directors. Additionally, he was president of **Arrowhead Global Solutions**, president and CEO of **SES Americom** and held leadership positions with **DirecTV Japan**, **NASA**, and the **U.S. State Department**.

Dean's numerous accomplishments throughout his career include executing the first foreign acquisition of a U.S. satellite operator, procuring and launching numerous communications' satellites, installing the world's first all-digital satellite broadcast center in Japan, helping develop the first broadband system for business jets, and managing development of the first U.S. Ka-band spot beam satellite for NASA, among others.

Dean was inducted into the **Space Technology Hall of Fame** in 1997, was an Individual Patron of the **Arthur C. Clarke Foundation**, and has served on several Federal Government advisory committees. Dean held a B.S. degree in Economics-Mathematics from **Western Washington University**, an M.S. in Engineering Economic Systems from **Stanford**



University, and completed Ph.D. studies in Economics at **The American University**.

SatNews Publishers sends heartfelt condolences to Dean's wife, Mara, his children, and his extended family. The family has requested that donations for scholarships in remembrance of Dean be sent to the Arthur C. Clarke Foundation or the Society of Satellite Professionals International.

A number of industry leaders have already expressed their condolences concerning Dean's passing, and we now offer insights from those who knew him best.

In Memorium

*“Stream of Thoughts” about my friend, Dean Olmstead
– by Scott Zimmer, Senior Vice President, EchoStar*

All friends are welcome, of course... we like other people worrying about us... and caring for us, don't we?

And some friends are extra special. Some don't really fit the mold of most... they are something more. Dean was that kind of friend, for me. Dean was more than a mentor to me... he was a considerate and attentive listener, a “like thinker”... a strategic partner, an advocate for change, a champion of unique and “out of the box” projects, and someone that looked for what could be...

not what couldn't.

Dean was exceptionally gifted intellectually... but he never acted like he thought he was a “smarty pants”, or particularly skilled at what he did, or even remotely more experienced than others...

although he was...VERY.

Dean was humble and soft spoken... not aloof, or unapproachable, as some people may have thought, I am sure...

Dean just stayed within himself.

The last time Dean visited me in Florida, he talked at length, and with great interest, with my wife, Cherry, about what it was like to be a caregiver. You see, at the time, Cherry's mother was in Hospice in our home... and died within days of Dean's visit.

Dean called us a couple of weeks after she passed on to see how we were doing... My last conversation with Dean happened on September 28th... and it went something like this...

“Dean, do you have a minute? I would like to pick your brain.”

“Sure, Scott, pick away...what do you have on your mind?”

At the end of the conversation I asked how his health was... and he said, “Not well. Short of a true miracle, I won't be here much longer. I am down to 140 pounds now.”

When I asked him how Mara was holding up, he told me how courageous she was... and how much in love he was with her... and how much he was going to miss his family... Dean was cerebral about most things... about business... life in general... and death...

but he wasn't cerebral about his family...

he was emotive, devoted, unselfish and loving. Dean could comprehend most things very easily... but not, so much, human relationships. Relationships were most valuable to him... yet more elusive and perplexing for him to understand. Hence, I think, his deep desire to love.

Dean was curious by nature... he wanted to know what was next... and why... or why not. I dare say that if he didn't figure it out before he left this life, he has it figured out by now. I count Dean Olmstead as more than a person that I looked up to and admired. I count him a true friend... and I am forever grateful to have known him.

Dean and I were not friends because we were once competitors turned colleagues. We were not friends because I invested money in a venture of his that ultimately failed. We were not friends because we worked on successful business projects together. We were not friends because we shared the great ambitions, joys, and anticipations of the future.

We were friends because we were genuine and honest with each other. Dean modeled the kind of professionalism and integrity that I can only hope to emulate. Dean's very last comment to me was that his only regret... was that he would not be able to be here to take care of his family any more. I share that regret.

Many, as I, knew Dean to be clever and thoughtful, kind...caring... articulate and succinct, professional in every way... This was the Dean we all liked and were honored to know. I was fortunate enough to have also known the hugging, laughing, vulnerable Dean. It was this Dean that I loved the most... and will chose to remember...often.

My last email from Dean came on October 4th... briefly outlining some potential options for us to consider. His last words were “please keep as a cheat sheet and we can improve as we go”... I will do so, Dean...

and I will also try to improve as I go.

In Memorium

Dean Olmstead was a major constructive force and significant leader in the world of satellite communications for over a quarter of a century. The entire satellite world stands in awe of his many achievements at the U.S. State Department, NASA, Hughes, SES Americom, Arrowhead, Echostar and Loral.

When the ACTS program was in danger, it was people like Burt Edelson, Elizabeth Young, and Dean Olmstead who breathed life into this key project and let it reach its full potential. It was an honor to work with Dean Olmstead, Clay Whitehead, and others at NASA to make some of the most exciting ACTS technology experiments come to life.

When the initial organizers of the SSPI were just getting that fledgling organization off the ground, we could always count on Dean Olmstead for support, wherever he was around the world.

There is a worldwide network of friends who prayed for Dean's recovery from his fight with a deadly disease these past two years. I know the members of the SSPI Hall of Fame Awards committee would have earlier bestowed on him this single honor had we known that he would lose his fight with cancer so soon.

I know that all around the world Dean Olmstead has made many friends and constantly won admirers for his tireless efforts to advance the world of satellites. I am proud to have been one of Dean Olmstead's admirers and friends.

— Joseph N. Pelton, Founding President of the SSPI, Former Dean, International Space University, Former Director of Strategic Policy at Intelsat and member of the International Academy of Astronautics.

I had the privilege of knowing and being associated with Dean over the past 15 years. Over the course of his illness we shared many uplifting messages and prayer via email and by phone. We were speaking about two weeks before he died and Dean said "I found the meaning of life...it is love." This statement epitomizes the Dean I knew; thoughtful, insightful and caring.

*— Mary Ann Elliott, President, MAE-LLC
Note: Mary Ann was the founder of Arrowhead, which she grew to be a highly successful business that served the U.S. Government and military services. During his stint as Arrowhead CEO, Dean was instrumental in negotiating the sale of the company to CapRock Government Solutions, now owned by Harris.*

Dean was always forward looking. He didn't talk about what happened before — he talked about what could be done next. For three decades, he blazed new trails through government and industry and laid the foundation for the commercial space industry we recognize today. Along the way, Dean inspired everybody he met, earning the respect and trust of stockholders, employees, suppliers, customers and even competitors. Dean always saw the best in people and always gave others room to have their own style.

William James observed, "A great many people think they are thinking when they are really rearranging their prejudices." Dean never had a problem re-arranging prejudices. If he had a prejudice, it was against thinking small. Whatever he applied himself to, Dean was relentlessly driven to make things better. And he knew that "better" is a process, not a destination. Dean told us, "Don't become complacent. Don't stop innovating, growing and adapting. Dream about what you can become."

Whatever is on the other side, Dean's already at work making it better for all of us who will follow. Don't think for a minute Dean Olmstead can't improve something — even a firmament — that was designed and built on the second day of a seven day project!

*— John Hane, Counsel,
Communications Division, Pillsbury
Winthrop Shaw Pittman LLP*

Dean Olmstead was a very unique individual who contributed to our industry in an amazing number of ways. I first met him about a dozen years ago and even then, in his early 40's, he had already helped shape international policy on space "real estate" at the US State Department, managed some of the very first Ka-band wideband satellite networking applications as program manager at NASA for ACTS, helped engineer the introduction of DBS TV in Japan, and had been inducted into the Space Technology Hall of Fame.

Of course, his accomplishments after that were equally varied and impressive. Dean was a very down-to-earth person – extremely smart, with an amazing breadth of knowledge, highly creative, insightful, and a quick and dry sense of humor. He's well known as an innovator in the space industry, and he recognized and appreciated innovation and creativity in those around him.

I was fortunate to get to work with him as his career carried him from SES Americom, to Loral, and then to Echostar. He was always a complete professional, always a good friend, and sometimes a challenging sparring partner. Dean loved the satellite industry. And, I think the satellite industry loved Dean.

We'll all miss him. I know I'm going to miss him a lot.

*— Mark Dankberg, Founder, CEO,
Chairman of the Board, Director,
ViaSat, Inc.*

We wish to thank Penelope Longbottom of Longbottom Communications for her timely and crucial assistance in obtaining these expressions of friendship and sympathies from those who knew Dean Olmstead best.



Wideband Radar + SATCOM Measurements

authors

Greg Jue, RF Applications Engineer, Agilent Technologies

Mike Flaherty, RF/ μ W Applications Engineer, Agilent Technologies

Thomas Dippon, Planner For Pulse, Function, + Arbitrary Waveform Generators, Agilent Technologies

We are going to examine the use of wide bandwidth oscilloscopes to directly measure and analyze X-, Ku-, and Ka-band radar and SATCOM transmitter outputs up to 32 GHz.

A growing trend in SATCOM and radar systems in the aerospace and defense market is the need for increased signal and analysis bandwidth and processing gain. SATCOM systems are being driven by demands for increased data rates, while modern radar systems require more processing gain to improve range resolution, which in turn drives wider modulation bandwidths. Modern radar systems also employ more complex pulse modulation signal formats to improve range resolution and lower the probability of intercept and jamming. Many radar and SATCOM systems operate at microwave frequencies (e.g., X-, Ku- and Ka-bands), which helps to support wider modulation bandwidths, increased capacity, and also offers the benefit of smaller antennas.

In some cases, the wide bandwidths required exceed the *intermediate frequency (IF)* bandwidths of commercially available RF spectrum analyzers and vector (or **FFT**) signal analyzers. Coupled with the higher operating frequencies, this creates a significant set of challenges for RF engineers testing radar and SATCOM transmitters.

Problem

Quickly, accurately and cost-effectively measuring the performance of RF/microwave transmitters in today's radar and SATCOM applications is a challenging task. In some cases (e.g., to measure a SATCOM transmitter's *Error Vector Magnitude (EVM)*), the transmitter output can't always be measured directly. Engineers often have to rely on custom-built down-converter hardware to down-convert the RF/microwave frequencies to an IF frequency that can then be measured with *commercial off-the-shelf (COTS)* test equipment. Unfortunately, the non-recurring engineering costs associated with designing, building and testing the hardware can be counterproductive.



The down-converter hardware also adds its own RF impairments that can mask the actual performance of the RF/microwave transmitter under test. Moreover, distortion may occur that contributes to the overall EVM being measured, making it difficult to discern how much EVM is from the actual transmitter output. With no other available option, many RF engineers are left with the measurement accuracy uncertainty that comes from this less than ideal approach.

Solution

The answer to this dilemma lies in finding a solution that enables direct measurement and analysis of the RF/microwave transmitter's output, without the need for custom down-converter hardware. An ideal solution for this task is the **wide-bandwidth oscilloscope**, which can directly measure and analyze X-, Ku- and Ka-band signals (up to 32 GHz) from today's radar and SATCOM transmitters.

Using the wide-bandwidth oscilloscope eliminates the time and cost associated with use of custom down-converter hardware as well as relieve the

engineer from having to deal with other issues such as hardware calibration, corrections for system impairments, and uncertainty in measurement results.

Other aspects of wideband radar and SATCOM measurements that typically pose some level of difficulty for RF engineers include:

- » *Creation of custom/proprietary wide-bandwidth signals. Traditionally, creating such signals for transmitter testing has been difficult since often times they are not supported with COTS equipment. As a result, engineers are forced to develop custom test equipment, a costly and time-consuming proposition.*
- » *Analysis of custom/proprietary wide-bandwidth signals. Radar and SATCOM signal formats may be custom or proprietary, and may require some level of custom signal analysis.*

Finding a COTS test solution that can create and analyze custom/proprietary signals with integrated software is, therefore, of paramount importance.



One such solution comes from **Agilent Technologies** and encompasses the **Infiniium 90000 X-Series (90000X)** high-performance oscilloscope, **81180** arbitrary waveform generator (AWG), **PSG** vector signal generator, and **Vector Signal Analysis (VSA)** software. Together, these solutions provide RF engineers with the capabilities and flexibility they need to perform wideband radar and SATCOM measurements.

The wide-bandwidth 90000X oscilloscope allows RF engineers to directly measure and analyze wideband radar and SATCOM transmitter outputs. With up to 32 GHz of true analog bandwidth, it delivers real-time measurement accuracy for direct measurement of transmitter outputs — without the need for external

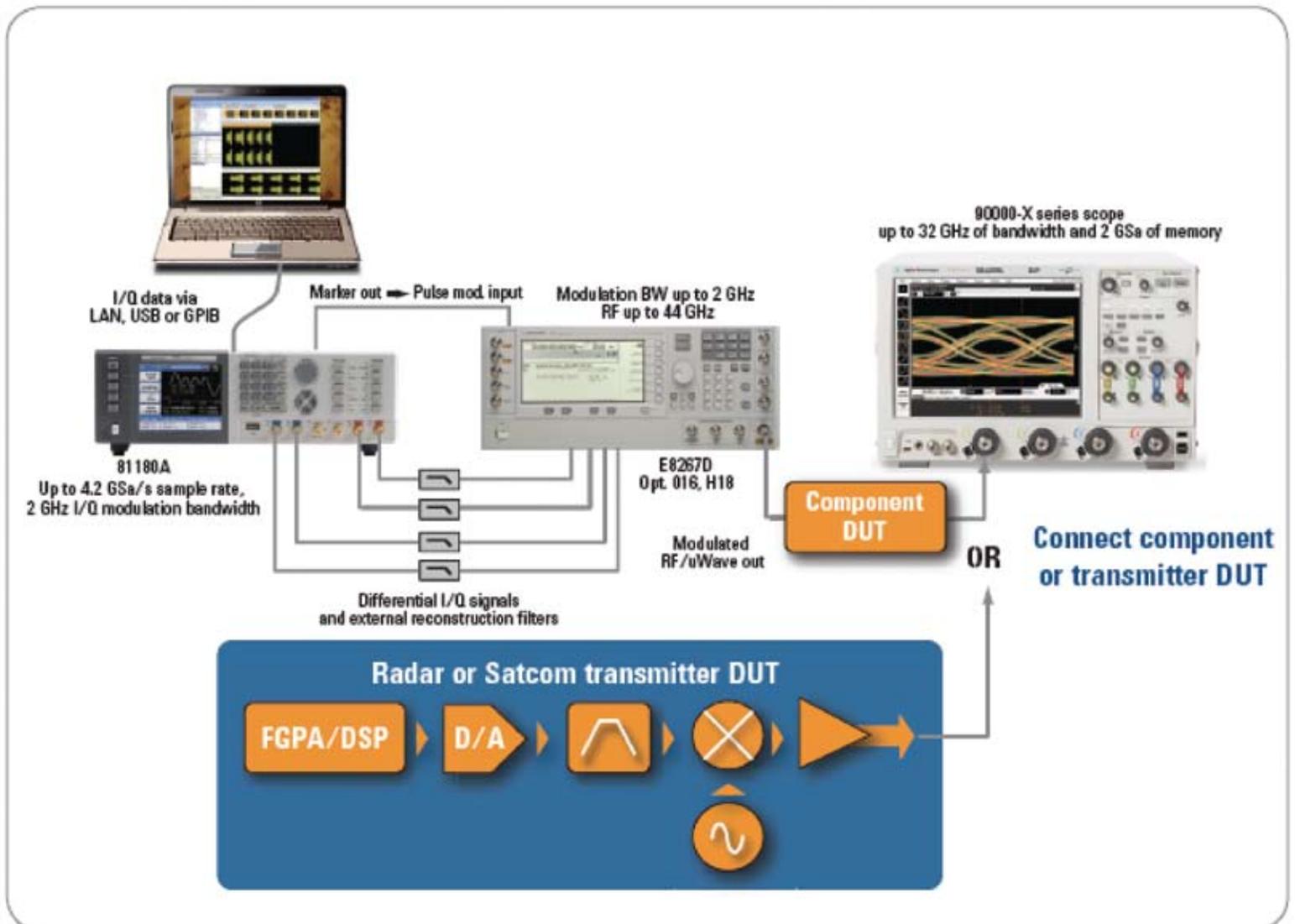


Figure 1: Shown is the typical test setup used to create and analyze wideband radar and SATCOM signals.

down-conversion hardware. Time-domain analysis can be performed to measure transmitter pulsed-RF characteristics (e.g., rise time, fall time and pulse width).

The 81180 is a 12-bit wide-bandwidth AWG, operating from 10 MS/s to 4.2 GS/s. The PSG signal generator features wideband IQ inputs. When combined, these two instruments provide the flexibility necessary to create custom/proprietary radar signals and wideband modulated signals (e.g., **QPSK** and **16QAM**) for SATCOM applications. These signals can be used for *device under test* (DUT) testing in the lab environment, without the need for costly custom test equipment.

While the 81180 features excellent spurious free dynamic range like its predecessor the N6030A/N8241A AWG, it also extends the I/Q modulation bandwidth to 2 GHz to accommodate today's wideband radar and SATCOM signals. When used for component DUT testing, the 81180 generates wideband IQ signals that are fed into the PSG's wideband IQ inputs. The PSG then generates the microwave test signal that will be used as DUT stimulus. Next, the DUT's output is connected to the 90000X oscilloscope where the radar and SATCOM measurements are made (*Figure 1*). To measure a standalone transmitter, the RF engineer simply connects the oscilloscope directly to the transmitter output.

Custom/Proprietary Measurements

Creating custom/proprietary waveforms and performing custom/proprietary measurements on radar and SATCOM applications is a task that can be made significantly easier using **MATLAB**®. It can be used for signal generation to create simulated waveforms that are then downloaded to the 81180 AWG. Here, they are synthesized into differential IQ waveforms that are fed into the external I/Q inputs on the PSG signal generator. The modulated RF/microwave test signals are then generated. Custom, user-defined MATLAB functions can also be used inside the 90000X oscilloscope and applied to the trace waveform (e.g., to calculate the pulsed RF envelope) so the pulsed RF waveform envelope can be measured and displayed. Pre-configured 90000X oscilloscope measurements are used to measure the rise time, fall time, pulse width, and overshoot on RF radar pulses (*Figure 2*). In this case, the 90000X's

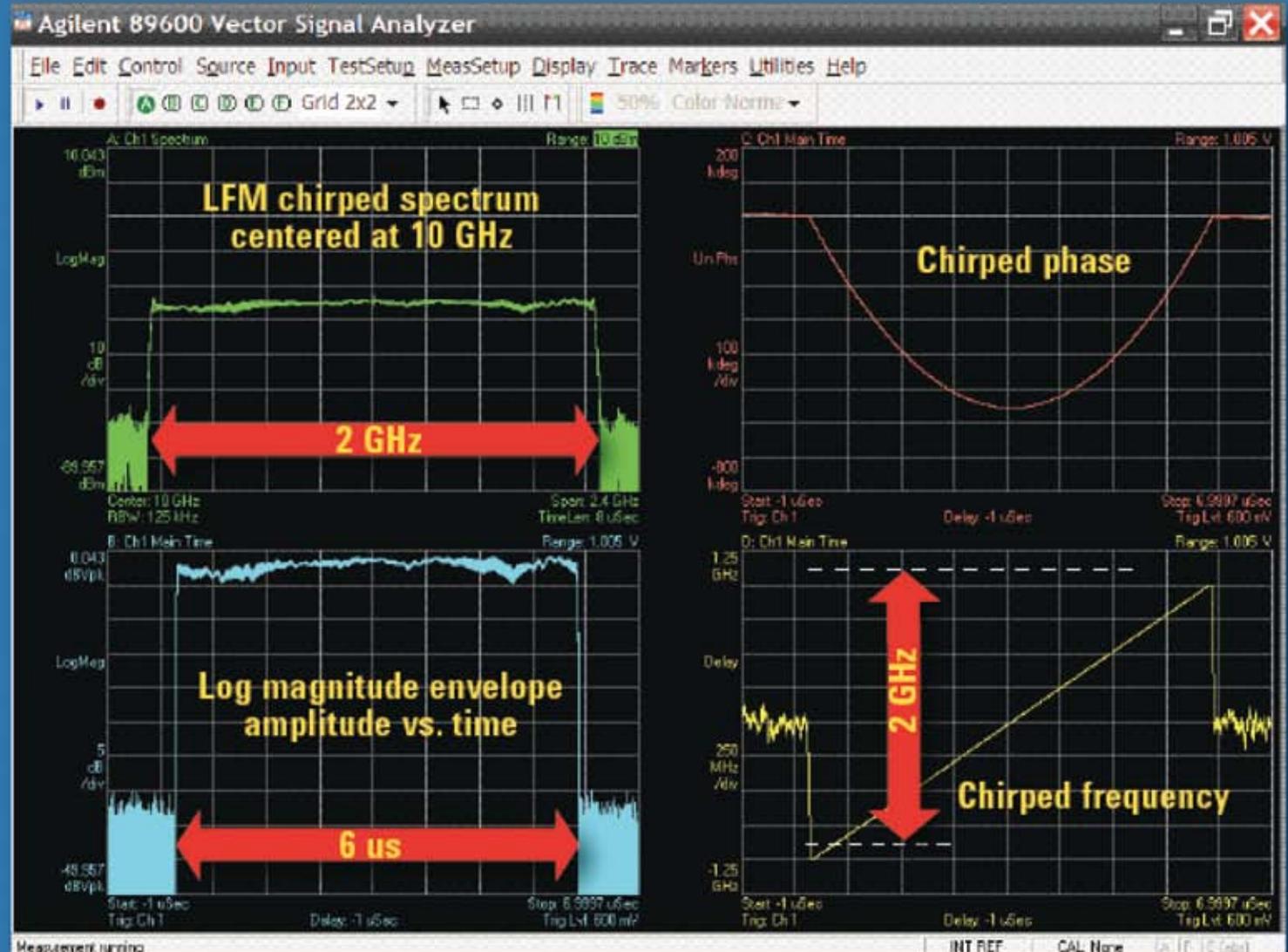
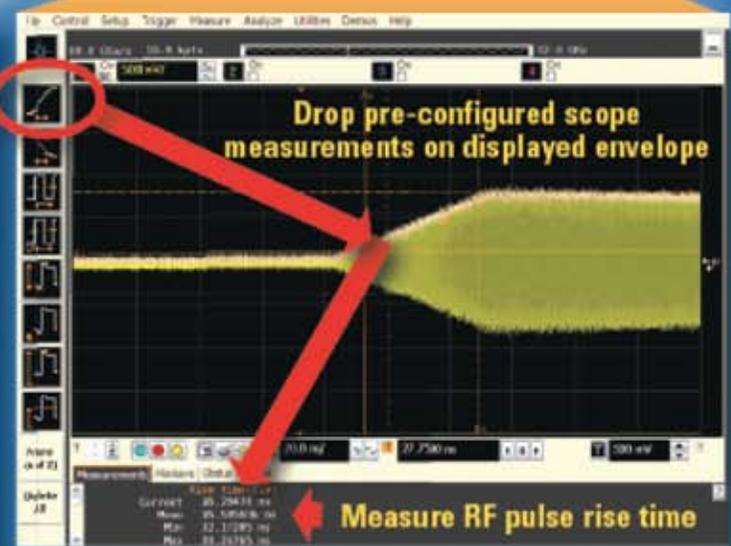
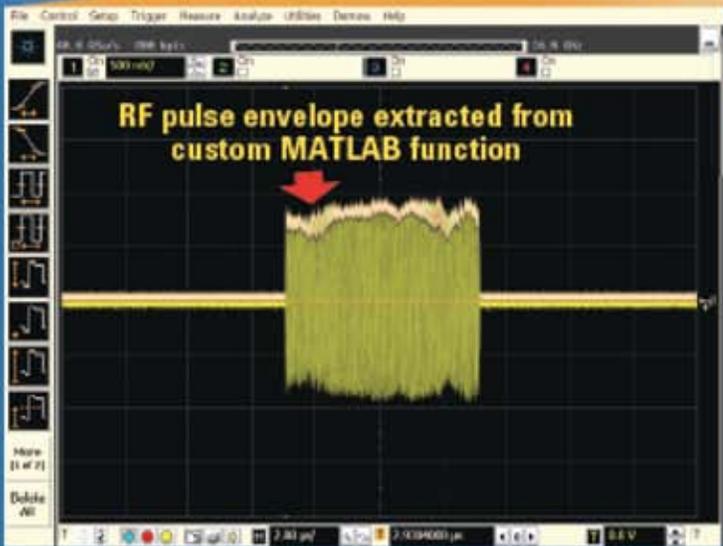
deep capture memory (**2GSa**) plays a critical role in allowing it to capture and analyze a large number of radar pulses.

Segmented memory further optimizes the number of radar pulses that can be captured and analyzed with the available oscilloscope memory. Essentially, it enables the user to zoom in on a pulse and capture only the "ON" time of the pulse, while ignoring the "OFF" time of the pulse. Note that while segmented memory can be used with MATLAB user-defined functions, this capability is not available with the VSA software.

Easing Migration to the Oscilloscope

While spectrum analyzer and vector signal analyzers have traditionally been used for RF testing, the challenges with performing today's radar and SATCOM measurements have become a catalyst for RF engineers migrating to wide-bandwidth oscilloscopes. Fortunately, Agilent's VSA software runs inside the 90000X oscilloscope and helps ease this migration by providing RF engineers the best of both worlds: the functionality and user-interface of a vector signal analyzer, and access to the oscilloscope's wide-bandwidth capabilities, which enables measurements up to 32 GHz for wideband radar and SATCOM applications.

With its familiar user-interface, the VSA software enables RF engineers to specify traditional RF parameters (e.g., frequency span and resolution bandwidth) on the oscilloscope. It then processes the data from the oscilloscope and displays the digitized results using vector signal analyzer amplitude and phase displays. VSA software can also perform frequency-domain analysis to measure characteristics like the RF/microwave spectrum, frequency and phase characteristics (e.g., chirped phase and frequency or frequency hopping characteristics displayed on a RF spectrogram), and EVM (*Figure 3*). In addition, the VSA software supports many signal standards and modulation types, to demodulate signal formats such as QPSK, 16QAM and 64 QAM for SATCOM and other applications. Such analysis provides the engineer with greater visibility into the actual radar and SATCOM transmitter hardware performance.



On the previous page:

Figure 2: Pulsed RF envelope and rise time measurements performed on the envelope.

Figure 3: Shown here is a wide-bandwidth LFM chirped radar measurement using the VSA software on the 90000X oscilloscope.

Summary Of Results

Using external down-conversion hardware to measure wide-bandwidth radar and SATCOM transmitter performance can be a costly and time-consuming task. It may not be optimal in gaining visibility into the RF/microwave transmitter's true performance. Agilent's 90000X oscilloscope provides RF engineers with a viable alternative; a means of directly measuring and analyzing the performance of RF/microwave transmitters for radar and SATCOM applications.

The oscilloscope can be combined with the 81180 AWG and PSG signal generator, which together can create and analyze physical test signals. Custom/proprietary signal waveforms can be generated using MATLAB and then downloaded to the 81180 AWG, combined with a PSG signal generator, to create the test signal. With the 90000X oscilloscope, the transmitter's output can be measured using Agilent's VSA software, a MATLAB user-defined function or the oscilloscope's built-in time-domain analysis capabilities. With today's radar and SATCOM applications employing wider bandwidths and higher frequencies, direct and accurate measurement of the transmitter's output using the 90000X oscilloscope has become essential in gaining insight into the transmitter's true performance, saving time and helping to mitigate costly design re-work.



For more information on Agilent Technologies' products, applications or services, please contact your local Agilent office. The complete list is available at: <http://www.agilent.com/find/contactus>

About the authors

Greg Jue is an RF applications specialist in Agilent's High Performance Scopes team. Previously he was an applications development engineer/scientist with Agilent EEs of Electronic Design Automation (EDA), specializing in SDR, LTE and WiMAX™ applications. Greg wrote the design simulation section in Agilent's new LTE book, and has authored numerous articles, presentations and application notes, including Agilent's LTE algorithm reference whitepaper and Agilent's new Cognitive Radio whitepaper. Greg pioneered combining design and test solutions at Agilent Technologies, and authored the popular application notes 1394 and 1471 on combining simulation and test. Before joining Agilent in 1995, he worked on system design for the Deep Space Network at the Jet Propulsion Laboratory, Caltech University.

Mike Flaherty is an RF/μW Applications Engineer in Agilent Technologies US Southwest District. Over his 30 year career with Hewlett-Packard / Agilent Mike has contributed to the development, applications and metrology of spectrum / signal analyzers, signal sources and arbitrary waveform generators. Mike has authored various software products, application notes, white papers, journal articles and sections of customers' websites. He graduated from University of California, Berkeley and DeVry Institute of Technology. He can be reached at mflaherty@agilent.com.

Thomas Dippon works as a strategic product planner for pulse, function, and arbitrary waveform generators. In almost 20 years with Agilent/HP he had several positions in R&D, technical support and project management. Thomas is based in Boeblingen, Germany.

Spotlighting Asia Pacific SATCOM

author: Timothy Logue, Senior Director, Thales Alenia Space

The Asia Pacific region continues to challenge and intrigue the satellite industry, as it has for the last several years, if not decades. AsiaPac

is home to more than two dozen global, regional and national satellite operators, a number that has been little changed over the years despite many predictions of major consolidations.

The region has also often been on the cutting edge of satellite services, from new digital media services, to cellular backhaul to broadband from the sky, and the businesses and citizens of the region show no signs of slackening their interest in satellite delivered services.

With more than half of the world's population within view from much of the geostationary orbital arc over Asia, vast new markets



Hilton Hawaiian Village® Beach Resort

continue to develop and dynamic changes are always underway in some corner of the region.

The annual ***Pacific Telecommunications Conference***, which will next be held **January 16-19, 2011**, at the Hilton Hawaiian Village on Waikiki, Hawaii, will again provide a showcase for issues and opportunities in satellite communications in the region. The conference, always a full buffet table of interesting discussions and people from across many sectors of the telecommunications and information technology industries, will focus this coming January on the theme of ***Connecting Life 24/7***.

The satellite conference concentration will kick off early, with a workshop mid-day on Sunday, January 16, co-sponsored by the ***Society of Satellite Professionals*** (SSPI) and the ***World Teleport Association*** (WTA). The focus will be ***Extreme Mobility - Where Satellites Connect To Daily Life***. The workshop will examine several issues including...

- i. How satellites are continuing to provide profitable and socially useful applications throughout Asia***
- ii. The relationship between mobility and satellites***
- iii. What satellite providers look for from telecommunications carriers and services providers as they overlay or support carrier networks to provide services that now impact all facets of daily life.***

The workshop is being organized by *Louis Zacharilla*, Director of Development for the WTA, and will feature a major address by *Mark Dankberg*, the Chairman and CEO of **ViaSat**, and a special presentation on backhaul and “hosted switch” services.

Dankberg, a familiar figure at past PTC’s, will also be a featured speaker during the main part of the conference. In addition to *Dankberg*, notables from the satellite industry will play high-profile roles during the conference.

For the second year in a row, a special luncheon will focus on vital satellite infrastructure issues. This lively panel discussion, which will be presented while luncheon is served, will be chaired by **Asiasat** Chairman *Peter Jackson*. Panelists will include three representatives, each one from the satellite manufacturing and launch services industries.

Participating this year will be...

- » ***Arnold Friedman, Senior Vice President, Space Systems Loral***
- » ***Eddie Kato, CEO, Thales Alenia Space North America***
- » ***Philippe Saint-Aubert, Senior Vice President, Astrium***
- » ***Jean-Yves Le Gall, Chairman & CEO, Arianespace***
- » ***Frank McKenna, President and CEO, International Launch Services***
- » ***Gwynne Shotwell, President, SpaceX***

Another highlighted session will look at broadband services from, or enabled by, satellites, which will be chaired by *Susan Irwin*, President of **Euroconsult USA**, and *Patricia Cooper*, President of the Washington-based **Satellite Industry Association (SIA)**. Dr. *Nongluck Phinaitisart*, from **Thaicom**, the operator of the region’s largest broadband satellite, **IPStar (Thaicom 4)**, will speak along with representatives of other current and prospective satellite broadband services suppliers in the region. Dr. *Nongluck* is also the current President of the

Asia Pacific Satellite Communications Council.

Those attending should expect to hear updates regarding IPStar's continuing progress, as well as the latest plans for broadband services in Australia, from Low Earth Orbit (LEO) to mobile satellite data applications.

Video, of course, is always **on** around the region, much of it delivered via satellite straight to AsiaPac residents' living rooms. Hong Kong-based *Gregg Daffner*, co-founder of **Asia Broadcast Satellite Inc.**, will chair a panel looking at developments in this key sector of the satellite and entertainment industry in the region.

Most of these satellite-related sessions are expected to be held on Monday, January 17, 2011, but the agenda for the conference is still being finalized. Please check for updates regularly at www.ptc.org.

PTC is always about networking and how the satellite industry plays its crucial role — plus, there's a robust social schedule during the conference. Given its diverse nature, the conference also offers a rare chance for the satellite industry professionals to meet with leaders in other sectors — broadband, mobile, telecommunications — and share concepts, ideas, and... business cards.



About the author

Timothy J. Logue is the Senior Director for Marketing and Sales for Thales Alenia Space North America. Mr. Logue has more than 30 years in the satellite industries, starting with the original Communications Satellite Corporation. He then worked as a staff consultant on many satellite and telecommunications projects while with two different law firms, Reid & Priest and Coudert Brothers. He joined Orbital Sciences Corporation in sales and marketing in 2005. He served in a number of leadership positions, including as President of the Society of Satellite Professionals International's Mid-Atlantic Division (2000-2002), Treasurer of the Arthur C. Clarke Foundation (ongoing), and co-chair of the Advisory Council of the Pacific Telecommunications Council (2009-2011).



What participants have to say about PTC:

"Year after year, the PTC conference brings members of the communications service provider community together, allowing us the opportunity to exchange industry views and critical insights. Over the past few years the format of the conference has enabled dialogues and meetings that contribute tangibly to the bottom line."

— Vinod Kumar, President and COO, Tata Communications, India

"Over the last three decades, PTC has established itself as one of the leading annual telecommunications industry conferences. I have attended PTC for the last 12 years - and keep coming back because of the opportunity it offers to engage and interact with the most senior business leaders in our industry."

— Diarmid Massey, VP, Carrier Services-Global Markets, Cable & Wireless Worldwide, Singapore

"Companies and industry members spend a lot of time and money traveling around the world meeting with people to build their industry relationships. PTC is a great venue for us to get together at a single meeting point, particularly over these great distances."

— Edward Rogers, Deputy President and EVP of Business & Corporate Development, Rogers Communications, Canada

"PTC provides an excellent opportunity to share ideas. I see PTC as a key conference that attracts a wide range of global senior industry representatives."

— Jeannie Diefenderfer, SVP, Global Engineering and Planning, Verizon, USA

"Because PTC draws a lot of high-level executives from major telcos, it is a good event at which to discuss strategic partnerships and new opportunities."

— Rod Ullens, CEO and Co-Founder, Voxxbone, Belgium

"PTC is a great place to network, where we can meet with many of our global peering partners and explore opportunities with prospective customers and partners."

— Frank Fawzi, CEO and Chairman of the Board, IntelPeer, USA

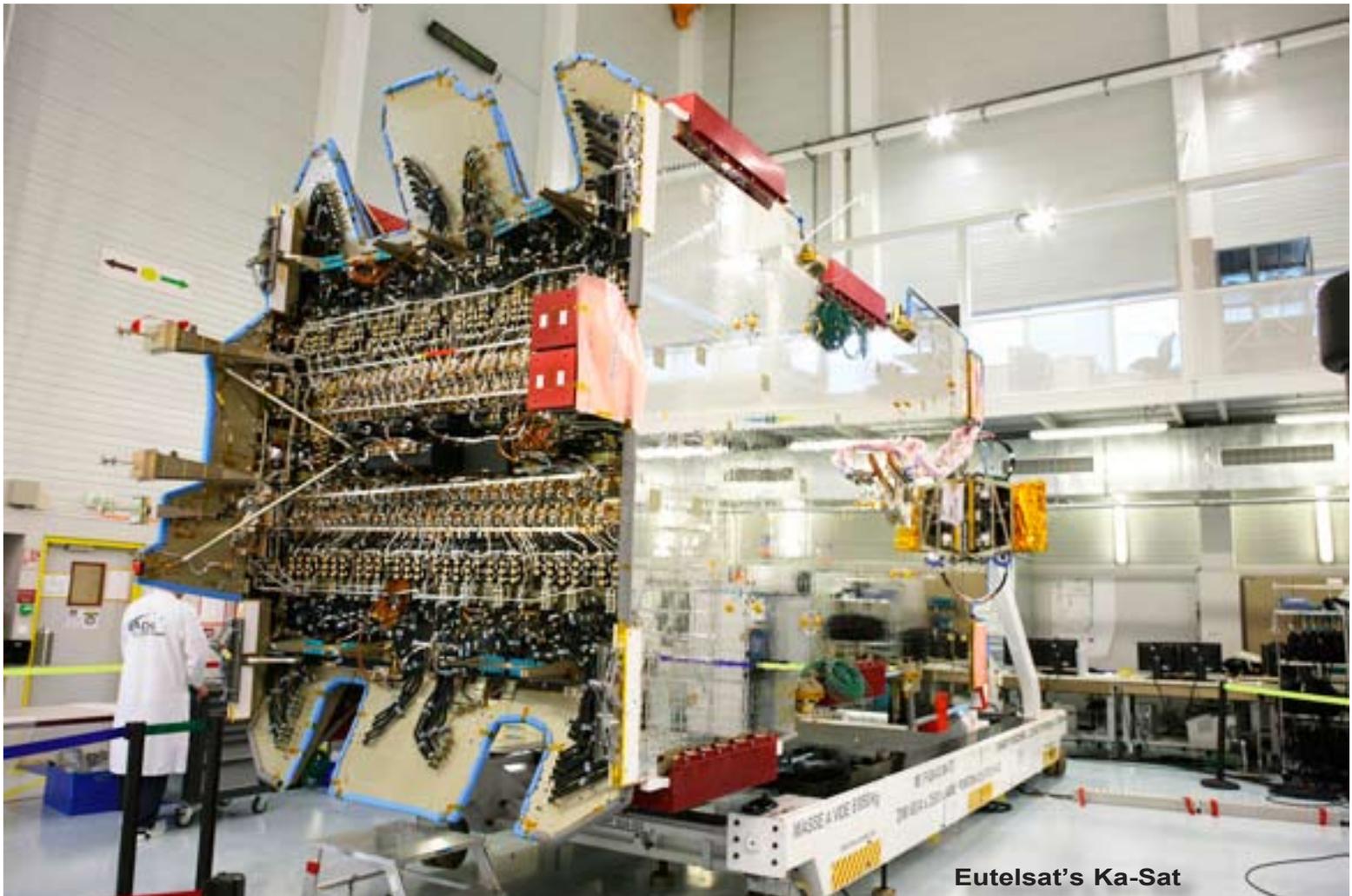
Eutelsat's Ka-Sat Ambitions

author: Chris Forrester, Editorial Director, RapidTV

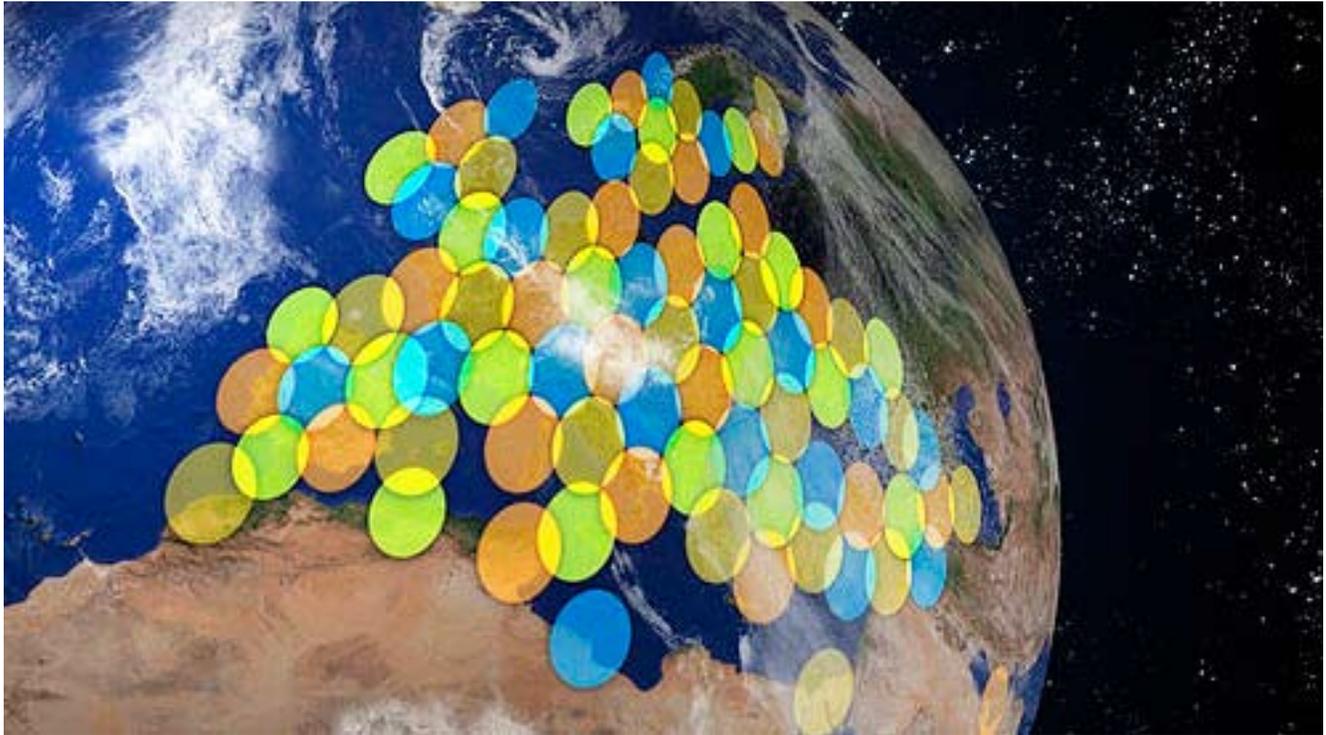
Eutelsat's business plans for its upcoming Ka-Sat launch have been unveiled. Ka-Sat, currently in the last stages of construction at the EADS-Astrium facility in Toulouse, will be launched from Baikonur as part of an ILS/Proton mission this December to 9 degrees East, and Eutelsat plan to start commercialising the craft by April next year.

Ka-Sat is an impressive craft, weighing in at some 6.1 tonnes and based on the trusted and reliable **EuroStar 3000** bus. It is also one of **Astrium's** massive 'three story' craft and sat in Astrium's clean room just a few meters away from **YahSat 1**, which has a quite similar mission (and a March 2011 launch), and **Astra 1N** which is still a few quarters away from launch.

French research company **iDate**, in a presentation, stated that Europe's demand for high-speed broadband bandwidth is "expected to explode". iDate suggest that while conventional terrestrial resources will satisfy much of this demand, Europe's need to bridge the digital divide will still leave many households either zero served, or under-served by any sort of broadband connection.



Eutelsat's Ka-Sat



Ka-Sat1's Spot Beams

“It appears that broadband coverage by terrestrial networks (DSL and cable) is still limited in rural areas,” says iDate. “The level of a country’s terrestrial broadband coverage, the chief indicator of the competition environment, has a strong impact on the market opportunities for a satellite internet access solution. Western Europe is very well covered, with rates that often well exceed 97 percent.

A final analysis by iDate says, “In 2009, iDate estimates 13 million HH in Europe and 16 million in North Africa remained not connected to terrestrial Broadband.”

“Although catching up, Eastern Europe still lags behind, but is catching up fast. As an example, DSL coverage in Poland moved from 64 percent (2008) to 83 percent (2009) of population. Meanwhile, North Africa is still characterized by a dire lack of fixed infrastructure. In 2009, only Egypt, Tunisia, and Libya were reporting coverage of over half the population while Morocco, at 20 percent, is the country with the lowest wireline network coverage.”

Eutelsat’s definition of their target market

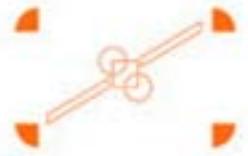
UNSERVED

Areas located further than 5 km from the next DSLAM or cable head-end, meaning no terrestrial broadband is available. In Europe, unserved areas usually have a low population density.

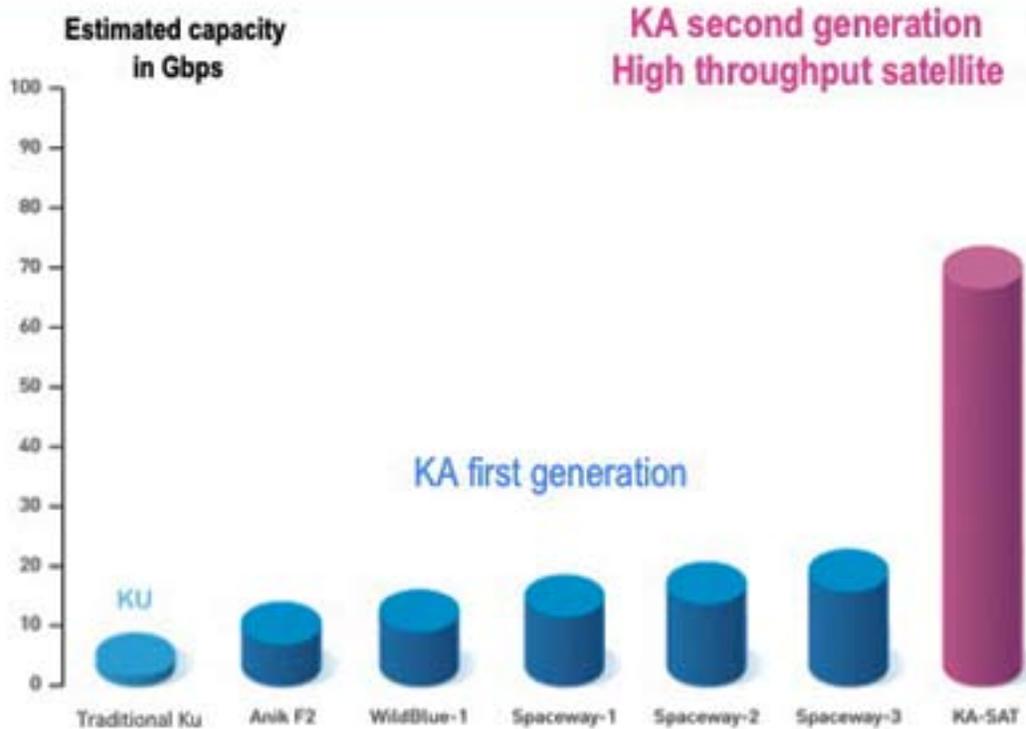
UNDERSERVED

Areas within approximately 3 to 5 km of a DSLAM. Broadband is available at a limited maximum speed, up to a few Mbps, not allowing for all kinds of services (TV, VoD). Usually there is only one, sometimes two, competing providers

KA-SAT 35 x more capacity than traditional broadcast satellite



This increase of capacity makes satellite connectivity affordable both for consumers and for business applications



Toulouse, October 7

12



Incidentally, Ka-Sat's spot beams, as well as covering the whole of greater Europe, also cover the major North African cities as well as having a dedicated beam looking at the Red Sea/Jeddah area of Saudi Arabia.

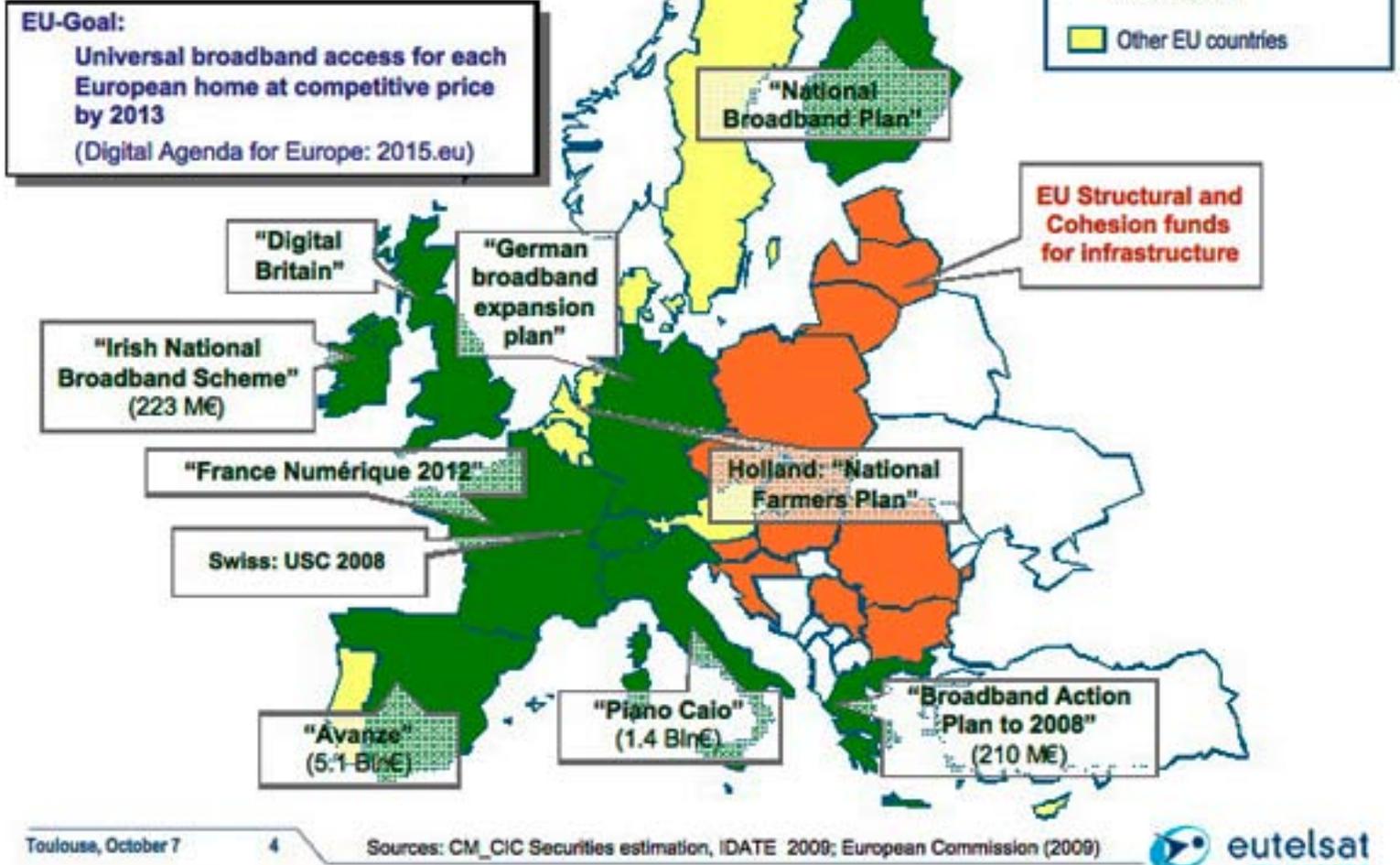
These 13m homes are **Eutelsat's** initial primary market for Ka-Sat, although the number rises to a target audience of some 30m when North Africa-based prospects are included. iDate cites the success of similar satellite-supplied broadband in North America and Asia, and specifically mentioning the 925,000 active subs to either **WildBlue** or **HughesNet** in North America, and the 200,000 subs using **IPStar** over Asia.

Ka-Sat dramatically reduces the cost per Mb delivered by a factor of 8, says Eutelsat, compared with existing wide-area Ku and Ka-band supplies of capacity.

"Three to five times more expensive than ADSL offers in the early 2000s, broadband satellite services have long required a sizeable investment from residential users interested in this type of access, with some even preferring to opt for "unlimited PSTN," says iDate.

"With the introduction of the Ka-band, prices have dramatically come down since then, as bandwidth costs are more than 8 times lower while number of supported users increases. Parallel to the decrease in the price of subscriptions, the price of satellite terminals has also dropped to reach 300 EUR in 2009 against 2000 EUR in 2003, thanks to technical improvements which have helped bring down production costs, and to the economies of scale generated by the tens of thousands of terminals sold by manufacturers," adds iDate.

Multiple initiatives in Europe to bring broadband for all



iDate specifically forecasts that the “first wave” of “massive subscribers” should occur in Europe and then North Africa from 2012 “when PC penetration rates will become sufficiently high”. By 2014, forecasts iDate, Europe and North Africa will top 600,000 and occupy more than 60 transponders (36MHz equivalent).

However, iDate’s bullish predictions go further, suggesting that there are “strong uncertainties” as to how rural regions of Europe will ever be served by any sort of “ultra broadband”. “Satellite technology is preparing the transition towards ultra broadband with projects aiming at reaching 50 to 100 Mbps from 2013. Eutelsat is already investigating ‘next generation’ High Throughput Satellites (HTS),” says iDate.

Eutelsat stresses that it will only wholesale its services, and will depend on a range of local

re-sellers and equipment installers to deal directly with subscribers. Eutelsat say that likely wholesale fees for capacity to its Sat2Way/Tooway service will be about €30 per month for a download speed of 3.6Mb/s (and an upload speed of 512 Kb/s) with a cap set at 2.4Gb max), or €60 for a 6 Gb cap. Eutelsat say that ViaSat-supplied SurfBeam 2 terminals will cost around €300, (and compares with €2000 back in 2003).

The satellite is but one part of the overall Ka-band commitment. Eutelsat’s Skylogic facility (SkyPark Teleport) outside Turin is the backbone hub of the system’s connectivity, which itself is linked to a comprehensive ‘ring main’ comprising 8 main gateways across Europe, plus a pair of back-up gateways, and a fully redundant fibre-optic ring backbone.

Jean-Francois Fremaux, Eutelsat’s business development director, says that the cost of rolling out



Eutelsat's Ka-Sat chemical thruster, which can be seen behind the ring that's been bolted onto the white trolley.

FTTH becomes prohibitively expensive as one moves away from urban areas. Even suburban installations can cost €800 per home passed, and this charge rises dramatically as one tries to connect up rural (around €3000 per home) to isolated regions at a massive €7,000 per home — or more.

Mr. *Fremaux* reminded journalists that Eutelsat already has considerable success in generating very real revenues from data services — currently

19 percent of Eutelsat's revenues (in the half year to December 31st 2009).

As to the prospects of turning these ambitions into hard cash Eutelsat is already on record with its thoughts: Eutelsat CFO *Catherine Guillouard*, speaking recently, said Ka-Sat is a sound investment. "We have had no red flags to show on this. We have [Ka-Sat service] distributors lined up in 30 nations. The decision was made in 2007 and it was a good strategy judging by the number of other companies that have followed since then. SES jumped in, Inmarsat jumped in. We are saying it will generate €100m in annual top-line revenue by 2013-2014. It is costing us €350m, to give you an idea of the return on deployed capital."

Of course, Eutelsat is not alone in terms of Ka-band. SES Astra is active with its Astra2Connect services, although takes a firm "step by step" approach to supplying extra capacity.

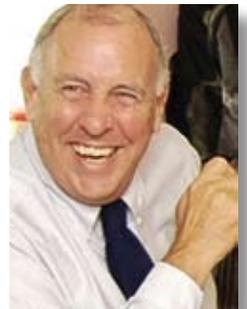
Then there's **Avanti Communications** with its *Hylas 1* satellite which is expected to launch aboard an Ariane 5 launch vehicle on November 26, 2010 (as of this writing), and again targeting Europe from its slot over the Atlantic. Avanti, despite modest revenue targets, currently has a market capitalisation in excess of £600m. Avanti is targeting 50,000 customers.



Artistic rendition of Eutelsat's Ka-Sat

About the author

Chris Forrester is a well-known broadcasting journalist and industry consultant. He reports on all aspects of broadcasting with special emphasis on content, the business of television and emerging applications. He founded *Rapid TV News* and has edited *Interspace* and its successor *Inside Satellite TV* since 1996. He also files for *Advanced-Television.com*.



The Colem Identity

author: Martin Coleman, Director, Colem

For some years now, Colem has been heavily involved in the Satellite Users Interference Reduction Group (SUIRG) and in November 2009 Colem's Director, Martin Coleman, was named chairman of the Video Carrier ID working group. Carrier identification is now a key and practical initiative

being rolled out. For the rest, Martin Coleman explains the thinking behind the initiative and why if you haven't signed up already, you really should.



Why ID?

In actual fact it seems a simple solution to a common problem in the world of satellite, which makes me feel that the real question ought to be, why haven't we done this already? Interference is the number one bugbear of the satellite industry and it affects all satellite operators, broadcasters, military and other users.

Interference has become an increasing problem in recent years, due to technological advances and the need to drive costs down. This has been especially noticeable in the world of VSAT where the need to drive costs down has led to using less experienced installers. On the video front, the simplifying of operations to allow cameramen and journalists to operate high-tech SNG equipment with little or no experience has had its affect on day-to-day operations.

As technology moves on, our dependence on that technology increases, meaning that operators are less experienced and mistakes are made, albeit, not intentionally. Interference is now beyond simply a nuisance and has a detrimental effect on all satellite operations. For broadcasters, it means loss of service, or loss of quality, for military operators, the interference can, of course, mean the difference between life and death.

Having globally agreed that we need to reduce interference, ID was a good place to start. It is a practical solution and it will significantly reduce the time taken to track and correct those day-to-day interference issues that crop up, quickly and efficiently. Many of the problems stem from the fact that no-one knows who is causing the interference in the first place. If two transmitted carriers attempt to use the same frequency, who is right? The problem can be simple or complex. ID tries to eliminate the obvious.

Having an ID assigned to each transmission makes sense, of course, but fast resolution is a must and making it easy to determine the cause of the problem and speedier resolution, in turn, will lead to less interference and therefore less downtime for the broadcaster or other affected services.

Making it Happen

Actually making it happen is not as simple as the solution itself, because it relies on the support of the entire satellite industry, from equipment manufacturer's right through to the satellite operators themselves. That is the reason for **SUIRG** and the work we have been doing with the organization.

Having made the first move with SUIRG in 2006 and established a working video ID solution with **WBU-ISOG** support, it has taken until 2009 for the industry, as a whole, to get behind SUIRG and back the need to resolve the interference issue. ID was one of a number of initiatives that were introduced. Since then, SUIRG now consists of three working groups: *Video*, *Data* (Modems) and *VSAT*, each headed up by an industry expert.

I, myself, am chairman of the video committee and, as such, it has been my responsibility to talk to all those involved in the delivery of video over satellite, from encoder manufactures to broadcasters. We are having a certain amount of success. The industry as a whole understands interference is a problem.

The broadcasters are signing on as well as manufacturers — all realize that if they don't come on board and make their products compatible with **Carrier ID** they will, in the end, loose out to competitors who are now involved. Taking video transmission as the example, we are now at a point where encoder manufacturers are preparing and, in many cases, achieving the goal of making Carrier ID available. For the single transmit chain scenario, this is a major achievement.

Looking Ahead

This is a huge undertaking. The responsible manufacturers are committed, but broadcasters are only starting the process. It costs time and, therefore, money. Everyone is looking to the next person to see if they have done it yet and, as more and more broadcasters do sign up to implement Carrier ID, I am sure we will see a domino effect take place.

A point worth making is that perhaps I have the easy task, as video has been the simpler task of the three to implement. This is due to the fact that video specifications and mandates were established some time ago. Data and VSAT requires starting with a blank sheet, and that is going to take longer, but also offers more opportunity to get it right — the first time.

That said, those groups need our support, as well. If the industry pulls together, we can significantly reduce, if not eradicate, the problem of interference for all of the companies effected.

The Next Steps

All three groups are working hard to ensure Carrier ID is up and running as soon as possible in order for satellite operators to start to see the full benefits of reduced interference.

For the video group, effort is currently being directed towards the inclusion of multiplexed transmission streams by using the uplink modulator to embed that same ID. The group is continuously looking at cost effective ways to integrate ID, in particular, the large broadcaster with a complex service structure. In the case of video, this has led to looking at the multiplexer itself as another way to embed ID for multiplexed system. Such had initially been avoided, but following discussion with some of the major broadcasters, this approach is currently being revisited.

All three working groups are now concentrating on various technical solutions.

At the SUIRG conference in San Francisco, it was decided to engage as many organizations worldwide as possible, to persuade broadcasters in all main regions, with specific input from the Americas, Asia, Europe, and the Middle East to implement ID regardless of service.

About the author

Martin Coleman is the Director of Colem



Executive Spotlight

Walter Thygesen CEO, Thrane & Thrane

Walter Thygesen, MSc (Engineering), MBA, has been with Thrane & Thrane since September of 2007. He is also the Chairman of the Board of Hewlett-Packard Danmark ApS and The Danish Fund for Industrial Growth. In addition, Mr. Thygesen is a member of the Board of Novozymes A/S and of Royal Unibrew A/S.



SatMagazine

Good day, Mr. Thygesen. As the CEO of a successful communication solutions company, such takes a true commitment of time and talent to become the Company's leader. How did you develop an interest in this? What is your history of experience?

Walter Thygesen

Most of my work has been based around IT and technology, so joining Thrane & Thrane was a natural step. I have a Master of Science in Engineering from '75, and I received an MBA from Stanford in '82. I have been in the IT industry ever since with various international sales, marketing and general management roles with Hewlett Packard, Apple and Compaq in Europe. I'm now delighted to be part of a respected and high-profile Danish company with hundreds of skilled and dedicated professionals onboard.

SatMagazine

Thrane & Thrane provides hardware for the aero, land mobile and maritime markets. What are the current highlights and opportunities in these markets?

Walter Thygesen

The maritime market is currently very strong. Inmarsat FleetBroadband is a major success story, with many of the world's largest shipping companies adopting the system quite soon after its launch. Another current highlight is VSAT, especially following Inmarsat's recent announcement that it would be developing a new Ka-band service based on the new Inmarsat-5 constellation. We'll be watching this very closely, especially as we launched our own proprietary VSAT antenna earlier this year.

In the aeronautical market, Thrane & Thrane experience a significant interest from aircraft manufacturers, governments and private owners of small and larger aircraft. We recently introduced a

whole new portfolio of SwiftBroadband products under the brand name AVIATOR — essentially enabling a true office in the sky. The newest product is the AVIATOR 200, which enables high quality, reliable communications for smaller aircraft. Its introduction has expanded the market considerably.

The land mobile market is mature and stable, and we continue to explore growth opportunities especially in China, Russia, Africa and Latin America. Our EXPLORER products are market leading, and are used by a wide variety of industries. For instance, EXPLORER is very popular with the media, being deployed regularly for outside broadcasts that require a fast reaction time. Likewise, the system is used by almost all emergency response organizations around the world as communication really can help to save lives. For example, Thrane & Thrane sponsors Télécoms Sans Frontière's ICT training programs.

We recently introduced EXPLORER 325, which we have high hopes for. It is an on-the-move, vehicular terminal that can be used for voice or data at speed, across almost all terrain. One of the first terminals has actually been loaned to a Danish electric car expedition, whose participants have been able to provide extensive updates whilst on-the-move all over the world.

SatMagazine

And what are the current challenges in these markets?

Walter Thygesen

The Shipping industry has been struggling the last couple of years, and the new building of commercial vessels has particularly been less than in previous years. There is now an increased focus on the cost of ownership and a higher demand for intelligent communication solutions.

The challenge in the aeronautical market is to make the equipment simple to install and to achieve regulatory approvals.

In the land mobile market the challenges are more based around new and emerging markets, as opposed to technology.

SatMagazine

How is Thrane & Thrane addressing these market challenges? May we expect to hear of new technological developments shortly to help the Company gain additional market share?

Walter Thygesen

As for maritime, Thrane & Thrane continue to develop and launch new products that meet the changing and evolving demand of the shipping companies. The increased focus on cost of ownership also means that more ship owners focus on the cost of service and maintenance. To support their need we have developed a new service concept that to a much greater extent will ensure the ship owner of the cost of ownership for the SAILOR products. This is another way to develop not only products but also services that support our customers.

We meet the aeronautical markets technical challenges by having common parts across our product range and making our products as simple as possible to install and use. We are able to achieve this quickly — demonstrated in the fast development of the AVIATOR 200 — by bringing in benefits from our land mobile and maritime product range. What we do in one segment has to be able to be used in the other segments; we are very keen on that concept. Feedback has proven that this approach is valid and customers are very positive about the ease of installation of our aeronautical products.

In the land mobile area, we are working to overcome the challenges and see potential for strong revenue all over the world.

SatMagazine

In the maritime industry, Thrane & Thrane is traditionally viewed as an Inmarsat hardware manufacturer — do you have plans to break into the VSAT market?

Executive Spotlight

Walter Thygesen

Inmarsat products are a significant part of our product portfolio and maritime business, and we expect this to continue in the future. However the SAILOR product portfolio already offers products outside the Inmarsat L-band service. For instance, the SAILOR 700 VSAT has been in the market for more than a year now, and we introduced the brand new SAILOR 900 VSAT at the SMM Conference in Hamburg this year.

SatMagazine

Can you explain what the new ThraneLINK system is that you recently launched?

Walter Thygesen

ThraneLINK is a unique new network that has a huge amount of potential in terms of integration, since it enables our products to operate with each other in an intelligent way. As this develops further, we expect the benefits that it brings to installation, maintenance and operations to be very positive factors in end-users choosing Thrane & Thrane.

ThraneLINK provides automatic device discovery that reduces time for installation and enables one point of service and troubleshooting, meaning the service technician no longer needs to connect to each individual product for diagnostics and other troubleshooting issues. Likewise the technician no longer has to connect a service PC to each individual product to upload new software. Instead he will connect a USB stick or a SD Card to the SAILOR Message Terminal, and via the ThraneLINK application the system will automatically identify, which products need to be software updated.

We believe that by providing an open standard, other manufacturers of equipment such as navigational and automation will be able to utilize the benefits of the protocol and the entire system will be linked together in an intelligent way.

ThraneLINK is currently only utilized on our new SAILOR 6000 GMDSS Series products, but we are looking at its potential across all of our products. The next few years are going to be very exciting.

SatMagazine

Your land mobile business operates across many industry sectors. How do you address the requirements of each category of end user?

Walter Thygesen

Although our EXPLORER products are used for many different applications, the customers all require the same service; simply fast, high quality data and voice connection for when ground infrastructure isn't available. We supply the hardware and our partners do specific solutions for the different segment requirements. That said, we continuously work to increase the level to which we offer further tailoring for the specific customer application.

SatMagazine

Inmarsat has recently gone live with its SwiftBroadband 200 service for the aero market. Will Thrane & Thrane capitalize on this move and, if so, how?

Walter Thygesen

We will work together with aircraft manufacturers in both the government and the private arena to bring the unique benefits of our AVIATOR 200 to the highest possible number of aircraft owners. As it is the most compact, lightweight SwiftBroadband terminal, this market is now much wider as more aircraft can have the system installed.

SatMagazine

Your Company has specific operations in the US and in China. Can you explain how these markets differ from one another and what are Thrane & Thrane's main focuses in each market segment?

Walter Thygesen

Of course we focus on all the big countries, but in general we see most potential for growth in the BRIC countries, which is reflected in our very successful office in China and our ambition to make Russia a major market.

SatMagazine

SatMagazine notes that Thrane & Thrane is sponsoring the Volvo Ocean Race for a third consecutive time.

Why are you so keen on this particular event? What exactly will your Company offer at this competition in terms of sponsorship and/or equipment?

Walter Thygesen

The maritime market is our largest sector and our SAILOR brand is highly respected. By linking it to what is the toughest maritime sporting event in the world, we demonstrate to a huge audience that SAILOR is the toughest equipment you can get. It's an ideal scenario really. We also use the race for testing our products; the conditions and environment aboard a Volvo Open 70 are actually more extreme than on a commercial fishing boat. We get fantastic feedback and suggestions from the crews that help us to further develop our systems. Also, it is a very professionally organized race, so our investment in it shows excellent synergies with the world's elite yachtsmen and women.

The scope of supply for the 2011-2012 race includes new generation products. With the World's first second generation FleetBroadband antenna, the in-house developed SAILOR 500 FleetBroadband will be the central communication hub for each race team. From upload of race footage, reports and interviews for television and web, to download of weather data,

vital for competitive navigation performance, all of the teams will benefit from true broadband communication along the entire course around the globe.

Every Volvo Open 70 race boat as well as Volvo Ocean Race's own crew and umpire fleet will be fully equipped with the newly introduced and advanced SAILOR 6200 VHF series with replay function and robust waterproof design. The teams will also benefit from the compact SAILOR 150 FleetBroadband for crew voice calling and IP data, whilst two SAILOR mini-C systems will constantly position data and global safety communication.

SatMagazine

Lastly, how does Thrane & Thrane encourage today's young people to gain an interest in STEM learning and activities to ensure enough qualified talent for the communications' industry workforce in the future?

Walter Thygesen

We have an excellent collaboration with the Technical [University of Denmark](#) (DTU), which is almost our next-door neighbor. Quite a few students do projects about us and/or are trainees for a period of time.

We are one of the few companies in Denmark that work with this kind of advanced technology, so it has

always been relatively easy to recruit the best candidates as they see Thrane & Thrane as a company where they can really develop their skills and careers.



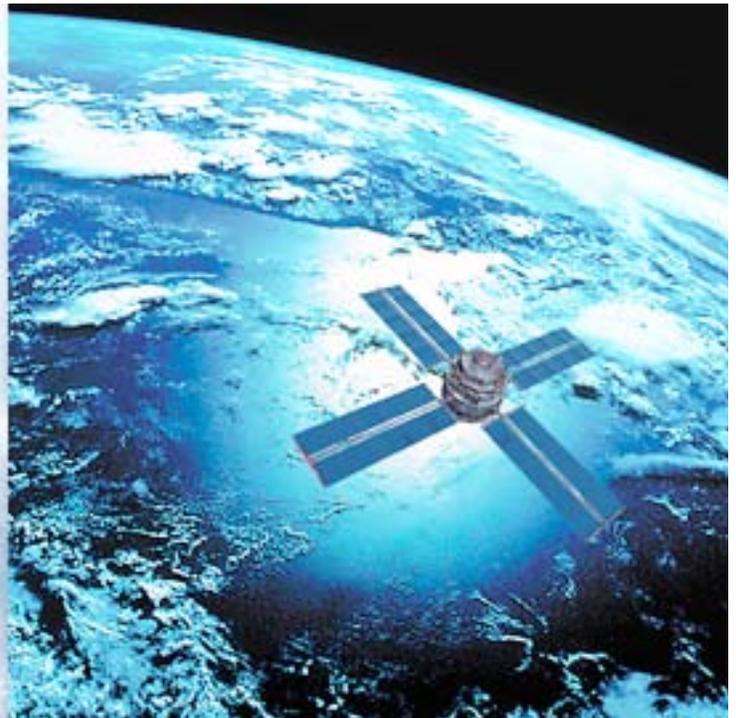
The fleet of 8 Volvo Open 70's power away from the start line on the first Volvo Ocean Race in-port race in Alicante, Spain (2008).

Aircraft Emergency Monitoring Solution – In Near Real Time

AeroMechanical Services Ltd. (AMS), a provider of data and voice communications' services for the aviation industry with its Automated Flight Information Reporting System (afirs™), and Iridium, have demo'd the ability to capture and continuously stream in-flight position and performance data from an aircraft's flight data recorder (FDR). Using an operating mode of afirs known as FlyhtStream™, the solution combines onboard smart electronics technology, a satellite constellation with fully global reach, including over the Poles, and secure, Internet-based data delivery to end users. If something abnormal occurs during an aircraft's flight, the system triggers an alert and begins streaming operating performance data via Iridium to designated recipients, including airline executives and ground support crews, aircraft and engine manufacturers, air traffic control, and search and rescue.

FlyhtStream represents a quantum leap for the aviation industry in terms of improving aircraft tracking and in-flight emergency communications. For the first time, the system offers to the aviation community

a tool that can be used to analyze, diagnose and resolve in-flight problems as they occur, holding out the promise of actually preventing crashes and loss of life, as well as facilitating better operating decisions



during non-crisis situations. The system has been proven during in-flight trials over the Atlantic Ocean and other areas globally, and **afirs** already is being utilized by more than 30 passenger-service airlines and business aviation customers as an economical solution to monitor in-flight aircraft performance from anywhere in the world.

A Long-Standing Industry Problem

On June 1, 2009, **Air France Flight 447** crashed into the Atlantic Ocean en route to Paris from Rio de Janeiro. All 228 passengers and crew perished and most of the aircraft disappeared. Officials investigating the **Airbus A330-200** disaster have never found the jetliner's FDRs in the deep ocean waters. Limited messages received from the aircraft during the emergency via conventional communications' systems did not provide enough information for ground assistance, nor did they clarify the cause of the emergency. As a result, investigators do not know what caused the jetliner to crash.

The loss of Air France 447 drove home the need to improve in-flight tracking and air traffic management of aircraft flying transoceanic routes and over remote land areas.

Much of the aviation community's attention has focused on **FDRs** (*black boxes*), which are mandatory equipment on airliners. While state-of-the-art FDRs accumulate a detailed record of hundreds of in-flight operating parameters, they are not designed to provide *live* information during flight. Their primary function is to provide a historical record of an aircraft's flight, equipping investigators with enough after-the-fact information, for example, to determine the

probable cause of a crash. In the event the black boxes can't be recovered after a crash, they are of no use at all.

The AMS Solution

The **AMS afirs-over-Iridium** solution, that incorporates the **FlyhtStream** data-streaming function, does not attempt to replace black box technology. Rather, it enhances and leverages FDR capabilities to offer airline operators valuable situational awareness of in-flight operations and flight path. In addition to giving ground crews, airframe and engine manufacturers, and others the ability to troubleshoot emergencies, the technology also provides raw FDR data in the event that the black box is not recovered after a crash.

Under its marketing brand **FLHYT**, **AMS** introduced its current-generation afirs product to the commercial aviation market in 2004. It is known as the **afirs 220**, a programmable, smart electronic device that monitors, records and processes data and manages real time communications over **Iridium**.

The FlyhtStream function that is available within afirs can be pre-programmed to automatically trigger an alert and begin streaming data over Iridium if an abnormal operating condition is detected, such as loss of cabin pressure, a rapid change in altitude, an engine failure, excessive *g* loads, etc. In addition, the data-streaming capability, including continuous transmission of an aircraft's GPS coordinates, can be triggered remotely by a ground crew or by the pilot of an airplane experiencing an emergency situation.

Focus

FlyhtStream is but one of the unique features built into the afirs 220. Coupled with Iridium's global satellite network, the system's *enabler*, afirs seamlessly integrates routine aircraft performance data, GPS tracking, and two-way voice and text-messaging communications between aircraft pilots and ground support crews, or air traffic controllers, during flights.

To date, the *Federal Aviation Administration (FAA)*, the *European Aviation Safety Agency*, the *Civil Aviation Administration of China* and *Transport Canada* have deemed afirs 220 as airworthy on more than 25 aircraft types and models. Some of the aircraft covered include the **Airbus A320** family, the classic and next-generation **Boeing 737, 757s, and**

767s, DC-10s, Bombardier regional jets and **Dash-8 Turboprops**, and **Hawker Beechcraft** business jets.

Since being introduced to the market, the afirs 220 system has delivered significant cost savings and operational efficiency improvements to aviation operators across AMS' business segments. Currently, more than 30 AMS aviation customers globally are using afirs, with flight operations in the Americas, Europe, Africa, the Middle East, China, South Asia, the Caribbean and even the Antarctic. Customers include scheduled and charter airlines, regional and commuter airlines, cargo operators, special mission operators, such as the *UN Food Program*, business aviation and the military.



Aviation customers report that afirs-over-Iridium gives them complete visibility over their fleet, regardless of where an aircraft is flying. Typically, afirs is programmed to transmit routine data messages every five minutes to aviation customers, reporting such information as an airplane's precise location and operating condition. Pricing is attractive because customers are billed based on actual use during a flight.

How afirs Works

The afirs 220 (see image to the left) is compact and lightweight at 8.7 pounds. The device is installed in the avionics' bay and is connected to aircraft sensors through data buses, similar to the way office computers are connected to local area networks. Other on-board equipment consists of a small cockpit indicator panel and several configurations of Iridium satellite phones for use by aircraft pilots or cabin crews. A low-drag dual-element antenna, about the size of a deck of cards, is mounted on top of the fuselage of an aircraft, providing both the connection to Iridium's satellite network and the reception of GPS time and position data.

Essentially, the afirs 220 *eavesdrops* on aircraft sensor data passing through the buses. The smart device is programmed to capture, record and analyze pre-selected criteria, including engine performance, excess vibration and other system deviations that typically signal the need for maintenance, and such routine readings as altitude, heading and speed. Data deemed to be high priority is compressed and transmitted via Iridium's satellite network to users on

the ground. Lower-priority data is saved to a data-storage card that can be downloaded, as needed, after an aircraft lands.

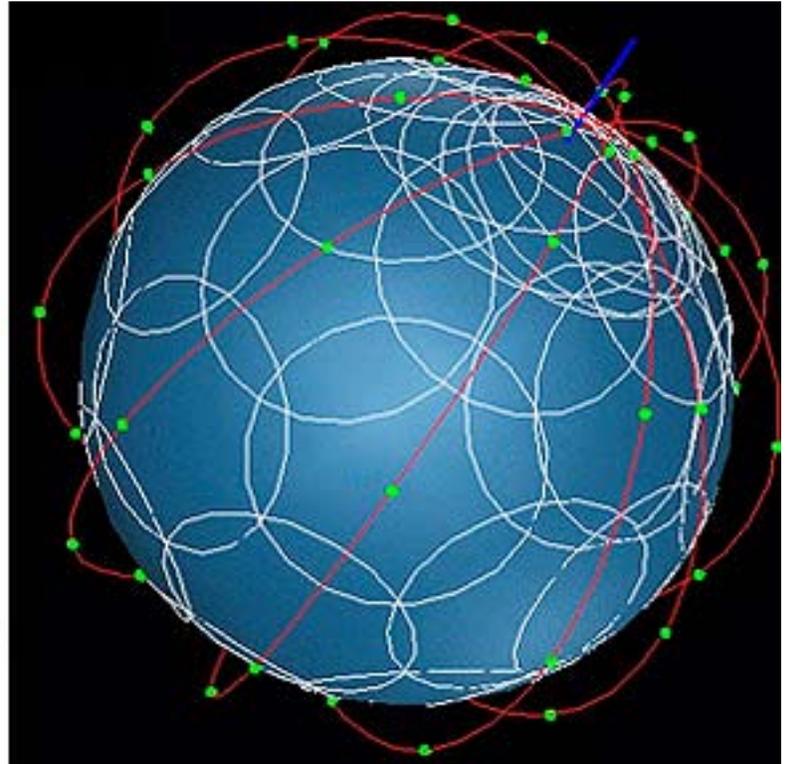
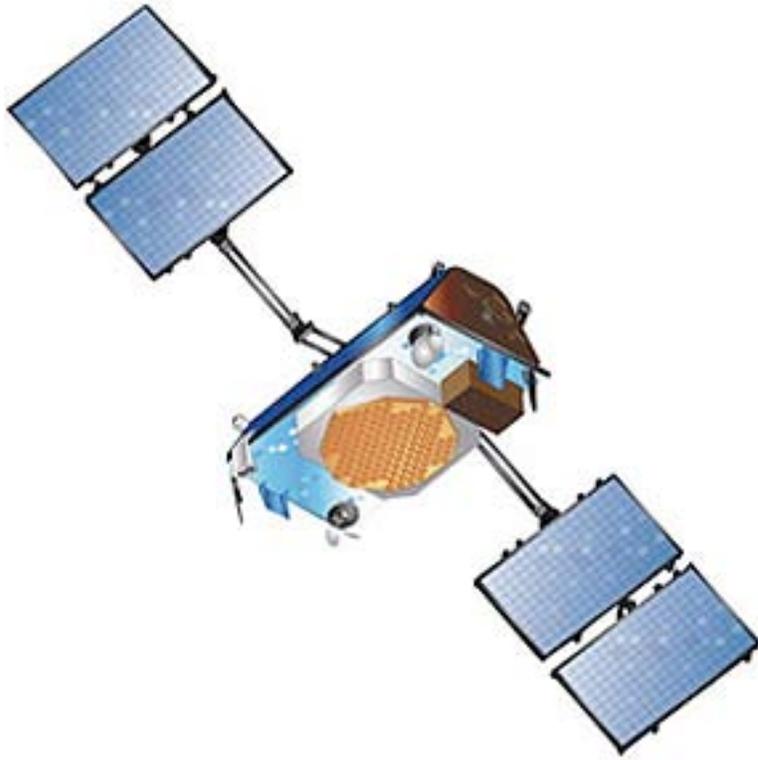
Information transmitted from the afirs 220 is routed seamlessly over Iridium to an AMS application called **UpTime**, a web-based server that processes the data into messages and forwards them to customers via the Internet. UpTime is the primary interface between afirs and end-users. Featuring sophisticated software programs and aircraft databases, UpTime automatically collects, generates and delivers standard aircraft performance reports, as well as customized reports prescribed by individual customers.

Using Iridium's fully meshed, cross-linked satellite network, the afirs system is able to transmit data from aircraft to end-user in seconds. Data passes from satellite to satellite, touching ground at Iridium's operations control center in Tempe, Arizona, and is then routed to AMS' UpTime web server. The near real-time speed of data throughput is a critical component of FlyhtStream's value proposition for use in emergency data-streaming situations.

Iridium provides afirs users with truly global coverage, a significant and unique capability among mobile satellite communications' providers. Iridium's 66 low-earth orbiting satellites circle above Earth on polar orbits, intersecting over the North and South poles. Iridium's constellation offers the only reliable and continuous two-way communications link with aircraft flying over the Polar Regions, transoceanic routes and remote land areas.

With a long-term commitment to its aviation, and other, industry customers, Iridium is in the process of designing and building its next-generation satellite constellation, **Iridium NEXT**. The company anticipates launches for Iridium NEXT to begin in 2015, with full replacement of the current constellation planned for 2017.

The new constellation will maintain the company's existing network architecture of 66 cross-linked satellites covering the globe. Iridium NEXT will



Artistic concept drawing of an Iridium NEXT satellite, courtesy of Iridium, and the constellation's global coverage map

not only meet the rapidly expanding demand for truly global mobile communications in the skies, it will also substantially enhance and extend Iridium mobile communications services, delivering higher data speeds; powerful new services and devices; advantages of IP technology; and backward compatibility with current devices and applications.

Iridium announced the execution of a fixed-price contract with **Thales Alenia Space** for the design and construction of satellites for the Iridium NEXT constellation. In addition, **Coface**, the French export credit agency, has issued, for the account of the French State, a *Promise of Guarantee* which commits to cover 95 percent of the \$1.8 billion credit facility for the project.

Proving FlytStream

To demonstrate the reliability and effectiveness of FlytStream-over-Iridium, AMS has worked with two airlines to test the technology on transatlantic and terrestrial passenger-service flights.

One of the trials, launched in fall 2009 and concluded during the second quarter of 2010, evaluated the data-streaming capability of an afirs 220 device outfitted on two Airbus A320s and a Boeing 757.

Another ongoing trial is using a Boeing 767. Both the Airbus and Boeing aircraft models are considered *data rich*, meaning their data buses collect enough information from FDRs to fully describe the airplanes' performance and status during flight.

In both trials, the aim was to use the FlytStream function to transmit as much of the FDR data as possible over Iridium while the aircraft were flying. Of particular interest was to demonstrate that Iridium's bandwidth was sufficient to handle the volume of data flowing from the FDR data file to the ground. The criteria for success was to demonstrate that FlytStream-over-Iridium had the ability to transmit enough in-flight data to be of value to airline operators, airframe and engine manufacturers, and government agencies that conduct airplane accident investigations.

Results from the trials clearly revealed the feasibility and power of using FlytStream-over-Iridium to monitor in-flight performance and position in near real time. With UpTime software tools, AMS staff involved in the testing was able to use data streamed from the aircrafts' FDRs to recreate an animation and diagnostics sufficient for an investigation board to determine what was happening to the aircraft.

The afirs 220 uses an Iridium transceiver capable of transmitting data at a rate of 2,400 kilobits per second. The trials showed that, due to AMS' ability to compress data passing through the smart box, the Iridium network had more than enough bandwidth to handle the load. During testing, the system was able to continuously stream data representing hundreds of aircraft performance parameters.

Underscoring the significance of the FlyhtStream trials, the *Bureau d'Enquetes et d' Analyses (BEA)*, the French government board that investigates airplane accidents, invited AMS to join a working group that was formed in response to the Air France 447 tragedy. Since then, AMS has worked with the BEA group to further demonstrate and extend FlyhtStream's capabilities. For example, to confirm the accuracy of the data-streaming trigger system, AMS programmed the triggers identified by the BEA working group into an afirs 220 unit being used in the trials. Those triggers were run against an on-ground FDR database that AMS maintains

to confirm the unit was not falsely triggering and that all triggering events did in fact launch the FlyhtStream mode.

In addition to its collaboration with the BEA, AMS was invited to join a consortium of airlines, aircraft manufacturers, data service providers and air traffic control entities involved in the **OPTIMI** project, an initiative launched by the *European Commission* to improve in-flight tracking and air traffic management. **OPTIMI**, an acronym for *Oceanic Position Tracking Improvement Management Initiative*, is evaluating existing technology that could be deployed to improve air safety. AMS is sharing information on its data-

streaming trials with the *Critical Event Detection and Reporting (CEDAR)* consortium that is carrying out the OPTIMI members, including **Air France, Air Europa, Airbus**, five Air Navigation Service Providers, a Communications Service Provider and AMS.

Technology Is Proven

AMS has proven that its afirs FlyhtStream-over-Iridium mode is capable of continuously streaming in-flight data from an aircraft's FDR to the ground in near real time. FlyhtStream is a unique capability developed as part of the afirs 220, an on-board smart avionics device produced by AMS. The afirs 220 has been certified as airworthy and currently is being deployed by more than 30 customers on revenue-producing transoceanic, terrestrial, and polar passenger and cargo flights.

At this point, attention is turning to developing a formal set of procedures that can be used to standardize the use of FlyhtStream. That process will involve

aviation regulators, aircraft and equipment manufacturers, and airlines and industry technologists.

AMS has met the regulatory requirements to install and operate the FlyhtStream application on commercial aircraft. Aircraft crashes are rare, but often result in the tragic loss of life when they do occur.

It is hoped that FlyhtStream will be used to help prevent aircraft crashes, not merely record them.



Executive Spotlight

Cliff Cooke

President + CEO, Wavestream

Clifton L. Cooke, Jr., served as Executive Vice President of Kratos Defense and Security Solutions. Prior to its merger with Kratos, Cliff was President and CEO of SYS Technologies, an \$80M provider of information connectivity solutions that capture, analyze and present real-time information to the Department of Defense (DoD), Department of Homeland Security, other government agencies and large industrial companies. Cliff also served on the Board of Directors of SYS. Previously, Cliff was founder and CEO of VisiCom Laboratories, which provided embedded real-time products and services to industry and government customers. VisiCom grew to over \$50 million in revenue before being acquired by Titan Corporation, where Cliff subsequently served as Executive Vice President. Prior to starting VisiCom in 1988, Cliff was founder and CEO of Advanced Digital Systems (ADS), which provided engineering services for DoD satellite programs. Cliff received his bachelor's degree in Applied Physics and Information Science from the University of California, San Diego.



SatMagazine

Mr. Cooke, how did you become involved in the SATCOM industry?

Cliff Cooke

I've been involved with SATCOM, communications and RF engineering since 1971. I began as an engineer working at what is now known as Space and Naval Warfare Command in San Diego. Since

then, I've started and grown several successful high tech companies, each involved to some measure with the development of communications products and services to suit defense, government and commercial applications.

The SATCOM industry continues to grow, providing valuable capabilities and offering new opportunities using innovative solutions that address a broad spectrum of requirements, whether for operations

facing the war fighter and the nation, or for consumers and businesses who need convenient, global access to video, voice and data information. Wavestream has had the opportunity to contribute truly enabling technology to support the industry's growth. I am proud of what Wavestream has accomplished and believe we have successfully leveraged the company's technology leadership and manufacturing innovation into an industry-recognized reputation for product reliability and quality.

It is easy for us to forget that satellites were first envisioned in science fiction. We truly are living in an environment where the "fictional" world is leading the real world in imagining what is possible. TV shows such as "24" offer a basis for warfighters to think about what they really could do with bandwidth of that magnitude. Don't laugh, it's happening. Just as we have UAVs providing sensor information and combat weapon systems, we have soldiers providing more and more sensor information, including real time, high definition video. I remain awestruck by the

SatMagazine

You have been involved with DoD satellite programs for over three decades. What have been the most significant advancements and where do you see it heading over the next few years?

Cliff Cooke

Actually I've been involved for four decades, but who's counting? SATCOM is a critical element of the communications infrastructure for the U.S. and foreign military. The number of satellites has increased dramatically and technology advancements in modems, antennas, encoders and compression technologies, as well as power amplifiers has helped meet the accelerating demand for greater access to real-time information at all levels in the chain of command. The DoD's growing network-centric focus has rapidly increased the demand for war fighter bandwidth, particularly as operations occur in more remote and rugged environments. Bandwidth per soldier has increased five times since the year 2000, and we don't see that trend stopping anytime soon.

Executive Spotlight

need to provide psychological support for combat stress to war fighters living in North Dakota, who are controlling equipment operating in Southwest Asia. The impact of satellite technology is just overpowering. Where else is the bandwidth that is accessible anywhere worldwide going to come from, but satellites providing seamless connectivity to local area, wireless networks? The US Army Win-T and SNAP programs are great examples of these kinds of technologies being implemented today. As a result, all of this technology and network connectivity will provide significant capabilities for police, fire and other first responders.



Shown in this photo is the WIN-T Increment One Satellite Transportable Terminal at the WIN-T Increment Two Engineering Field Test, Fort Huachuca, AZ. (U.S. Army photo by Richard Mattox.)

Mobility for global reach is making smaller terminals more desirable, putting pressure on power amplifier companies to deliver more compact, more efficient products that support multiple frequencies and higher data rates. There is additional pressure to purchase COTS' products to help field systems in a shorter time period, reduce overall system costs, and significantly reduce system development and integration cycles. Systems must be extremely reliable and be ready to deploy quickly to provide key communication links for critical military operations, disaster relief, humanitarian assistance, and search, rescue and recovery efforts anywhere in the world.

Going forward, SATCOM will help ensure connectivity to get information to those who need it, when they need it and where they need it. We look for the requirements to provide smaller and lighter equipment as a driver to provide more capability to individual war fighters. While we may not be "beamed up to Scotty", we will be able to talk to him. Scotty, wherever he is, will be able to see and hear what those on scene see and hear, and that enhances the overall situational awareness and decision-making capabilities, resulting in increased effectiveness and more importantly, greater safety for those on scene.

SatMagazine

Do you work with the Department of Homeland Security as well? How do you see them evolving?

Cliff Cooke

Not really. I have tried repeatedly to provide state-of-the-art situational assessment systems to our own local governments and DHS. We continue to demonstrate the benefit of those capabilities, but progress is very slow.

Wavestream supports integrators who provide systems support to international emergency response agencies. The international first responder community seems to be taking the lead in actually buying products, putting them in the field, and seeing the operational benefits. The same issues facing the military can also be found in DHS and international response agencies, namely the increasing demand for high data rate mobile communications to support emergency and homeland security applications. We are seeing a trend towards comms-on-the-move, which provides the mobility needed to support first

responders in challenging environments where terrestrial infrastructure is not as robust, and setting up a base station at one location is not an option for many reasons, safety being a critical one. The trend is to have seamless connectivity on the move, anywhere in the world. Again, smaller, lighter, rugged and mobile SATCOM systems to handle real-time video and data information will provide the critical link for emergency, security and disaster preparedness and response.

SatMagazine

In the areas of SSPAs and Block Upconverters (BUCs), which markets seem best positioned for growth?

Cliff Cooke

Wavestream has seen tremendous growth from the DoD with the transition to smaller, lighter and more capable terminals. We believe that we are the leaders in providing products today that achieve our customer goals in this area. We believe that our R&D efforts will enhance these capabilities significantly in the next three years. The transfer of our technology from the university laboratory to the field has improved performance and reduced package size and weight. This capability has made Wavestream products the ideal feed-mount solutions for the new, smaller antennas. We are proud to have shipped over 6,000 Ka and Ku-band amplifiers to support war fighters operationally in some of the most extreme environments imaginable.

Wavestream is uniquely poised to continue providing field-proven solutions to meet the DoD's mission requirements as bandwidth demand increases and as harsh terrains continue to drive the need for amplifiers that offer optimal size, weight and performance capabilities. Likewise, these capabilities are desired by non-military customers for the very same reasons.

We also see substantial growth in the broadcast industry for SSPAs and BUCs. Like the DoD customer, reliability, efficiency and smaller, lighter product packages are critical, particularly for SNG and

flyaway applications. SSPAs are increasingly viewed as attractive replacement alternatives to TWTAs to help broadcast sites improve functionality and reduce operational, energy and lifecycle maintenance costs. Wavestream can offer broadcasters and teleports significant cost savings as they move to solid state from the TWT environment.

Wavestream has not only anticipated this need but introduced solid state products as viable alternatives to consumable TWTAs, offering significant lifecycle cost savings. Wavestream's solid state product line is equivalent in size, weight, function, efficiency and price to traditional TWTAs. Our patented spatial power combing technology offers equal performance and the added value in energy savings in redundant configurations. TWTAs must remain in a warm-stand-by

mode 7/24, constantly using up power and operational life. Our SSPA solutions operate in a cold stand-by mode, with no power usage. Customers save energy costs over the life of the system, which in can add up to hundreds of thousands of dollars annually.

SatMagazine

The increasing use of SATCOM for broadcasting, from delivery of SD, HD and 3D content, is taking its toll on satellite capacity. How can products such as yours assist in this regard?

Cliff Cooke

The solution for diminished availability based on increased demand is not going to go away through the application of better power amplifier technology alone. Broadcasters need a more cost efficient way of delivering the increased demand for content bandwidth with high reliability. Wavestream will play a role by offering higher frequency solutions at higher power levels using solid state technology. Clearly, optimization of networks, modem and compression technology play significant roles in meeting demand now and in the future.



Executive Spotlight

SatMagazine

How important is troposcatter for both the commercial and military user? How is such implemented by Wavestream?

Cliff Cooke

Special users are looking at alternatives to provide the connectivity and information flow they need. Anything that can reduce SATCOM dependency and provide high capacity communications channels will also decrease the demand and load on satellites. Troposcatter mobile technology has advanced to permit tropo systems to be set-up and operate high data rate communications within one or two hours, as opposed to the up to 24 hours for older systems. Tropo is a much lower cost, tactical medium range, point to point communications mode to SATCOM. For military users, tropo offers a back-up alternative to increasingly vulnerable satellites. Troposcatter implementation depends on architecture, terrain and many other factors, and continues to be considered by the military in some scenarios.

Wavestream SSPAs for tropo systems have been proven successful in operational environments. We are confident we can help make troposcatter systems successful based on our demonstrated performance to date. We have previously seen companies deciding to build their own high power tropo amplifiers internally, but we have not seen products fielded to date. Given our experience and knowledge, Wavestream is in a unique position to supply proven tropo products when the need arises.

SatMagazine

One area critical to the success of any company is their customer support. How does Wavestream manage their operations in this regard?

Cliff Cooke

I am proud that Wavestream's reputation for product reliability and high quality standards has resulted in extremely high customer satisfaction and extremely low product support inquiries and RMAs. However, when an inquiry has been logged, our support team has a track record for quickly advancing a resolution to help keep customer systems up and running. For Wavestream, the constant emphasis on quality, reliability, rapid customer response, and problem resolution is at the core of our continued

success and growth going forward. Fortunately, our early growth has been based upon sales to large military integrators that provide most of the day-to-day handling of end-user customer calls. As we grow internationally and into commercial markets, we have been expanding our support through our representative network and through establishing key support centers in strategic locations such as Singapore, China and the UK. As we continue to grow, we continue to expand this area and are constantly looking for partners to help us maintain support across the globe.

SatMagazine

What can we expect to see from Wavestream over the coming months?

Cliff Cooke

We're continuing to grow and expand our product lines to support new technology directions and new market requirements. We are paying particular attention to the creation of new technology and product solutions to meet the challenges facing customers who need to improve efficiency and reduce costs while migrating to increasingly bandwidth-intensive content distribution. Wavestream is an established, trusted supplier of Ku- and Ka-band amplifiers to the DoD and has proven market leadership in the development and delivery of solid state amplifiers for flyaway and on the move systems.

Our product roadmap includes several new product introductions to expand that market leadership, including the introduction of solid state amplifiers to support the anticipated rapid growth in X-band and commercial Ka-band, both domestically and internationally. In addition, we're planning to release more C- and Ku-band products to support the broadcast market to replace aging tubes with more efficient technology. You should expect to see at least one new Wavestream product each quarter for the next two years.

Further out on the horizon, you will see Wavestream's spatial power combing technology fielded in higher frequency bands for both SATCOM and non-SATCOM applications.



Solutions From Space: Disease + Pandemic Early Warning

author: Mariel John, Research Analyst, Space Foundation

Millions of people die every year from preventable diseases, such as malaria and cholera. Pandemics put the world population at risk and have the potential to kill thousands and cripple the global economy. In light of these dangers, it is important to make use of technologies that can help address these issues. The data and imagery gathered by environmental remote sensing satellites can be used to develop models that predict areas at risk for disease outbreaks. These early warnings can help decision makers undertake preventive and control measures.

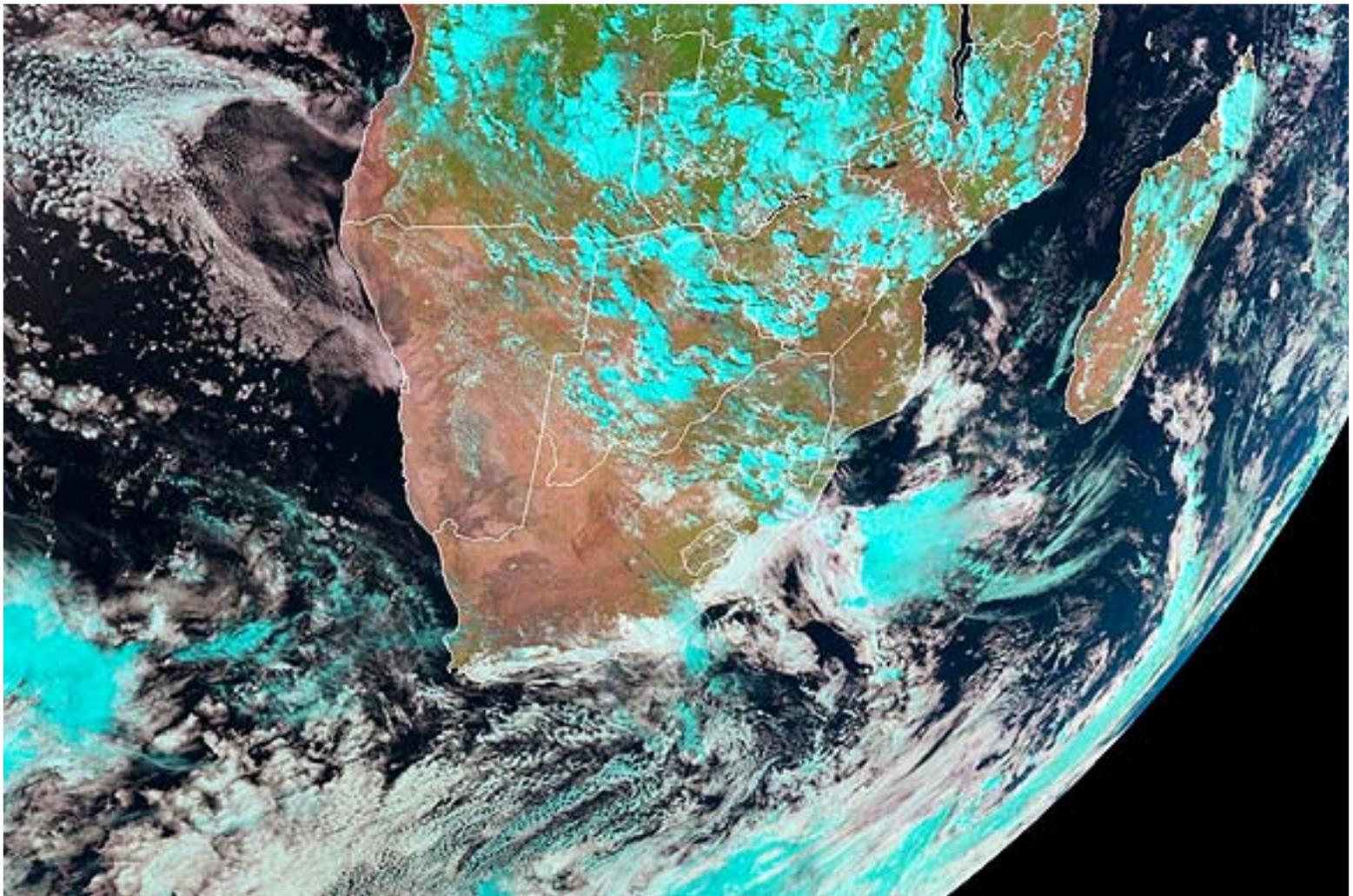
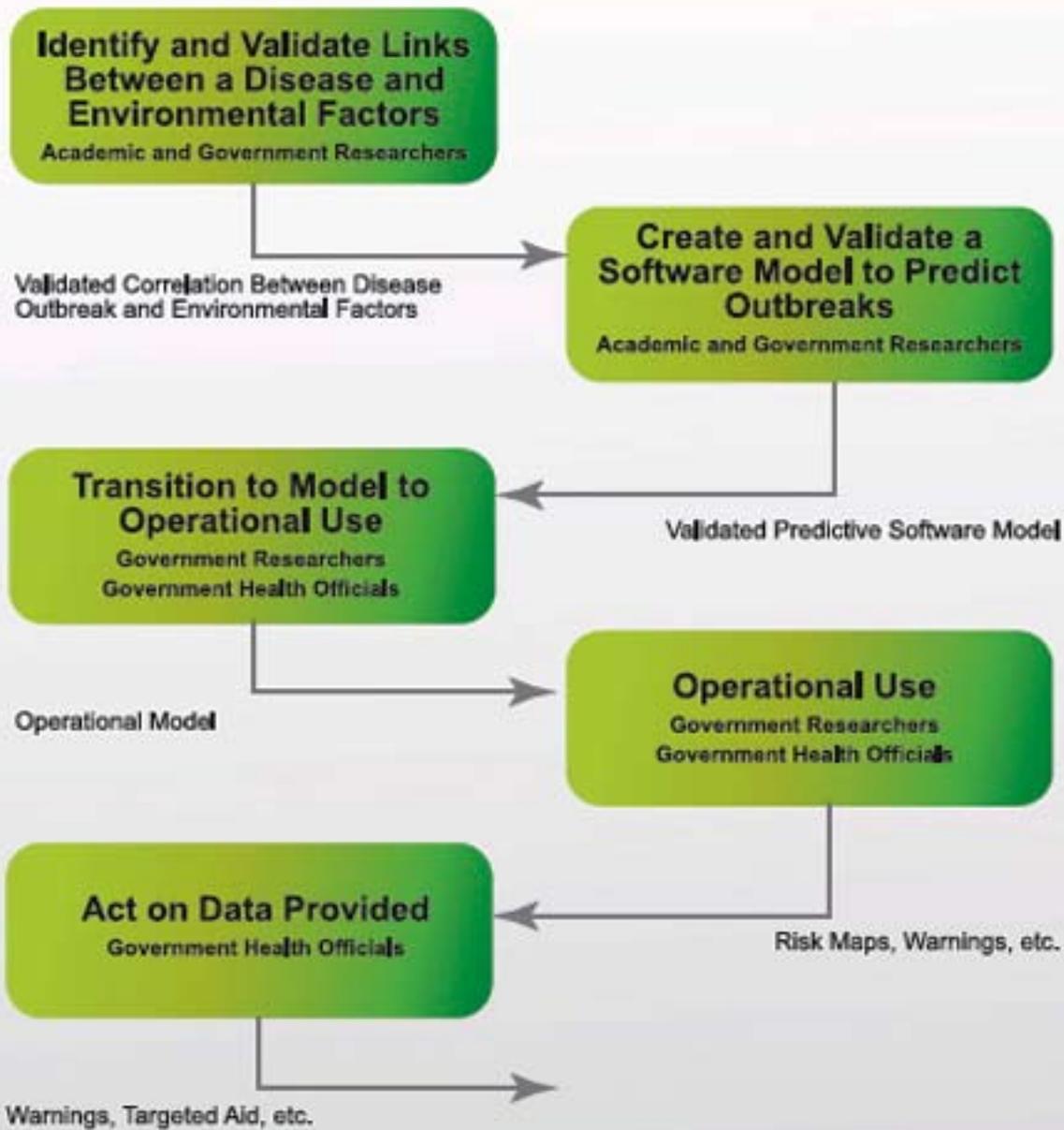


Image courtesy of EUMETSAT

Development of a Climate-Based Disease Prediction System



There are already many Earth observing satellites with the ability to provide relevant data and imagery. Researchers have created models based on this information, and some are already being used. The Space Foundation believes these capabilities should be further developed and supported by governments and international organizations to benefit as many people as possible.

To understand the benefits and challenges of space-based disease early warning models, it is useful to understand how they are developed. A number of steps must be taken for satellite data and imagery to be used to prevent disease outbreaks; each requires a variety of inputs and may include a range of experts and other stakeholders.



The National Oceanic and Atmospheric Administration (NOAA) Advanced Very High Resolution Radiometer (AVHRR) is a sensor that provides some of the most commonly used data for disease prediction models. The AVHRR is an instrument on board the NOAA Polar Operational Environmental Satellite (POES), which circles the Earth 14 times each day.

AVHRR uses six detectors that collect light at different wavelengths, allowing it to monitor cloud cover, ground temperature, vegetation, land-water boundaries, snow and ice, and sea surface temperature.⁴

The POES satellites, one of which is shown above, are used for Earth observation. Credit: NASA

Disease + Environmental Factors: The Links

Remote sensing satellites cannot directly detect disease outbreaks but they are able to detect a wide range of environmental factors, such as ground water, vegetation, or flooding.¹ Before a model can be developed, an association must be found between environmental factors and the ecology of the disease agent or host. This is usually possible for vectorborne diseases, in which a third party, or vector, is necessary

to transmit the disease. Malaria, which is spread by mosquitoes, provides a good example. Mosquitoes breed in water, so they are often more prevalent when there is a greater amount of surface water. Increased amounts of surface water or rainfall, which can be detected by remote sensing satellites, represent a possible predictor for an outbreak of malaria in regions where the disease is known to exist.²

These models are more effective when they integrate other data sources that help to identify multiple links between environmental factors and a disease. In addition, some models incorporate the biological process of susceptibility, exposure, infection, and recovery. This requires an understanding of what causes people to be particularly vulnerable to a particular disease, the ways in which people come into contact with the disease, the process by which the infection affects the body, and the process of recovery.³

It is also important for these models to include information about the region being studied, often referred to as geospatial information. For example, predictions of areas at risk of outbreak should take into account the population density throughout the region. If an area likely to have many mosquitoes is also near a village, there is a higher risk of a malaria outbreak than would be the case for a very sparsely populated area.

Once these associations have been identified, historical data is used to demonstrate that there is a correlation between the environmental factors and disease outbreaks. In addition to the satellite imagery and population data, it is necessary to gather epidemiological data, including information about when and where outbreaks have occurred in the past, in order to validate the connection. This data can be difficult to acquire, particularly for rural areas or in developing countries. Because of the wide range of environmental factors that could affect the spread of disease in different areas, it is necessary to have data representing as much of the area of interest as possible. This first step, which includes identifying and validating links between diseases and environmental factors, is usually carried out by researchers either in academia or government.⁵

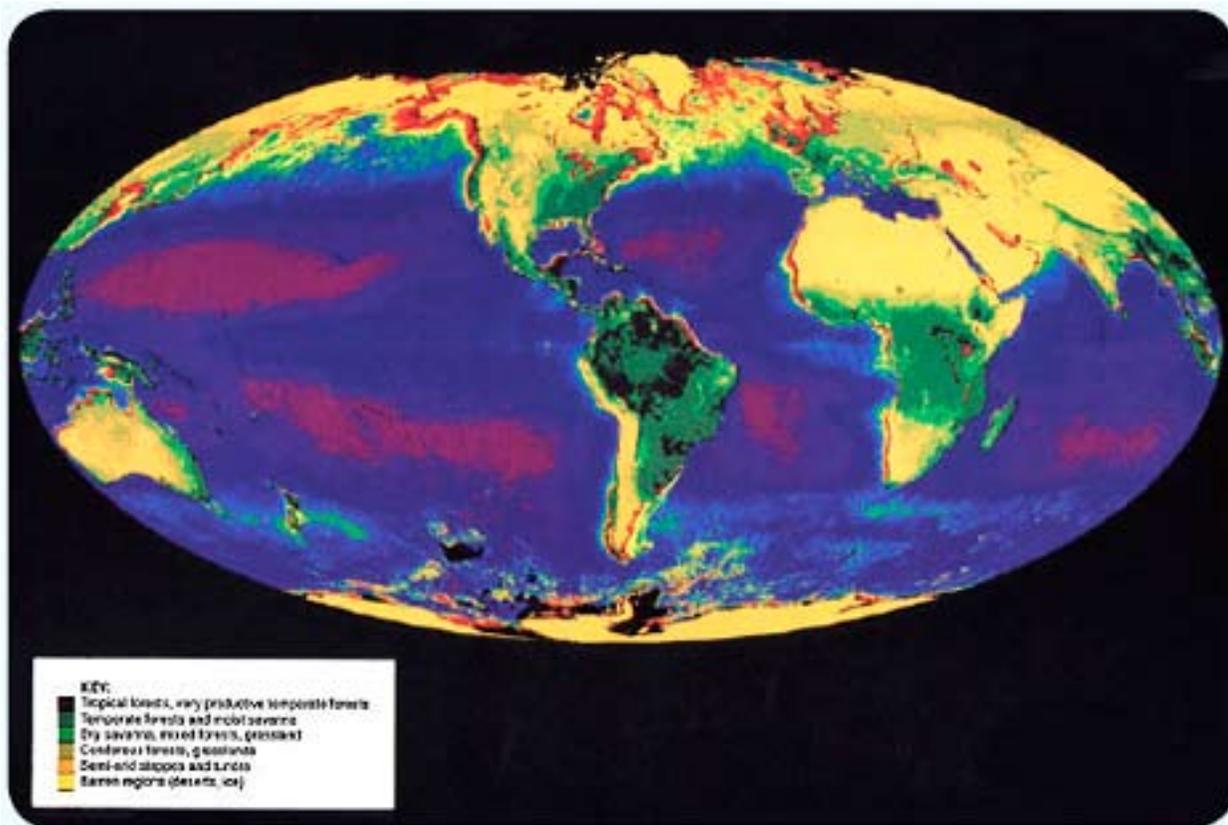


Image of the Earth created by the AVHRR instrument, which is often used in disease early warning models. Credit: NASA

that is relatively inexpensive to treat, it may be more effective to spend available funds on broad distribution of vaccines or other preventive medicines rather than developing and operating a model to predict high-risk locations.⁹

If it is deemed beneficial to transfer a model to operational use, connections must be made with government health officials and other stakeholders. These stakeholders

Creation Of A Model

The next step in developing a disease early warning system is creating a software model. This model is based on the connection between disease outbreaks and environmental factors that have already been identified and validated. Its focus is on using the satellite data and geospatial data to predict areas at risk for disease outbreaks. For this step, it is worthwhile to consider the types of products that may be useful to stakeholders, such as color-coded risk maps. Again, historical epidemiological data will be necessary to validate the model's predictive capabilities. This step in the process requires significant effort and support from a customer interested in using such an operational model. Generally, this is carried out by government researchers.

Transition To Operational Use

After a predictive model has been developed and validated based on historical data, it can be put into operational use. This may require additional research and modification of the model, to allow its use in real time. Before making this transition, the cost and benefits should be considered. For a disease

can help in identifying the type of outputs that will be most useful, including risk maps, text warnings, or other information.

Operational Monitoring

Once the predictive system is operational, it must actively monitor the region at all times so it can be used to produce risk maps, warnings, and other outputs as needed. This requires a source of continuous, timely satellite data and imagery as well as geospatial information. It is necessary to maintain a permanent facility to host the software model and accompanying hardware, as well as trained professionals to operate the model and work with stakeholders. Risk maps, warnings, and other products must be produced on a regular basis and provided to government health officials.

Taking Action

The final step in the process is carried out by the government health officials who receive the outputs from the operational disease prediction model and must decide how to act. They may choose to issue warnings in high risk areas along with suggested methods for reducing the population's risk from the

Disease	Transmission	Distribution	Climate-Epidemic Link
Cholera	Food- and waterborne transmission	Africa, Asia, South America, Russia	Increases in sea and air temperatures as well as El Niño events associated with epidemics. Sanitation and human behavior also are important.
Malaria	Transmitted by the bite of female <i>Anopheles</i> mosquitoes	Endemic in more than 100 countries throughout the tropics and subtropics	Changes in temperature and rainfall associated with epidemics. Many other locally relevant factors include vector characteristics, immunity, population movements, and drug resistance.
Meningococcal meningitis	Airborne transmission	Worldwide	Increases in temperature and decreases in humidity associated with epidemics.
African trypanosomiasis	Transmitted by the bite of male and female tsetse flies.	Sub-Saharan Africa	Changes in temperature and rainfall may be linked to epidemics. Cattle density and vegetation patterns are also relevant factors.
Dengue	Transmitted by the bite of female <i>Aedes</i> mosquitoes.	Africa, Europe, South America, Southeast Asia, West Pacific	High temperature, humidity, and heavy rain associated with epidemic. Non-climatic factors may have a greater influence.
St. Louis encephalitis	Transmitted by the bite of female <i>Culex</i> and <i>Aedes</i> mosquitoes.	North and South America	High temperature and heavy rain associated with epidemic. Reservoir animal factors also are important.
Rift Valley fever	Transmitted by the bite of female <i>Culex</i> and <i>Aedes</i> mosquitoes.	Sub-Saharan Africa	Heavy rains associated with onset of epidemic. Cold weather associated with end of epidemic. Reservoir animal factors also are important.
Murray Valley fever	Transmitted by the bite of female <i>Culex</i> mosquitoes	Australia	Heavy rains and below-average atmospheric pressure associated with epidemic.
Lyme disease	Transmitted by ixodid ticks.	North America, Europe, and Asia.	Temperature and vegetation patterns associated with distribution of vectors and disease.

Common Communicable Diseases, Their Distribution, and Sensitivity to Climate⁶

disease. In the case of malaria, this may include avoiding outdoor activities during dawn and dusk, when mosquitoes are most active. Another option is to use risk maps to target high risk areas to receive aid resources, such as mosquito nets or preventive medicines. This type of targeted aid may be more effective because it reaches people most in need.

It is also more efficient because funds are spent only in areas that are likely to need them. These warnings and other actions can result in lives saved and in the prevention of the outbreak of a disease. Many of the diseases discussed in this paper are endemic to the regions in which they are found. In these cases, the response to an early warning may simply be an amplification of controls that are already in place.

Although these activities are presented as discrete steps, many of them occur continuously, and there are many feedback loops. After an operational model is developed, researchers may continue to identify and validate links between the disease and additional environmental factors. New software models may be developed using improved algorithms. Any of these developments may improve the quality and effectiveness of a system that is already in operation. Similarly, the process of developing useful products for stakeholders does not necessarily stop after a model becomes operational. It is often worthwhile to improve the utility of outputs from the system.

Existing Models

A significant amount of research has been done regarding the link between remote sensing data and disease, and this research continues in academic centers around the world.¹⁰ In the United States, NASA, the Department of Defense (DoD), and the Centers for Disease Control (CDC) and Prevention all have ongoing programs.¹¹ The European Space Agency (ESA) runs a project called Epidemio, which is intended “to provide Earth observation-derived information on the environment to epidemiologists working to study, monitor and predict threats to human health.”¹² The Canadian Space Agency, in cooperation with Kenya’s National Malaria Control Program, funded the demonstration of Earth observation technology for identifying natural mosquito habitats and predicting malaria risk in Africa.¹³ International organizations, such as the United Nations, the World Health Organization (WHO), and the Group on Earth Observations (GEO) are also involved in this effort.¹⁴

In a 2004 report, the World Health Organization noted that efforts to prevent a number of diseases have the potential to benefit from environmental prediction models. These diseases include malaria, cholera, diarrheal diseases, meningococcal meningitis, leishmaniasis, African trypanosomiasis, dengue fever, St. Louis encephalitis, Rift Valley fever, Ross River virus, Murray Valley fever, and Lyme disease. Populations all over the world suffer from these diseases, and all could benefit from climate-based prediction models.

FEWS NET

Disease outbreaks are not the only dangers that can be predicted using remote sensing data. The United States Agency for International Development (USAID) collaborates with NOAA, NASA, the U.S.

Geological Survey, and other agencies to operate the Famine Early Warning System Network (FEWS NET). The program provides early warning and vulnerability information on food security issues.

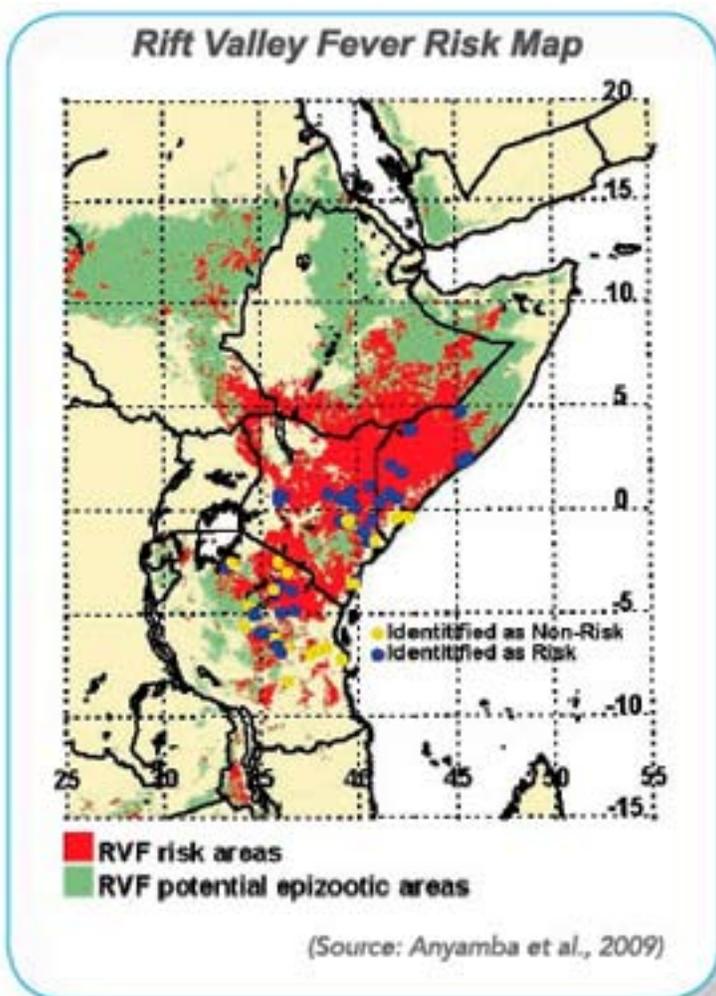
FEWS NET uses satellite remote sensing data to monitor climate, ground vegetation, and other conditions, and combines this data with a variety of other geospatial data. When issues are identified, FEWS NET alerts officials in countries around the world.⁷ FEWS NET also supports experimental malaria risk maps based solely on rainfall.⁸ As operational disease prediction models become more common, they may be able to benefit from collaboration with the FEWS NET program.

Insight

Despite this widespread activity and the high number of relevant diseases, there are few operational models currently in use. The following section provides an overview of three such models.

Rift Valley Fever Early Warning Tool

Rift Valley Fever is a disease that affects both animals and humans. It can be spread by infected mosquitoes or through contact with an infected animal. The disease is almost always fatal for livestock, such as sheep or cattle, although it is rarely fatal for humans. Prediction of Rift Valley Fever outbreaks is available through **NASA's Goddard Space Flight Center**. NASA uses near-real-time satellite vegetation measurements and climate data to generate predictions of epidemics in East Africa several months before an outbreak might occur. NASA researchers analyze the data and provide monthly reports and risk maps. The model successfully predicted an outbreak in 2006-2007, providing warnings two to six weeks in advance. This allowed local health authorities to implement programs for public awareness, mosquito control, and vaccination.¹⁵



Prediction for Flu Epidemics

In the spring of 2009, the World Health Organization (WHO) declared the H1N1 virus, commonly known as swine flu, a global pandemic, and millions of doses of H1N1 vaccinations have been manufactured and delivered.¹⁸ WHO has previously noted that decreases in temperature during the winter season are associated with influenza epidemics, but that a range of human-related factors are more significant.

The seasonal variability of the disease suggests that it may be possible for a climate-based model to provide some advanced warning. However, it is not clear precisely how the seasonal variations are tied to climatic conditions. Scientists are continuing to research and attempt to identify any such connections. If they are able to do so, it may be possible to develop a predictive model for the H1N1 virus, or for other influenza viruses, based on satellite remote sensing data.

NASA Malaria Modeling and Surveillance

NASA carries out its *Malaria Modeling and Surveillance* project in partnership with **U.S. Air Force Special Operations Command**. According to the **World Health Organization**, there were 247 million cases of malaria and nearly one million deaths in 2008. Malaria is spread by mosquitoes and is particularly common in tropical areas.¹⁶ NASA's monitoring and prediction program is focused on Thailand, with the aim of allowing U.S. overseas

forces to deal with the threat of malaria in this location. NASA provides data, model outputs, and analytical and modeling experience. The goals of the project include identifying the habitats for malaria vectors (mosquitoes), estimating current risks and predicting future risks, and also better understanding transmission characteristics to allow more cost effective malaria control. Climate data is gathered using a variety of remote sensing instruments on a number of different satellites. Epidemiological data is provided by the World Health Organization and the Ministries of Health in Afghanistan, Indonesia, and Thailand. Although predictions are not available online, data is shared with local public health organizations to help reduce risks among the general populations.¹⁷

Meningitis Decision-Support Tool

The **Group on Earth Observations (GEO)** is coordinating efforts to use Earth observations to help predict outbreaks of meningococcal meningitis. Meningitis is a dangerous disease that can cause severe brain damage and is fatal in 50 percent of cases if untreated. Meningitis epidemics occur regularly, on a four to seven-year cycle, in an area of Africa known as the “Meningitis Belt,” which stretches from Senegal to Ethiopia.¹⁹ The World Health Organization estimates that 300 million people in this area are at risk each year. Between January and April 2009, a Meningitis outbreak killed more than 1,000 people in west Africa.²⁰ Unlike other diseases monitored by other operational systems, meningitis is spread person-to-person, not through a vector.²¹ Despite this fact, research has shown that environmental factors such as temperature changes, humidity levels, and concentrations of sand and dust aerosols seem to influence the occurrence of epidemic outbreaks. Data on these factors can help to understand and predict the timing, occurrence, and extent of outbreaks. The *GEO Meningitis Decision-Support Tool* is still under development. A modeling framework will be tested using information from the 2009 season. Following this testing, GEO will incorporate environmental information into the model to demonstrate the new decision-support tool.²²

Conclusion and Recommendations

The **Space Foundation** believes disease prediction using satellite remote sensing data represents a unique opportunity to combat disease and save lives. There are many things that governments and researchers can do to make this opportunity a reality.

Data

- » ***Governments at all levels (national, regional, local) should support regular collection of geographically referenced data for their regions, including epidemiological and demographic data. This data would give the specific geographic location of population centers and past disease outbreaks.***
- » ***Governments and other organizations should make an effort to collect records electronically in geographically referenced databases, rather than on paper, to allow their use in the development of these models. In addition, paper records should be converted into electronic data.***²³
- » ***While privacy should be respected, governments should make an effort to make epidemiological and other data available to researchers.***
- » ***Governments should ensure the continuation of remote sensing satellite programs that provide remote sensing data with sufficient quality for use in disease prediction models.***
- » ***Governments should explore ways to collaborate on the use of remote sensing data to improve the capabilities for disease prediction, similar to current agreements to provide remote sensing assets in the case of disasters.***
- » ***Governments, academics, and non-governmental organizations should coordinate to define data requirements, formats, and schema for data representation. When possible, they should attempt to provide interoperability with existing health management tools to facilitate the collection, codification, sharing, and use of data required for these models.***



Research + Development

- » *Governments should support research aimed at better understanding the connection between environmental factors and the most prevalent or costly diseases.*
- » *Interdisciplinary cooperation should be encouraged to ensure that researchers combating infectious diseases are able to work with medical, computational, and space professionals.*
- » *Governments should support research to consider whether these models may be expanded to address additional challenges, such as new risks stemming from climate change or economic development planning.*

Operational Models

- » *Government agencies should draw on research models created in academia to develop operational systems*
- » *Regional and international collaboration should be undertaken in developing and operating disease prediction models to help share costs and ensure benefit for a wide range of nations.*
- » *The socioeconomics of the affected regions present significant challenges to the implementation of an early warning system. Nations should pursue cooperative relationships with international organizations, such as the United Nations, to develop and operate models. At the same time, international organizations and countries with advanced remote sensing capabilities should actively seek to engage and work with nations that could benefit from this technology.*
- » *Measures of predictive accuracy and response effectiveness should be developed to allow evaluation of the early warning models. This information can help to determine which interventions are most effective. Data collected may include measures of human life and economic savings resulting from the intervention.*

Action

- » *Operational models should receive support from multiple government agencies, particularly those for public health and for space assets, to ensure information generated by the model can be used efficiently.*

If you have questions about this article, contact...
Research@SpaceFoundation.org.

Micah Walter

Range Director – Research and Analysis
 202.618.3062

Mariel John

Research Analyst 202.618.3064

To learn more about the Space Foundation, visit
www.SpaceFoundation.org

Space Foundation research products can be found at

www.SpaceFoundation.org/research

About the author

As a research analyst for the Space Foundation, Mariel John analyzes space policy and emerging space issues, authors' white papers and research reports on key space issues, monitors legislation that affects space policy and supports development of the Space Foundation's annual report on the space industry, *The Space Report: The Authoritative Guide to Global Space Activity*. She has a bachelor's degree in aerospace engineering with a minor in applied international studies from the Massachusetts Institute of Technology and a master's degree in international science and technology policy from the George Washington University. She is currently pursuing a Ph.D. in public policy at the University of Maryland, focusing on space policy. Ms. John is based in the Space Foundation's Washington, D.C., office and frequently presents at U.S. and international space conferences.





One of NOAA's polar orbiting satellites (POES), artistic rendition courtesy of NASA

References

¹“CHAART Sensor Characteristics: Current and Future Sensor Systems.” Earth Science Division. NASA, Sept. 2004. Web. 24 Aug. 2009. <<http://geo.arc.nasa.gov/sge/health/sensor/cfsensor.html>>

²Shaman, Jeffrey, and Jonathan F. Day. “Achieving Operational Hydrologic Monitoring of Mosquitoborne Disease.” *Emerging Infectious Disease* 11.9 (2005). Centers for Disease Control. Sept. 2005. Web. 24 Aug. 2009. <<http://www.cdc.gov/ncidod/EID/vol11no09/05-0340.htm>>

³Kiang, Richard. “Remote Sensing and Disease Prediction.” Message to the author. 12 Aug. 2009. E-mail

⁴“Advanced Very High Resolution Radiometer.” NOAA NESDIS Direct Services Division. Web. 24 Aug. 2009. <<http://noaasis.noaa.gov/NOAASIS/ml/avhrr.html>>

⁵*Using Climate to Predict Infectious Disease Outbreaks: A Review. Rep.* Geneva: World Health Organization, 2004. Print

⁶*Using Climate to Predict Infectious Disease Outbreaks: A Review. Rep.* Geneva: World Health Organization, 2004. Print

⁷“FEWS NET.” Web. 24 Aug. 2009. <<http://www.fews.net/pages/default.aspx?l=en>>

⁸“Africa Data Dissemination Service.” FEWS NET Early Warning System. 3 Feb. 2004. Web. 24 Aug. 2009. <<http://igskmncnwb015.cr.usgs.gov/adds/readme.php?symbol=ml>>

⁹Kiang, Richard. “Remote Sensing and Disease Prediction.” Message to the author. 12 Aug. 2009. E-mail

- 10** Lobitz, Brad, and Louisa Beck. "Climate and infectious disease: Use of remote sensing for detection of *Vibrio cholerae* by indirect measurement." *Proceedings of the National Academy of Sciences* 97.4 (2000): 1438-443. PNAS. 15 Feb. 2000. Web. 24 Aug. 2009. <<http://www.pnas.org/content/97/4/1438.full.pdf+html>>
- 11** Stone, Andrea. "Earthbound mission for NASA: Public health." *USA Today*. 12 Dec. 2007. Web. 24 Aug. 2009. <http://www.usatoday.com/tech/science/space/2007-12-11-nasa_N.htm>. "Public Health." *Science*. NASA, 22 Jan. 2009. Web. 24 Aug. 2009. <<http://nasascience.nasa.gov/earth-science/applied-sciences/national-applications/public-health>>
- 12** "Disease Surveillance." *Space For Health*. European Space Agency, 2 July 2008. Web. 24 Aug. 2009. <http://www.esa.int/esaMI/Space_for_health/SEMNVMB474F_0.html>. "EO in Epidemiology." *Epidemio*. 2004. Web. 24 Aug. 2009. <<http://www.epidemio.info/index.php?section=homepage>>
- 13** "Satellites Projects." *Canadian Space Agency*. 16 Oct. 2006. Web. 24 Aug. 2009. <http://www.asc-csa.gc.ca/eng/satellites/tiger_project.asp#africa>
- 14** "Health." *Societal Benefit Areas*. Group on Earth Observations, 2008. Web. 24 Aug. 2009. <http://earthobservations.org/geoss_he.shtml>. *Using Climate to Predict Infectious Disease Outbreaks: A Review*. Rep. Geneva: World Health Organization, 2004. Print
- 15** Lawrence, David. "Geographical analyses come of age." *The Lancet: Infectious Disease* 9.7 (2009): 402-03. *The Lancet*. July 2009. Web. 24 Aug. 2009. <www.thelancet.com/infection>. "About DoD-GEIS." *DoD-GEIS Central Hub*. Web. 24 Aug. 2009. <<http://www.geis.fhp.osd.mil/aboutGEIS.asp>>. "Africa: The art of predicting Rift Valley Fever outbreaks." *IRIN*. UN Office for the Coordination of Humanitarian Affairs, 21 July 2009. Web. 24 Aug. 2009. <<http://www.irinnews.org/Report.aspx?ReportId=85368>>. Anyamba, Assaf, and Jean-Paul Chretien. "Prediction of a Rift Valley fever outbreak." *Proceedings of the National Academy of Sciences* 106.3 (2009): 955-59. PNAS. National Academy of Sciences, 20 Jan. 2009. Web. 24 Aug. 2009. <<http://www.pnas.org/content/106/3/955.full.pdf+html>>
- 16** "WHO | Malaria." *World Health Organization*. Web. 24 June 2010. <<http://www.who.int/mediacentre/factsheets/fs094/en/index.html>>
- 17** Kiang, Richard. *Malaria Modeling and Surveillance: Verification and Validation Report: Assessing Malaria Risks in Thailand Provinces Using Meteorological and Environmental Parameters*. Rep. NASA, 12 July 2006. Web. 24 Aug. 2009. <http://aspres.gsfc.nasa.gov/upload/PH_proj-163_4599_MMS_V%26V_Part1.pdf>. *Malaria Modeling and Surveillance Using NASA Data to Combat the Threat of Malaria*. Rep. NASA. Web. 24 Aug. 2009. <http://nasascience.nasa.gov/earth-science/applied-sciences/resources/Malaria_R1.pdf>. Kiang, Richard, and Farida Adimi. "Meteorological, environmental remote sensing and neural network analysis of the epidemiology of malaria transmission in Thailand." *Geospatial Health* 1 (2006): 71-84. Print. "Malaria Modeling and Surveillance." *NASA Goddard Earth Sciences*. Web. 21 June 2010. <http://disc.sci.gsfc.nasa.gov/malaria_modeling/overview>
- 18** "Pandemic (H1N1) 2009." *World Health Organization*. Web. 24 Aug. 2009. <<http://www.who.int/csr/disease/swineflu/en>>. Kiang, Richard. Telephone interview
- 19** "Improving Intervention Strategies for Meningitis Epidemics in Africa." *GEO - Group on Earth Observations*. *GEO Health*. Web. 24 June 2010. <http://www.earthobservations.org/documents/sbas/he/46_Improving%20intervention%20strategies%20for%20meningitis%20epidemics%20in%20Africa.pdf>
- 20** MacInnis, Laura. "Meningitis Kills over 1,100 West Africans - WHO | Reuters." *Reuters*. 27 Mar. 2009. Web. 24 June 2010. <<http://www.reuters.com/article/idUSLR95915420090327>>
- 21** "Meningococcal Meningitis." *World Health Organization*. WHO. Web. 24 June 2010. <<http://www.who.int/mediacentre/factsheets/fs141/en/>>
- 22** "Improving Intervention Strategies for Meningitis Epidemics in Africa." *GEO - Group on Earth Observations*. *GEO Health*. Web. 24 June 2010. <http://www.earthobservations.org/documents/sbas/he/46_Improving%20intervention%20strategies%20for%20meningitis%20epidemics%20in%20Africa.pdf>
- 23** Lawrence, David. "Geographical analyses come of age." *The Lancet: Infectious Disease* 9.7 (2009): 402-03. *The Lancet*. July 2009. Web. 24 Aug. 2009. <www.thelancet.com/infection>.

Satellite Operators Find Advantages In Coax

authors

Troy Brandon, product line manager, DBS ODU Solutions, Entropic Communications

Jon Iwanaga, director, MoCA product marketing, Entropic Communications



image courtesy of
**Telenor Satellite
Broadcasting**

The battle for television subscribers is heating up as new entrants open up additional markets, the subscriber pool stagnates, and the economy sputters. Eager to stay competitive, direct broadcast satellite (DBS) service providers are looking for ways to differentiate themselves by providing innovative services to attract new subscribers and retain current ones.

Technologies such as **MoCA** (*Multimedia over Coax Alliance*) and *Channel Stacking Switch (CSS)* solutions are key tools for DBS operators to generate new lines of revenue while providing significant infrastructure savings. In fact, **DIRECTV**, the largest payTV operator in the world, has recently deployed MoCA and CSS together to deliver their whole-home DVR service, while improving installation aesthetics and reducing installation costs. These technologies, whether used in a combined or stand-alone fashion, improve the customer experience, reduce churn and offer a conduit to deliver new services to drive

average revenue per user (ARPU) — all of which can create a positive position in the highly competitive payTV market.

MoCA® 101

Using existing coax cables found in typical residential dwellings, MoCA liberates multimedia content from the confines of a single room or device, providing the ability to stream multiple high-definition video, audio and data traffic throughout the home. Any room with a coax outlet has accessibility to devices in other rooms, enabling the opportunity for delivery of new

SatBroadcasting™

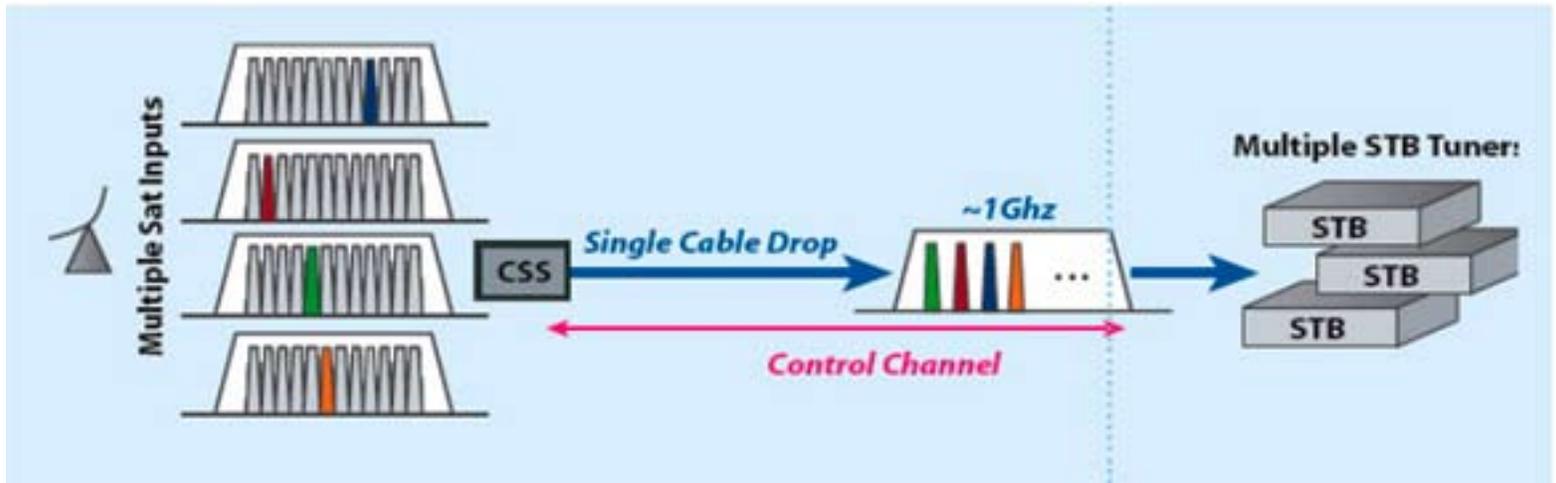


Figure 1: CSS Single Cable Solution

services. Benefits of a MoCA home network include:

- » **High reliability to assure operators MoCA works at virtually any coax outlet in any subscriber's home – without rewiring**
- » **High throughput to support real-time streaming of multiple HD/SD video programs**
- » **Low error rates and low latency to ensure a good subscriber viewing experience**
- » **Frequency coexistence with established operator services to avoid contention**

With more than 95 percent outlet coverage, MoCA has achieved 175 Mbps of application layer throughput, more than enough to support multiple high-definition video-on-demand programs and other services like multi-room *digital video recorders (DVR)*, broadband/WiFi extension and video-on-demand programming. In addition, *low packet error rates (PER)* and low latency are achieved through a fully-coordinated and collision-free *medium access control (MAC)*, ensuring a high quality consumer experience.

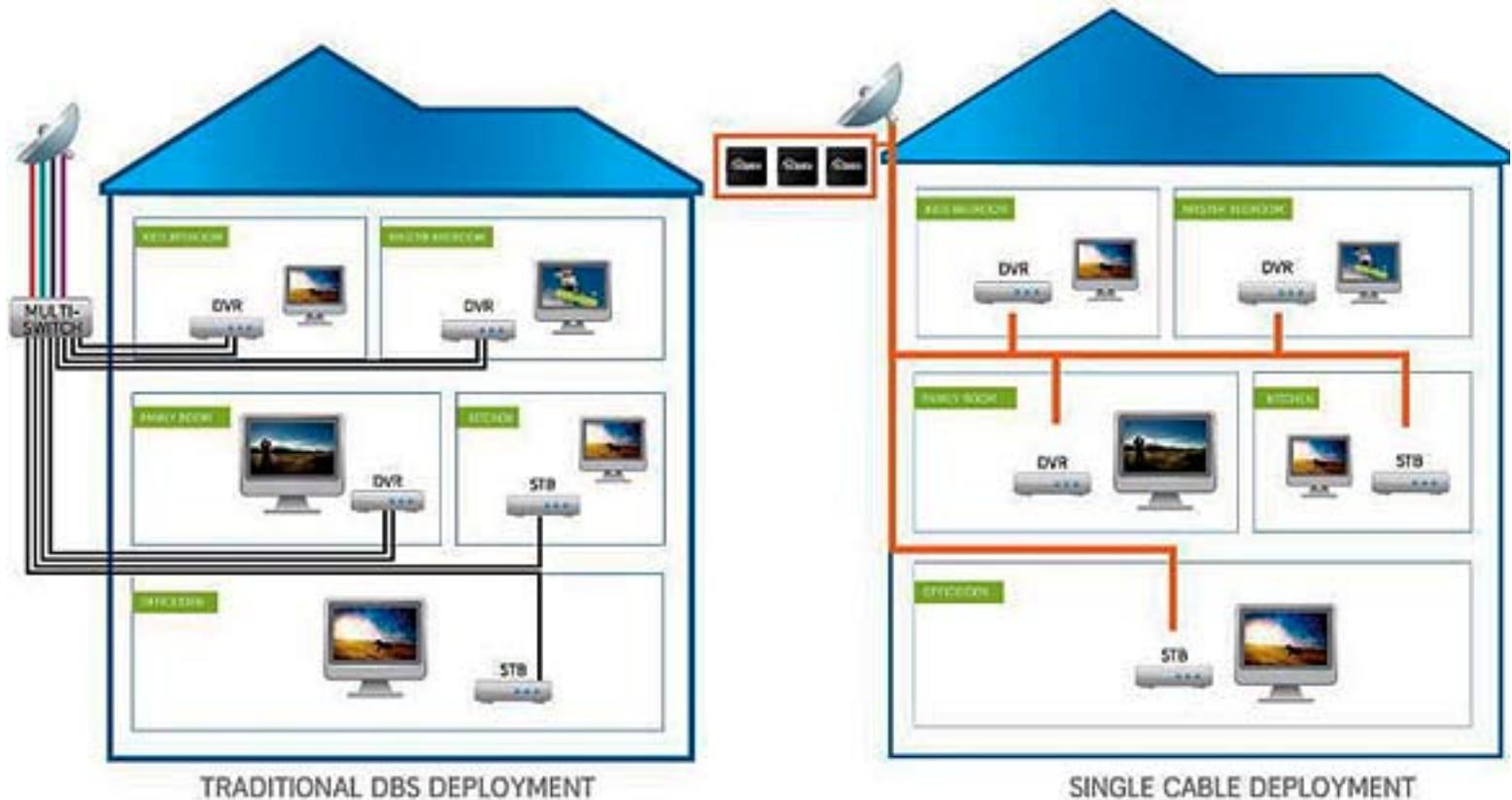


Figure 2: DBS CSS Single Cable Home

Channel Stacking Switch 101

Changes to the television viewing experience and the adoption of DVRs, sometimes multiple DVRs per household, have created an increasingly complex, difficult and expensive installation for DBS service providers. Traditional DBS installations consist of one or more dishes with an applicable *low noise block (LNB)* converter. The output(s) of the LNB is run directly to either each satellite *set-top box (STB)* in the home or to a multi-switch with its outputs run to the STB. An individual cable run is required from either the LNB or multi-switch to each tuner in the STB. A typical DVR/PVR has at least two tuners to support watch and record functionality.

translates a particular satellite channel of interest and passes through a dedicated *surface acoustic wave (SAW)* filter. The desired channels are then combined, or in other words, 'stacked,' onto the single cable, and the ODU tells each receiver where a requested channel is located.

These DBS systems typically transport programming from the ODU to STB using a frequency range of 950 to 2150 MHz, which provides a useable bandwidth of 1.2 GHz. Individual transponders are typically only 20 to 36 MHz wide, depending on satellite transmission symbol rates. For example, a CSS system can convert and pass desired channels with a typical SAW bandpass filter, allowing 12 individual channels to be stacked on a single cable. This translates into the

DBS CHANNEL STACKING SWITCH FREQUENCY PLAN

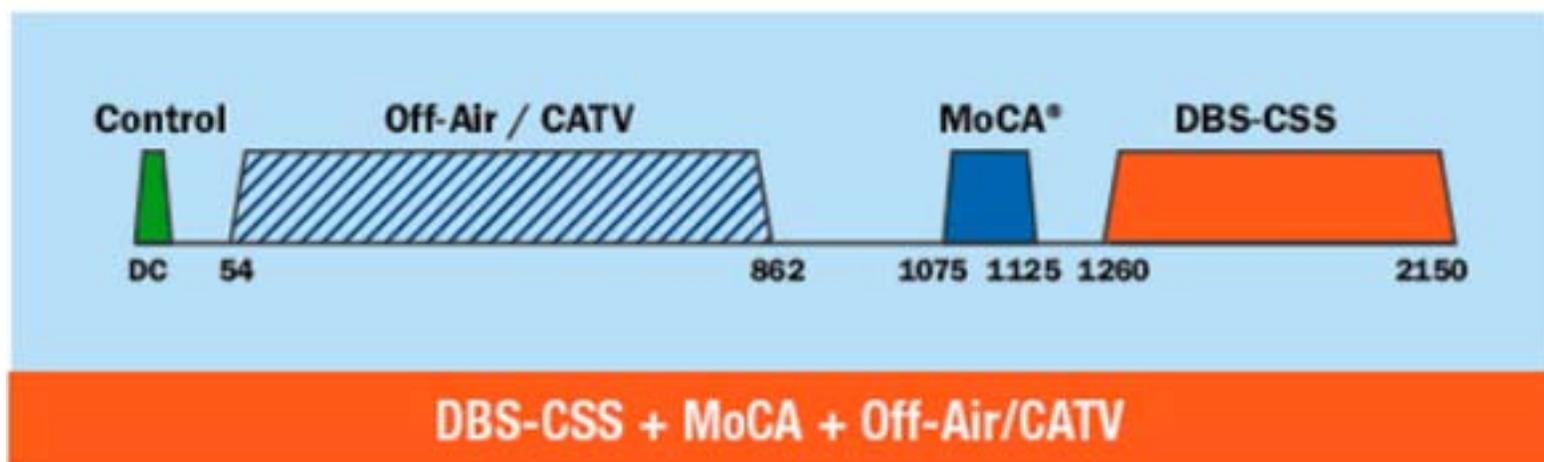


Figure 3: DBS-CSS with MoCA and Terrestrial/CATV

For a traditional DBS installation, this DVR would require two unique cable runs to the STB. A home with three DVR STBs requires six cable runs. CSS solutions create a channel-stacking architecture where multiple channels can be transmitted on a single cable based on the demands from multiple STBs and tuners connected to that cable. A single cable drop from the *outdoor unit (ODU)* provides each STB tuner with dedicated channels, eliminating the need for multiple cables. (See Figure 1 on the previous page).

In-home receivers communicate with a CSS-enabled ODU to request specific channels. The CSS

ability to support 12 separate, active STBs, or tuners, on a single cable drop.

CSS: Single Cable Solution

Most US homes have a cabling network already in place, usually consisting of a single point of entry at the curb or garage with splitters used to support multi-room outlets. This preexisting network goes largely unused during a traditional DBS installation, resulting in a lost opportunity to leverage the existing cabling and extra labor and material costs to the Operator.

A single cable network allows *video-on-demand (VOD)* and *pay-per-view (PPV)* support with only a

central, conveniently located phone line or broadband connection versus a connection at each STB location. Additionally, with the CSS frequency agility, a DBS Operator is able to create large chunks of BW within the 950MHz -2150MHz band. This entire band is reserved for DBS service which provides the Operator means to incorporate a whole home entertainment network system like MoCA.

MoCA & CSS Coexistence

For DBS operators, MoCA provides a network channel with a center frequency of 875 MHz that can coexist with the 950 MHz to 2150 MHz range of a typical DBS system. Currently, MoCA operates with channel bandwidth of 50 MHz. Operating a MoCA home network at 875 MHz provides 50 MHz of transition bandwidth between the home network and DBS video.

The frequency agility of MoCA and CSS can also be used to support cable or terrestrial broadcasts simultaneous with DBS-CSS and MoCA, (Figure 3). In addition, Operators have the option of only using the amount of BW needed to support the specific numbers of tuners within the home. If a home has four DVRs (eight tuners) the Operator only needs ~800MHz to support this home from a broadcast video standpoint. This leaves ~400MHz free for other uses by the Operator. And as the bandwidth needs of the home network and DBS operator continue to grow, an operator can rely on the CSS technology to shift the operating range of the video, keeping the cost impact of filtering between the future home network and DBS video delivery in check.

Potent Coexistence

By combining MoCA and CSS, DBS operators can deliver programming from a single cable structure that also supports whole home entertainment networking to expand the service offerings to subscribers.

Coexistence of CSS and MoCA technology enables competitive customer service advantages and monetization of revenue generating system technology solutions. Together MoCA and CSS offer DBS operators proven, ready-to-deploy technology solutions that are future proof, reliable, cost efficient and can help drive the operator's bottom line.

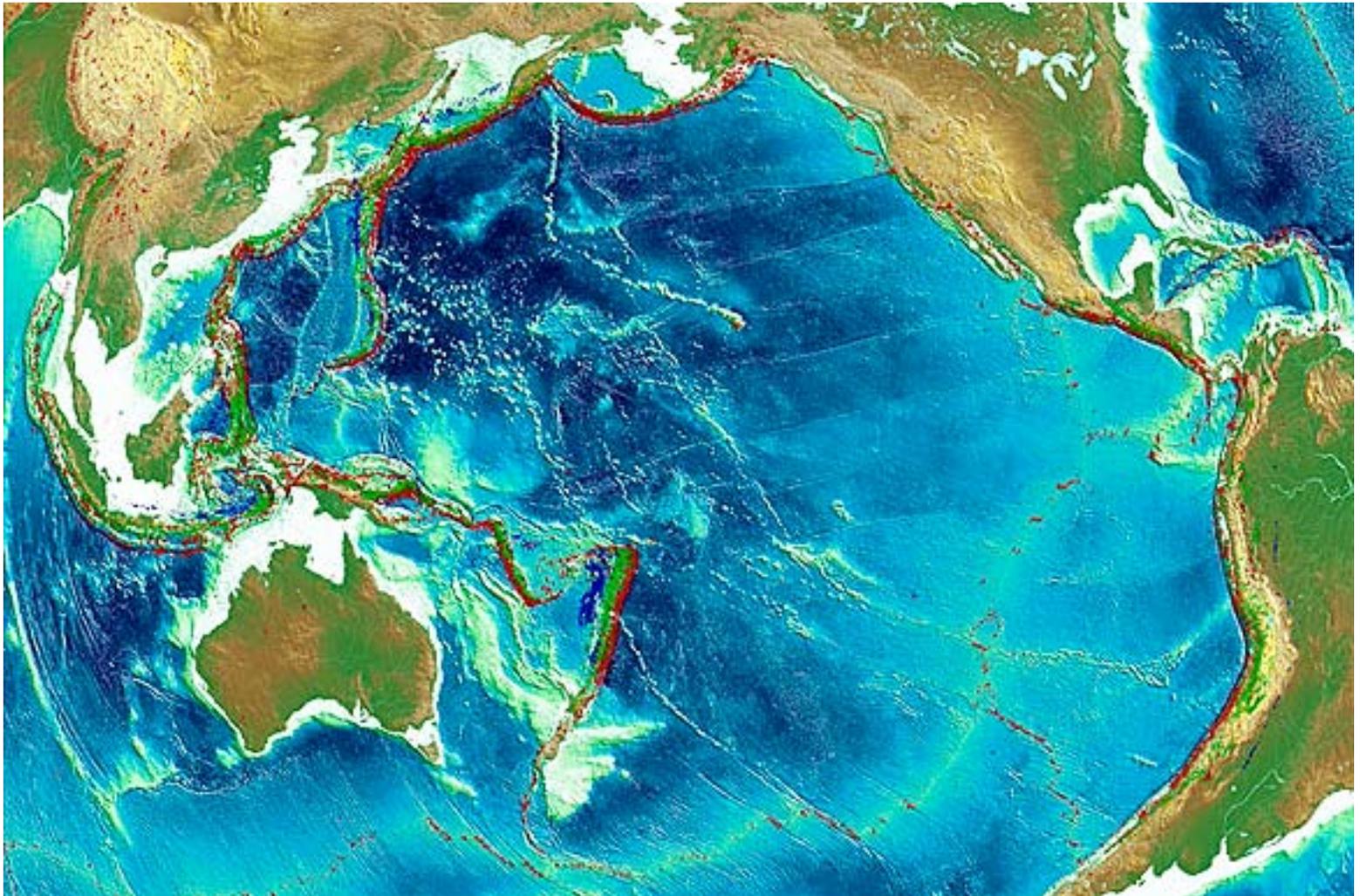


Focus

A New Approach To Disaster Response

author: Paul Krzystoszek, Operations & Marketing Manager, Australian Satellite Communications (ASC).

When a disaster hits, the toll on human life is often determined by the speed of response efforts. Recent catastrophes around the world have consistently shown that the 72 hours following an event are when the most lives are saved or lost. It's no surprise more governments and Non-Government Organizations (NGOs) are shifting their focus from disaster relief to disaster preparedness in order to accelerate response times and give potential victims around the globe the greatest chance of survival.



The Pacific Ring Of Fire, map image courtesy of [Geoware](#)

Disaster Hotbed: The Pacific Ring Of Fire

This change in mindset is especially prevalent in areas where emergencies are most likely to occur. No region on the planet sees more natural disasters than **The Pacific Ring of Fire**. Aptly named, this geographic phenomenon forms a 40,000 kilometer arch around the perimeter of the Pacific Ocean, extending from the West coasts of South and North America to the East Coast of Asia, across the East Indies and South to New Zealand.

This region is home to 452 volcanoes and about 90 percent of the world's earthquakes. In recent years, tsunamis and flooding have wreaked havoc across the Pacific, destroying houses and infrastructure and jeopardizing human life.

The Challenge: Reliable Communications

For emergency responders in the Pacific Ring of Fire, one of the key challenges to initiating an effective relief campaign is establishing voice and data communications on the ground to provide visibility and direct operations toward the areas that need the most

immediate attention. Without this communications lifeline, operations are blind. But in major disasters, terrestrial communications infrastructure, including cellular, microwave and fiber networks, are often wiped out by the event itself. And terrestrial backup systems usually share the same fate.

As a result, all major disaster organizations have adopted satellite as the only reliable way of establishing the critical first connection. While it is a necessary and effective technology for emergency situations, satellite has traditionally posed some key challenges that limit disaster response organizations from using it more effectively:

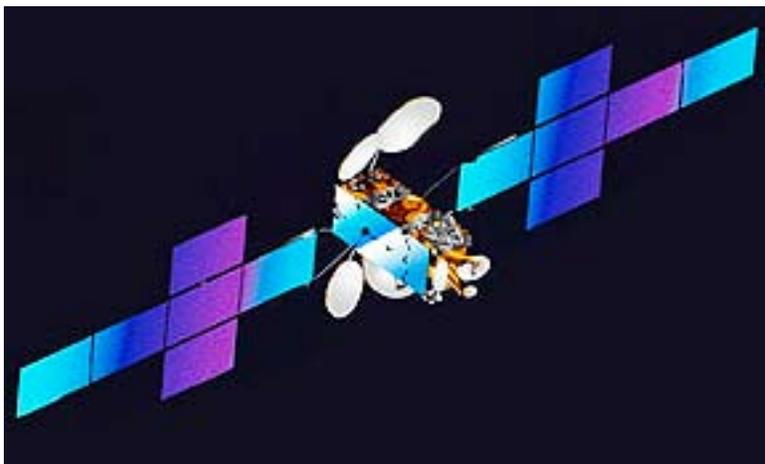
- » ***Time consuming deployment – Satellite systems include several hardware and software components, so assembly and activation can take up to several hours***
- » ***Requires trained technician – Deploying a remote satellite system requires a trained technician on site to align the satellite antenna and establish a link before a connection can be established***



- » *Fluctuating prices – Relief organizations typically purchase satellite connectivity using a “pay-as-you-go” model. But satellite bandwidth costs often increase during emergencies, making it hard for these organizations to properly predict and budget for the right level of connectivity*
- » *Difficult to train with – Due to the cost of bandwidth, many organizations hesitate to activate their satellite equipment during training, so teams are not as familiar with the technology when it really matters*

A New Approach To SATCOM

To overcome these challenges, three of the leading satellite communications and technology providers to the Asia Pacific region have teamed up to build **ReadyCONNECT™**, a complete, portable, and off-the-shelf disaster recovery communications solution that gives emergency response teams with minimal training the ability to establish voice and Internet connectivity in just 10 minutes.



GE23 satellite, artistic rendition



ReadyCONNECT combines reliable and field proven hardware with constantly available bandwidth and can be used across the Asia Pacific region, via the **GE23** satellite.

The new system was developed by a leading service provider with a regional presence and complete coverage of the Pacific, **Australian Satellite Communications (ASC)** with partner — global satellite equipment provider — **Cobham Satcom**. The network is powered by **iDirect**'s advanced and reliable platform of VSAT hubs, routers, and software that is used daily by military, government agencies, and emergency responders worldwide to provide stable connectivity in extreme and hazardous environments.

ASC is a leading provider of satellite communications solutions in Australia and throughout the Pacific region. The company specializes in designing and implementing the most

complex VSAT communication solutions. With the use of two teleports covering the entire Pacific region, ASC has access to significant quantities of Ku-band bandwidth a resource which is increasingly in short supply.

ASC turned to Cobham's technology as it has proven to be a reliable solution that is easy to use and the products' build quality, ruggedness, and portability are "must have" features for emergency teams in the Asia Pacific.

Cobham's equipment has been successfully used in defense applications in the most challenging environments on the planet; it has also been used with great success in post disaster relief efforts in Haiti. In all situations, the equipment has performed extremely well.

Inside ReadyCONNECT

ReadyCONNECT™ offers emergency responders high bandwidth reliability in a variety of weather conditions, and simultaneously supports the operation of multiple bandwidth-intensive applications while ensuring terrestrial-quality voice and data communications.

The standard ReadyCONNECT™ package includes all necessary hardware, bandwidth, support and training to make connectivity in the field simple and effective for emergency responders:

- » **ReadyCONNECT comms unit: four transportable cases that house a complete communications system with an iDirect satellite remote, a telephony interface, VoIP ethernet switch and back-up power supply/conditioner. On the ground, users can connect directly to the unit**
- » **ReadyCONNECT quick deploy antenna: featuring single button activation and automatic satellite acquisition, without requiring a VSAT specialist to become operational**



Cobham's TracStar In-Motion VSAT and TV Systems, On-the-Pause vehicle mount and Fly-Away antenna systems

- » **ReadyCONNECT service: immediate, reliable access to Ku-band satellite bandwidth, with complete coverage across the Pacific via the GE23 satellite. Included are two days per month standard use for training or short-term connectivity needs. Customers can choose between single or multiple beam service, enabling them to deploy the unit across different satellite beams.**

Always Prepared

With ReadyCONNECT, emergency response organizations have a reliable, cost-effective solution that is ready to go at a moment's notice. This allows response teams to focus on the critical task at hand, knowing that when disaster strikes connectivity is only a few minutes away.

About the author

Paul Krzystoszek is the Operations & Marketing Manager for Australian Satellite Communications (ASC).

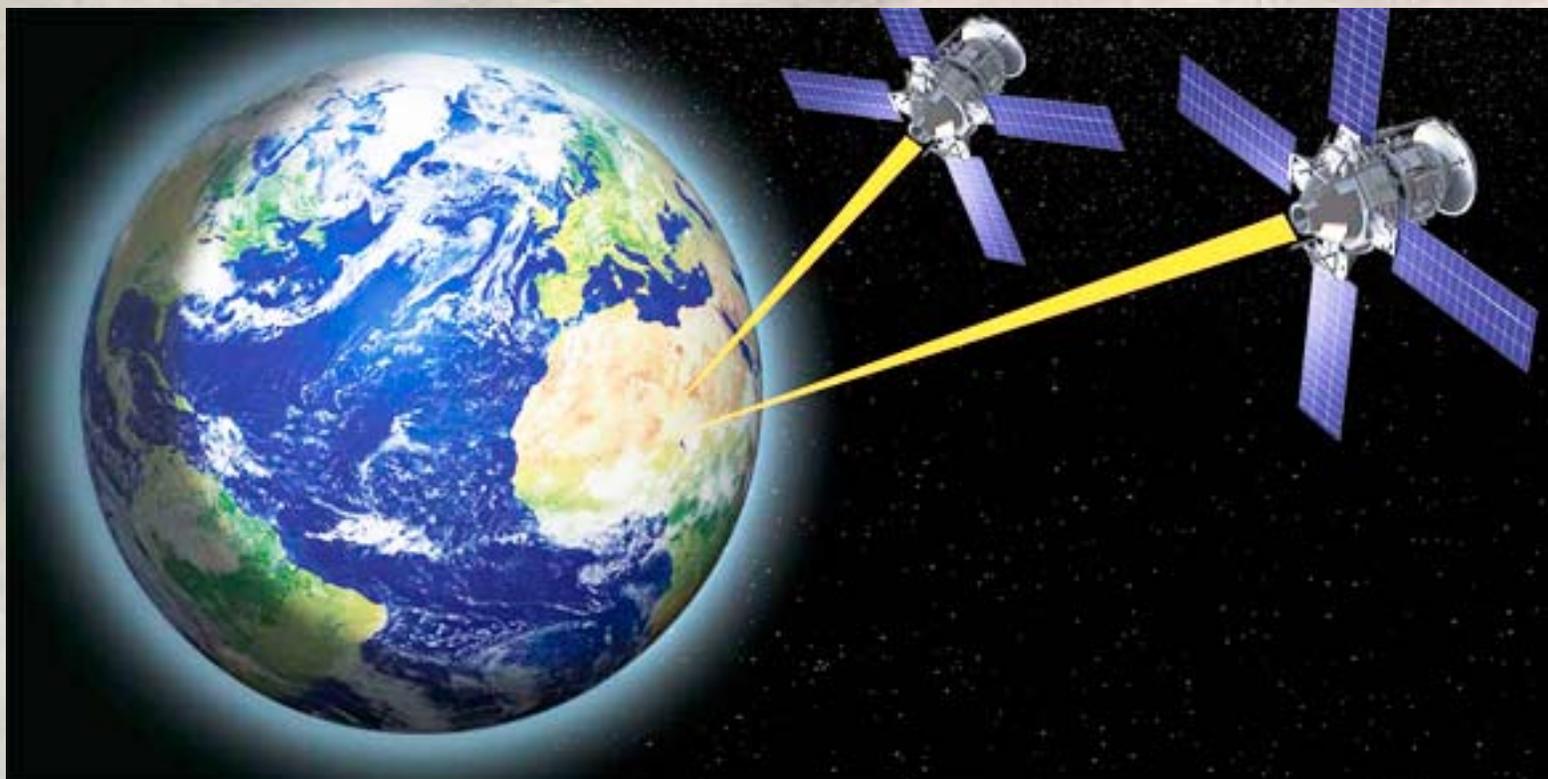


Geolocation: Past, Present + Future

author: Dan Ojennes, RT Logic

Radio Frequency Interference is a persistent and growing problem for SATCOM network operators. Industry groups such as the Satellite Users Interference Reduction Group (SUIRG) have reported that signal interference significantly impacts margins, Quality of Service (QoS) and operational efficiency. In addition, it is estimated that the impact of interference on a relatively small satellite fleet can cost an operator more than \$1 million per year.

Modern SATCOM interference geolocation systems employ differential time and Doppler measurements taken in the satellite downlink to produce geolocation estimates of uplink sources of interference. Recent advancements in geolocation system features and capabilities have expanded the use of these systems into new domains. It is an exciting time for geolocation use as the market increases in size with new applications.



Traditional Use Of Geolocation

Most high profile applications of satellite geolocation systems have traditionally been targeted at combating intentional interference. There have been numerous instances in recent history where intentional interference has been employed, typically by government entities, in an effort to deny access to satellite communications links for political and economic reasons.

A recent example was during the **FIFA World Cup™** in July of 2010. Broadcasts of several football matches by the *Al Jazeera Sports Channel* were deliberately jammed. Geolocation techniques were applied to the interference to determine the origin of the signals to within three kilometers. While these cases typically draw significant attention in the press, they account for a relatively low percentage of actual interference events.

Common Geolocation Applications

A much more common use of satellite geolocation systems is for the investigation and mitigation of unintentional interference. These events are often caused by equipment failure or operator error, and can manifest themselves in many ways, some of which might appear intentional.

One past case involved transmission hardware that defaulted into a state where a sweeping CW signal was transmitted when the unit should have been idle. At first glance this would appear to be a case of intentional interference. In another instance, an amplifier in a transmission chain was left powered with no input source, which had the effect of transmitting

a wide band noise signal. Geolocation can be effectively used for quickly identifying these types of problems, which in turn reduces the duration of the interference event.

New Geolocation Applications

As advances in hardware and algorithms push the envelope of SATCOM interference geolocation system capabilities and the products evolve to become easier to use, they are increasingly being adapted to new uses, often by communities that have not been traditional users of these systems.

Traditionally, performing a geolocation of SATCOM interference sources has been an iterative, time-consuming process, which required the close involvement of an expert operator. Advances in user interfaces and smart processing algorithms have drastically reduced the amount of operator involvement required to perform a geolocation. Many modern geolocation systems are sufficiently user-friendly as to allow their operation by technician-level operators, with little or no theoretical background in communications or astrophysics. Further advances are allowing for fully automated geolocations to be performed with no operator involvement whatsoever.

This approach to satellite traffic surveillance is of significant interest to satellite operators that seek to monitor their own authorized users, as well as collect intelligence on their competitors. By surveying the traffic across a competitor's satellites, a satellite operator can learn valuable information about the size and nature of a competitor's customer base. Geolocation of traffic on a satellite is a valuable tool for communication regulatory agencies as well. These agencies can use a geolocation system to verify that transmissions from within a given region or country are associated with a valid license to transmit from that area.

Satellite traffic surveillance also has numerous military and intelligence applications. Blue force tracking can be performed on mobile military SATCOM users to supplement and verify mobile terminal performance. Valuable intelligence can be obtained at stand-off distances by monitoring an adversary's satellite links and users.

Advances in hardware and signal processing algorithms are also enabling the detection and geolocation of low power and exotic signal types that had been previously difficult, or impossible, to geolocate. Carrier-under-carrier techniques perform automated decompositions of composite signals into their constituent signals, any of which can then be geolocated. This is of particular interest when combating unauthorized satellite access and pirating, where the offending signal may be intentionally weak or spread in frequency so as to make geolocation difficult. By geolocating these sources of interference, a satellite provider can ensure that their customers are receiving the appropriate quality of service.

The ability to detect and geolocate very weak signals also enables satellite controllers to use reverse geolocation techniques to generate improved satellite ephemeris without affecting traffic on the satellite. Referred to as *Ephemeris Error Compensation (EEC)*, this technique exploits a priori knowledge of one or more emitters at known locations, and uses them as calibrators to calculate improved satellite ephemeris.

With satellite ephemeris typically being the dominant source of error in SATCOM interference geolocation systems, this technique enables significant improvements in geolocation system accuracy. Current EEC techniques use traditional above-the-noise-floor communications waveforms as calibrators, but with the ability to process very weak signals, spread spectrum waveforms can be used that are broadcast well under the satellite noise floor, that will not affect existing traffic on the satellite.

Tooling Along

Continual advances in the capabilities and usability of geolocation tools have expanded the reach of these valuable tools into new fields. This will not only continue to happen in the coming years, but will likely accelerate due to the interest level and increased research and development in the geolocation field. For organizations that have considered geolocation in the past but have not employed its use, it may be time to reconsider.



About the author

Dan Ojennes has been working on the satID product line at RT Logic, a wholly-owned subsidiary of Integral Systems, since it was acquired by the Company in 2009. He has performed various roles on the team from technical lead to business development lead. Dan is involved in many of the aspects of the satID product from design and development to customer delivery and marketing. Prior to joining RT Logic, Dan spent 12 years developing high-performance, data intensive test and measurement equipment including logic analyzers and protocol analyzers at Hewlett-Packard, Agilent and Fluke Networks. Dan received his BS in Mathematics from the Colorado School of Mines.

Executive Spotlight

Mark A. Pieczynski, Vice President, Space Launch Strategic Development, Orbital

Since 1995, Mr. Pieczynski has held a series of senior-level positions on Delta launch vehicle programs for McDonnell Douglas, The Boeing Company and, most recently, United Launch Alliance (ULA) that included responsibility for engineering, manufacturing and launch site activities, as well as contractual and financial matters. From 1995 to 2002, he served as the Program Manager for the deployment of Iridium low-Earth orbit communications satellites aboard Delta II rockets. In 2002, he was promoted to Director of U.S. Air Force Delta II Programs, overseeing the launch of military spacecraft for the U.S. Department of Defense and its agencies such as the National Reconnaissance Office, Defense Advanced Research Projects Agency and Naval Research Laboratory.

For the past 15 months, Mr. Pieczynski served as the Delta Program Site Executive in Southern California, overseeing a workforce of over 900 ULA employees. He was responsible for coordinating the transition process for the ULA employees at the Huntington Beach location while all Delta rocket programs were being moved to ULA's new Denver, Colorado, location. Orbital then named Mark as the Vice President of the company's new Southern California Engineering Center in Huntington Beach, California.

In his position, Mr. Pieczynski will oversee the technical support provided to Orbital's various launch vehicle and space systems programs from the company's newest facility, as well as being responsible for on-site staff management and development. In particular, Mr. Pieczynski will support the company's strategic goal of evolving the new Huntington Beach engineering facility to be a center of excellence for liquid rocket propulsion.

SatMagazine

Mark, can you tell us about your background and your current role with Orbital?

Mark Pieczynski

I spent 25 years working on the Delta II program as Commercial Program manager. My major accomplishments in that capacity included the successful deployment of 60 Iridium satellites. The last several years of my work on Delta II were dedicated to the deployment of DoD payloads, the most notable of which was the delivery of 20 satellites into the GPS constellation.

I joined Orbital two years ago with the primary objective of assisting the development of Taurus II, which after the retirement of Delta II will be the only medium class vehicle in the U.S. fleet. I am also responsible for space launch strategic planning and business development for our entire family of space launch vehicles.

SatMagazine

With the recent success of the Minotaur IV launch in September, what is the outlook for the Minotaur IV in 2011?

Mark Pieczynski

We were proud to have successfully delivered the SBSS mission for the Space Development and Test Wing to orbit in September. That was our second successful Minotaur IV launch in as many attempts. The inaugural Minotaur IV mission, a suborbital flight, was successfully conducted in April of this year.

We're currently focusing our attention on the next Minotaur IV launch, scheduled to take place before the

end of this year, which will carry the Air Force's STP-26 payload. This mission to deliver a small developmental satellite for the Air Force will originate from the Alaska Spaceport launch complex in Kodiak, Alaska. [*Editor's note: The launch was a complete success on Friday, November 19, 2010.*]

Looking forward into 2011, we have three Minotaur I and three Minotaur IV missions on our manifest, so it will be a big year for the Minotaur program. In 2012, we have another Minotaur IV scheduled, as well as

the first Minotaur V, which will be the first launch for our NASA customer. Minotaur V will be carrying LADEE, a lunar payload for NASA.

SatMagazine

Orbital has also been working on a mid-class launcher, Taurus II, in large part to service the International Space Station. What's the status of that program, and what other launch services could it provide?

Mark Pieczynski

The development of Taurus II is progressing quite well. PDR was conducted in the beginning of 2008 and CDR in the 2nd quarter of 2009 and today we are actively engaged in testing the system and in early production of the major elements. The main engine tests have been promising, and as of October we are readying the first flight engine for static fire tests at NASA's Stennis Space Center. Our first booster is completed in the Ukraine and is being shipped to our Wallops launch site, where it is due to arrive mid-November. In addition, ATK is now producing our second stage motor, which passed performance testing last December.

The Wallops launch site in Virginia has also made great progress: the Horizontal Integration Facility is near completion, commodity tanks for our tank farms are in place, the 300 foot water

deluge tower and the ramp to the launch pad are in place, and the pad is being readied for the pouring of concrete. We are a just a few months from turning this into an operational launch site.

SatMagazine

How is Orbital differentiating its services for satellite customers?

Mark Pieczynski

Orbital is a recognized leader in both the satellite and launch business. More recently, we have been providing end-to-end services for satellite customers — including system design and manufacturing, launch services and post-launch operations. Our flexibility and straightforward approach to space systems comes through in this type of customer agreement. For years, we have conducted much of our business under fixed price contracts. So we are well seasoned and able to provide very affordable, high-value systems both for our civil, military and intelligence government customers and for commercial customers.

SatMagazine

Counting the Minotaur IV and Taurus II, Orbital has six launch vehicles on the market. What are some similarities and differences between them?

Mark Pieczynski

Orbital has four major space launch vehicle product lines: Pegasus, Taurus XL, Minotaur and Taurus II. The performance of these vehicles ranges from small-class through the medium-class of launchers, with Pegasus at the small end of our systems and Taurus II providing the greatest capacity.

By using systems that are common and flight proven across all the vehicles we gain great design and production efficiency and, most importantly, mission success. The most noteworthy of these common systems are in the avionics and software areas. All of our vehicles are compatible with our Modular Avionics Common Hardware (MACH) system, which was designed and is produced in-house.

SatMagazine

What percentage of Orbital's business is satellite development versus launch services?

Mark Pieczynski

Orbital has achieved a desirable balance among its three business units — launch vehicles, satellites and space systems, and advanced programs — with each of them contributing about one-third of the company's approximate \$1.2 billion in revenues.



Orbital's Taurus II launches from Wallops

A Case In Point

AlpacaComms

Nestled in the rolling hills of Southern Ohio and home to more than 40 alpacas, Harmony Ridge Farms is typical of most American small businesses in rural areas. Though small in size, it needs the same caliber of high-speed Internet access as a large business to stay competitive in the marketplace. For its owners, Jeff and Marie Bradford, their older dial-up Internet connection made it extremely difficult to manage livestock purchases, register for shows, and organize deliveries, let alone attempt any sales and marketing email campaigns.



To keep their business up to speed, the *Bradfords* decided to upgrade from dial-up to satellite broadband from **Hughes**. HughesNet Business Internet service has since allowed the *Bradfords* to streamline communications with customers and suppliers, build a dynamic website, and given **Harmony Ridge Farms** a presence at online livestock auctions. For the *Bradfords*, as for many other American small business owners, HughesNet offers a cost-effective, high-speed option to successfully position and manage their business online

Green Acre Dreams

In 2006, after three decades of “navy life,” recent retirees *Jeff* and *Marie Bradford* started to look for property to build the log cabin retirement home of their dreams. They quickly fell in love with a 200-acre piece of land outside Jackson, Ohio and decided they would build a farm instead.

“We spent the first six months or so just deciding what to do with all that land,” said *Jeff Bradford*. “We knew we didn’t want horses or cattle, and the land is too hilly to grow hay or crops, but we’d heard the alpaca business was booming in the U.S. and knew that raising them didn’t require a lot of livestock education.”

They were first introduced to alpacas at the 1999 Ohio State Fair, but had no idea the South American-bred animal would one day become their livelihood. “We started off buying three bred females, and the rest is history,” said *Bradford*

Today, the *Bradfords* have 42 alpacas on their property and are expecting to add another 15 this year. They maintain their business by selling both alpaca fleece and the animals themselves, by regularly attending alpaca shows, entering their animals in contests, and doing a fair amount of email marketing.

A Case In Point



More Alpacas, More Online Needs

As Harmony Ridge Farms is located beyond the reach of cable or DSL, and a high-speed T1 connection would be too expensive, the Bradfords originally thought dial-up was their only option for

getting online. “We hated that it tied up our phone line,” Bradford said, “but we knew we needed to be sending emails and doing research.” At a previous job as a defense contractor, Jeff worked with a division of Hughes and remembered that the company also provided small businesses with their HughesNet satellite broadband. “I thought it would be a great fit, considering our location, so we signed up for their entry-level Business Internet plan.”

One element that drew the Bradfords to HughesNet, they say, is that the Business Internet plans are flexible and built for growing businesses. As their business needs evolved, the Bradfords began to rely on more bandwidth-heavy applications. Monitoring online auctions with streaming video, for example, was becoming difficult. And as they expanded their herd and started to realize more interest in their offerings through their website, they realized they needed a faster plan to help expand their online capabilities.

For growing businesses such as Harmony Ridge Farms with growing bandwidth needs, HughesNet Business Internet offers the opportunity to upgrade to higher speed plans immediately, when the need arises. “Changing plans just took one phone call to Hughes and the next day we had faster speeds than ever before,” said Bradford

HughesNet offers a full suite of services designed to help businesses like Harmony Ridge Farms adapt to their marketplace. There are seven HughesNet Business Internet plans that can also be customized to include private networks and backup solutions. Plans offer download speeds up to 5 Mbps.

The Future of Harmony

Today, the Bradfords plan to add alpacas, attend six to eight shows, and hopefully win a few blue ribbons. They’ve also updated their web site to include pictures, video, and *Ridge Notes*, a journal about day-to-day life and news from the farm.

“We’re constantly reaching out to potential customers through email and inviting people to visit, so it’s really necessary that we have a reliable, high-quality connection. Needless to say, we’re glad we’ve found that with Hughes,” Bradford said.

“Honestly, running a business from a rural community is really tough, but over the past few years, we’ve realized that a good Internet connection can make it a whole lot easier.”

Jeff Bradford advises that “similar farmers need to realize that they have to be on the Internet and active to be successful. Especially in rural areas, people aren’t going to drive out and find you — you have to find them, and you simply can’t do that on dial-up.”

About Hughes Network Systems

Hughes Network Systems, LLC (HUGHES) provides broadband satellite networks and services for large enterprises, governments, small businesses, and consumers. HughesNet encompasses all broadband solutions and managed services from Hughes, bridging the best of satellite and terrestrial technologies, based on global standards approved by the TIA, ETSI, and ITU standards organizations, including IPoS/ DVB-S2, RSM-A, and GMR-1. To date, Hughes has shipped more than 1.9 million systems to customers in over 100 countries. More info at...

<http://www.hughesnet.com>



YEAR IN REVIEW — 2010

currently positioned. ABS has already secured two top tier anchor customers for ABS-2 with two of Asia's leading telecom companies Korea Telecom (KT) and Singapore Telecom (SingTel). Over the next 12 months ABS aims to aggressively fill the satellite's capacity prior to launch.

Earlier this year, ABS successfully completed the transaction to acquire Koreasat-3 (renamed ABS-7) as part of its fleet expansion. This is the second successful transaction after the completion of the purchase of Koreasat-2 in 2009. ABS-7 will provide significant high powered Ku-band and Ka-band capacities to meet ABS' customer demands for cellular backhaul, VSAT services, satellite broadband and US/NATO government requirements in the Middle East region and allow continued growth in revenues during the construction period of ABS-2.

ABS also recently announced the investment in ABS by Permira funds, a global private equity firm, to become the majority shareholders of ABS. The acquisition of ABS is entirely equity funded. The Permira funds have significant experience in the satellite sector with successful investments in Inmarsat, a leading provider of global mobile satellite communication services (2003) and Intelsat, the leading provider of fixed satellite services worldwide (2005). Permira funds support ABS' ambition to become a leading satellite operator in our target markets. One of its key near-term initiatives is to build and launch the new ABS-2 satellite, which will be one of the largest fixed service satellites to be launched over the Eastern Hemisphere.



ABS fleet: from left to right — ABS-1 75° E | ABS-1A 75° E | ABS-1B/W75 75° E | ABS-5 146° E | ABS-7 116° E | ABS-2 75° E, scheduled launch in 2013

Looking ahead, ABS will be enhancing its services and infrastructure with expansions of its Standard Definition and High Definition video playout capabilities and professional MCR facilities. ABS will also be opening up additional offices and teleport operations across the region, closer to the key markets which ABS serves today. ABS is very optimistic about maintaining the growth in 2011 with plans for developing new orbital locations and exploring opportunities to expand the business through further strategic acquisitions.

Richard Pak, Senior Vice President, Business Development, ABS



Advantech Wireless, an ISO 9001: 2000 certified corporation, continues to offer leading-edge wireless broadband communications. Since 1988, Advantech manufactures and deploys networking solutions for broadband connectivity, broadcast solutions, and backhaul requirements, using satellite and terrestrial wireless communications. Products include: VSAT / DVB-RCS Hub & Terminals, SSPA's, Block-up Converters, Frequency Converters, Satellite Modems, Antenna Controllers and Terrestrial Microwave Radios.

David Gelerman, CEO and Chairman of the Board of Directors, reflects that, in 2010, Advantech Wireless Broadband benefitted from its increased Research and Development programs. "We brought to market new and more efficient SSPA technologies based on

a line of GaN (Gallium Nitride) products. Being first to market quickly propelled us to a leadership position." Advantech Wireless Broadband's line of GaN-based products exhibit increased power efficiency, reduced power dissipation, more linear amplitude response, increased MTBF and are available to support Ku and X bands.

On the VSAT product line, the Company has made significant deliveries: Agile Communications has delivered the Advantech DVB-RCS/S2 hub and remote terminals to the U.S. Department of Defense (DoD) for in-theatre use and also selected the Advantech DVB-RCS/S2 hub, due to advanced features, redundancy, product performance, transec security capabilities, and open standards-based compliance.

Another major accomplishment for Advantech has been the program with a major Latin American telecommunications service provider, CANTV. With more than 600,000 Internet subscribers in Latin America, CANTV received delivery of an Advantech DVB-RCS/SCPC multi-Hub solution along with thousands of terminals. The HUB solution is capable of supporting over 18,000 remote terminals operating in TDMA/SCPC mode, supports quadruple play, TV, Internet, VoIP and GSM backhaul applications over satellite for remote locations, as well as maritime terminals — continued sales with this program are expected well into 2015.

In response to USCENTCOM for another DVB-RCS network to support increasing requirements for UAV video backhaul and dissemination from in theater operation, Advantech has been contracted through its US partner, Marshall Communications, for the design, supply and installation of an additional DVB-RCS Hub. This hub is similar to the previously delivered DVB-RCS hubs and will incorporate new features such as DVB-S2 technology which will allow increased bandwidth efficiency.

The new order from DISA includes equipment procurement as well as services from Advantech's systems engineers and support staff. These services include system design, operators training, installation, Integration and various support activities.

YEAR IN REVIEW — 2010

The fully redundant Advantech DVB-S2/RCS Hub supports two outbound links operating at up to 135 Mbps each, and inbounds to the hub. This totals 120 Mbps based on Advantech technology. Advantech has also received an order for an undisclosed number of modems to be integrated and used for in-theatre operations.

The Allgon Transend product line made major advances in 2010, being part of the US FAA's Next Generation Surveillance System. More accurate than radar, the system is used for air traffic control and separation of aircraft. Advantech's Transend products have also been sold into major video surveillance and broadcast customers.

Mr. Gelerman concluded, "We have consolidated our mergers and acquisitions to bring in all product lines under the Advantech Wireless brand. As one company, we are now perfectly positioned to expand our offering as key supplier of satellite communications equipment to world markets. In the coming year, we will be announcing major new initiatives and sales in the Military and Commercial communications markets. Stay tuned for more exciting news from Advantech Wireless!"

Mr. David Gelerman founded Advantech in 1988, serving initially as President and, since March 2006, as Chief Executive Officer. Prior to founding the Company, Mr. Gelerman has held various positions at Nortel Networks, including Manager of the Transmission Networks Division, where he managed and supervised teams which developed several key Point-to-Point (P2P) radio systems.



**Right: David Gelerman, CEO, Advantech
Left: Silvano Payne, Publisher, SatMagazine**

At Agilent Technologies, we provide the measuring instrumentation that ensures satellites operate as intended, once they reach their destination orbit. Clearly, this is a serious task where there is little margin for error. High performance equipment must be available to test state-of-the-art satellite systems. Just as important, the advancing technology must be supported, and the cost of that support must be affordable.

Through Agilent's expertise in measurement science and test processes, the Company gives you more time for the bigger issues: fulfilling today's satellite mission and managing the transition to what comes next. Agilent has been a major test equipment supplier to satellite manufacturers for decades and is committed to meet the industry's measurement needs into the future.

For the past year, strong sales growth for the worldwide satellite market with expanding business from abroad, where Japan and South America are ramping up development capabilities, has been experienced. There was also continued strength for the industry in military communications and surveillance applications.

This year, new modular products in the PXI and AXIe form factors were launched, which expanded our portfolio and enabled new capabilities and choices not previously available. The growing range of modular products is an extension of Agilent's measurement expertise geared to meet the challenges of current and future satellite test requirements. For example, the industry's first single-vendor PXI microwave vector signal analyzer (VSA) — Agilent M9392A — provides detailed analysis of communications signals up to 26.5 GHz and industry-leading instantaneous bandwidth of 250 MHz. The Agilent M9392A is enhanced by Agilent's powerful and widely used 89600 Vector Signal Analysis (VSA) software for use in next-generation communication systems and other wide bandwidth applications.

Looking forward to 2011, Agilent notes movement of the satellite industry into the Ka-band. The Company is well positioned to provide viable solutions, including the PSA and PXA Signal Analyzer product lines. These offer the low noise and wide bandwidth capabilities needed for demanding microwave measurements. For signal stimulus and custom waveform generation, Agilent continues to manufacture the only integrated vector signal generator with a frequency range to 44 GHz with the PSG signal generator. Additionally, the PSG is able to modulate signals with an instantaneous bandwidth of up to 2 GHz. To provide these wide bandwidth baseband signals, Agilent has new arbitrary waveform generators (AWGs) available with features that make waveform engineering easy.

RF payload test systems are offered through the integration group in association with channel partners. Systems are presently specified for testing up to 40GHz with bandwidth of at least 1 GHz. Systems include flexible switching for medium to high-channel count testing and simple calibration procedures to ensure results and optimize test time.

The coming year will also see the continuing quest for improved efficiency of transponder power amplifiers. With the ability to characterize the non-linear performance of these amplifiers with the PNA-X based Non-Linear Vector Network Analyzer through the use of X-parameters, engineers can accurately model their amplifiers under operational conditions. This enables them to achieve their desired design goals and optimize design tradeoffs. X-parameters are revolutionizing the characterization, design, and modeling of nonlinear components and systems.

The expanding use of Orthogonal Frequency Domain Modulation (OFDM) on space-based communication platforms is also noted. This modulation scheme has demonstrated the promise of higher data rates, less susceptibility to interference, as well as lower power consumption. To adapt and optimize this technology for satellite applications, there will be development of non-standardized OFDM waveforms unlike the terrestrial counterparts. The development of these waveforms is facilitated by Agilent's SystemVue modeling product with the capability for modeling and generating proprietary OFDM configurations.

To receive and demodulate these signals, the Company's VSA software enables flexible demodulation and analysis of the transmitted signals.

Agilent is optimistic about satellite test in 2011. Agilent will continue to provide test tools and resources with the latest technical insights and best practices to help customers focus on what matters most; the assurance that satellites and subsystems will work the first time, every time for the duration of the mission. For the latest in Satellite test recourses from Agilent, visit:

www.agilent.com/find/satellite-focus

**Dave Myers, Vice President
and General Manager of
Americas Field Operations,
Agilent Technologies**



With a heritage of more than 40 years in the development of satellite antenna systems, ASC Signal Corporation (which used to be the SATCOM division of Andrew Corporation) designs and manufactures cutting-edge satellite Earth station systems used by broadcasters, enterprises, and government customers worldwide.

These users actively need very high-quality products that are flexible and capable of being uniquely tailored to meet their specific application requirements. Most importantly in today's environment, ASC Signal's solutions must support the long-term financial and business goals of its clients. ASC's satellite Earth station antenna business offers Earth station antennas ranging in sizes from 3.5 to 9.4 meters, available in every frequency band used in the satellite industry today. The market depends on ASC's highly engineered

YEAR IN REVIEW — 2010

systems to fulfill long-standing applications such as satellite-based broadcasting, VSAT networking, and other traditional telecommunications services. At the same time, ASC is also committed to supporting the growth of newer commercial and government/military applications, including Ka-band services and highly mobile communications systems.

One recent trend has been the need for multi-band capable antenna technology, driven by customer demand for flexibility in accessing multiple, recently-adopted frequency plans. ASC has built countless antennas that can be switched from band-to-band simply by changing the feeds. More recently, ASC has been creating products that are multi-band capable in a single feed, eliminating the need for operators to physically switch components. This type of technology differentiates the innovators in the market, as creating more specialized technology supports more efficient delivery of services by operators.

Higher gain is another trend that continues to be an important requirement in Earth station antennas. As customers serve more infrastructure-critical and power-sensitive applications, they require higher quality equipment in the smallest space possible. In-the-field performance tests show that the majority of ASC's antennas provide higher gain than comparably-sized antennas made by competitors.

While many manufacturers, especially in Asia, offer lower-cost alternatives, they do not meet the quality standards and high-performance benchmarks that users demand today. Along with its line of fixed Earth station antennas, ASC Signal's Trifold™ transportable satellite antenna systems are well known for their high-gain, high-efficiency aperture design and versatility which can be configured for various commercial and military customer applications.

The Trifold™ system continues ASC's tradition of delivering industry firsts to its customers. Research and development has become an important value-added component to Earth station technology, and critical to the business. Investment in research and development helps ensure ASC's antennas perform at a higher level for specific applications.

For example, by focusing on broadcasters' specific needs, ASC designed and introduced the 4.5m and 3.7m Earth station antenna products in the early days of the satellite network roll out to meet high-availability requirements across widely varying physical environments. These antennas soon became the industry standard in the entire North American broadcast market. To this day, every major broadcasting network in the U.S., as well as many in Canada and Mexico, use the ASC Signal 4.5m and 3.7m antennas, with ASC supporting thousands of these antennas around the continent.

ASC also makes very specialized equipment and antennas for certain other applications. The recently-introduced Next Generation Satellite Controller (NGC) was developed based on market demand for engineering flexibility and simplicity. The NGC is a satellite antenna controller which can manage all of the various sub-systems within an Earth station or a network of Earth stations. This small, (3RU) modular device provides a central control mechanism over an entire satellite transmission chain and enables monitoring, positioning, and tracking by one person at a single site, or centralized remote monitoring, coordinating and configuring complex user network environments.

The functionality of the NGC can be expanded by simply adding easy-to-implement optional features, either when the mission or the sophistication of the application changes. In addition, the controller can be used with essentially any antenna on the market today, whether from ASC Signal or any other manufacturer, making it available to as many users as possible.

Ka-band technology, one of the frequency bands being utilized more in recent years, has been proven to deliver many advantages to users. ASC Signal began focusing on this newly adopted spectrum more than eight years ago, at the earliest stages of its development. As a result, ASC Signal was selected to help build four of the largest commercial Ka-band



infrastructure networks to date: IPSTAR, DirecTV, Wildblue and HNS Spaceway. In European networks, ASC Signal's Ka-band products are also currently in use on SES Astra and Eutelsat systems and the company is continuing to design and manufacture products for other newly-launching services.

ASC has developed many cutting-edge, high-performance features for Ka-band, including a patented sub-reflector tracking (SRT) technology that delivers superior satellite tracking performance. ASC has become a leader in the deployment of new technologies that continue to help build the global Ka-band footprint. ASC Signal will continue to develop and deliver highly-sophisticated antennas and systems based on the ever-changing technical requirements of its commercial and government/military customers. By being an agile, engineering-focused company, ASC will anticipate and satisfy the demands of the satellite industry for newer, higher-performing antenna products.

Keith Buckley is the President and CEO, ASC Signal Corp.



The past year was marked by some exciting developments in the areas of new business and services. In June, AsiaSat's new Direct-to-Home (DTH) project, DishHD, officially launched its services in Taiwan. This project is a joint venture between AsiaSat and EchoStar Corporation and offers HD DTH satellite television services to Taiwan and other targeted regional markets. Delivered in MPEG-4 format via AsiaSat 4's Ku-band Broadcast Satellite Service (BSS) beam, DishHD provides its customers with a choice of 39 enhanced and high definition (HD) channels, delivering content that encompasses all genres, from sports, movies, entertainment and documentaries, to lifestyle, fashion and food.

Also in June, a new client — Vietnam Multimedia Corporation (VTC) — began delivering a new premium DTH platform via AsiaSat 5, the Company's newest satellite. Using four transponders on the new Ku-band Indochina spot beam, VTC provides up to 30 HD and 70 SD channels in various subscription packages to address the diverse needs and interests of television viewers in Vietnam.

New business continues to be acquired and existing clients are introducing new services. For example, the client portfolio has been expanded to now include a compelling program neighborhood of more than 500 TV and radio channels. These serve Asian audiences with the most comprehensive and highest quality content. One of the most exciting additions during the year was the launch of six new premium HD channels by Asia's largest international TV broadcaster, Fox International Channels, on AsiaSat 5, the ideal satellite platform for distribution service of HD and SD in the Asia-Pacific region.

During 2010, AsiaSat continued to see growing regional demand for HDTV and an increasing number of new DTH satellite television and other payTV platforms serving Asia. The Company was able to benefit from the recovering economic activities and new growth opportunities across the region.



AsiaSat-7

YEAR IN REVIEW — 2010

A strategic replacement program assures service continuity to AsiaSat 3S customers. Additionally, AsiaSat 7 was originally ordered as AsiaSat 5C, a backup satellite for AsiaSat 5. However, following the successful launch of AsiaSat 5, this backup satellite was reconfigured as AsiaSat 7, which will be a replacement satellite for AsiaSat 3S at the orbital location of 105.5 degrees East. Construction of this new satellite is progressing on schedule. In early October, we entered into a contract with International Launch Services (ILS) to launch AsiaSat 7 on an ILS Proton rocket in late 2011.

In the area of occasional use service, 2010 has been one of the busiest and most exciting for AsiaSat. AsiaSat satellites' ubiquitous access to all leading Asian terrestrial networks and pay platforms makes it the most popular choice for video service providers and broadcasters for occasional use transmission of live international sports events. Events delivered via AsiaSat during the year included the Vancouver 2010 Winter Olympics, the Indian Premier League, the FIFA World Cup, the New Delhi 2010 Commonwealth Games and the Guangzhou Asian Games.

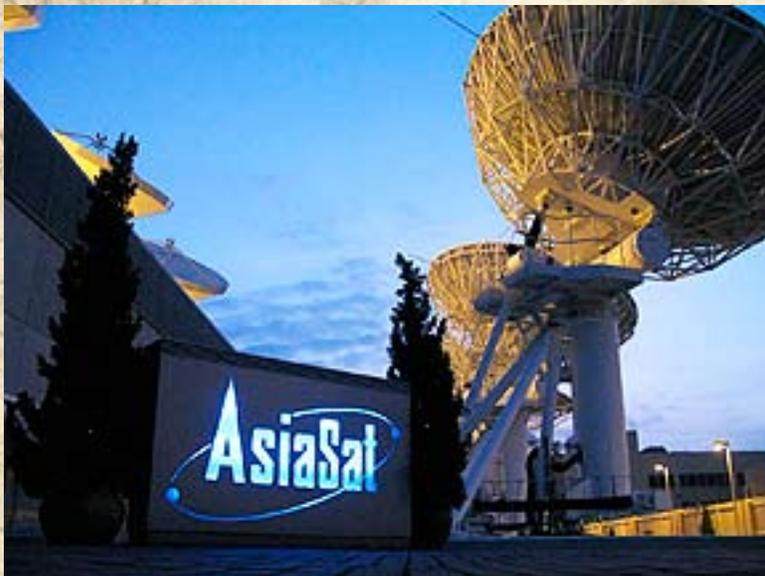
Not only does AsiaSat provide quality transponder capacity to support the HD and SD telecasts of these tournaments across the region, we also provide seamless, reliable and cost-effective turnaround and uplink solutions for our clients. For example, during this year's FIFA World Cup, transmission services were provided to long-time client, Eurovision. The Eurovision signals from South Africa were transported

via a dedicated fibre network to the Tai Po Earth Station in Hong Kong. From those facilities, signals were uplinked to the satellite, providing coverage for the entire Asia-Pacific region. To further expand the one-stop transmission solutions for customers, the Company has also introduced new C-band MCPC platforms that use DVB-S2 modulation to provide cost effective content delivery solutions across our satellite fleet from Tai Po.

During the year, AsiaSat's wholly-owned subsidiary, SpeedCast, also achieved positive growth with an encouraging increase in turnover and net profit during the first half of 2010. This was accomplished by actively growing their business and investing in new areas, such as the maritime broadband and VSAT services.

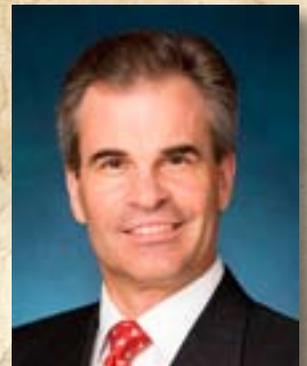
Going forward, the landscape in Asia looks ready for new growth opportunities. Continued growth in DTH is expected as well as the launch of new services across the region. Demand for capacity for content distribution region-wide, particularly HD, and for broadband services in places not well served by terrestrial networks are expected to continue to grow. With the construction of the AsiaSat 7 satellite making good progress, and the continued expansion of ground infrastructure to provide more comprehensive transmission solutions and services, the Company is well positioned to seize the new and existing business opportunities that lay ahead.

As the market leader in the Asia-Pacific region, AsiaSat serves over 100 broadcasters, news agencies, video service companies, telecommunications and broadband service providers as well as governments and commercial enterprises through its powerful fleet of three in-orbit satellites and world-class ground infrastructure in Hong Kong.



Tai Po Earth Station

William Wade, CEO, AsiaSat, appointed on August 1, 2010 — prior to assuming this new role Mr. Wade had served as the Company's Deputy Chief Executive Officer for 16 years.



This time last year, I wrote with some surprise that the anticipated dip in market activity after the financial crisis of 2008 had failed to materialize: Instead, we experienced a record year, with some major projects coming to fruition as well as strong increase in demand for our systems across the board. There were some jitters at times as customers paused to consider their investment strategies, but then pressed on as before.

The last 12 months have seen a continuation of this trend — and perhaps that is not so much of a surprise as things settle down after the initial shocks of 2008. Nevertheless, this is not a favorable financial climate for business growth — excuse me for stating the obvious. What makes our sector of the market so buoyant in difficult times?

When times are tough companies look to protect their business. In a rapidly evolving industry, such as the media, this can require several considerations. First, no-one wants to lose ground while competitors forge ahead carving out a market position in new service provision. In the media industry there are so many new opportunities arising from technological development, expanding infrastructure, and changes in consumer habits, the impetus for investment cannot be ignored. There's also the economist's adage that as money gets tighter, people turn more to entertainment as a form of escape.

If investment is an absolute requirement as a key to survival, the other main concern that follows from this is that investment should be directly linked in a quantifiable way to financial performance. Put more succinctly, if an organization can see rapid, tangible financial payback arising from an investment, it is likely to press the button.

This means those manufacturers and service providers whose offering delivers direct benefits in terms of cost savings — or a competitive advantage in service levels — are strongly placed to do well in the current climate. As that's exactly what Bridge

Technologies offers its customers, it shouldn't be too much of a surprise that the past year has been another period of strong performance for us.

Behind every headline-grabbing innovation that holds the promise of media industry expansion — 3DTV is this year's poster child — there remains one simple constant: Consumers may be excited by these innovations, and demand may rise as a result, but unless media services are delivered to acceptable standards of quality, they will not be successful in the market. Unless media organizations can provide those quality standards in a cost-effective way, they will lose competitiveness.

A monitoring and analysis system offering a precise and efficient way of maintaining standards all the while keeping costs down is a good investment decision for any media business. We've seen a clear trend that the logic of this is inescapable for media operators, even if they did not factor such a system into their initial planning. After operating without good fault diagnosis capabilities for years and seeing maintenance costs and customer dissatisfaction rise inexorably, what media organization would not take the opportunity to halve maintenance spend, and boost service levels? This is exactly what happened this year at Tre-For, a public utility company turned media provider in Denmark. Tre-For since 2010 has experienced a tenfold increase in their business, dramatically reduced costs, and increased service levels — all vital to the company's performance.

Service-affecting errors can be introduced anywhere in the media delivery chain. Therefore, integrated monitoring of all key points in the chain is important. An end-to-end solution such as VideoBRIDGE is so valuable precisely because it is comprehensive and can pinpoint exactly where errors are being generated, anywhere in the chain. In 2009, our Company placed the last link of the system in place, with the introduction of the VB270 probe with its satellite DVB-S/S2 interface, giving VideoBRIDGE true satellite-to-STB capability.

Since its introduction, the VB270 has been installed by many companies, often with results that surprise them. The quality of the satellite signal is often

YEAR IN REVIEW — 2010

overlooked as the source of problems further downstream, yet companies using the VB270 soon learn such an assumption is a mistake. Any device, such as a satellite dish, which is exposed to atmospheric conditions and widely varying temperatures will undergo physical changes. In the case of a satellite dish, this means drift. The general assumption is that once a dish is in place, and as long as signal is being received through it, no further attention is necessary. However, the built-in error correction that makes satellite reception viable is designed to compensate for atmospheric conditions such as fog and rain. If, through physical drift and misalignment, a large part of the error correction headroom is taken up, higher levels of errors will be introduced into the signal. By checking the integrity of the signal at the dish with the VB270, companies ensure they do not waste time and costs trying to track errors further downstream, when the cause is at the dish. Larger operators use the VB270 on every dish to ensure the quality of uplinked data. Even on a smaller scale, the results can be dramatic: after introducing the VB270 into its system, Tre-For quickly traced 85 percent of its data errors to satellite dish misalignment.

Uplinking, downlinking, contribution, IPTV... there are many applications, and high-quality integrated monitoring that embraces the broadcast and IP domains delivers crucial benefits in all of them. The key is to be able to monitor — in detail — at

all points in the chain. The principle of total access to every inch of the signal's journey is at the core of the Bridge Technologies offering. It's what's driven the design of our main product launch in 2010: the VB12-RF. This compact, highly portable broadcast-IP monitoring and measurement appliance for terrestrial and cable applications packs every required interface for RF, ASI and IP into a ruggedized chassis smaller than a laptop computer, with full TR101290 alarming and analysis, and support for all major media transportation codecs. Designed for the rigors of real-world use on the road, the VB12-RF is smaller, lighter and tougher than any comparable monitoring solution. And, like all VideoBRIDGE probes, it instantly contributes detailed data to the system as a whole, adding to the 'big picture' of the digital media delivery chain, without being limited to an IP or RF approach alone.

It's this big picture view — from satellite to STB — that saves media operators time and money.

Simen K. Frostad is the Chairman of Bridge Technologies



CETel Germany (Central European Telecom Services GmbH) is one of the leading providers of Teleport & Satellite Services worldwide. The company offers services from their European headquarters with their own teleport facilities in Germany, and their affiliated company CETel Middle East in the U.A.E. CETel's strength is to provide satellite connections between worldwide facilities, offices, production platforms and oil and gas rigs for international industrial companies and governmental organisations. The provision of many services across the world demonstrates CETel's reliable service and close collaboration with strong and trustful partners worldwide.

Looking back at 2010, CETel had an excellent year and significantly expanded its satellite portfolio with new Ku- and C-band satellites. At the start of 2010, CETel implemented new service on NSS-12 from SES WORLDSKIES, to serve the tremendous demand for satellite communication in the Middle East market. In addition, CETel complemented its portfolio with several transponders on the powerful C-band satellite Arabsat 5A that covers the entire African continent. This service allows CETel to further expand its business and to also reach new countries in southern Africa. (CETel can offer excellent coverage with its satellite portfolio that includes satellite services on the Arabsat fleet, SES WORLDSKIES, Eutelsat, Intelsat, Telesat and others. From its headquarter and teleport facilities, CETel can easily reach satellites located between 68 degrees West and 75 degrees East. This means CETel is able to provide its services to more than 100 countries.

In 2009, CETel celebrated the expansion of its business as well of its own teleport facilities in Germany (near Cologne/Bonn). Together with customers and business partners, the Company inaugurated the opening of 600m of new office space and additional technical facilities, as well as two new 9m antennas. CETel's achievements were honored by the World Teleport Association (WTA) which ranked CETel as third in the category "Fastest growing

Teleports in the World" of 2009. Evaluating the year-over-year revenue growth in the most recent fiscal years, CETel achieved an impressive growth rate of 62.81 percent.

"We are delighted about this award from the WTA and we are proud to be among the fastest growing teleports in the world. CETel and its team has been extraordinarily successful with its services, particularly for integrated end-to-end solutions and corporate networks based on state-of-the-art technologies", said CETel's Managing Director Martin Terlunen.

CETel's philosophy is to further develop and enhance the business and to constantly increase efficiency to generate more profitability. One example is the launch of "FlexACM" technology from Newtec for a customer project in 2010. The implementation of FlexACM resulted in a significant increase of the data throughput in a given satellite segment while also guaranteeing 100 percent link availability.

"The installation of the Newtec infrastructure has been the culmination of our drive to deliver higher quality and greater efficiency in our services", says Sergey Raber, Director of Operations at CETel. "With the implementation of FlexACM, CETel can now achieve



YEAR IN REVIEW — 2010

far more with our bandwidth, and guarantee availability of the link under conditions that would otherwise have caused a service failure. This increased efficiency resulted in much greater profitability.”

CETel also broadened its teleport and hosting services and established a partnership with Nynex to expand its satellite IP network and introduce new broadband services onto the NSS-12 satellite. This partnership is a significant deal for CETel as it is a great combination of excellent teleport and satellite service with strong iDirect knowledge. The main target markets are telecoms, military institutions as well as maritime solutions requiring strong Ku-band coverage over the Middle East.

CETel is proud to partner with major players in the satellite industry and is looking forward to strengthening these partnerships and jointly serve the demand for satellite communication in order to follow demands of customers. CETel enjoys also a strategic partnership with Arabsat and is cooperating with all other major satellite operators, Telephone Network Carriers, leading TIER-1 IP backbone providers and Field Service Providers worldwide. CETel is able to offer End-To-End broadband communication solutions as a complete package.

Looking into the future, CETel is confident in the Company's ability to expand its business and to enlarge its customer base, all the while increasing revenues and broadening the service portfolio. The teleport infrastructure allows us to further extend our facilities and further satellites to serve the market worldwide. Extension of Company facilities and satellite access will be enhanced through current and future teleport capabilities. There will be a tight market due to the limitation of available space segment, at least during the first quarters of 2011. With the successful launches of additional new satellites, however, the shortage of satellite capacity within the international market should certainly be alleviated.

**Guido Neumann, Managing Director,
CETel Germany**



2010 has been a year of significant change for the Codan group and the Codan Satcom team. After 19 years at the helm, their CEO Mike Heard retired in November and was replaced by Donald McGurk. Donald, who has been a senior executive in the business for over 10 years, is a change manager and will help drive the next phase of Codan Satcom's exciting future.

In May of 2009, Codan Ltd. in Australia acquired Locus Microwave in Boalsburg, Pennsylvania, to form CODAN SATCOM (USA). With design and manufacturing capability in Pennsylvania, Locus Microwave's work in X-band continues with a steady supply of Block UpConverters, SSPA Modules, Low Noise Amplifiers and LNBS for use in WGS and other Military/Government networks. Included in the Locus product line is the recent introduction of a high power, Ku-band BUC (100, 120 Watt) which rounds out a variety of solutions for MILSATCOM requirements

The integration of the Locus business into Codan continues at pace. In August, our USA internal sales, marketing and customer support capabilities were consolidated into the Locus Microwave facility in Pennsylvania. The size of our team in Pennsylvania has also increased significantly with new staff in sales, engineering and manufacturing, effectively doubling the head count at Locus Microwave during the year.

Codan Satcom's global sales and marketing activities for Codan and Locus Microwave branded products are supported by the Engineering and Manufacturing teams in the USA and Australia and our new website at www.codansatcom.com. The next generation of products has also been successfully launched: Codan 8 W Ku-band Mini-BUC is positioned to support the rapid growth in the Maritime market for Ku-band VSAT terminals. Locus Microwave 100 and 120 W Ku-band BUCs round out the product portfolio for Military X- and Ku-Band requirements and extend our capability to support the Commercial market with the Codan C & Ku-band RBUC family.

The product roadmap for 2011 includes further extensions to the Codan and Locus Mini-BUC platforms to support C-, X-, Ku- and Ka- requirements in both Military Manpack and Maritime and Commercial VSAT markets. There will also be continued extension of our higher power C-, X- and Ku-band products focusing on new and innovative technologies that further reduce size and weight with improved RF efficiency.

Gary McGovern, Executive Vice President, Locus Microwave



Towards the end of last year, I was named Chairman of the Satellite User Interference Reduction Group's (SUIRG) Video Carrier ID working group, and as such, satellite interference has taken up a lot of my year in one form or another. If you read my article in this issue, "The Colem Identity," you will receive an insight into the work SUIRG carries out and the project we have been working on leading toward Carrier Identification for all satellite video transmissions. As you can imagine, that has kept me pretty

busy in itself, but I have found time to roll out a few projects and to even do some product development, thanks to the support of Tom Blake, my recently appointed Product Architect.

The ID project is an extremely worthwhile initiative. Satellite interference is becoming an increasing problem, due to increased demand on the satellite infrastructure and the plethora of activities satellites are used for these days.

With my SUIRG hat on, and while attending a number of events this year, I have been actively working to bring broadcasters, manufacturers, and other satellite operators, on board with both the Carrier ID and training initiatives. The work is proving successful, with many of the companies involved in that chain realizing the importance and business benefit of reducing interference. In fact, taking video transmission as the prime example, we are now at a point where encoder manufacturers are preparing and — in many cases — have achieved the goal of making Carrier ID available on all video encoders for the single transmit chain scenario.

Colem launched a number of features at this year's IBC aimed at reducing interference, including the Company's standard offering of Automated Carrier ID. This ensures the unique ID is registered automatically on product deployment. In addition, Colem has developed a range of tools that allow the unique ability to self-monitor a terminal's transmission parameters as well as the ability to check spectrum availability. Using the equipment within the terminal and applying analytic techniques unique to Colem, users are now able to automate the live monitoring of available transmission bandwidth. In addition, media management has been added to the mix, giving broadcasters more flexibility at the vehicle, or flyaway, than previously possible and ensuring interference is avoided.

Tom Blake, on the other hand, has been focused on larger NMS projects and has developed new techniques in production and configuration of these systems. Colem has two projects at present using these capabilities; a data system with multiple modem links and a news broadcast system. Both of these products are fully client configurable yet remain tailor-made to suit individual customer requirements. All

Our Imagination is your Future

include an array of features from predictive and logical alarm handling, reporting, logging and mapping. These techniques will be incorporated into Colem's SNG and FlyAway products during 2011.

As I am often known to say "it doesn't stop at Carrier ID or Training" and "we need to look beyond that to new initiatives and future technology so that we can, eventually, stop interference altogether!"

Martin Coleman is the Director of Colem



Comtech AeroAstro (CAA) is excited about, and remains determined in its passion that small satellites and related technologies provide significant capability for effectively achieving military, civil, and commercial space mission goals. Now in its 22nd year, it is evident CAA's patience is paying off — the time of high-utility and smaller, modular space systems has truly arrived.

Strategically, CAA continues to position itself with improved high-performance hardware and software designs for smaller satellites and with space situational awareness technologies. CAA is setting the standard for the future of this critical industry capability with rapid, responsive spacecraft development using its modular plug-and-play technologies.

Ashburn, Virginia-based Comtech AeroAstro, Inc., is a wholly owned subsidiary of Comtech Telecommunications Corporation (NASDAQ:CMTL) in Melville, New York. Comtech AeroAstro, Inc. is a leader in satellite systems, components and selected payload and mission domain expertise technologies. President Paul Lithgow, a 30-year aerospace veteran, led the organization through acquisition and transformation while maintaining CAA's heritage as a premier small satellite, component and mission payload provider.

Under Mr. Lithgow, innovation and entrepreneurship continue to thrive, but with increased emphasis on expanding CAA's customer base, 'right size' processes to satisfying government space systems programs requirements, and increasing mission-level expertise and modeling capability. Examples of this are CAA's STPSat-1 and -2 Programs. Developed for the DoD Space Test Program (STP), these satellites are designed to capitalize on excess mass and volume margin as secondary missions on Atlas V and Minotaur IV launch vehicles instead of requiring their own expensive launch vehicle.

CAA developed and supported the launch of the STPSat-1 in March 2007 on an Atlas V. This satellite, designed for a one-year mission life, was decommissioned in October 2009 after successfully providing more than two years of valuable mission data.

In December 2008, CAA delivered the first STP Standard Interface Vehicle (SIV) satellite bus; that mission, STPSat-2, was launched in November on a Minotaur IV rocket. Once flight proven, the STP-SIV bus will be a workhorse platform for hosting a variety of missions and payloads to a wide range of low-Earth orbits. Moreover, CAA was honored by being recognized by the American Institute of Aeronautics and Astronautics (AIAA) with the 2010 Space Systems Award. Mr. Lithgow accepted the award on behalf of the government and contractor team. The award read "in recognition of the STPSat-1 government-led, multi-contractor team for their successful design, development, integration, and on-orbit tests of technologies and mission operations supporting critical USAF and USN missions."

CAA is currently developing the U.S. Navy's microsatellite bus on the Joint Milli-Arcsecond Pathfinder Survey (JMAPS) Program, to provide highly accurate star position data for military and civil applications. Similar in size to the STPSat-1 and -2 vehicles, this satellite bus, called the Astro 200AS, is more stable, more agile and has better pointing accuracy than vehicles in the commercial imagery business at a fraction of the cost. This capability enables a range of new high-value mission and sensor options on an affordable platform that can be rapidly developed and deployed.

CAA offers star trackers, miniature imagers, Sun sensors and transceivers to the growing small satellite community. CAA is also expanding its expertise into unique mission areas, including payload and sensor development that support national security needs in ISR, space situational awareness and special communications.

During 2010, CAA continued to invest in significant upgrades to tools and facilities to be better equipped to support the broad national security space customer community. One ongoing, funded effort, PACS, CAA's Payload Alert Communications System, is a novel, new and revolutionary approach supporting low-Earth orbit space traffic control while monitoring space situational awareness. PACS provides low cost, low size, weight and power position, velocity, time information along with low-data rate host vehicle health and status reporting utilizing a CAA patented waveform. The system uses a unique tagging, tracking and locating device along with existing navigation constellation infrastructure to provide PACS services to users. This data availability can be critical during post-launch initialization and anomaly resolution, since the availability or lack of information for extended periods can be the difference between rescue and loss of an orbiting asset.

Building on these successes and advancements, CAA is looking to the future. Specifically, the goals of rapid and reconfigurable spacecraft fit ideally with CAA's commitment to the value of smaller, rapidly developed systems to execute critical missions. CAA has been operating in this area since 2000 and supported the Operationally Responsive Space Office's (ORS) initial efforts, developing a detailed preliminary design for a Modular Multi-mission Space Vehicle for ORS in



early 2009. This design was further refined and led to an award in September 2009 for a five-year IDIQ contract from AFRL for Advanced Plug-and-Play (PnP) development. CAA has been an advocate for spacecraft PnP since 2001 and believes it to be an enabling technology for spacecraft that can be configured and launched in days rather than months — a key goal for successful responsive space operations.

However, PnP's utility does not stop there. CAA sees the technology as an enabler for a new way to develop spacecraft of all size classes, big and small, by shortening schedules and reducing costs without compromising delivered performance. With completion of AFRL's Advanced Plug and Play Technologies Task Order (TO) 1, and TO2, CAA was also recently awarded TO3 which sets the stage for spacecraft providing support to not only AFRL, but also ORS, NRO and NASA.

In 2009, CAA unveiled its Coral CubeSat high-performance satellite; this satellite, about the size of a loaf of bread, is deployed as a secondary payload from almost any launch vehicle. CAA's Coral satellite provides very high performance for a variety of mission sets in a small, compact, low cost package. Coral uses miniaturized but sophisticated components (many developed by CAA), and affords serious experimenters the opportunity to quickly launch and

YEAR IN REVIEW — 2010

test their mission and payload ideas in space. CAA continues its advancements in miniaturization of electrical and mechanical systems; it is breaking paradigms and setting the industry standard. During the past year, CAA has experienced tremendous growth. With increased revenue and projected sales, growth is at its highest ever.

Continued contracts and bookings offer CAA what promises to be a successful FY2011 and beyond. Investments in training programs such as Earned Value Management System (EVMS), Cost Account Managers (CAM) software and Responsible Engineering Authority (REA) development has resulted in improved customer support for program coordination and execution. Upgrades continue to its Ashburn labs and clean rooms, and both Ashburn and Littleton expanded their secure file servers. CAA now has new firewalls and servers providing improved security and seamless sharing of data to include sharing and synchronizing CAD drawings between its two sites. During 2010, CAA's organization had nearly doubled at its two locations. With concentration in support of the JMAPS and APT Programs, aggressive recruiting continues for key engineering staff.

Using IT tools developed for the social networking industry, CAA continues to promote a virtual working environment allowing its staff to support ongoing efforts from either of its two locations as well as remotely from other parts of the country. To learn more about Comtech AeroAstro, visit the Company at www.aeroastro.com.

Mr. Paul Lithgow was named President of Comtech AeroAstro, Inc. in August 2008. He was previously AeroAstro's Chief Operating Officer. Prior to joining AeroAstro, Mr. Lithgow served as the Director of Advanced Concepts at Radyne and led the Advanced Programs Division at Spectrum Astro until 2004.



Stanley O. Kennedy, Jr. serves as the Vice President and General Manager of Programs for Comtech AeroAstro. In this role Mr. Kennedy is responsible for executing all program activities to include Space Systems and Space Product development.



One of the best methods wherein a Company's success in 2010 can be measured is by reviewing contract and product success. Such is certainly the case for Comtech EF Data, a wholly-owned subsidiary of Comtech Telecommunications Corporation. With million dollar orders being received throughout the year, a review of their October and November orders reveal the significant opportunities received by the Company.

A major event for Comtech EF Data was the acquisition of Stampede® Technologies, a company that developed the FX Series WAN optimization and application acceleration platforms. Such will now assist Comtech expand their WAN offerings for commercial applications, which, overall, aids in far better use of satellite links and reduces the bandwidth required for SATCOM. The Stampede technology merges one-sided application delivery and two-sided WAN optimization into a single platform, and there are a renumber of remote side WAN optimization options, as well. Using Stampede's Application Delivery Controller (ADC) and WAN Optimization technologies (WOC), the number of channel bits are reduced through multiple forms of compression to minimize IP congestion on satellite links. Typical users for the Stampede products include ISPs, enterprises, offshore/maritime, and telecommunications operators.

In early November of 2010, the Company was awarded several million dollar contracts. There was a \$1.0 million contract for a DTH service provider for modulators and demodulators for expansion of that firm's services in the USA. Specified were Comtech's DM240XR Digital Video Broadcast Modulator and the Demodulator units as well as the RRS11 Solid State Transfer Switches. Incorporated into these units are high capacity, programmable FPGA cores, which allow users to expand networks and also minimize the impacts of new technologies or service offering, as well as reducing costs for service providers.



Comtech EF Data's DM240XR

Another contract was for \$1.9 million from U.S. government agencies for the firm's turboIP-G2 Performance Enhancement Proxies. These will be used to upgrade networks that support tactical communications at fixed site as well as aiding communication-on-the-halt applications. The turboIP-G2 accelerates TCP sessions at speed of 15 or 45 Mbps, all the while requiring minimal topology alterations. With the ability to operate as a hub device, or at a remote site, WAN optimization features are tailored to address SATCOM and, to minimize the data traveling via satellite links, advanced compression techniques are employed.

A \$1 million order was received in October of 2010 for placement of their Vipersat-powered dynamic Single Carrier per Channel (dSCPC) satellite networks in a variety of Asia-Pacific countries to provide high-speed IP emergency services communications for governments and utility companies in case of natural disasters or other terrestrial failures. This order included the Company's SLM-5650A, CDM-570L, CDD-564 and CDM-562L satellite modems as well as the Vipersat Management System (VMS), which provides dSCPC bandwidth management of the space segment.

Also in October, a \$3.2 million order was received to upgrade fielded satellite terminals in support of tactical military communications. The MBT-5003 Up/Down Converter System and the SLM-5650A Satellite Modem were on the order requisition. The former provides frequency conversion between L-band IF and C-/X-/Ku-band RF frequencies with a 3Ru platform package and is designed for rugged fly-away terminal use. The latter Satellite Modem is compliant with MIL-STD-188-165A, modem types I, II, IV, V and VI for applications on DSCS, WGS and commercial satellites. The modem supports advanced options such as increased bandwidth efficiency and flexibility, including TRANSEC and Network Processor modules.

Comtech EF Data also won the Frost & Sullivan "North American New Production Innovation of the Year in Satellite Communications Modems". A number of criteria were used to benchmark the performance of the CDM-750 modem. These included performance against key competitors, product elements, leading edge technologies inclusion, value-added benefits and features, and the value to the customer as well as customer acquisition and penetration potential. The CDM-750 simultaneously supports DVB-S2, ACM, GZIP compression and DoubleTalk® Carrier-in-Carrier® and also leverages DVB-S2 EN 302 307 LDPC/BCH for a blend of modulation and coding to ensure the maximum amount of satellite traffic is transported for a given signal to noise capacity. The modem can also automatically adjust performance and error correction when confronted with changing link conditions.

In commenting on the Company's performance and business outlook for Fiscal 2010 Q4 and Full Year, Fred Kornberg, President and Chief Executive Officer of Comtech EF Data, said, "Our fourth quarter and fiscal 2010 results were strong and benefited significantly from the timing of shipments of multiple large orders from the U.S. Army. Although our fiscal 2011 guidance reflects lower sales relating to these orders, all of our other product lines are expected to show year-over-year growth." Mr. Kornberg added, "We believe that business conditions are slowly improving and are excited about our long-term business prospects."

Mr. Kornberg has been Chief Executive Officer and President of the Company since 1976. Prior to that, he was the Executive Vice President of the Company from 1971 to 1976 and the General Manager of the telecommunications transmission segment.



YEAR IN REVIEW — 2010

For EB (Elektrobit), 2010 was a year of accomplishments and new beginnings. A developer of embedded technology solutions for automotive and wireless markets, EB continued to develop state-of-the-art integrated satellite and terrestrial technology, enabling next generation broadband mobile IP services and applications for companies worldwide.

Looking into the present and future of the industry, EB maintains its focus on supporting the next-generation of wireless communication technology and has identified M2M (Machine-to-Machine) and MSS (mobile satellite service) markets as key drivers for the advancement of technologies in the mobile space.

The MSS industry is in the midst of a revolutionary change. New, larger satellites are becoming available to power smaller, more efficient devices. However, outdated satellite-only devices are still being used, in spite of their performance, features, and pricing structure. More importantly, outdated devices lack smartphone features and interoperability as they do not run on terrestrial networks.

Recognizing the change in the MSS landscape, EB has marked its first step into the future of this technology by introducing the world's first dual-mode (satellite-terrestrial) smartphone — the EB-designed TerreStar GENUS. Officially announced for availability in the government and enterprise markets in October of 2010, the GENUS is a hybrid smartphone that provides an overall more user-friendly MSS experience. The unit allows for texting, email, calling, and other services across 3G terrestrial and IP-based satellite networks.

As research from an AT&T Business Continuity Study revealed that businesses are stressing greater importance on disaster planning and business continuity, the GENUS provides an economic and sensible solution that addresses many of the concerns surrounding these issues. Working with TerreStar and AT&T to bring the GENUS to market, EB has made it possible for users to gain access to the vast capabilities and advantages of a satellite connection, uncovering new levels of mobile efficiency, convenience, and business opportunities.

What does this mean for the MSS market in 2011? Due to the growing importance of data and interoperability, for 2011 EB sees the Long-Term Evolution (LTE) and other all-IP network solutions as the best platforms for providing hybrid MSS services. As these all-IP networks transition from IPv4 to IPv6, a virtually unlimited number of devices with unique addresses will be enabled for MSS use. Coupled with more powerful satellites and chipsets, the future MSS phone allows for a more compact form factor with economized production and scalability capabilities.

With improvements in device form factor that will makeover MSS devices to resemble normal smartphones, we can also look forward to the adoption of open source technologies such as Android OS across special verticals. Consumers will be able to choose from a range of more intelligent and inexpensive devices, and enjoy data-centric applications on their MSS capable phones as they become available through a satellite network.

Automotive Software



Wireless Solutions



Wireless Communications Tools



telcos seeking a competitive IPTV solution for popular video and audio channels, including high definition.

In June, EchoStar announced that XStreamHD, an emerging leader in the delivery and distribution of Full HD entertainment directly to the home, entered into a long-term satellite service agreement with EchoStar to use satellite capacity from the EchoStar-leased AMC-16 satellite that is centrally located at 85 degrees west longitude. XStreamHD will increase its capacity on the AMC-16 satellite as the company's transport needs grow over time. The two companies have been working together for the past two years as XStreamHD completed the operational testing of its revolutionary transport technology.

One of the most exciting announcements came in September when EchoStar created a joint venture with Deluxe Digital Cinema, Inc., to form Deluxe/EchoStar L.L.C., a joint venture to build an advanced digital cinema satellite distribution network targeting delivery to digitally equipped



theaters in the U.S. and Canada. This Deluxe/EchoStar Network brings the full power of the digital satellite technology directly to the local multiplex. With Deluxe as the leading worldwide provider of services in film and digital media to the entertainment industry and EchoStar's veteran experience as a satellite services provider, Deluxe/EchoStar can deliver traditional 2D and 3D feature films, live events, special content, and other programming developed specifically for digitally equipped theaters at the highest quality and with the most coverage, reliably and efficiently.

These new initiatives and business opportunities were led by Dean Olmstead, president of EchoStar Satellite Services, who, sadly, passed away in October after a courageously fought battle with cancer. *(Please read the memorial tribute to Dean that leads off this issue of SatMagazine.)*

EchoStar Satellite Services L.L.C., a wholly owned subsidiary of EchoStar Corporation, and a provider of satellite-related aggregation and distribution of video, audio and data domestically and internationally, experienced a year of growth and launch of new business initiatives.

EchoStar started the year by donating satellite communications services to Haiti relief agencies following the disastrous earthquake. The company also worked in collaboration with Spacenet Integrated Government Solutions, a division of Spacenet Inc., to deliver two-way satellite communications involving space and ground equipment to the American Red Cross to aid in relief efforts in Haiti.

EchoStar's ViP-TV service for telcos and small cable operators continued to sign on new customers, including resellers such as Mega Hertz, Inc., Fidelity, and Pace. The resellers are important for marketing the ViP-TV transport solution to cable systems and



EchoStar assists with SATCOM in Haiti earlier this year.

YEAR IN REVIEW — 2010

Dean joined EchoStar shortly after the company's spin-off from DISH Network in January of 2008, and was instrumental in building the foundation and guiding the strategic course for the company's then-nascent satellite operations.

"Dean will be remembered as a true legend in the satellite industry and will remain an eternal inspiration for our employees," said Mike Dugan, CEO and president of EchoStar Corporation. "Dean was a visionary who helped reshape the entire industry. His accomplishments at EchoStar and through his esteemed career have created the base upon which others will build for years to come."

EchoStar looks forward to continuing to build on its new satellite-related business ventures into 2011.

Mr. Michael T. Dugan was named the company's President and CEO in November of 2009. Mr. Dugan served as a member of the board of directors since October 2007, and previously served in several executive roles at the combined company from 1990-2004, prior to EchoStar's spinoff from DISH Network Corporation in January of 2008.



EMP (Europe Media Port) is a global service provider for the distribution of video, Internet services and data connectivity solutions to the media, ISP, and government markets, via the Nemea teleport located in Greece.

EMP delivers the highest quality transmissions to broadcasters, teleports, satellite operators, enterprises, ISP providers, PTP data carriers, and governments. With a strategic geographic position, EMP offers high quality access to all satellites in the 45 degrees West to 90 degrees East range,

covering Europe, the Middle East, Africa, the Americas and Asia.



Nemea Earth Station

Europe Media Port is partnering directly with satellite operators and teleport facilities around the world to provide diverse end-to-end solutions to the satellite service market. We are delighted to have been selected by the World Teleport Association (WTA) as the "fastest of the fast" for the second year in a row, with an impressive 127 percent revenue growth in our most recent fiscal years. The "Fast Twenty of 2010" award, together with the recently announced deals with O3b Networks and Kahkeshan Digisat fit securely within EMP's corporate strategy of expansion in the video and data markets. Additionally, the company is continuing to grow by serving new global clients through the expansion, by offering a value proposition that stays competitive, customized, and flexible to customer needs.

New infrastructure investment continues in new products and services across the entire market. For example, the Nemea teleport just completed the installation of three, new, large dishes that range in size from 7.2 to 11 meters with an order already placed for additional dishes to be delivered in 2011.

On the fiber side, recent upgrades support STM-64 and Gigabit Ethernet high speed data rates. Human capital is also a top priority for us by retaining highly skilled and well trained employees.

In an expanding satellite market, there are many opportunities for maintaining growth through the application of well-conceived strategies — there is room to expand further in revenues and profitability. The strategy focuses on the global delivery of video solutions and the provision of new broadband high-speed data services

Future growth appears strong for the African and Middle East markets, where new satellite capacity propositions can satisfy increasing demand for capacity, combined with the appropriate mix of teleport uplink and turnaround services.

Europe Media Port is operating within a niche market which possesses its own dynamics of economic behavior — sometimes the dynamics appear to be uncorrelated with global trends. With an excellent geographic position, diverse connectivity with fiber networks, a competitive value proposition, and professional attitude to the most demanding customer, EMP is constantly working on various projects that are unbounded by any geographical or service limitations. The target for 2011 is to offer more solutions and end-to-end services as the Company continues its aggressive move up the value proposition chain.

**Dimitrios Papaharalabos,
Head of Sales & Marketing**



◇ **Broadcasting Satellite Services Not Slowed Down By Recession**

Despite a limited market slowdown, the FSS market grew both in terms of transponder demand (+5.3 percent) and revenue reaching \$ 10.3 billion in 2009. Television broadcasting and emerging markets continue to be the primary growth drivers, with satellite broadband service (“BBS”) systems contributing to growth as well.

The broadcasting satellite services market has good prospects for the coming years. Future growth is expected in the emerging digital markets of Latin America, Asia, and Eastern Europe, while the mature markets of North America and Western Europe will continue to sustain a large volume of channels.

Speakers on several panels at the World Satellite Business Week that took place from September 6 to 9 in Paris agreed that the broadcasting market is undergoing deep technological changes, resulting in the growing sophistication of services being offered. High definition is expected to be a key growth driver in the next decade. From content producers to equipment manufacturers, the value chain is progressively turning to HD.

The transition from SD to HD will generate further activity for satellite service providers, to the detriment of broadcasters whose priority is to limit the costs of migration. Both global and regional operators are confident in the growth prospects of their business as consumers continue to watch TV, even during an economic crisis. New TV channels will be launched in the future, led by the rollout of new platforms and the enlargement of existing satellite pay-TV platforms' offerings.

Some of the biggest challenges for pay-TV remain piracy and the size of the free-to-air market. In the emerging digital markets where terrestrial pay-TV penetration is still low, operators offering satellite pay-TV have an opportunity to increase market share. In mature markets such as North America and

YEAR IN REVIEW — 2010

Europe, where the satellite video broadcasting industry is already largely developed, future demand in satellite capacity is expected to come from the roll-out of enhanced services (non-linear TV) and from higher-quality content such as HDTV, 3DTV and Ultra HD which require more capacity. Source: **17th Satellite Communications & Broadcasting Markets Survey, Forecasts to 2019** — Mounia El Bouzegaoui

Mounia works as an analyst primarily in the area of digital broadcasting. She contributes to both client missions and research reports, such as **Satellite TV Platforms and Satellite Communications & Broadcasting World Markets Survey**. Prior to joining Euroconsult in 2007, she worked for IBM Global Technology Services and a small consulting firm in the UK.

bouzegaoui@euroconsult-ec.com

◇ Growth Ahead In The Maritime Satellite Communications Sector

The recession's impact on the maritime satellite communications industry has been modest.

Despite a drop in sales of some equipment and a slowdown in new installations, a large number of service providers reported continuous growth in satellite usage and service revenues. Despite the generally poor economic climate worldwide at the time, revenues increased by nearly 9 percent, with tier-1 service provider revenues reaching nearly \$1.4 billion.

Source: **Maritime Telecom Solutions by Satellite--- Global Market Analysis & Forecasts** — Projections on SATCOM terminal installation in the merchant shipping sector — Wei Li

Wei is a regular contributor to Euroconsult research reports and clients missions, focusing on capacity demand and pricing, as well as applications and FSS downstream sectors evaluations. Prior to joining Euroconsult Wei worked at Vizada (formerly known as France Telecom Mobile Satellite Communication), where he analyzed opportunities in specific vertical and geographic markets for the Inmarsat BGAN service and managed pilot projects for new products.

li@euroconsult-ec.com

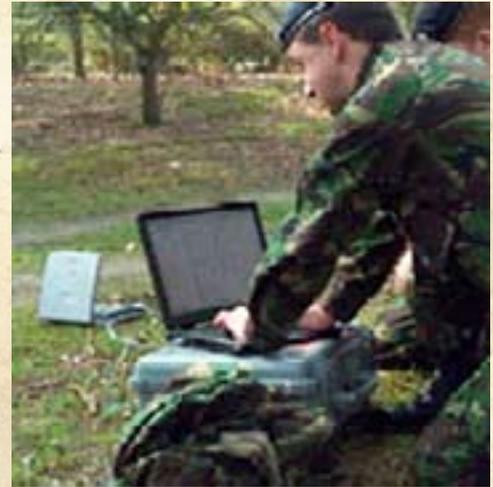
At GateHouse, 2010 marked the year for the completion and release of the Company's BGAN Software Defined Radio (SDR) waveform. A complete SDR-based BGAN radio was successfully demonstrated at the SDR Forum Conference and Exhibition in Washington DC in December 2009.

The demonstration showed the result of the joint SDR program completed by GateHouse, Inmarsat plc and Spectrum Signal Processing by Vecima, and offered evidence that BGAN SDR-based satellite communication is an opportunity readily at hand for manufacturers of military radios.

In July of 2010, GateHouse and Inmarsat signed an agreement to jointly promote the BGAN SDR waveform. The agreement strengthens the technological and commercial co-operation

between the two companies and supports a joint effort in bringing the complete BGAN SDR waveform, compatible with the Software Communications Architecture (SCA) framework, to the Joint Tactical Radio System (JTRS) program. BGAN SDR opens a new path to establishing broadband satellite Communication On The Move (COTM), and will provide beyond-line-of-sight (BLOS) communication capabilities for military forces engaged in remote regions where BGAN currently is the only viable option.

SDR radio manufacturers will benefit from the joint implementation road map which ensures a fast track to developing a type approved Inmarsat BGAN user terminal. Further, SDR provides radio manufacturers with the opportunity to customize their offering to meet changing customer demands with limited extra costs and extended time to market, i.e., the opportunity to



deliver greater customer value at lower costs. GateHouse is confident the agreement with Inmarsat precludes a breakthrough for the BGAN SDR waveform. The technology has proven to be mature and will significantly reduce development efforts and allow military, commercial radio, and terminal manufacturers to quickly bring unique communications solutions to the market.

In the Autumn 2010, GateHouse formally joined an international project team — counting amongst others Inmarsat, Broad Reach Engineering, and COM DEV Europe — which will co-operate in the development of a satellite terminal for the new SB-SAT technology. The SB-SAT technology uses the Inmarsat BGAN network and I-4 satellites to enable online, real-time communications with Low Earth Orbit (LEO) satellites from the ground. GateHouse is commissioned to deliver protocol and application software to the project.

In perspective, SB-SAT capability is envisioned to enhance current missions, and may enable a whole new set of space missions that have mission critical needs to send and receive data with only seconds of latency.

Looking ahead, GateHouse is pleased with the portfolio of newly planned features to BGAN that were announced by Inmarsat in 2010 — the Company is confident these plans will attract further projects and enable a continued high activity level in the company's satellite communication business unit in the years to come.

Michael Bondo Andersen is the Chief Executive Officer (CEO); M.Sc EE; and the founder of GateHouse.



GATR is coming off a great 2009... a larger facility was obtained and further expansion is in the works. The Company was also listed #259 in the Inc. 500 (one of Inc. 500's Hottest Products) and also landed a \$26M IDIQ contract... 2010 was certainly heating up!



GATR is an Inflatable Satellite Antenna System (1.8m- and 2.4m- diameter dish). The product's uniqueness stems from the inflatable radome, or ball, with a flexible, parabolic reflector mounted at the equator. This design results in an extremely portable packaged antenna that, when inflated with normal air, produces a large-aperture dish (inside the ball), resulting in a precision satellite antenna for remote communications.

The GATR antenna performs like a rigid antenna of the same size, but with 10-15 percent of the packaged size of a conventional rigid antenna system. When the antenna is deflated, it fits into as few as two airline checkable cases. The system can operate on low power provided by solar, DC battery, or AC power. When the system is coupled with a higher-power transmitter, its performance is comparable to a large satellite truck system, such as those used in live broadcast television.

GATR has been adopted by Special Operations Commands, the Armed Forces, FEMA, the intelligence community, municipalities, and commercial customers. The GATR system enables customers to remotely establish critical communications with large-aperture antennas that are:

YEAR IN REVIEW — 2010

- » *Easy to transport (in as few as 2 cases and < 100 lbs. each)*
- » *Quick and easy to setup (1 person, < 40 minutes)*
- » *Stand-alone or can be integrated with existing equipment (i.e.; replace a 1.2m dish with a 2.4m inflatable antenna with minimal additional weight and volume)*

In January, GATR reacted quickly to assist in Haiti's earthquake recovery efforts by supplying antenna systems and support personnel. Other GATR systems were deployed by several organizations to setup high-bandwidth satellite communications in the wake of this disaster. One such effort was spearheaded by employee David Hoffman, who setup and established a link near the Mission Aviation Fellowship (MAF) hangar supporting InSTEDD's search and rescue base at the Port-au-Prince airfield in Haiti, with bandwidth donated by GATR for emergency information systems. Another GATR employee, Caleb Pal, departed to the Dominican Republic with two antennas and supported



GATR in Haiti at the Port-au-Prince airfield

a group of physician's as part of the Chandasha Foundation, with bandwidth donated by INTELSAT General. The effort also furthered the communication links throughout the island (phone, Internet, cellular connection, etc.).

"Part of our company philosophy is to turn our success into the ability to help others in crisis situations, like the humanitarian aid efforts in Haiti," said Paul Gierow, President of GATR Technologies Inc.. "We were proud to participate in these efforts

and will continue to support other situations as long as we are able."

GATR also debuted and delivered the world's first inflatable FCC-certified C-band satellite antenna system. The C-band product adds to GATR's existing FCC-approved 1.8- and 2.4-meter Ku-band product line and expands coverage capability in remote areas. C-band typically requires larger-aperture antennas (2.4m or greater), which makes mobility a big issue.

"Our system combines the worldwide coverage of C-Band with the portability of our inflatable large-aperture system," said Larry Lowe, GATR's VP of Engineering. "It is a perfect combination for situations in remote areas of Europe, Asia, Australia, South America, and Africa. It is also perfectly suited for operation in the mountains of Afghanistan."

No good deed goes unrewarded. GATR was named a winner in the R&D 100 Awards for Communications presented by the editors of R&D Magazine. The R&D 100 Awards are based on the 100 most technologically significant products introduced into the marketplace over the past year. In addition, GATR was also ranked, for the 2nd year in a row, in the Inc. 500/5000, Inc. Magazine's exclusive ranking of the nation's fastest-growing private companies. The list represents the most comprehensive look at a vitally important segment of the economy — America's independent-minded entrepreneurs.

With orders for more than 50 systems in 2010, and 500+ documented deployments since its first deployment in 2005, GATR continues to grow. The Company is currently in the process of testing X-band (range tested and has already met the requirements for commercial X-band), and Ka-band (range tested), with the goal of becoming WGS terminal certified (Wide-band Gapfiller Satellite) in 2011. GATR also plans to add a smaller man-packable solution (~1m class solution) to its product line in the near future.

Enabling Communications Around the World™ — that's GATR's motto and one that continues to define the Company's ever-increasing global success.

2010 was a year of new dimensions for GlobeCast Australia. When I started in television, it was the era of film, everything in black and white. There's been much evolution and the odd revolution since that time.

The past decade alone has seen various chapters open in the digital era of production and transmission. Over those years, it has been a significant achievement for GlobeCast Australia to establish its reputation as a global digital hub with long-term clients around the World.

GlobeCast Australia is a Company well aware of its primary purpose, which is to move content rather than make, store, or own it. Moving content once meant driving a Morris Minor to and from CTC7's Black Mountain studios to the Canberra Airport with a film can. That was back in 1968 — coincidentally, the year when 2001: A Space Odyssey was released to cinemas in 3D. More than 40 years later, and after all those decades of promise, 3D broadcasting

arrived with much fanfare in 2010, sending us on a whole new odyssey. It literally brought a whole new dimension to those of us who operate satellite and fibre networks. Given our affinity with broadcasters and live events, for the teams at GlobeCast Australia, the transition was seamless and the service flawless.

GlobeCast Australia conducted successful 3D trials and delivery for TV Channels and Sporting Organisations and also delivered several different types of football live, in 3D, onto cinema screens. Audiences delighted in the ability to watch everything from FIFA games to the Grand Finals of Australian football codes, live, via satellite.

Ironically, 3D leap-frogged to the front row of our industry just as its technology standards were still being set. By mid-2010, 3D was already dominating the floors of television retail showrooms, even while many TV organizations worldwide were still incrementally ushering in the HD era.

For example, for the first time this year, more than half the Super 14 Rugby Union games we moved across three continents were delivered in crisp HD. For the first time, the Australian Open Tennis global delivery will occur in HD in January 2011. GlobeCast Australia



YEAR IN REVIEW — 2010

was on the ground in Vancouver to set up and transmit the Winter Olympics globally in HD, including to its Asia Pacific clients, such as ESPN Star, Fiji TV and SKY New Zealand.

But while we'd had years to prepare for and introduce consummate HD delivery, 3D broadcasting's eventual arrival seemed sudden. As sporting organizations committed the budgets for enhanced coverage, GlobeCast Australia drew on its expertise to move to this new dimension. We built on our reputation for digital transmissions to cinemas nationwide, and our people liaised with colleagues at networks including Nine and SBS to ensure the 3D signals moved effectively, whether for cinema or TV.

All of this activity simply proves — again — that new technology and content revolutions gain their own momentum. The broadcast industry is littered with those who held to strict timelines and could not foresee critical changes. What is a leading broadcast services company to do in such an environment? Deliver. Adapt. Innovate. Communicate. Expand. All of those things and more. The very ethos of GlobeCast Australia is to listen to its Clients and to provide what they want, promptly, not to build or buy something and wait for clientele to appear. All of our success are due to a true team effort.

For example, Commercial Director Andrew Nealon and Commercial Manager John Graham refined the way GlobeCast Australia meets and exceeds the expectations of its clients, with improved delivery solutions. To cope with increasing demand, a new fibre platform was rolled out, quadrupling capacity on the global backbone from London to Los Angeles to Sydney and Auckland.

Operations Manager Peter Doueihi led the Broadcast Centre to ensure DTH and Occasional Use clients could expect flexibility and reliability.

DTH Director Mark Lobwein and DTH Manager Tony Thornton worked with clients around the Globe to sign up new channels that included CCTV News and to renew global names such as Setanta.

Engineering Manager James Moody and Senior Engineer Shally Bandhu, who joined from BskyB, led their team in overseeing a number of major

expansions and worked closely with IT Manager Raj Padavala to enhance the Company's capabilities. The new initiatives came after Building and Teleport Manager Tony Seddon led an upgrade of the Broadcast Centre in late 2009 to quadruple floor space, triple monitoring, and enhance Teleport power.

DSNG Director Greg Littrich doubled HD DSNG capacity as his expert team of engineers enhanced Australia's largest DSNG fleet to prepare for delivery of the Ashes Cricket in HD from November 2010 to February 2011 for BskyB.



The Bookings Team of John Fitt, Louise Hawthorne, and Renee Bulbert once again handled a tremendous increase in Occasional Use and Permanent services, which experienced a 40 percent growth rate in two years, all working closely with Finance Manager Rini Chandra and her team for seamless reporting to Clients.

GlobeCam Manager Gerry Justus and his team continued to innovate with new camera angles for sports coverage and with the world's first live in-car 3D trials for motor racing coverage.

Our people know the technology and contracts are worth far less if relationships are not paramount on everyone's agenda. At all levels of GlobeCast Australia, interacting with all levels of client companies in Australia and around the globe, the relationship is the key. It's critical to how well the Company handles major channels, events, and sports, including cricket, golf and tennis, for networks, sporting organisations and agencies; along with global distribution of news

events, such as the Chilean mine rescue. GlobeCast Australia prides itself on recruiting industry professionals from around the world. More than half our workforce was born in other countries, drawn from 14 countries in all, offering global delivery with global expertise.

As well as operating its own global fibre backbone via leases with SingTel and other key local and global providers, GlobeCast Australia completes its innovative delivery framework with satellite leases on Optus, AsiaSat, and Intelsat. Locally, satellite is a key method of delivery in a region as geographically diverse as Australasia and the Pacific Islands.

The global fibre backbone is key to support delivery in an era of continuing globalization of sport; and ongoing proliferation of devices, screens and channels. Capacity is of course in even greater demand to service these needs in a world of HD and 3D transmissions.

As a team, we nurture a broadcast focussed culture, and while all team members strive for technical excellence, we also keep a clear service focus to help exceed client expectations.

As we get that right, it ensures GlobeCast Australia is the leading provider of services for International Broadcasters in Australia, New Zealand, and the Pacific Islands, operating facilities and links that span the World — specializing in live digital delivery, SD and HD, and also at the cutting edge of 3D in 2010/2011.

Mike Lattin, GlobeCast Australia's CEO of almost 10 years, has more than 40 years' experience in international broadcasting. He's a former CEO of Optus Television, Head of Television at TV New Zealand, and Head of Marketing and Programming at Network Ten.



Revolutionaries like to brag that their revolutions are never-ending. The leaders at Globecomm are no wild-eyed anarchists but painstaking engineers instead. Their revolution, however seems to be in full swing.

Only four years ago, the Company earned most of its money doing what it was founded to do: integrating satellite systems and building satellite networks. In the 2009 fiscal year, that ended in June 2010, half of the Globecomm's income came from providing communications services instead. The services are also not your grandmother's satellite services. Instead, the company has moved into new markets and new technologies, and is learning to manage new levels of complexity in the process.

One of those markets is mobile. At the end of 2009, Globecomm placed a carrier-class 3G mobile switch into service. The company uses it to provide hosted core switching as an outsourced service for carriers seeking to broaden coverage without major capital or operational investment. The switch has the capacity to service more than a million subscribers with a 100 percent IP-based soft-switch architecture offering a forward path to 4G. Since then, the company has gained numerous regional carriers as customers in the US, the Caribbean, and as far away as Africa. Globecomm's Mobile Switching Center now carries millions of minutes of voice traffic and hundreds of gigabytes of data traffic every month.

At NAB 2010, Globecomm introduced TempoSM, a hosted service providing enterprises with a single platform for delivering interactive training, employee communications, and digital display to global audiences. Tempo is a secure platform for publishing content, conducting interactive live events, and managing each viewer's access to programming. It offers interactive, high-quality video broadcasts with integrated polling, chat and powerful analytics from any Web browser with a broadband connection.

The growth of these new services has certainly applied pressure on Globecomm's own infrastructure, and in August, the Company expanded its fiber point-of-presence and teleport

YEAR IN REVIEW — 2010

facilities fourfold and added a new POP in New York. The infrastructure includes connection into the DISA network, as Globecomm continues to expand its role as a supplier of satellite technology and transmission services to the Department of Defense and civilian agencies of the US Government. In 2010, the company announced more than \$35 million in new deals with government agencies.



Satellite, however, remains a vital technology for the firm. As a market that depends on satellite, maritime has become highly attractive to Globecomm. The Company acquired maritime players Mach6 in the Netherlands and Telaurus in the USA in 2009.

Today, the company delivers communications services to 2,500 vessels around the world. In 2010, Globecomm acquired two more companies in the sector. Carrier2Carrier, based in the Netherlands, provides satellite services across Africa, the Middle East, Europe, and Asia, and maritime services in the Atlantic, Mediterranean, Gulf of Mexico and the Indian Ocean regions. Its teleport in Biddinghuizen, Netherlands, has added another teleport node to the company's global network. The second company, Evosat, provides Inmarsat land-based BGAN, maritime-based Fleet Broadband services and mobile communications.

In 2010, Globecomm's Telaurus subsidiary won one of its biggest jobs ever, a three-year managed services contract from Singapore-based PACC Ship Managers. Telaurus is providing 30 vessels trading worldwide with maritime Fleet Broadband terminals and its se@COMM managed communications platform, which simplifies management and controls costs.

In October, Globecomm landed a project that returns the Company to its business roots but also reaches far into the future. Hughes Network Systems selected the company to design and install the gateway ground

stations that will support the 100 Gbps Ka-band Jupiter satellite that is due for launch in early 2012.

Through the Earth station network developed by Globecomm, Hughes expects to deliver low-cost, high-speed broadband via satellite to millions of customer terminals in rural areas across North America. Ka-band represents the industry's first serious attempt to provide a service comparable to terrestrial broadband providers, and more than \$5 billion in new assets are being placed into orbit through 2014. The contract win positions Globecomm at the leading edge of an exciting new market — a territory the company has been occupying since it launched an Internet via satellite subsidiary back in 1998.

The revolution will continue in 2011. Like the satellite industry itself, Globecomm will drive farther into the niches where satellite communications provides unique value, while further integrating its systems and services into the global communications market. Satellite stood alone for decades as a solution for unique applications such as broadcasting and maritime. In the next decade of the new century, Globecomm will be one of the companies taking it to the mainstream.

David E. Hershberg is the Chief Executive Officer and Chairman of the Board of Globecomm



2010 has been a busy and interesting year for Glowlink. Busy, as the company decided to shift into high gear in developing new products and technologies, while remaining focused on customers who have been deploying Glowlink equipment on a global scale. Talk about making do with two hands while basically we needed four!

Interesting, because the vision that guided the company since its founding almost 11 years ago — solving the problem of satellite interferences with innovative, affordable solutions — is finally in step with the somewhat belated realization by key segments of the satellite community — satellite owners, operators, and users — that interference is a serious problem facing the satellite industry, and is getting far worse.

The year started with Glowlink supporting the US Government in activating and transitioning to the Wideband Global Satcom (WGS) constellation of satellites. Glowlink monitoring equipment comprises what is known as the WGS Spectrum Monitoring System (WGSMS), a global network of spectrum monitoring and interference detection systems charged with the responsibility of standing sentry over critical military communications going through the WGS satellites.

In addition, the company's geolocation product, the Model 8000, continues to serve the military in the detection and geolocation of interferences affecting mission-critical traffic going through commercial satellites, in a world-wide network of Model 8000 systems known as Eagle Sentry. This capability

continues its successful track record in a multitude of situations where other similar products on the market either fell short or failed entirely. A good year indeed for hunting down interferences with Glowlink products!

2010 has also been an extraordinarily productive year in terms of the technology and product innovations introduced by Glowlink — a bumper crop in terms of the significance and the sheer multitude of the products introduced.

Early in the year, the company rolled out the Model 1000x2, a dual-channel spectrum monitoring product. This is fundamentally two separate Model 1000 units in one-single chassis, resulting in significant savings in costs, rack space, and logistical support such as maintenance, shipping, and so on.

Closely following the Model 1000x2, the company introduced the Model 1010, an ultra-wide bandwidth spectrum monitoring system that allows customers to instantaneously look at 180 MHz of satellite bandwidth without having to retune. This is at least 3X the capability of other carrier monitoring and spectrum monitoring products on the market.

In April, 2010, the company rolled out the Model 1000 3G, with features such as the simultaneously monitoring of as many as nine (9) separate spectra, enabling the customer to better assess where spectrum problems occur in a carrier along its transmission path. 3G also has the ability to monitor paired-carrier traffic, a new, bandwidth-saving satellite transmission technique that allows two signals to occupy the same bandwidth at the same time, doubling bandwidth efficiency. The Glowlink 3G products are the only one on the market with this monitoring feature. Also significantly, Intelsat, the world's largest satellite fleet operator, has begun to deploy 3G in its Global Monitoring System (GMS), a world-wide satellite monitoring network built and maintained by Glowlink.

One month after the 3G announcement, Glowlink introduced a 4th generation integrated geolocation and interference detection product, the Model 8000 GEO4. GEO4 incorporates state-of-the-art features that smash the barriers to an effective geolocation product: speed, accuracy and ease of use. With advanced math, extensive automation and built-in



YEAR IN REVIEW — 2010

smart algorithms, 4G lowers the threshold of operator skill requirements while simultaneously increases speed and accuracy. At the same time, existing features of the Model 8000 that are highly valued by its users, such as the seamless integration of spectrum monitoring, interference detection and geolocation in one single, compact chassis, have been preserved and enhanced.

In the late summer of 2001, the company rolled out an interference-reduction product, the automated VSAT commissioning system, VXCS™. This product is aimed at VSAT service providers, users and installers. VXCS automates the most labor-intensive, interference-prone procedures in deploying VSAT networks, saving considerably time, labor and costs. Most significantly, it dramatically reduces the chance of inadvertently causing satellite interferences during the installation and routine operations of VSAT networks.



During the fourth quarter of the year, the company introduced one of the most, if not the most, significant innovation and technology in its 11-year history: the capability to perform geolocation of interferences using a single satellite. The result of several years of challenging, if not seemingly insurmountable obstacles, this technological break-through re-affirms the company's reputation — and tradition — of the relentless pursuit of innovations of significance. The single-satellite geolocation capability provides an indispensable tool for customers to deal with an entire category of satellite interference anomalies in ways that no other product on the market can.

Looking ahead to 2011, while the overall economic uncertainty continues to weigh heavily on all of us, and the clarity we try to muster for the satellite industry is less than crystal clear, Glowlink remains cautiously optimistic. In our view, the satellite community's refreshing focus on the problem of interference is spot on, if not overdue. Even as the satellite operators complete their fleet build-out and replenishment process, satellite based traffic for both developed and developing regions of the world will most certainly continue to grow unabated.

This is good for business, no doubt; but it will also result in more frequent and high-impact incidences of interferences — unintended or otherwise — and the attendant clamor from the user community for better patrolled and more pristine spectrum. These two intersecting strands of industry dynamics should bode well for Glowlink's suite of interference prevention and mitigation products. In our mind, they are a necessity for ensuring high-quality bandwidth and traffic integrity. Not a luxury.

Jeffrey C. Chu is the co-founder and Chairman and CEO, Glowlink Communications Technology. He has extensive experience in satellite communications monitoring and control, having co-invented and managed the 1G of such systems for the U.S. government.



In August of this year, the maritime communications world was stunned as Inmarsat, the stayed and conservative ruler of maritime markets and the staunch advocate of L-band services, announced it was going to launch Global Xpress, a revolutionary new Ka-band VSAT service. At that moment, the world of communications at sea changed. VSAT, a service long scorned by the communications giant, was finally and formally acknowledged as a preferable

means of providing economical, high-speed access to the Internet at sea.

Those who follow these markets closely have seen change coming. Driven by an ever-increasing demand for fixed priced high-speed broadband service, major fleet operators are abandoning pay-by-the byte service. Bit by bit, VSAT has eaten away at Inmarsat's L-band share, forcing the Company to accept the inevitable: with monthly levels of demand rising to 20 to 50 Gigabytes of data per-month, major Tanker and Containership fleets have found Fleet Broadband's pay-by-the-byte services simply uneconomic.

Among the major shipping segments, justification for VSAT adoption is increasing at significant rates. Among the reasons for the recent increase:

- » *Average crew age is dropping as younger Internet savvy seamen come aboard ship and expect the same level of communications onboard as they have become accustomed to at home*
- » *In the Tanker industry, crew shortages are acute and providing Internet connectivity and low or no cost — VoIP calling is critical to reducing crew attrition*
- » *Video demand for personal and business use is soaring, including security and surveillance applications, and Skype with video calling is becoming a preferred means of IP communication*
- » *New, broadband dependent applications are offering ship managers the opportunity to enhance efficiency and lower costs. Applications such as Sperry Marine's new Fuel Optimization software application, Vessel Telematics, remote PC and Bridge Consol maintenance offer substantial operational savings and are becoming more common*
- » *Electronic charts will be mandatory in 2012 and can be received via VSAT without the need for a \$4,000 decoder now required for the popular Chartco/Inmarsat service*
- » *Regulatory documentation is increasing. For those vessels carrying hazardous cargo access to document and forms libraries onshore has become critical*



This year, Tanker Market Leaders Tsakos, Teekay, Frontline, Stolt Nielsen, Crystal Pool and others have all opted for VSAT. In the Containership segment — despite the difficult economic times — Peter Doehle has installed VSAT on several of its vessels and shipping giant Hapag Lloyd is now tendering for VSAT on 35 vessels.

More than a dozen primary VSAT providers (not including re-sellers) now offer Global Ku-service to the market, including service suppliers Marlink, Ship Equip, Eutelsat, Orange Business Services, GE Satlynk, MTN, NSSL, Speedcast, Radio Holland, Mach6, Caprock, KVH Industries and Singtel. Competition has driven prices down to the sub \$3,000 per-month level for 256 X 512 (10:1 or better contention ratio) and Marlink and KVH have recently introduced entry level, upgradable services at \$1,500 and \$1,000 per/month respectively.

On the capacity side, to satisfy the growing demand for bandwidth, more satellites are being added. VSAT operators Intelsat, Telesat, and Eutelsat are rapidly adding new satellite capacity. Telesat now covers 2/3 of the Atlantic with Telesat 11n and 14n (soon to be replaced by 14R), and Intelsat is launching several new satellites over the next three years including IS 19, a satellite planned to vastly expand coverage over the Pacific Ocean Region.

As competition intensifies, vendors are struggling to add value and differentiate their offerings as an alternative to relying on aggressive pricing to sell their services. More and more offerings feature complete or semi-complete solutions. Some notable service advancements include:

- » *Market leader Marlink's @SEAwebControl, software that manages bandwidth and controls access to harmful and inappropriate websites*

YEAR IN REVIEW — 2010

- » *MTN's StreamXcel Plus, which includes IP switching, remote administration of servers and computers on board, anti spam and anti-virus solutions and data compression*
- » *Integration of SeaTel antennas with the Uplogix Appliance thereby enhancing remote maintenance capabilities and reliability*
- » *Globe Wireless iFusion, one of the most aggressive efforts yet at providing a total solution, offers a service that includes a Fleet Broadband 250, a least-cost satellite router with provision for additional gateways, GSM network, crew services, applications, network management and remote monitoring and management tools.*

With the adoption of VSAT by many of the largest Tanker and Containership companies this year, we expect the transition to VSAT to accelerate dramatically. In 2011 and beyond, Crew Welfare, new applications, increased satellite capacity and the offering of complete solutions packages by vendors will make unlimited, fixed priced Broadband a new and widespread reality at sea.

<http://gottliebinternationalgroup.com>

Mr. Gottlieb is Managing Director of Gottlieb International Group Inc. Established in 2001, his firm specializes in the application of VSAT Technology in the Maritime and Oil and Gas Markets.



GTX Corp is in the business of keeping you connected — the Company continues to be at the forefront of the personal location industry and debuting new technologies that impact how you ask the “where is” question.

With the end of the year upon us, it is evident by the milestones achieved that GTX Corp was not only building a Company, but actually defining a category. The novel and award winning idea of putting GPS tracking devices inside shoes to monitor the elderly with dementia rapidly expanded into a lot more; through the incorporation of customization, localization and optimization. GTX Corp (GTXO) has pioneered 2-way GPS tracking technology over the past eight years and has defined an innovative category of Location Based Services (LBS) by coining the phrase Personal Location Services (PLS) — personal, because “location” is all about you and keeping you connected.

This past year, GTX engendered quite a few headlines. The Company started the year with the launch of our the popular GPS Tracking app, which “hit the charts” in its second week and remains one year later, on the Apple App Store’s top downloaded, and top grossing list, closing out the year with 17 apps on six platforms with more than 750,000 customers in 100 countries. This kind of development roadmap and traction is fueling this new market, which carriers are calling “pure gold” and is on track to be a \$15 billion dollar industry within the next three years.

GTX formed a relationship with Samsung and developed two custom apps for its new bada platform, which is expected to be available on 40 million phones by mid-2011. Also, GTX is currently in discussion with several handset, wireless operators, and tablet manufacturers about custom development and placement of several of our apps “on deck”.

Shifting gears to the enterprise side, GTX has signed on several new license partners, both in the U.S. and



Latin America, and recently launched its enterprise portal, fully localized in Spanish and operational in Mexico. The most gratifying technology for the Company is the multi-patent GPS Smart Shoe™. This product won the 2010 People's Choice Award for Most Innovative Connected Location Device. The GPS Shoe, licensed by Aetrex Worldwide, is available through e-commerce at www.foot.com and will be coming to retail stores in 2011.

The latest surge in consumer awareness of GTX can be attributed to several factors, ranging from millions of new GPS handsets hitting the market to an increase in an older population requiring care giver assistance products to corporations wishing to manage work productivity and logistics in a more effective manner. However, the seismic shift came from the massive life style adoption of mobile location based social networking. Facebook and Twitter, for example, became giants by answering the “what are you doing” question. Now add in the missing component — “where” — shifting the question to “what are you doing and where are you doing it”. This has now become the new paradigm for staying connected in today's digital and global world.

GTX's increase in traction is directly related to greater brand recognition, a diverse pipeline of products, and an intense focus on delivering customized, localized solutions. The business model for GTX is to provide a complete customizable solution of hardware, middleware, apps, connectivity and professional services, to become a one stop shop for the consumer or enterprise looking to implement GPS Tracking technologies.

GTX Corp recognizes the global landscape and understands the different requirements from country to country and how dissimilar geographies and economies factor into the equation of choosing a solution that's correct for the individual consumer.

Looking forward to 2011, GTX will continue to pave the LBS way and will introduce new products to the market, with a focus on e-Health and apps for various mobile platforms and devices, from smartphones to

tablets to TVs. Today, the Company is acknowledging the user demands, which require an experience based on where they are, with that information readily available through whatever device they are viewing. Asking the “where is” question in Korea via a TV set is different than asking “where is” from an iPhone in Los Angeles or a desktop in Mexico City. To accelerate consumer traction, customization, localization and optimization are paramount objectives for GTX Corp in 2011.

Patrick Bertagna is the Chairman, President, CEO, and founder of Global Trek Xploration (GTX) and co-inventor of the patented GPS Footwear technology. His career spans 27+ years in building companies in technology and consumer branded products.



For Haivision, 2010 was another record year in terms of growth. Delivering innovative technologies specifically focused on IP video solutions has always been our forte, and this year we have grown our business by more than 40 percent. While Haivision has been historically focused on LAN delivery of IP video, we are now expanding towards multi-platform support for inbound and outbound streaming requirements associated with IP video.

To this end, one of our 2010 initiatives involved addressing the fact that digital video broadcast signals over satellite must be effectively retransmitted over LAN environments. Part of our commitment to this effort was the release of our new Torpedo™ DVB-to-IP gateways. Torpedo takes European DVB satellite and terrestrial signals and re-encapsulates them for distribution over LAN. Some of the related challenges the Company has taken on over the past year are the streaming management and content

YEAR IN REVIEW — 2010

protection considerations associated with bringing satellite broadcast signals to a LAN for distribution.

The video signals transmitted via satellite are finely tuned for the capacities, quality specifications, and other unique requirements of that transmission medium. When those signals are brought onto a LAN for streaming delivery within an enterprise, two factors must be taken into account.

First, the decode environment must be able to handle those digital video signals. HaiVision has invested heavily in bringing the capacity of our soft players and set-top boxes into accord with this requirement. Second, the capacity of satellite networks typically does not match the characteristics of the LAN or of the players. For example, digital satellite can support HD signals up to 18 Mbps. The bandwidth of these signals is too large for general LAN delivery or computer based decoding. In 2010, there was significant investment in transcoding technology that can take streams of a bandwidth suited for satellite and adjust them so they are suitable for consumption throughout an enterprise, whether with respect to network considerations or to the endpoint, be it a set-top box, soft player or mobile device.

Content-management security is a critical consideration, as any free-to-air or paid subscription content needs to be protected when it is distributed across a network. Content providers need the comfort of knowing that IP streams are not being readily recorded. Over the course of 2010, Haivision introduced new solutions including VF Encrypt, as well as ongoing enhancement of our end-to-end Furnace™ IP video delivery solution, to provide this level of security. Furnace guarantees content production through the application of AES encryption across the network from head end to any end

point and also gives administrators the technology to monitor the consumption of any feed. This combination of security and reporting in turn allows the enterprise to adhere to any requirements of bulk provisioning agreements.

All of these developments in Haivision's approach to IP video delivery represent a transformation from an encoder-centric proposition to a comprehensive facility-oriented position that embraces digital video broadcast over satellite. Haivision is focused on delivering such capabilities throughout our target market segments: military, enterprise, education, as well as sports and entertainment. These segments demand attention not only on delivering media to TVs, but also on delivering media to any visual endpoint, including displays, desktops, and mobile devices.

In response to the demands of these markets, Haivision will continue its innovation and ongoing development in 2011 to address new challenges. Throughout the coming year, we will be focusing on extending the unique benefits of our IP video proposition — performance, security, accountability, control — to all viewers, regardless of device.

Miroslav (Mirko) Wicha is the President, Chief Executive Officer and Chairman of Haivision. He has more than 25 years of executive management and worldwide sales experience with software and hardware companies in the graphics, high performance computing, and multi-media industries.



Peter Maag is the Executive Vice President, Marketing and Business Development, for Haivision. Peter brings almost 20 years of proven experience in international business development, sales, marketing, and strategic partner development to the Company.



Despite the prevailing uncertainty in the global economy, Hughes continued impressive growth in 2010, once again led by our highly successful consumer business in North America which surpassed 550,000 subscribers in Q3. New orders in that quarter alone grew by a whopping 164 percent over the third quarter of 2009, evidencing a resurgent enterprise business across multiple verticals both domestically and abroad. Our strategy of leveraging service revenues by continually introducing innovative products and applications that fuel demand, continues to succeed. A growing base of new and repeat customers in our North America, Europe, India, and Brazil service businesses now generates over 70 percent of overall company revenues, driving profitability ever higher.

I'm proud to say that we received numerous awards recognizing our success, including 'Fastest Growing Technology Company in North America' of the Deloitte 2010 Technology Fast 500™, and as Euroconsult's 'Broadband Satellite Operator of the Year'. In addition, our Indian subsidiary, Hughes Communications India Ltd. (HCIL), was recognized as the Best VSAT Operator in India at the Telecom Operator Awards.

In North America, our HughesNet® high-speed satellite Internet business earned the company an A+ rating from the Better Business Bureau (BBB), based on strong yearly gain of 20 percent in services revenue and a total subscriber base of 558,000 as of September 30, first in the marketplace. We are continuing to focus new consumer activations on our groundbreaking, switch-in-the-sky SPACEWAY® 3 satellite, which now serves over 60 percent of all subscribers. I am also delighted to report excellent progress on development of Jupiter™,

our next-generation, high-throughput satellite, which will bring over 100 Gbps of additional Ka-band capacity over North America and is on schedule for launch in the first half of 2012.

A landmark event for Hughes this year was the award of \$58.7 million as the only national provider of high-speed satellite Internet service under The American Recovery and Reinvestment Act of 2009. Administered by the U.S. Department of Agriculture's Rural Utilities Service (RUS), this award is an important part of the government's investment in broadband projects to bring jobs and economic opportunity to communities nationwide.

We're very excited that RUS recognizes the essential role that satellite plays in helping bridge the digital divide in the U.S., and has selected Hughes as a prime mover to make our high-speed Internet access available to the millions of unserved consumers and small businesses across the country. Funds from the award are being used in our Broadband NOW (No One Waits) program to expand HughesNet service in communities across the U.S., which will bring all the benefits of broadband to an estimated 106,000 qualified new subscribers.

Our enterprise business growth rebounded this year, domestically and internationally, with substantial new orders from major enterprises and government agencies. As a result, our non-consumer backlog crossed \$1 billion for an all-time high. Today, Hughes is one of the world's premier managed service providers, with more than 300,000 enterprise and government sites under contract and employing a range of technologies, including satellite, DSL, fiber, and wireless. For example, we signed a contract valued at \$60 million with one of the top drugstore chains in the U.S. for a high-availability managed broadband network to deliver advanced applications to more than 4,700 retail locations.

We also signed multi-site, managed services contracts with a leading broadline retailer, a major fashion apparel and home furnishing retailer, and a number of state governments. These contracts represent the growing community of large enterprises and government agencies that rely on Hughes to manage complex networks, ensuring reliable and secure connectivity, and peak performance of critical applications.



YEAR IN REVIEW — 2010

Our branch server-based managed services not only supply enterprise-wide network management, but also include value-added services such as optimizing web access, accelerating protocols and applications, and overlaying a blanket of security to ensure network safety at all locations.

Internationally, our subsidiaries continue to grow at a healthy rate, driven by enterprise demand for high quality, turnkey managed services. The fastest growing is Hughes Brazil, which is well-positioned to take advantage of expanding enterprise and government projects as that economy flourishes. For example, a major reseller agreement was signed with Primenet valued at over \$13 million over 60 months which calls for them to sign up a minimum of 1,000 sites by the end of the first quarter of 2011. In addition, Vivo, one of Brazil's largest cellular operators, signed a \$7 million contract extension for satellite backhaul connectivity to its cell sites provided by Hughes through its nationwide service.

Among numerous other wins, Hughes India recently signed a managed services agreement with Allahabad Bank to extend connectivity to its remaining 1,400 branches using both terrestrial MPLS and satellite technologies as part of its Core Banking Solutions (CBS) Phase II project.

Meanwhile, our European subsidiary announced the sale of a sixth HX broadband satellite hub and an additional 2,000 HX broadband terminals to Bentley Walker, a leading international satellite Internet services provider which is expanding its service footprint and solutions to military personnel in Afghanistan and Iraq.

Hughes continues its commitment to

help governments bridge the digital divide, bringing broadband to unserved communities around the world. In China, to meet the growing demand in the world's largest telecom market, we formed HughesNet China Co. Ltd., a joint venture of Hughes and China UnifiedNet. HughesNet China and its licensed partner, Beijing UnifiedNet (together known as "Hughes China") will offer a wide range of managed broadband network services to leading telecom carriers and enterprises, and will support the government's initiatives in expanding rural development through access to education and emergency communications across China.

In Europe, Hughes expanded a multi-year, strategic partnership with Avanti Communications Group plc to supply advanced Ka-band networking infrastructure for its HYLAS 2 satellite, building on last year's deal for HYLAS 1. This important win raises total orders to \$42 million for Hughes to supply 56 HN System gateways for both satellites and an initial 50,000 terminals to bring affordable, high-speed communications to consumers and businesses starting in early 2011. Both deals include acquisition of satellite capacity by Hughes to deliver Ka-band broadband services across Europe, the Middle East, and Africa to its growing base of small business and enterprise customers.

This year we also announced the formation of Hughes Network Systems Australia Pty. Ltd. (known as Hughes Australia) to serve this strategic and rapidly growing market. Australia's NBN (National Broadband Network) is another example of a government-subsidized initiative to bring affordable broadband Internet access to all its population, exploiting the power and continent-wide reach of Ka-band satellite technology and services.

An emerging global opportunity is broadband on planes, boats and trains. In the U.S., Southwest Airlines began offering broadband Internet access to passengers using their Wi-Fi-enabled PDAs and laptops using an onboard system supplied by Row 44 and powered by a Hughes HX satellite communications platform and nationwide service. For defense and emergency response applications, Hughes developed a groundbreaking airborne video solution this year in conjunction with several partners which was demonstrated to a key government



Hughes HX Gateway

agency, confirming full D-1 video resolution at air-to-ground user data rates of over 2 Mbps. And fleets of numerous maritime customers were outfitted with Hughes broadband-on-the-go satellite technology, including several providing services in support of the massive oil spill clean-up in the Gulf of Mexico.

We can conclude that 2010 was a very good year for Hughes and for the satellite industry, and all signals point to a promising future. Demand for broadband continues at healthy double-digit growth rates globally in developed and developing countries alike, with many governments now actively subsidizing satellite technology to reach consumers and small businesses in so-called unserved and underserved areas. The resurgence of the enterprise market is evidence that an economic recovery has begun and hopefully will gain momentum next year and beyond.

It remains for us to do what we do best: keep pushing the envelope on broadband technologies, products and services, delivering ever more value and competitive-edge benefits to our customers—a strategy that has helped us to successfully navigate through the storms of prior years and positions us for strong growth well into the future.

Pradman Kaul is the President and CEO of Hughes Communications as well as the Chairman and CEO of Hughes Network Systems, LLC (HNS). Before joining Hughes, Mr. Kaul worked at COMSAT Laboratories in Clarksburg, MD.



Hughes Defense & Intelligence Systems

On the military and government side of the business, Hughes Network Systems, LLC (HUGHES) has become a world leading provider of broadband satellite networks and services, sharing a rich heritage of technology innovation with the former Hughes Aircraft Company, a trusted partner of the U.S. military community for many decades which was acquired by Raytheon Corp.

In the past three years, a dedicated team established as the Hughes Defense and Intelligence Systems Division (DISD) has made significant strides applying the company's highly successful commercial satellite networking technology for military and government customers. Several groundbreaking solutions were demonstrated during 2010, evidencing Hughes' commitment to research and development, with the goal of delivering advanced communications systems that meet the military's needs today and the innovations for the military of tomorrow.

Hughes takes great pride in providing solutions to support the men and women serving in the U.S. and Coalition forces, and that directly address the 2010 Quadrennial Defense Review (QDR) recommendations, namely "the capabilities, flexibility and robustness of U.S. forces across the board will be improved by fielding more and better enabling systems, including intelligence surveillance and reconnaissance, electronic attack capabilities, communications networks and more resilient base infrastructure, and enhanced cyber defenses." Highlighted below are our most notable achievements during the past year.

Early in the year, Hughes participated in the Coalition Warrior Interoperability Demonstration (CWID), directed by the Joint Chiefs of Staff, to test homeland defense applications of its award-winning Ka-band SPACEWAY® 3 satellite, the world's first commercial satellite system with on-board packet switching/routing, and ten times the capacity of conventional, Ku-band bent-pipe satellites.

According to the CWID Final Report issued in February, SPACEWAY 3 successfully demonstrated high-definition video teleconferencing between the U.S. Northern Command (USNORTHCOM), the Naval Surface Warfare Center, Dahlgren Division (NSWCDD), and the Space and Naval Warfare Systems Center, San Diego (SSC Pacific). The report noted that the SPACEWAY 3 system established a highly reliable broadband satellite link that maintained 100 percent connectivity, as well as maximized bandwidth for internet, data, VoIP, videoconferencing, and IP-based applications. "It's better than anything I've ever seen," noted a warfighter from the CWID Final Report. "If you need a semi-portable satellite communications system, this will work as described."

YEAR IN REVIEW — 2010

Hughes DISD is proud of the work accomplished in the CWID trial and looks forward to continuing to demonstrate SPACEWAY 3 as well as demonstrating the capabilities of Hughes' latest satellite under development, Jupiter™, scheduled for launch in the



first half of 2012. Jupiter is a next generation, high-throughput Ka-band satellite system with more than 100 Gbps of capacity, 100 times greater than today's conventional Ku-band satellites. Jupiter's advanced multi-spot beam, bent-

pipe architecture will also support other waveforms for military use. Through partnerships, Hughes is developing a worldwide, Ka-band network based on Jupiter technology.

This summer, Hughes DISD demonstrated its Advanced Airborne Video Solution to a U.S. Government agency — with extremely positive results. High quality, D-1 video resolutions were consistently delivered using a fully configured Albatross aircraft at air-to-ground user data rates of over 2 Mbps, which is significantly greater than other offerings on the market today.

As situational awareness becomes ever more essential to achieve mission success, the Company considers it a requirement to develop solutions that are leading-edge and cost-effective, with minimal set-up times. The Advanced Airborne Video Solution confirms these principles and is based on a commercial-off-the-shelf (COTS) platform that delivers unmatched performance while operating at affordable broadband satellite data rates.

This autumn, Hughes DISD developed a prototype system to operate at Ku-band on small antennas that

are less than 9-inches in diameter. With many U.S. and Coalition troops in mountainous or urban conflict zones, SATCOM-on-the-move (SOTM) is the only reliable and effective solution to maintain net-centric communications. Solutions with radically smaller antennas translate into greater mobility and limited detection by enemy forces.

Rugged and highly portable SOTM terminals are also vital to maintaining communications with the Global Information Grid (GIG), especially in challenging environments. Hughes DISD expanded collaborative efforts to offer its commercially successful HX broadband satellite technology for integration into a variety of lightweight, easily portable SOTM terminals, optimized for Wideband Global SATCOM (WGS) use by the U.S. Department of Defense and Coalition forces. Our HX technology brings numerous benefits, including being fully compliant with Federal Information Processing Standards (FIPS) 140-2 cryptographic security, as well as with the DVB-S2 standard (Digital Video Broadcasting — Second Generation receiving capability and Time Division Multiple Access (TDMA) return channels). The Company looks forward to continuing to work with all of the partners to deliver the best possible solutions for military and government users.

Hughes also introduced its HX Expert Network Management System (ExpertNMS™). ExpertNMS provides superior usability, featuring an intuitive and interactive interface, and advanced diagnostics monitoring to optimize network performance. ExpertNMS has been trialed by a number of U.S. and Coalition military organizations and received very positive feedback.

As 2011 quickly approaches, Hughes DISD is looking to expand its offerings in airborne Intelligence, Surveillance and Reconnaissance (ISR) applications and continues to grow its classified business. Work continues in developing enhanced mobility systems with ever more compact footprints and improved cost-effectiveness. Hughes is also successfully growing its business globally, including international defense markets.

Hughes DISD is not in the business of selling boxes — solutions are provided. At headquarters in Germantown, Maryland, Hughes DISD has a number of labs where talented personnel

continually work to evolve and develop new solutions which are ideal for military customers. The products integrate into military networks, and the back-end service for these networks is often provided, as well as Network Management Systems to monitor and maintain their operation. Hughes looks forward to continuing to provide net-centric communications and new innovations for our military and government customers.

Rick Lober is the Vice President and General Manager of Hughes Defense and Intelligence Systems Divisions. He has more than 25 years experience with COTS-based and full MIL communications and intelligence systems, starting as a design engineer and progressing to a P&L executive.



This has been a significant year of opportunity and growth for International Datacasting Corporation, celebrating the 25th Anniversary as a global leader in providing IP-based datacasting solutions for the distribution of broadband multimedia content.

Building on the Company's historical strengths, International Datacasting has achieved growth through expansion and acquisition. In 2010, the renowned Tiernan video and audio product lines were integrated into IDC, as well as the Logic Innovations group. With these strategic acquisitions comes technology innovation, particularly a stronger market breadth and depth in video, a solid global customer base, and a talented team of broadcast industry professionals.

IBC 2010 marked the debut of the new Tiernan Titan® product from IDC. Tiernan, the original leader in news and sports contribution, delivers a strong product portfolio designed to provide improved compression performance for HD transmissions in MPEG-2 and MPEG-4 that result in a dramatic reduction in bandwidth usage. Applications include HD sports contribution, news contribution, ATSC, ISDB-T, DVB-T, and HD support.

This past year, IDC gained substantial traction and global recognition as a leader in the digital cinema and 3D-Live space. Digital cinema solutions provide a fully managed delivery service for media distribution clients. These systems power the delivery of feature-length films, movie trailers, and live alternative content such as sporting events, concerts, and theatrical exhibitions to cinemas equipped with the IDC's satellite system.

Exciting examples of Company successes include the 3D-Live streaming of the 2010 FIFA World Cup sports event, which brought IDC global recognition. Further, key collaborations with Arqiva and the new Deluxe / EchoStar joint venture have just been announced for the deployment of turn-key content delivery systems to distribute digital content via satellite to cinemas. IDC has reached a critical mass with digital cinema technology in Europe and North America, with inroads into Latin America. This success is a direct result of innovative approaches to solving the complex technical challenges associated with this type of unique network deployment. Further, working collaboratively with customers has put the Company well on its way to becoming the de facto standard in the rapidly evolving industry of digital cinema.

This past year, IDC continued to work with the Public Broadcasting Service (PBS) for its Next Generation Interconnection System (NGIS). IDC is deploying video distribution infrastructure that includes DVB-S2/ IP satellite transmission equipment as well as dual redundant advanced satellite receivers with custom expanded storage capabilities for PBS' approximately 180 Public TV licensees.

Also being provided is the File Transfer System (FTS) — the backbone of the new PBS distribution network. The FTS will distribute high quality HD video programming in an innovative new file-based

YEAR IN REVIEW — 2010



Broadcast Radio



Broadcast Data



Broadcast Video

workflow. The FTS will interface seamlessly with other NGIS sub-systems to enhance efficiency and ease-of-use for the end-user station.

International Datacasting continues to offer innovative products and solutions for radio broadcast networks with our new STR product line — which is further enhanced by the recent PROLine integration in Europe. Featuring low symbol rate DVB-S/S2 front-end and G-bit IP, it is tailored for the mid-size and low cost radio distribution market. Also enhanced was the trusted SFX Pro-Audio family with high-end store and forward capabilities along with the FM product line that features a new redundancy switch for FM radio networks. The SFX Pro Audio Series is IDC's professional DVB-S/S2 audio receiver with integrated Datacast XD and offers live IP audio decoding plus time shift audio file playout for advanced radio networks.

In the key radio market, IDC is working closely with National Public Radio (NPR) on a significant project to update and refurbish the Public Radio Satellite System® (PRSS®). The PRSS transmits programming to more than 800 public radio stations throughout the United States. NPR's Distribution Division has managed system since the PRSS' inception in 1979. IDC provided the infrastructure currently in use and will be updating and augmenting the system for advanced functionality for region-specific programming.

Also in 2010, employing our expertise in systems integration, International Datacasting did substantial work with The Wananchi Group for the development, build up, and roll-out of a new direct-to-home (DTH) broadcasting service that will provide television programming to the Sub-Saharan region of Africa. This work includes head-end equipment that will enable a satellite-to-set-top box distribution platform for the delivery of a secure broadcast system to homes throughout the subject

region. The Wananchi Group is launching the first triple-play network in the region under the Zuku consumer brand which brings video, voice and data services to consumers in the area.

“IDC has a strong 25-year history of developing innovative products and solutions to meet the dynamic needs of the evolving broadcast market. Our products have always been regarded for their interoperability, consistency and reliability in real-time, real-life broadcast environments,” said Fred Godard, IDC President and CEO. “This year, we were proud to build on this reputation through introducing next generation end-to-end solutions to our diverse customer base in the areas of digital cinema, IPTV and radio networks, among others.”

Forging ahead into 2011, IDC will continue to focus on emerging trends in the industry to best address the dynamic needs of broadcasters, continuing to build on the Company's global success in the areas of 3D-Live and digital cinema as well as working with broadcasters in developing new potential revenue opportunities. Further traction in Radio markets is expected as broadcasters invest in continued network upgrades. IDC will continue to invest in the areas of hybrid networks and management monitoring as key areas for customers and the expansion of the Professional Services business will bring IDC even closer to the customer.

Frederick L. Godard is the President and Chief Executive Officer of International Datacasting



Over the past 12 months, satellite's role in the modern communications landscape has continued to expand and mature. Satellite is now, truly, a widely-deployed communications technology that supports an ever-growing range of applications across several industries. However, many regions continue to struggle with satellite capacity shortages and the resulting high prices of bandwidth.

With DVB-S2 now embedded in the market and no major new transmission technologies on the horizon, 2010 was a year for iDirect to turn attention towards features and capabilities that allow operators to become more successful by optimizing, differentiating and expanding their services to new regions and markets. iDirect continued to develop the capabilities of existing technologies; enhancing and improving them to enable customers to deliver more bandwidth at lower cost, ensure higher availability and reliability, offer a broader mix of services, and take their business to the next level of growth and expansion.

Over the past year, strong adoption of the Evolution platform was experienced, with 75 percent of iDirect's customer base now operating on the DVB-S2 based product line, collectively launching more than 250 Evolution networks to date. As we continue to expand and enhance Evolution's capabilities, the goal is to push the boundaries of network performance in order for service providers and network operators to capture the satellite industry's biggest market opportunities.

This year also saw the release of the fourth major software upgrade to Evolution, iDX 2.1. With 2.1,

iDirect has, once again, expanded the power of DVB-S2, delivering several new capabilities to the platform that help service providers introduce innovative, differentiated services to their customers: Faster data processing speeds that enhance DVB-S2/ACM efficiency gains, network scalability improvements, expanded functionality for the platform's built in feature set and the industry's most powerful inbound coding option available, 2D 16-State. iDirect is the first satellite technology provider to integrate 2D 16-State into its satellite communications platform. Following 2.1, iDirect also released a minor software upgrade to Evolution, iDX 2.2, which incorporated DVB-S2 TRANSEC support for Government and International Defense customers.

At the start of the year, iDirect introduced a key addition to our product line when the Company acquired the award-winning SatManage network management software suite. For most service providers, network management has become a primary consideration for selecting a satellite communications platform as they focus on building global networks, capable of delivering seamless and guaranteed connectivity in any business, geographical or communications environment. As networks grow in size, it becomes harder to manage and monitor them effectively while responding to the needs of new and increasingly demanding customers.

SatManage is a sophisticated suite of web-based software tools for automation, monitoring and integration of hybrid networks and NOC based applications. Leading service providers such as BT, MTN and Intelsat General have implemented SatManage to improve overall service quality and network operations, scale their networks and gain the intelligence and visibility necessary to optimize their business.

Midway through 2010, iDirect made SatManage even more accessible and easier to implement by bundling the software's primary tools into five distinct feature packages. Bundles such as the Mobility or Customer Management packages integrate specialized capabilities to meet specific end user requirements and transform a NOC into a powerful, automated intelligence center.



iDirect Evolution 8000 Series Satellite Router

YEAR IN REVIEW — 2010

iDirect witnessed several key vertical trends in 2010 as a result of Company efforts to make satellite communications even more efficient, reliable, easier to use and easier to manage in any location, environment or for any application. One of these market trends was the emergence of VSAT in the energy and utilities industry to enhance the communications network that powers today's smart grid.

With today's utilities investing in smart grid strategies to make yesterday's electrical grid infrastructure more intelligent, reliable and efficient for tomorrow, they require an integrated communications system that supports emerging applications and provides instant access to any location to control every aspect of their operations.

Thanks to recent advancements, satellite connectivity now presents a cost-effective solution for utility companies to manage growing operations and integrate with core communications to establish connectivity in remote geographies. Satellite provides a single, flexible solution for Supervisory Control and Data Acquisition (SCADA) and broadband capabilities and a resilient, secure network to protect assets and improve the reliability of their operations.

iDirect commissioned analyst firm Pike Research to develop a report on satellite's role in the smart grid to educate the energy and utilities market on the unique opportunities VSAT offers their business, and developed a five-minute animated video that demonstrated how and where satellite can impact operations.

The Pike paper profiles one utility, Southern California Edison (SCE), that has taken a leading role in bringing satellite into the smart grid. SCE currently uses satellite links to provide reliable connectivity for 30 percent of its remote substations locations. The company is rolling out technology upgrades to its satellite network to enable Voice over IP, Internet and video surveillance applications in addition to core SCADA at these substations.

As service providers focus on building global networks to meet end-user demands for seamless and guaranteed connectivity in any business, geographical or communications environment, they must address

key mobility challenges. This is especially true of the maritime market, where vessels must pass through multiple networks as they travel across the globe. According to the 2nd edition of the [Maritime VSAT report](#), published by leading industry analyst firm COMSYS, maritime VSAT services grew as much as 30 percent between 2005 and 2009. iDirect is committed to ongoing technology innovation and end-user education as the steady of VSAT in the maritime market continues.

This year a key innovation for this market was the "OpenAMIP" protocol, which improves integration between stabilized marine VSAT antennas and iDirect's line of remote satellite routers. Through OpenAMIP, the Company intends to remove some of the complexity of implementing maritime VSAT solutions and promote a shared standard within the industry for technology providers to work together on making networks more reliable, manageable and affordable for end users.

Heightening awareness of satellite communications in the industry by helping to launch the new Maritime SATCOM Forum, organized by GVF, was another iDirect activity. Comprised of maritime satellite service providers and technology manufacturers, the forum aims to strengthen advocacy efforts, expand delivery of training at the end-customer level and provide a single voice to help shipping companies understand the value of satellite services.

The COMSYS report affirms iDirect's growing success and key accomplishments in this market, naming our platform the "de facto standard" that supports 12 of the industry's top 15 network operators and service providers, with iDirect routers comprising 47 percent of those installed on vessels today. Using VSAT for cost-effective satellite backhaul. iDirect has also seen heightened demand for VSAT in the cellular backhaul market.

For mobile operators, the rural market is one of the few market segments where they can expand their reach and attain new customers. While significant business opportunities exist, operators have been challenged to build and finance mobile networks in remote locations. Terrestrial backhaul options are either unable to reach these areas or become too costly when spanning great distances.

The arrival of IP-enabled mobile infrastructure equipment combined with recent innovations in VSAT technology has finally made rural service affordable for mobile operators, enabling them to support core operations more cost-effectively and expand their offerings.

This year saw many operators upgrading to all-IP network infrastructure, with iDirect's IP-based platform enabling operators to share network capacity across multiple locations, allocating bandwidth on demand to maximize efficiency while reducing costs.

2011 promises to be another exciting year for satellite operators, with iDirect working towards the rollout of several ground-breaking innovations that will once again change the SATCOMs landscape. Expect several new capabilities to be introduced that dramatically improve efficiency and flexibility on the inbound channel, comparable to the efficiency gains that DVB-S2 enabled for the outbound channel.

As new service providers enter the industry, existing providers adopt VSAT for the first time or growing network operators look to expand operations, iDirect will continue to enhance and innovate our platform to deliver the most efficient, reliable and adaptable satellite communications that helps them improve operations, lower costs and capture new market opportunities.

David Bettinger is the Chief Technology Officer and Senior Vice President of Engineering at iDirect. He joined the Company as the Director of Hardware Engineering in 1996 and took over responsibility of all hardware and software development as VP of Engineering in 2002. In his role as Chief Technology Officer he is responsible for the oversight of all technology decisions within iDirect and serves to drive the strategic direction for product development.



The industry continued to face challenges in 2010. The global economic recovery predicted at the beginning of the year did not take hold as experts had expected. Yet, bright spots quickly emerged, including the continued increase in demand for Satellite Communications (SATCOM) by commercial and government customers, the reliance on partnerships across the industry to increase efficiency and decrease costs and the need to acquire affordable, easily accessible and customizable Commercial-off-the-Shelf (COTS)-based solutions as an alternative to expensive, proprietary products.

For almost 30 years, Integral Systems has concentrated on delivering affordable, effective products and solutions to our customers and our business partners to support their business and mission success. The Integral Systems family of companies — Integral Systems, Inc., RT Logic, Newpoint Technologies, SAT Corporation, Lumistar and Integral Systems Europe — provides best-in-class products and is uniquely positioned to extend our COTS-based approach to deliver cost-effective solutions, systems and services. Our deep industry expertise in command & control, signal processing, network management, interference monitoring, detection and geolocation and secure communications is meeting the needs of customers globally on-schedule and within budget. Our solutions allow our customers to optimize and expand their operations with little to no increase in staff.

In March, the Company announced the acquisition of CVG-Avtec. The following month, Integral closed on the most recent technology acquisition, Sophia Wireless. Both CVG-Avtec and Sophia Wireless now operate as part of the SATCOM Solutions Division (SSD). The acquisitions significantly increased Integral's portfolio of COTS-based products and our customer base within the Department of Defense (DoD), a critical growth area for the Company.



Integral Systems' EPOCH client, real-time monitoring and control of satellite and ground systems

At the 2010 SATELLITE Conference in March, the newest initiative was launched to bring efficient, affordable operations to commercial and government organizations. Integral Systems Service Solutions (IS3) offers RF signal monitoring, interference detection and geolocation, Quality of Service (QoS) assurance and remote network management as a subscription service, eliminating the need for significant upfront capital investments and significantly reducing annual operating costs. I am pleased to report that IS3 has already secured multiple customers — well ahead of schedule — including a contract by the United States Strategic Command (USSTRATCOM) to provide worldwide interference geolocation services. The immediate traction we have seen, confirms the need for comprehensive SATCOM Network Operations (NetOps) management offered as a service.

This summer, Al Jazeera Sports Channel turned to Integral Systems Europe (ISE), a wholly-owned subsidiary of Integral Systems, to identify and locate a significant satellite interference event that disrupted broadcasts of FIFA World Cup™ football matches to millions of Al Jazeera Sports subscribers across the Middle East and North Africa. Our industry-leading satID® Expert with Monics® comprehensive

interference monitoring, detection and geolocation solutions was used to quickly and accurately identify and locate the source of interference.

This customer partnership is a hallmark of Integral Systems' philosophy. We remain committed to listening to our customers and delivering innovative products to better achieve their objectives. The research and development teams continue to deliver innovative, customer-focused solutions, as exemplified by the newly developed SATOPS Enterprise Architecture. This technology provides satellite and space operators with a platform for a comprehensive Space Situational Awareness (SSA) capability by integrating mission relevant multi-source data from Integral Systems best-in-class products and technology, as well as third-party products and data sources.

The year ahead will find Integral continuing to work closely with customers and partners to bring COTS-based approaches to market to provide cost-effective, flexible solutions. As the need for more efficient, scalable, affordable operations continues to increase, the opportunities to bring industry-leading, COTS-based solutions to a new customers and new industries is self-evident.

The Integral Systems Family of Companies will continue to develop commercial-based products that are open and flexible and that incorporate new technologies as well as the ability to integrate with legacy systems, required to provide longevity and return on investment. The Company remains committed to delivering the industry's most comprehensive and economical solutions based on a shared mission to help our customers succeed.

Paul Casner is CEO and President of Integral Systems. Before assuming his current role, Mr. Casner joined Integral's Board of Directors in December 2006. He has more than 40 years defense industry experience, including several senior positions in business management, technical management, strategic planning and business development.



Integral Systems’ Civil & Commercial Group

Integral Systems provides satellite command and control, network management, interference detection and geolocation and Telemetry, Tracking and Control (TT&C) antenna/radio frequency (RF) solutions to this market, often times in an integrated turnkey package or as a service. Looking at 2010 from a global perspective, we saw a noticeable increase in interest for Commercial-off-the-Shelf (COTS) satellite ground system products and services.

Over the course of the year, this group deployed four large international integrated solutions for satellite command and control and are in the process of deploying two more. Product sales and antenna/RF systems integration work internationally have also been very active this year. The COTS product-based approach is particularly relevant here as satellite operators, service providers, and broadcasters are looking to lower costs, increase margins, enhance Quality of Service (QoS), enforce Service Level Agreements (SLAs) and quickly and easily upgrade their systems with the latest technology.

International military and civil government also embraced COTS solutions. These customers face a unique set of challenges, and oftentimes require systems be deployed in a very short period of time, if not immediately, relying on proven commercial products that offer a full-featured, low-risk approach with an accelerated development and deployment schedule.

Looking forward to 2011, the international market is a major growth area. The “condo-sat” approach will gain momentum as satellite operators share costs with partners, and take advantage of the high-power, high capacity communications satellites available today. As our ground system solutions are so widely used, the chances are excellent that one or both of this group’s partners will have our systems in place. Continuing to use cost-effective COTS solution eases the integration effort for the ground systems, while maximizing value to both partners.

In addition, as the hyper-competitive environment in Asia-Pacific shrinks margins for service providers, Quality of Service (QoS), Service Level Agreement (SLA) enforcement and efficient network operations will be critical to ensure customer satisfaction, as well as to protect the bottom-line. The COMPASS Network Management System (NMS) with Remote Site Management (RSM) has been developed to specifically address these issues, especially for customers who need to centrally monitor and manage 50-500 geographically spread out sites to ensure consistent and reliable coverage. In most instances, COMPASS is able to restore a site without having to send out a technician, saving the service provider the considerable cost.

Similar to Asia, EMEA-based customers face a myriad of complex communications issues. In addition to working with satellite operators to provide ground system solutions, there is an increasing demand for Monics® signal interference monitoring, detection, and satID® geolocation systems by military and government regulators in the region. These cost-effective COTS solutions provide the means to police the spectrum and to protect critical communications used by the warfighter.

James Kramer is Senior Vice President and General Manager of the Civil & Commercial Group at Integral Systems. He is responsible for the Civil Programs Division, the Commercial Programs Division, and two wholly-owned subsidiaries located in Toulouse, France and Newcastle Upon Tyne, United Kingdom.



Integral Systems’ Service Solutions Division (IS3)

In 2010, the global thirst for Satellite Communications (SATCOM) bandwidth continued to increase as the efficiency of these services dictated the daily functions of commercial and government entities. The need to actively manage SATCOM Network Operations (NetOps) assets (payloads, terminals and links) to ensure Quality of Service and increase margins becomes increasingly important.

YEAR IN REVIEW — 2010

For many smaller satellite operators, resellers and bandwidth service users, the significant costs of establishing and operating a modern SATCOM NetOps infrastructure have proven prohibitive, with implementation often being beyond the means of smaller organizations. The scarcity of cash and the difficulty of financing or investing in new systems is a concern for most businesses.

To mitigate these risks, and meet the needs of smaller organizations and others wishing to outsource requirements, turnkey subscription services offer access to industry-leading solutions without upfront capital investment. Significantly reducing annual operating expenses is an additional benefit.

Integral Systems has been working closely with our aerospace and communications customers for almost 30 years to solve their most complex problems. These capabilities include satellite command and control, signal processing, network management and Radio Frequency (RF) monitoring, interference detection and geolocation.

Evaluating the market and discussing requirements with customers, the need for interference monitoring, detection, and geolocation capabilities as a service became clear. The ability to successfully monitor carrier signals, identify interference and geolocate a source is incredibly difficult. Additionally, upfront capital costs and ongoing operating expenses often put a best-in-class solution out of reach for small- to mid-sized satellite operators, service providers, resellers and broadcasters.

According to industry group estimates, an operator managing a small fleet of satellites can expect interference to cost up to \$2 million per year. With millions of dollars per year in lost revenue and decreased margins on the line, turning to inferior interference detection and geolocation systems or attempting the “do-it-yourself” approach to reduce costs is no longer a viable option.

To meet the needs of these customers, we formed an autonomous group offering these and other related managed services to commercial and government customers. Integral Systems Service Solutions (IS3) brings together our industry-leading Monics® signal monitoring and interference detection system, which

is in use by an overwhelming majority of satellite operators globally, and our satID® geolocation solution, the market’s most accurate geolocation system.

Earlier this year, a major international broadcaster used our satID Expert with Monics comprehensive interference monitoring, detection and geolocation system, along with our technical experts, to restore its broadcast signal to millions of FIFA World Cup™ viewers in the Middle East and North Africa. We partnered with the broadcast network to quickly and accurately identify and locate the interference source. As a testament to the system’s power and precision, the interferer’s location was narrowed to a three-kilometer area.

In 2011, RF interference will continue to plague the industry. By not proactively addressing the problem with proven technology and techniques, commercial satellite operators, service providers, resellers and broadcasters risk losing millions of dollars. More importantly, as signals are degraded or interrupted altogether, they jeopardize hard-earned customer relationships. In an industry with ever-shrinking margins, every customer lost is a direct hit to the bottom line. With the introduction of satellite interference monitoring and mitigation capabilities as a service, small- and medium-size organizations now have access to the most powerful interference detection and geolocation capabilities available today. Deploying proven technology managed by industry experts, interference issues are identified and mitigated quickly and accurately, resulting in enhanced customer satisfaction and ultimately, increased margins.

The new year will also bring about another significant change. As satellite operators and service providers look to increase margins, they will begin to view network management as an enablement solution with a direct tie to the bottom line. In order to meet this demand, IS3 has assembled a team of industry experts with a proven track record of building advanced network management systems to align to today’s multi-use networks. The complexity of networks and the challenge to unite voice, video and data into a seamless network has created an environment with multiple management systems and multiple organizations managing these resources. Furthermore, many are stovepipe systems with

limited interoperability between each other or with other network management organizations. IS3 can solve these issues by consolidating these stovepipe systems into a single interface and one interconnected network ecosystem.

Ernie Dickens is Vice President and General Manager of the Integral Systems Service Solutions (IS3), a business unit of Integral Systems, Inc., that provides global managed network services for satellite and terrestrial communications markets, specializing in Quality of Service link monitoring, remote infrastructure management and interference detection and geolocation subscription services. Mr. Dickens has more than 30 years defense industry experience.



With viewer interest in the 2010 World Cup a prime example, the world is becoming a smaller place through the globalization of content. Broadcasters remain in the forefront of this trend. As the World Cup showed, satellite technology is essential in distributing content worldwide. The Intelsat network delivered more than 500 transmissions for broadcasters covering the World Cup matches and, more recently, we distributed over 620 hours of transmissions for more than 24 global broadcast organizations who were covering the Chilean mine rescue.

Intelsat works with broadcasters to identify the most efficient means to enter new regions. On average, the top 20 video distribution customers buy service on our network across three or more geographic regions, demonstrating the value provided by the global reach of this network. The IntelsatONE MCPC platforms and leading video neighborhoods enable broadcasters to economically extend their programming reach to new audiences abroad.

An example is HBO Latin America Group, which signed a multi-year contract for capacity on three of our neighborhoods to increase its program distribution to cable headends across Latin America. HBO will use this distribution to introduce new high-definition programming in the region. Similarly, BBC World News will use four of our satellites to support its Americas and Asian operations. Sony Pictures Television, also seeking expansion across Asia, is an anchor customer on our Intelsat 17 satellite at 66

In 2010, the satellite industry demonstrated repeatedly the indispensable role of satellite communications. Customers are expanding their service regions and the applications they support, resulting in continued worldwide demand for the services Intelsat satellites deliver.

From the emergence of high definition programming in developing regions to the urgent need for capacity to support unmanned aerial vehicle missions, Intelsat's global communications infrastructure delivered more connectivity, to more countries, than any other satellite operator.

There are three major trends shaping the industry and driving our strategies to support our customers' growth requirements:

- » *The globalization of content, be it special events or regional programming reaching international audiences*
- » *The ever-present need for connectivity, especially in emerging regions like Africa and Latin America*
- » *The increased use of commercial SATCOM services by governments worldwide*



Intelsat 17, image courtesy of SS/L

YEAR IN REVIEW — 2010

degrees East, extending our leading neighborhood at 68.5 degrees East.

Cellular backhaul services continue to be an important application where satellite remains a significant element for expanding infrastructure and connectivity. In our experience, the availability and quality of terrestrial-based services decline as the distance from urban areas increases. Work continues with customers to support their infrastructure build-out beyond the fiber access point. For example, in Latin America, Intelig Telecom of Brazil will enhance its cellular service via the Intelsat 14 satellite, enabling it to expand its network that serves more than 41 million mobile users.

Another example of connectivity can be found in the Company's approach to meeting the challenges of maritime broadband. Intelsat's mobility offering allows customers to take advantage of the Ku-band beams designed into six of the satellites in our current launch plan. Maritime data service leaders Newwave Broadband and Vizada's Marlink unit are using Intelsat capacity to develop compelling broadband offerings for the maritime industry.

In 2010, Intelsat General business experienced strong growth that was fueled by the U.S. Department of

Defense's (DoD) expanding satellite communications bandwidth requirements. Warfighters continue to use applications that demand more and more capacity, including UAV missions and tactical communications that cannot be met by the DoD's limited satellite resources. This demand, coupled with a gap caused by DoD satellite launch delays and program cuts, has made commercial satellite capacity a strong complement to military satellite communications.

Hosted payloads offer an avenue to fill this gap. In April, the remaining channels of the Intelsat 22 satellite's UHF payload to the Australian Defence Force were sold off and, in August, the construction of IS-27 was announced. The satellite will include a UHF payload for use in government applications. Intelsat understands the military's need for control and autonomy, and believes that UHF payloads offer numerous options to the DoD.

In addition to hosted payloads, the U.S. Navy selected Intelsat to bring the most advanced, next-generation network to its fleet through the Commercial Broadband Satellite Program (CBSP). A team of satellite operators and integrators were assembled to provide the Navy with a solution that includes unparalleled flexibility, depth of operations, growth and surge options, and a future vision for network enhancements. The offering that will be delivered includes the use of C-, Ku- and X-band satellite capacity.

The deployment of new, customized capacity and integrated hybrid satellite-terrestrial platforms is paramount to the satellite industry, remaining able to address the growing needs of its customers. Intelsat is in the process of executing the largest fleet investment program in the company's history. In 2010, a ninth satellite was added to the current plan, the Intelsat 27 satellite, a replacement for Intelsat 805 and slated for launch in late 2012. As the new satellites are launched and deployed, Intelsat will have capacity customized for fast growing applications, and will create a global fabric of Ku-band beams that will provide broadband connectivity for the maritime industry.



Intelsat 27

In addition, IntelsatONESM was introduced, the Company's integrated terrestrial network of PoPs, teleports, and IP/MPLS based fiber, which fuses with the satellite network to deliver a single platform for converged voice, video and data solutions. Our commitment to providing a hybrid terrestrial-satellite solution is unique when compared to other satellite

operators. IntelsatONE delivers the single platform customers demand when seeking a global, diverse communications system. This also holds true for Intelsat's fleet replenishment program, as the right capacity continues to build out, in the correct location, offering frequency bands that will serve customers' long-term business needs.

Any wrap up of 2010 would be incomplete without acknowledgement of the unprecedented industry cooperation witnessed this year as we collectively navigated the effects of the Galaxy 15 anomaly and joined forces to combat Radio Frequency Interference. I am proud of the industry's willingness to join with us in our focus on these and other challenges to ensure television signals, data transmissions and other customer services continue to be delivered with the outstanding reliability for which our industry is renowned.

Stephen Spengler is the Executive Vice President, Sales & Marketing, for Intelsat. He is responsible for Intelsat's global sales, marketing, strategy, and customer support engineering organizations, which provide services to media, network and other satellite related services customers in approximately 200 countries and territories. Mr. Spengler has more than 25 years experience in the telecommunications industry.



total billable subscribers grew 22 percent year-over-year.

Buoyed by another successful year, the next big step is the full development and deployment of Iridium NEXT, our next-generation satellite constellation. Here are a few highlights of this year's impressive performance, which more fully tell the story about how Iridium NEXT will come to full realization.

In June, Iridium capped a long procurement process by selecting the prime contractor for development of Iridium NEXT, awarding a \$2.2 billion contract to Thales Alenia Space France, one of the top satellite manufacturers in the world. The contract with Thales Alenia Space France calls for the design and construction of 81 satellites — 66 operational satellites, six in-orbit spares, and an additional nine ground spares. Iridium has also signed the largest single commercial launch deal ever with Space Exploration Technologies Corp. (SpaceX) to be the primary launch services provider for Iridium NEXT.



Artistic impression of Iridium NEXT in orbit

2010 has been a bellwether year for Iridium. The Company has experienced steady and robust growth in all metrics, with third quarter financial results, released November 9th, revealing total revenue grew 12 percent over Q3 of 2009, while Operational EBITDA was up 22 percent over the same period last year — the number of total billable subscribers has grown to 413,000, which is up from 339,000 for Q3 of 2009 and up from 383,000 for the previous quarter of this year. Our

Work has already started under the contracts, and the first launch of Iridium NEXT satellites is scheduled for early 2015. In October, the financing facility for Iridium NEXT successfully closed. A syndicate of nine international banks will provide up to \$1.8 billion of financing to Iridium for the design and manufacture of Iridium NEXT satellites. Ninety-five percent of the borrowings under the financing facility are insured by the French export credit agency *Compagnie Française d'Assurance pour le Commerce Extérieur*, or Coface.

YEAR IN REVIEW — 2010

In addition, Iridium entered into two comprehensive, long-term agreements with The Boeing Company for maintenance, operations, and support of Iridium's satellite network. Under the first agreement, Boeing will continue operating Iridium's current satellite constellation and will provide support for Iridium's satellite control system. The second agreement is a new support services contract under which Boeing will become the exclusive operations and maintenance provider for Iridium NEXT. The combination of these agreements allows Iridium to benefit from having a single operator during the transition from the current constellation to Iridium NEXT.

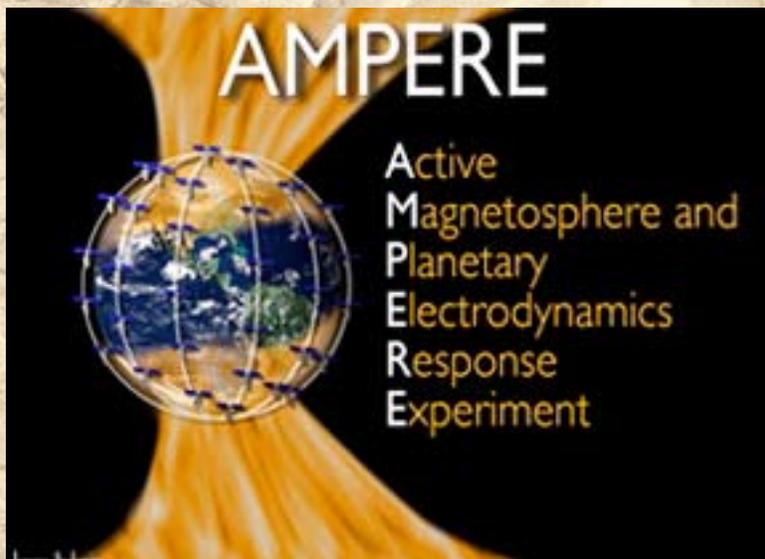
Network investments continue to ensure the provision of a highly reliable service to the customer base during the transition to Iridium NEXT. Important upgrades are being completed to our gateways, operation centers and tracking and telemetry stations, transitioning infrastructure into a state-of-the-art teleport architecture. Iridium recently won three U.S. Department of Defense (DoD) Defense Information Systems Agency (DISA) contracts to upgrade the Enhanced Mobile Satellite Service (EMSS) Gateway in Hawaii. The DoD's Iridium EMSS Gateway serves as a dedicated portal for the uplink and downlink of voice and data traffic through Iridium satellites for the DoD and other U.S. government users throughout the world. With the upgrades, enhancements that support our mutual migration toward Iridium NEXT are being built.

In conjunction with the Johns Hopkins University Applied Physics Laboratory (APL) and The Boeing

Company, Iridium successfully implemented a new space-based system to monitor Earth's space environment in real-time for the first time ever. Known as the Active Magnetosphere and Planetary Electrodynamics Response Experiment (AMPERE), the system provides real-time magnetic field measurements using commercial satellites as part of a new observation network to forecast weather in space.

Throughout 2010, Iridium continued to increase its international expansion by strengthening its partnerships with companies and customers around the world. This year, Iridium announced the establishment of Iridium South Africa, under which Iridium has licenses to operate, provide and sell mobile satellite services (MSS) in the country. This authorization enables Iridium partners to better address the growing government and commercial enterprise market demand with Iridium products, services and applications in South Africa. The Company continues to pursue licenses in other significant geographical markets which represent the opportunity for further expansion of the company's products and services. Strong business relationships have been built in Latin America, where the mobile data market for asset tracking and management is in high demand. In Brazil, for instance, distribution partners have signed major enterprise customers such as Enalta and JBS Friboi.

The maritime sector, including commercial shipping, fishing and private yachts, is definitely one of Iridium's core markets. The Iridium OpenPort® broadband satellite system continues to provide unequalled value



proposition of multiple phone circuits and data links up to 128 Kbps. More than 2,500 terminals have been delivered and activated on a wide range of vessels. Demand for lower-cost solutions for crew welfare

services, enabling crew members to call and e-mail their families and friends when at sea, is a primary growth driver for Iridium in this arena.

In the aviation sector, Iridium is working with LiveTV, a leading provider of live in-flight entertainment and connectivity technology, to develop an Iridium OpenPort®- Aero platform for commercial and business aircraft. Like the maritime version of Iridium OpenPort, the new broadband aero system will provide multiple voice channels and data rates up to 128 Kbps with always-on IP connectivity. In addition to in-flight passenger e-mail, the Iridium-based broadband system will provide real-time voice and data connections for flight operations and cockpit communications. Supplemental Type Certificate (STC) trials for Iridium OpenPort - Aero are scheduled to begin in Q1 2011, with commercial rollout expected in Q2 2011, pursuant to regulatory approval. Iridium is also in the final stages of obtaining FAA certification for air safety communications on commercial transoceanic flights.

In the government sector, Iridium has also experienced rapid growth of the Distributed Tactical Communications System (DTCS). Also known as "Netted Iridium," DTCS leverages Iridium's constellation of cross-linked, low-Earth orbit (LEO) satellites to enable over-the-horizon, beyond-line-of-sight, push-to-talk radio nets for military personnel on the move in mountainous terrain. They operate similar to military tactical radio, but without the restrictions of terminal distance. There are nearly 5,500 DTCS units currently principally deployed in the Middle East.

In April, a Government Advisory Board comprised of former senior U.S. government officials and business leaders was initiated to provide counsel to Iridium, as the company continues to enhance its suite of products and services for federal and state civilian, defense, intelligence and law enforcement customers.

Iridium satellite phones have become widely accepted as a "utility," providing worldwide voice and data links for a broad range of users who live, work and deploy in regions where landlines and terrestrial wireless communications are unavailable, unreliable or overburdened. Since its initial launch in 2008, the Iridium 9555 satellite phone has established a new benchmark in the industry for reliability and performance. New features and enhancements

continue to roll out for the Iridium 9555, making it easier for subscribers to connect to a laptop with a standard mini-USB cable and to interface directly with computers running on most operating systems, for example.

Early this year, the Iridium 9602 SBD transceiver was unveiled, the first and only device offering global, low-latency, two-way data links. Designed to be embedded into partner-systems that enable remote machine-to-machine (M2M) asset tracking and monitoring, the smaller, lighter and lower-cost Iridium 9602 two-way device is making global satellite M2M obtainable for a much larger group of partners and applications. The Iridium 9602 has further enhanced our ability to serve the Company's faster growing market — the M2M sector — and has quickly become the premium service in the market. More than 90 of our value-added manufacturers and resellers have already been testing and integrating the Iridium 9602 into their products, including a new generation of personal satellite location and distress alerting devices.

Recognizing the need for standards in this emerging market, Iridium joined with other satellite providers, equipment manufacturers, government regulatory bodies and the international search-and-rescue community to create a coalition called the ProTECTS (Promotion of Two-Way Emergency Communication and Tracking Systems) Alliance. Formed in late 2009, the ProTECTS Alliance serves as a framework for its members to dialogue and work in a collaborative atmosphere to foster broad-based industry standards for two-way data communications products. Since its inception, the ProTECTS Alliance has more than doubled its membership to 38 companies in representation. Working with the U.S. National



YEAR IN REVIEW — 2010

Search and Rescue Committee (NSARC), the ProTECTS Alliance spearheaded the development of standardized message formats for reports from portable data devices to first responders. Recently, the ProTECTS Alliance became a Special Committee of the Radio-Technical Commission for Maritime Services (RTCM).

Iridium products and services have proven to be critical communication links for relief-and-recovery operations during recent earthquakes and other natural disasters. In Haiti, more than 60 different organizations depended on Iridium handsets in their relief efforts. Also, during the Gulf of Mexico oil spill, several Iridium-based technological solutions, such as remote tracking devices, data-collecting Seagliders and drifting ocean buoys, were on the front lines of the clean-up efforts.

In 2011, Iridium will work with various partners in the aviation market to commercially roll out the Iridium OpenPort - Aero system for aircraft, and to achieve full certification internationally as a supplier of air safety communication services for commercial aircraft on long-haul flights. Leveraging the established success with Iridium 9602-based tracking and monitoring devices, rapid deployment of these products is expected and the focus will be to maintain growth in the M2M sector. This will include a number of large enterprise organizations as well as niche players.

Moving ahead with full-scale development of Iridium NEXT is a major priority for 2011, investing in infrastructure enhancements and debuting new products during the year. Next year's *Year in Review* column will, no doubt, contain many interesting developments to share with all. In the meantime, let me personally take this opportunity to wish all our friends in the satellite industry a Happy New Year, as we all look forward to the excitement 2011 will bring to Iridium.

Matthew J. Desch is the Chief Executive Officer (CEO) of Iridium Communications, Inc., has more than 30 years of experience in telecommunications management and over 19 years in the global wireless industry.



Until three years ago, the limited options for broadband communications at sea forced mariners to select from a menu of unpalatable choices that either offered small hardware and prohibitively expensive airtime, or massive antennas with unreliable airtime supported by a patchwork of regional services. All changed in late 2007 with the launch of the mini-VSAT Broadbandsm service and TracPhone® V7 antenna from KVH Industries, Inc., and its partner, ViaSat, Inc.

For the first time, vessel owners and operators were able to choose a solution that offered a unique combination of features — an antenna 75 percent smaller than traditional VSAT systems, the power of a seamless global Ku-band network, broadband connections up to four times faster than Inmarsat's fastest data rates, airtime costs more than 85 percent less expensive than competing services, and a single point of contact for hardware, airtime, and worldwide support.



KVH TracPhone V7

The response has been remarkable, with more than 1,000 systems shipped to vessels worldwide, making mini-VSAT Broadband the fastest growing maritime VSAT solution in the industry. The professional dealers and technicians in the National Marine Electronics Association recently named the TracPhone V7 the best marine communication system available, and mini-VSAT Broadband has become the satellite communication solution of choice for the U.S. Coast Guard, while also being used on vessels in the U.S. Navy, foreign coalition navies, state emergency service organizations, commercial fleets, and leisure yachts.

KVH believed that the marine marketplace was ripe for the emergence of a new, truly disruptive approach to maritime communications, one that offered faster speeds, smaller hardware, more reliable service, global coverage, and a level of affordability that was unmatched. That's exactly what has been achieved with the development of our TracPhone V7 hardware and the creation and launch of mini-VSAT Broadband in collaboration with ViaSat. Our long-term partnership with ViaSat enabled the two companies to leverage KVH's expertise in mobile satellite antennas, maritime sales, and global service with ViaSat's powerful ArcLight® spread spectrum technology and network capabilities to develop an end-to-end hardware solution and a seamless network that is unique in the industry.

The result of this collaboration and the network's ongoing evolution is a robust, high-capacity, Ku-band global broadband service offering data rates as fast as 2 Mbps shore-to-ship and 512 Kbps ship-to-shore. Subscribers enjoy access to multiple Voice over IP telephone lines with optimized service as well as voice prioritization to ensure crystal-clear connections at all times. ViaSat's proven ArcLight technology, frequency re-use architecture, and burst message transmission approach provide enhanced efficiency resulting in lower airtime costs for end users. Just as valuable, it also enables the use of small, 60 cm VSAT antennas while offering faster speeds than Inmarsat while serving as ViaSat's Yondersm in-flight broadband network for business and commercial aircraft.

The U.S. Coast Guard's recently selected the TracPhone V7 and mini-VSAT Broadband as its new satellite communication solution. The \$42 million contract will result in mini-VSAT Broadband



deployment on as many as 216 Coast Guard cutters while displacing the existing, legacy systems and service. This a huge milestone in the establishment of mini-VSAT Broadband as the new industry leader for maritime satellite communications and represents one of the largest maritime VSAT awards ever, in terms of the number of vessels.

To assist customers such as Nordic Tankers, Mowinkel, Vadero, and others, KVH continues to enhance the value of the fully integrated, end-to-end solution. The recent introduction of the GlobalCare Premium Support Program provides 24/7/365 concierge-level support in thousands of ports around the world.

It is crucial for us, and for our customers, that the Company continues to add value to the mini-VSAT Broadband solution, along with providing the most reliable and affordable maritime VSAT service available. That's one reason for the Virtek Communication AS acquisition, which equips us with a new suite of network and data management tools through the CommBox™ technology to further improve network efficiency and equip our customers with powerful features to control and manage their own airtime use.

YEAR IN REVIEW — 2010

KVH is also integrating crew communication options, picocell technology, and other features to make the TracPhone V7 and mini-VSAT Broadband even more versatile. The Company has worked hard and invested aggressively to seize this leadership position in the maritime satellite communications market and will do everything possible to improve the network, keep our customers happy, and increase the value of our solution to them.

James S. Dodez is the Vice President, Marketing & Strategic Planning for KVH Industries, and has served as in that position since March of 2007. He joined KVH in 1986, and over the past 20+ years has held the positions of marketing director and vice president of marketing and reseller sales.



For Marlink, this year's developments have resulted in a rise in demand for our broadband services, which range from Inmarsat Fleet Broadband products to our VSAT portfolio Sealink™, WaveCall™ and @SEAdirect™. A highlight in 2010 has been the expansion of the contract with one of the world's largest shipping companies,

AP Moller-Maersk. The renewed agreement has seen Inmarsat FleetBroadband airtime services supplied to an additional 200 vessels, increasing the total number of AP Moller-Maersk vessels sailing with FleetBroadband airtime supplied by Marlink to 370.

The contract with AP Moller-Maersk is testament to Marlink's strong understanding of that company's communications requirements, especially with exceptional global 24/7 support, guaranteeing customers access to the highest quality and most reliable satellite communications, which is fundamental to AP Moller-Maersk's operations for business-critical and crew applications.

In 2011, the demand for increased communications systems which offer enhanced services will continue to increase. Marlink has identified a number of opportunities wherein product lines are expanded to offer creative solutions for customers.

The maritime businesses will continue to focus on cost efficiency — Marlink is committed to introducing new and innovative services to ensure our Inmarsat and VSAT offerings provide exceptional value. We also expect satellite network operators to increase satellite capacity, which will allow for higher data rates and better coverage for VSAT services.

The strategy for 2011 will remain much the same as for 2010, to provide unmatched flexibility, reliability, and cost-effective satellite communication solutions to the maritime

2010 has been a year of continued growth for Marlink. Despite the global economic downturn, there are some sectors of the maritime industry that have been relatively unaffected. The demand for satellite communication services to facilitate a wide range of applications such as improved operational efficiency and online monitoring of vessel performance has continued. In addition, the introduction of smaller antenna systems and entry-level VSAT services has resulted in VSAT becoming more accessible to a broader range of customers.

A key development throughout this past year has been growth in data consumption, driven by Internet usage for social applications. Demands from crew have become focused on data and for social applications, such as Facebook. An important consideration for crew is being able to stay in touch with their lives ashore at an affordable cost. To meet this demand, the Company has focussed on delivering solutions which offer acceptable quality for social communication on the Internet, in a cost-effective method.

industry. Part of this is the Company's operation of customer service centers in major regions throughout the world. This level of local presence means we are able to offer faster, more effective, and locally focused levels of service intervention, and customer support, whenever required. In addition, experienced and skilled engineers are employed who are available all year, ensuring reliable communications, any time, at any location.

Tore Morten Olsen is the CEO of Marlink



The start of this year held a lot of promise. The industry was waking up, projects were starting, and new confidence was evident. The reality was that caution remained in the back of people's minds — now, the industry seems to be moving forward, but at a very calculated and deliberate pace. As a manufacturer of satellite communications hardware, this could be unnerving, but in reality it is prudent and allows for better planning for the future. It is evident that customers want more bandwidth, the satellite industry is intent on meeting that demand, and MITEQ is capable and ready to support these requirements.

There are opportunities in all economies, but not necessarily in all markets. MITEQ is a diverse microwave engineering and manufacturing company that operates 15 different departments in Hauppauge, New York, plus MCL Inc., a high power amplifier company in Bolingbrook, Illinois. Each is a world class supplier of microwave components and technologies for SATCOM, RADAR, missile guidance, reconnaissance systems, and commercial

avionics systems. The depth of products for the satellite communications include Low Noise and High Power Microwave Amplifiers, Up- and Downlink Frequency Converters, Test Translators, Beacon Receivers, and virtually every microwave component between the modem and the antenna. Miteq listens to customers and offers cost-effective solutions that are not available from companies with less product depth.

MITEQ's plan is to stick to the basics, reinforce our product lines, continue to provide value for customers, and continue to develop the technology that is, and will continue to be, in demand. In the past few years, MITEQ has strengthened its operation — organized manufacturing, realigned products, reinforced program management, and focused on engineering. This strengthened the organization and improved the Company's ability to meet the increasingly tough demands and flexibility in products that are required by our customers. Numerous new products are continually added for the SATCOM market as well as the addition of many new microwave products to support military and space systems customers.

In 2010, Miteq introduced a number of new products: (1) Ka Band multi-band block up and down converters — (2) exotic slope and ripple equalizers to insure system compatibility with the latest wide modems — (3) 500 watt Ka-band high power amplifiers — (4) a number of Q-band products to support the next generation frequency spectrum.



YEAR IN REVIEW — 2010

In 2011, MITEQ expects to continue introducing new microwave products, improving current product offerings, and combining all of these products to offer customers a total, integrated, microwave solution. MITEQ's high quality, innovative engineering, and customer service have enabled the Company to successfully navigate uncertainty in the economy and maintain our position as a source for the highest technology and quality products at affordable prices. By holding steady to these principles, Miteq expects to maintain its position as an innovative source customers can turn to, making their next generation products a reality.

Howard Hausman is the President of Miteq



2010 has been a great year for MTN. Despite the difficult economy, the Company grew in each of our markets — cruise, yachts, commercial shipping, aviation and government — by retaining existing customers, expanding with new customers, rolling out exciting new value-added services for our subscribers and increasing our investment in upgrading and enhancing our global VSAT satellite network in order to provide better communications for our customers.

Most recently, iDirect's Automatic Beam Switching (ABS) technology was deployed, integrated with MTN's proprietary Mapserver software across the entire C- and Ku-band VSAT network. With 32 satellite beams, MTN now operates the largest ABS VSAT network. This means ships can sail anywhere, thanks to the extensive worldwide coverage area, with seamless transition from one satellite footprint to another.

During 2010, a major upgrade to — and doubled the size of — our Network Operations Center (NOC) in Miramar, Florida, adding new capabilities and improvements to the 24/7/365 technical support offerings. Substantial improvements to our primary teleport and our NOC in Holmdel, New Jersey, were also completed.

In April, a new teleport in Santander, Spain, was opened, under a joint venture with Erzia, the leading Spanish satellite services company. It was built with the latest technology and architecture in a technology park sponsored by the local government and serves as a central gateway for MTN's VSAT communications with coverage over the Americas, Europe and Asia.

MTN also activated a new Ku-band satellite beam in the South Pacific to provide significant enhancements to our fully managed VSAT services to customers in waters surrounding Australia and New Zealand. The South Pacific Ku-band beam is uplinked through a teleport in Sydney, which is connected via fiber optic cable into MTN's extensive terrestrial support infrastructure.

A new sales and service office in Southampton, U.K., was opened, and appointing key staff personnel with strategic experience and a vision for moving the company forward continues at full pace. Key appointments were made of new resellers and Maritime Service Providers serving major maritime markets in Europe, Asia-Pacific, and the Middle East.

Today, MTN's private dedicated network encompasses 32 overlapping C- and Ku-band satellite beams, eight teleports, two NOCs, and five additional international points of presence, all interconnected by more than 30,000 miles of fiber cable. This extensive network permits the offering of an unmatched value proposition with guaranteed bandwidth (Committed Information Rate), with a 1:1 contention ratio and the ability to burst to higher data rates (Maximum Information Rate) as needed.



MTN is also rapidly becoming the preferred VSAT provider to the megayacht industry. More than 75 percent of yachts over 40 meters in size that were launched in 2010 using our service and also provided are the enabling technologies for new services, including as worldwide TV reception and remote medicine with live videoconferencing.

Among the new megayachts outfitted with MTN's global VSAT services in 2010 are the M/Y Eclipse, which, at more than 550 feet, is the largest private yacht in the world, and M/Y Cakewalk, the largest yacht to be built in a U.S. shipyard. The MTN DirectNet service offers guaranteed bandwidth service used for more demanding applications such as video streaming, online trading or IPTV, where constant bandwidth is a must for these large vessels.

Early this year, the new FlexNet service was launched to provide a cost-effective and flexible VSAT communications solution for yachts under 150 feet with lower bandwidth requirements.

A strong position in the commercial maritime industry is under development, with market growth for VSAT being largely driven by demand for lower-cost crew welfare solutions such as Internet, email and phone calls. Successful installations for existing customers include Teekay Shipping, Elcano, Hartmann Offshore and for new international shipping lines switching to MTN such as Beluga Shipping, Goodwood Ship Management, Intership Navigation Co. Ltd and Hellepont Ship Management GmbH & Co. KG, to name a few.

The Company continues to leverage the robust network and unique value proposition to develop new value-added services for core cruise business. Launched in February 2010, MTN Worldwide TV is the cruise industry's first television broadcast service delivering live programming from seven major U.S. and international television networks to cruise ship passengers anywhere in MTN's worldwide coverage area. Participating networks include BBC World News, CNBC, E! Entertainment Television, Fox News, MSNBC, Sky News and Sky Sports News. We currently provide MTN Worldwide TV to over 40 ships with over 35,000 passenger cabins.

As the pioneer of cruise ship VSAT communications with more than 20 years of experience, MTN continues to take the lead in bringing state-of-the-art broadband Wi-Fi connectivity to the cruise industry. In October, we worked with Silversea Cruises to complete a major retrofit program for shipboard Wi-Fi connectivity on two of its ships, Silver Wind and its flagship, Silver Spirit. The upgraded MTN Wi-Fi network has allowed Silversea's passengers and crew to access high-quality satellite Internet connections anywhere on the ship, giving them the same comforts and conveniences they get when staying in a luxury hotel or resort. Over the coming months, work with Silversea will continue to roll out the Wi-Fi service across the remainder of their fleet.



YEAR IN REVIEW — 2010

The StreamXcel Plus product was debuted at the September SMM maritime exhibition in Hamburg. This new software/hardware package assists ship owners with managing bandwidth and securing their networks; the improved technology automatically and seamlessly switches the satellite signal between VSAT and Inmarsat FleetBroadband, splits the administrative network from the crew network, employs least-cost routing, compresses data passing across the link and optimizes throughput.

The MTN Government Services (MTNGS) business, which was established as a separate, wholly owned subsidiary in 2009, provides advanced network solutions, information management solutions, system-integrated solutions, operations and maintenance service and technical consulting services. It is the fastest-growing sector of MTN, and is becoming widely recognized as a major player for the government and military, currently serving eight of 15 U.S. Government cabinet agencies, three of five military branches, and several non-governmental organizations (NGO).

The new MTN facility in Leesburg was established to accommodate the growth of MTNGS and will include all the facilities necessary to accommodate the demand for commercial satellite bandwidth to support Department of Defense (DoD), government and NGO field operations.

In March, MTNGS was awarded a five-year \$50 million DISA contract to supply managed satellite services, and, in the fourth quarter of this year, MTNGS was awarded a contract renewal to continue

providing broadband satellite communications to the National Oceanic and Atmospheric Administration (NOAA) fleet of research ships. Under this contract, MTNGS will provide end-to-end managed voice and data solutions for NOAA's 18 ships, as well as a new research ship under construction. We also recently supplied one of the most complex satellite communication systems ever installed on a maritime vessel for NOAA's newest and most sophisticated research ship, Okeanos Explorer. MTNGS enabled an unprecedented level of integration between ship and shore never before possible in oceanographic field operations.

A look forward into 2011 finds a great deal of anticipation for continued growth across all Company business sectors. Our customers, whether they be passengers on a cruise ship, engineers on a tanker, crew on a yacht, soldiers on the ground, or passengers on an airplane — all are demanding more connectivity and the same experience they enjoyed at home or in the office. During 2011, exciting new products will continue to be introduced, including services for remote or mobile usage that require outstanding reliability, consistency, and responsiveness, whether such is a new mobile application for an iPhone, or a better connection with Facebook or TV stations watched at home. Stay tuned, for MTN will continue its business growth in 2011.

Jonathan Weintraub is the CEO of MTN Satellite Communications. He has spent his career advising and managing growing companies as an investment banker and as an operating executive. Prior to his appointment as CEO, he served as the company's chief financial officer and acting chief executive.



MTN Government Services One Meter Flyaway Transportable Terminal

2010 has been a tough year for the satellite industry, especially for the ground segment equipment providers — full of challenges and changes. Ka-band begins to play a broader role, instead of connectivity, we are now going into end-to-end solutions and all this combined with a high demand for flexibility, mobility and security. Nevertheless, with nearly three decades of experience, our company has met the challenge to better serve the needs of our market, our customers and partners. I would like to take the opportunity to look back on the year, especially at some of our major activities.

My role in 2010 included taking on additional responsibilities as President and CEO of ND SatCom in June. This position is exacting, but one I relish. I am delighted to be able to build on the company's success and pave the way for further business achievements. "If our customers are successful, then we are successful as well" — this is my personal motto. It is so important not to lose sight of customers' needs and requirements. A key element is the strategic development of ND SatCom and its products, combined with the management team, our 350 employees worldwide and our partners.

Satellite communication in the IT industry is the option of choice if no terrestrial link is available or reliable — neither cost or latency are much of an issue. The outstanding success of this year was the product launch of our innovative IT solution, making cloud computing via satellite possible and eliminating the latency issue while saving significant bandwidth and such also cost. In April, XWARP® was introduced to the international satellite and IT community during "SatCom Africa" in Johannesburg — and received an excellent response. Just six months later and ND SatCom has already become a certified Citrix Ready Partner, being now the only satellite modem provider who has achieved this certification.

For the first time, the XWARP® solution combined with Citrix virtualization technology enables cost-efficient cloud computing via satellite. This solution

allows companies to provide virtual applications from their data centers to users anywhere and anytime, and our new, enhanced technology cuts latency in satellite-based IT networks to almost zero.

Perhaps the most interesting activity in 2010 for has been the launch of our new global "Valued Partner Program", aimed at resellers of SkyWAN®. This program gives committed partners in the telecommunication, IT, enterprise, government and defense industry customized resources and incentives, with sales support, discounts, training and marketing campaigns — partners will become even more successful with leading edge SkyWAN® technology.



In 2006, ND SatCom was awarded with the largest satellite communication project in the history of the German Armed Forces (Bundeswehr). The overall project called "SatCom BW2" comprises the delivery of two communication satellites, an overall communication management system, the upgrade of existing fixed stations and some mobile stations and several hundred transportable ground stations of various sizes. ND SatCom's responsibility in this project is the complete ground segment, including the management system and the related services. ND SatCom managed to deliver two, pre-series units of 2.4m triband mobile terminals and two, 4.6m triband mobile terminals, all within a very tight timeframe, the last one in October. This award, combined with the final delivery of the last set of 400 1.2m FlyAway terminals, created trust in ND SatCom's capabilities. The serial production of the 2.4m and 4.6m terminals will start in early 2011 and will last until late 2012. To further strengthen the Company's portfolio in the governmental market, the Ranger FlyAway terminal family from 1.0m to 2.4m was completed, now available with and without automatic pointing and in C-, X-, Ku- and Ka-band.

A further highlight in 2010 was success in China. In the broadcast area, ND SatCom delivers SNG uplinks and SkyWAN® networks for CCTV7, the special

YEAR IN REVIEW — 2010

interest station of China Central Television, covering military and agricultural topics. The scope of delivery included about 50 units of SkyRAY Antenna Systems, 400 W High Power Amplifiers, and corresponding SkyWAN® modems. In the area of homeland security ND SatCom signed an agreement with the Chinese Civil Air Defense to standardize on SkyWAN® and SkyRAY light technology for all provinces and to customize the Network Management System for the Chinese market.

While addressing features such as link encryption and BPSK for the governmental and communication-on-the-move market in 2010, the highlight in 2011 will be the expansion of the SkyWAN® product range. The new modem will comply with the familiar standard and as such will be based on our fully meshed architecture and will also include additional features while focussing on the price sensitive midrange enterprise market.

Looking at ND SatCom's product portfolio, the delivery capabilities, complex projects, and worldwide reach, the Company is very optimistic that 2011 will be an excellent year for us, our partners, and customers. Finally, I wish to express my special thanks to all employees at ND SatCom, worldwide, for their hard work and superb team spirit.

Johann Pohany was appointed as the Managing Director, President and CEO of ND SatCom in July of 2010. Previously, he served as Chief Technology Officer (CTO) and Chief Operations Officer (COO). Mr. Pohany joined ND SatCom in January 2008, and oversees in his role ND SatCom's product lifecycle, groupwide project delivery, quality assurance, IT and world wide sales and marketing.



Between the rocky economy and the fast-changing landscape of the global communications industry, creativity and innovation have become more important than ever before for businesses operating in the satellite communications sector.

For NewCom International, a global communications company specializing in the transport of video, voice, and data via satellite, the secret to success in today's tumultuous marketplace comes down to a single word: Diversification.

"We have a plan that we started executing in 2009 and will continue to focus on for the next three to four years," says NewCom President and COO Jaime Dickinson, who was named the World Teleport Association's 2010 Teleport Executive of the Year. "It all centers on diversification: Diversification of our footprint coverage, diversification of our products, and diversification of our technologies. We are focusing on services that cover a mass volume of users and we are ensuring that we work with a broad range of clients. When we first started NewCom, we grew the company by servicing a small number of large clients — but that was a big risk. Now we service an even mix of small and large companies, in part a result of the new value-added products we have been offering."

Rather than providing one-off services to the clients it serves, voice, video, and data solutions are bundled together into customized packages that are targeted to vertical markets in developing regions around the globe. At the core of NewCom's business strategy is its commitment to quality service.

"For us, it has always been about servicing our clients in the best way possible and providing excellent quality," says Dickinson. "It's the personal relationships we develop and 24/7 support we provide that keeps our customers with us and ensures we continue to grow and succeed in today's competitive environment."

Looking ahead to 2011, the Company — which specializes in servicing the fast-developing regions of Latin America, the Caribbean and Africa — will continue to focus on three key market opportunities: Rural Markets, Cellular Backhaul and Natural Resources. NewCom will also continue to market its popular VideoMeetings™ service and is introducing an exciting new product offering into the mix: IPTV Services.

Recognizing that 21st century communications is the key to education and economic growth in rural, developing regions, NewCom International has made it a priority to bring world-class communications to remote villages and towns throughout Latin America and Africa.

By teaming with private contractors and government officials in Colombia, the Company has been instrumental in bringing high-speed Internet access to more than 1,000 rural schools, hospitals, government offices and businesses scattered throughout the country.

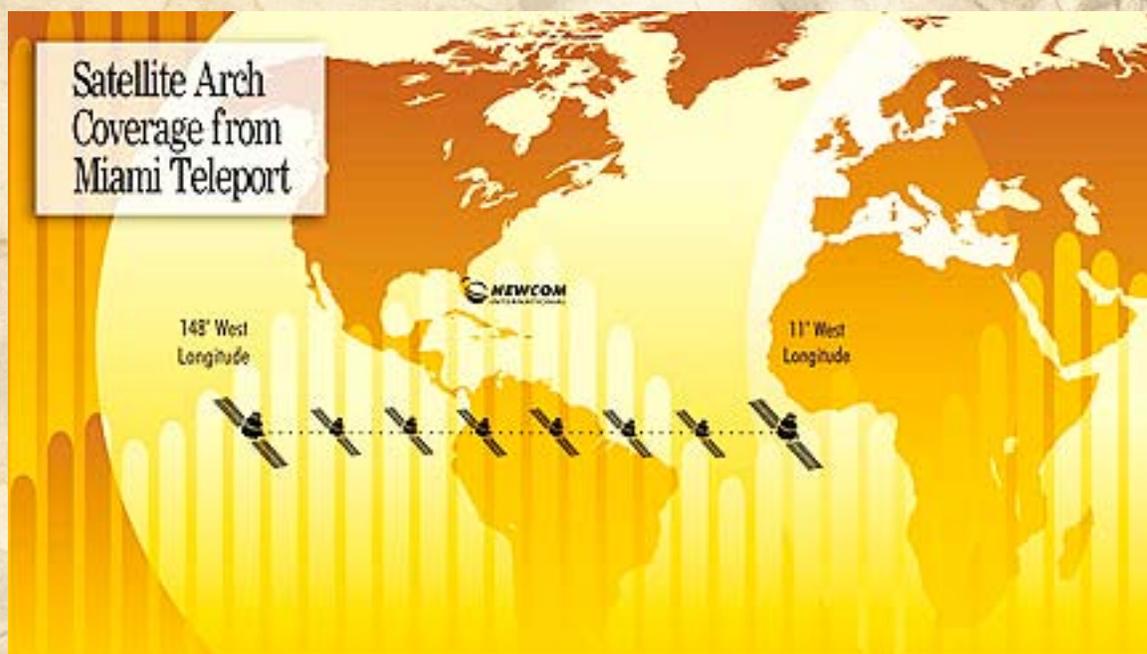
The government-funded communications initiative has given these rural communities an open window to the world. Families once cut off from loved ones living far away now have the ability to instantly communicate with them. Teachers and students at schools located high in the Andes now have a world of educational material at their fingertips. Farmers can now connect online to learn more about their trade and earn more by producing new crops in the fields. Doctors at remote medical facilities now have access to telemedicine consultation with medical experts from top hospitals throughout the United States. It's a model that NewCom is working to emulate in countries throughout Africa with a packaged approach that combines quality voice, video, and data communications delivered via satellite.

NewCom has teamed with top IPTV content providers to offer a variety of news, entertainment, sports and pay-per-view channels to content hungry providers in the Caribbean, Latin America and Africa. NewCom, which houses several top IPTV content providers at its teleport hub in Miami, is able to transport the IPTV services to any country in Africa, the Caribbean and Latin America through a concentrated satellite link. The content is then delivered to individual subscribers through a local fiber or wireless network, and can be accessed via a small Internet port about the size of an old mobile phone handset.

“There is such a huge demand throughout these regions for content,” notes Dora Mejia, director of business development for NewCom International. “In some areas, they can currently access only three channels. So to be able to offer IPTV Services is very exciting for us.”

The fast-growth of cellular providers in developing regions throughout Africa has given NewCom a huge opportunity to partner with these operators to provide cellular backhaul services to the remote corners of the country.

By integrating its satellite services with Comtech's new CDM 625 modem, NewCom offers GSM operators the flexible, cost-effective interface they need to connect with the various telecom players in the market and reach the most remote corners the regions they serve.



YEAR IN REVIEW — 2010

“The bottom line is that GSM operators need to grow their footprint throughout an entire region, not just in cities, and that requires satellite communications,” says Dickinson. “All in all, I view cellular providers as strategic partners for us because they are doing the local market work to develop the customer base. As they do, there is a growing demand for more capacity — which is where satellite comes in.”

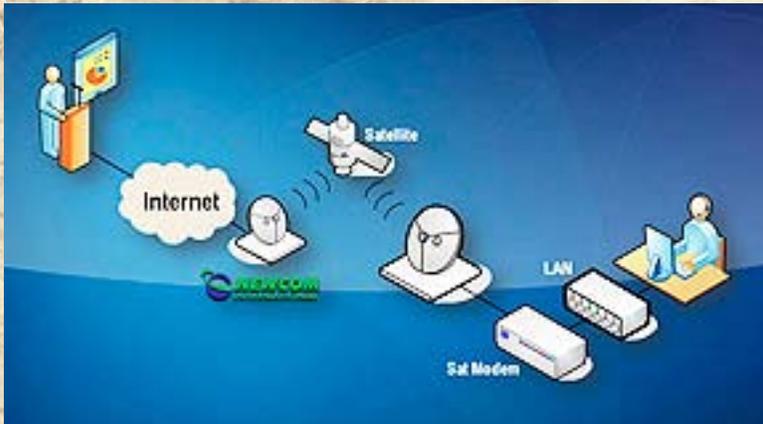
The discovery of vast oil, gas and mining resources in African countries such as Nigeria and Congo has brought a huge influx of international companies into the region, which in turn is driving a huge demand for top quality communications. NewCom recently unveiled its Office Without Borders™ communications solution that enables businesses to enjoy all the global communications benefits and security of a first-class business office from remote jungles and exploration sites throughout Africa.

NewCom’s Office Without Borders™ communications package is a turnkey solution that includes voice, Internet, email, fax or data services delivered via satellite. Because the multinationals working for these companies are hungry for video content, NewCom is also exploring partnerships to deliver its IPTV service offerings to this market sector.

The Company recently partnered with the Smithsonian and a team of engineers from Virginia Tech and Iowa State University to broadcast a live video cast of a historic Inca Engineering expedition from the remote, treacherous Andean mountains of Peru to a large auditorium screen at the Smithsonian’s National Museum of the American Indian in Washington D.C. The company has also

facilitated various telemedicine projects, including one recently launched at a hospital in Haiti that enables medical staff to consult face-to-face with top medical experts around the globe. In addition, the Company has teamed with several university campuses to launch interactive virtual classes, and makes it possible for businesses to hold interactive sales meetings with associates around the globe without ever leaving home. In 2011, NewCom will continue to explore ways to advance medicine, research, education and business development around the world by incorporating its VideoMeetings™ technology.

Jaime Dickinson is the President + CEO of NewCom International. He was recently honored as the World Teleport Association’s 2010 Teleport Executive of the Year and he oversees all operations and drives the company’s strategic partnership efforts — working to expand NewCom’s presence around the globe.



NewCom International’s VideoMeetings illustration

The space and terrestrial communications media paid a great deal of attention this year to the global economy, Space Situational Awareness (SSA), major Radio Frequency (RF) Interference events, the growing demand for Satellite Communications (SATCOM), and more. Rightly so, these are important issues.

However, as often is the case, the technology challenges network managers face often went unnoticed — especially when things go smoothly. At Newpoint Technologies, a wholly-owned subsidiary of Integral Systems, we worked with satellite operators and service providers around the world to ensure their networks ran at peak performance.

Customer focus was on streamlining operations and increasing the overall Quality of Service (QoS) for clients and in building the revenue potential of the networks. In order to accomplish this, many centralized management of their ground station assets, whether in a single facility or across multiple facilities, into a single Newpoint Technologies' COMPASS Network Management System (NMS).

This was not limited to centralizing management of the RF equipment components, but encompassed all the station assets: Heating and Ventilation Systems (HVAC), security, uninterruptible power supplies (UPS), generators, fueling systems, and more. With COMPASS, operators had complete situational awareness of the true condition of the remote site or network from a single console.

Network operators and service providers also began to look at network management as an enablement solution, as opposed to a passive "monitoring and control" tool. The concept of Service Management was introduced into COMPASS this year, giving operators the ability to immediately identify critical equipment failures and correlate the alarms to the services or traffic that was affected by the failures.

By doing so, operators can prioritize recovery of services based upon established Service Level Agreements (SLA) and recover higher priority services first, maximizing customer satisfaction and network revenues. COMPASS Service Manager also allows operators to automate the set up and tear down of services on the network by allowing them to dynamically store service profiles, which ensures quick and easy network restoration when there is a failure on the network.

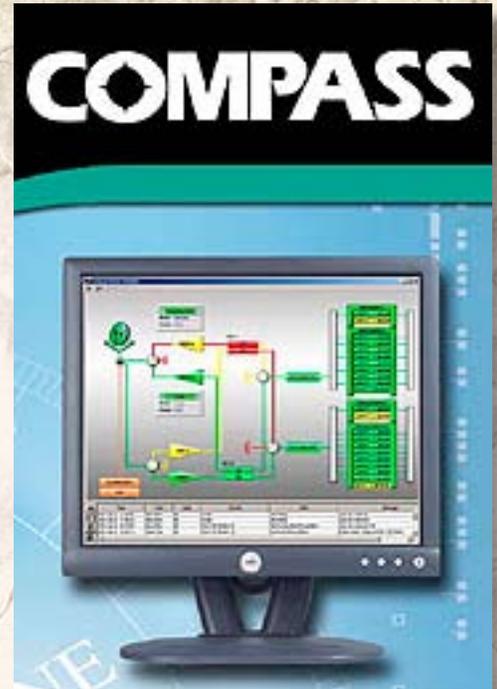
Having a centralized service network management solution with complete situational awareness of the entire network, operators now have the foundation for automating and exchanging information with other software applications and

systems used by the network operator. Previously, it was cost prohibitive and complex to integrate a number of disparate systems to these other applications, but now there is only one system that these applications must look to for network status.

The network management system can feed important decision making information, such as when a service comes on-line and goes off-line, if a failure occurred while it was running and how long it took to recover the service and more.

Along these lines, Newpoint also introduced two other new modules for the COMPASS NMS in 2010 designed to automate and simplify management of the network. COMPASS Inventory Management System (IMS) and the COMPASS Trouble Ticketing System (TTS) are natural progressions of the network management system.

COMPASS IMS tracks all the equipment, managed or unmanaged, that comprise the network, or stocked as spares. It maintains the typical inventory items such as make, manufacture, model numbers, serial numbers, contact information, location, usage, status,



Newpoint Mercury Site and Remote Managers, respectively

YEAR IN REVIEW — 2010

etc. The system can warn operators when routine maintenance on equipment is required, and allows operators to quickly identify replacement components for failed equipment.

COMPASS TTS allows operators to open trouble tickets either manually or based upon an alarm in COMPASS NMS. They can then assign the trouble tickets to an operator or technician who is emailed the new ticket. From the network management graphical user interface (GUI), operators can see that a ticket is opened and a technician assigned. They can then track the problem from origination to solution, and build a knowledge base for others to refer to in the future when trying to resolve network issues.

Looking forward to 2011, Newpoint expects the fundamental transformation of viewing network management systems as an enablement solution, with a direct tie to bottom line revenue to be fully entrenched throughout the industry. As network demands continue to increase, service management and automated network management will no longer be a nice-to-have-feature, but an imperative part of comprehensive solution.

A solid network management foundation is the only way that satellite operators and service providers can meet increased performance, QoS and SLA enforcement requirements of their customers.

Wally Martland is the President of Newpoint Technologies.



For everyone in the satellite industry, these are interesting times. New technologies appear on the horizon as well as enhanced developments upgrade existing technologies, all mean the landscape is changing rapidly — the implications for operators and their customers have to be weighed most carefully.

Few areas of industry have been unaffected by the financial fall-out from the current financial crisis. While some infrastructure projects have been put on hold around the world, others are going ahead with renewed impetus, as business opportunities open up, usually as a result of new technologies coming on stream. Many of these new technologies are making it possible to do business in new ways, and to reach markets that were previously inaccessible.

Service providers also have to deliver ever-greater value in the competition for revenue, which acts as a spur to innovation. As a technology provider for 25 years, Newtec has an undivided commitment to developing ways for customers to grow their businesses profitably. The Company is constantly excited by the inventive ways customers supply services to meet demand. Newtec's commitment to its customers and technology was recently recognized at the highest industry level, with a rating as one of the top three companies in Belgium in Ernst & Young's annual Entrepreneur of the Year® 2010 award.

In the past year, a number of tremendous success stories from customers around the world have been realized, who have been able to make new technologies Newtec developed work well for their businesses. One interesting application story is an alternative energy program in Italy where more than 5,000 wind, solar, and hydro-electric plants are connected by satellite in a monitoring and forecasting network using the award winning Sat3Play® technology. The ability to create this kind of network cost-effectively for Supervisory Control and Data Acquisition (SCADA) applications will become more and more vital as conventional energy sources begin to run out.

Also exciting to see is Newtec's Elevation FlexACM® technology with an important success in the military and governmental market. The reliability of Newtec equipment, together with its efficiency, allows for significant optimization of satellite transmission and ensures 100 percent link availability.

Elevation FlexACM also plays a crucial role in the work of the Antarctic climate research program collecting and disseminating data on weather, atmosphere, oceans, land and near-space environments. It's no less important to make connections between people, too, and the great work being completed in Africa, the Middle East, Latin America and Asia Pacific by customers reveals just how much it means for isolated communities to be suddenly plugged into the global village.

The revolution about to be ushered in by Ka-band multi-spotbeam satellites is more significant than many operators realize. The new satellite launches and the capacity they bring will transform industry, and many companies — teleports and satellite service providers — are not yet fully aware of how this will impact their business.

There will be a huge impact as capacity will explode, substantially lowering the cost of transmission. However, the technical limitations of the new satellites will mean access will only be available through a limited number of gateways.

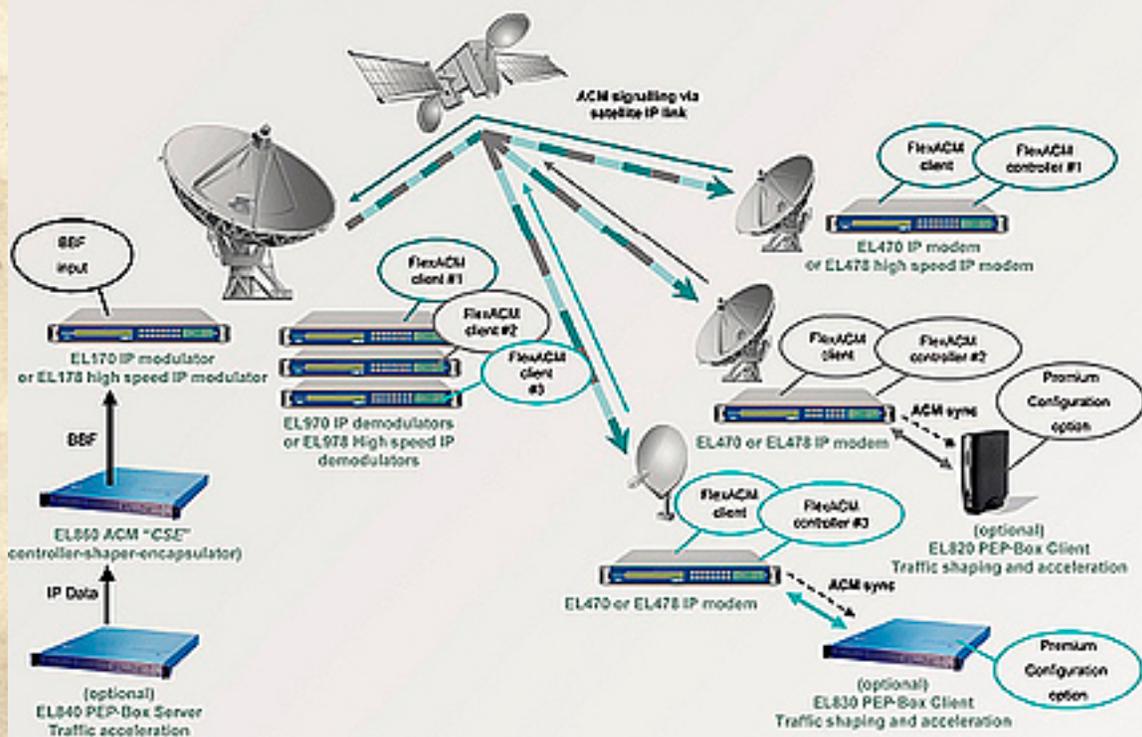
With Ka -band multi-spotbeam satellites, uplink from any point in the footprint for transmission to all terminals will no longer be possible. Such will have a major impact on many existing players, as the Ka-band satellite fleet starts to come into the equation over the next three to five years. While Ka-band satellites launches are planned with consumer broadband as the primary initial market, we're convinced that, in many regions, Ka-band will also come to be used for other applications, such as DTH, IP trunking or TV contribution and distribution to cable headends, as such an abundance of capacity and the likely lower costs will open up new approaches to these businesses.

FlexACM — Newtec's solution for IP trunking over satellite — is a key component for successful operation with Ka-band satellites when they become available. FlexACM was launched in 2009 and won the World Teleport Association (WTA) award for most innovative technology that same year. Since then, further development has occurred, enabling

customers to more than double capacity and to deliver 100-percent link availability. Case studies from Newtec customers using, for instance, Intelsat satellite capacity, show an enormous profitable impact, with the increase in business delivering a return on investment in less than six months.

Further upgrades to Newtec's consumer broadband product, Sat3Play, finds new support for Ka-band operation. Sat3Play has enjoyed great success in Europe,

FlexACM, Point-to-Multipoint, Two way



YEAR IN REVIEW — 2010

with the ASTRA2Connect service now number one in consumer subscriptions, 90,000 terminals shipped, and more than 70,000 consumers on ASTRA2Connect. Sat3Play is a consumer-friendly solution and one of its key features — the easy self-install set up with the point and play functionality — is fully compatible with Ka-band.

This year has also seen major developments as the introduction of HDTV in our Multimedia Exchange Network Over Satellite (MENOS) solution, first launched in 2008 with Arab Satellite Communications Organization (Arabsat) and the Arab States Broadcasting Union (ASBU). MENOS is now also being rolled out all over Saudi Arabia, and by early 2011, all TV and radio broadcasting operated by the Ministry of Culture and Information (MOCI) throughout the country will be transmitted using the MENOS technology.

Innovation never stops at Newtec — the big product launch this year has been DualFlow™. Specifically aimed at the contribution, DSNG, and distribution markets, DualFlow allows operators to select when they wish to make the switch to IP through support for ASI and IP in the same unit — operators can, therefore, continue to service clients using ASI and cater to clients who have already converted to IP operation.

DualFlow allows broadcasters to simultaneously transport live broadcasting and data over the satellite link in the same carrier and enables two-way connectivity over satellite, introducing new interactive services to boost productivity. For SNG operations, this delivers truly significant benefits, as mobile SNG units become remote offices that are able to access two-way interactive IP services over satellite to conduct real time interviews, and use services such as VoIP, file sharing, and translation for events as used during the World Cup or Tour de France.

Looking into the near future, more new technology will soon be with us in the form of O3b. Combining the advantages of global satellite reach with low latency, the O3b service will add some complexity through the need for two antennas to track the satellites, but it's definitely an interesting evolution. The launch of eight satellites at eight-kilometre altitude over the equator will substantially reduce latency, but new

antennas will be needed to track the satellite as it rotates and catch the next one as it comes over the horizon. Newtec is currently working on solutions for this exciting new generation and are committed to extending the potential for customers so they can explore all benefits of the new technologies.

Above all, the Company remains committed through 2011 and beyond as a technology provider — and solely a technology provider. The strategic decision was to continue helping customers with our technologies and to not move into delivering services that compete with our customers and their business. On the contrary, next year a unique partner program will be launched, one that will permit joint growth and success based on a unique business offering in the SATCOM equipment marketplace. Once registered in the program, which is based on three building blocks — products, support and knowledge — partners will have access to such elements as attractive discounts and incentives, sales and technical training, business portals, multifaceted demo equipment, configuration tools. The advent of this new program paired with Company advancement into new markets during 2010 opens the door for exciting new possibilities that will help more customers benefit from our technology, while also helping Newtec sustain expected growth.

With our passionate commitment to R&D, Newtec continues its role as a leading pioneer, shaping the future of the satellite business.

Serge Van Herck is the CEO of Newtec and he holds an electrical engineering degree from the University of Ghent and a MBA degree from the Vlerick Leuven Gent Management School in Belgium. Serge has more than 15 years of experience in the satellite telecommunications industry.



The evolution of O3b continued at a rapid pace in 2010 as the world's first Medium Earth Orbit satellite operator made significant strides as an organization while remaining on target for the commercial launch of its constellation. Now a dynamic, highly professional, global player, the Company looks forward to an even more successful year in 2011.

O3b will transform communications by deploying an innovative Medium Earth Orbit satellite constellation, which offers customers the highest combination of bandwidth, speed, low latency, coverage and availability — with a commitment to quality that customers can rely on and at a price accessible to everyone. O3b will reach customers in more than 150 countries across Asia, Africa, Latin America and the Middle East. O3b's groundbreaking concept is endorsed by investments from SES, Google Inc., Liberty Global Inc., HSBC Principal Investments, Northbridge Venture Partners and Allen & Company.

The year started with a focus on expanding and improving the executive management team of the Company, in preparation for the transition from a start-up to a world class, global organization that is capable of meeting its targets and obligations to customers, investors, and the telecommunications industry as a whole. In February, the Company announced the appointment of Mark Rigolle as the new Chief Executive Officer to succeed Greg Clarke, who was stepping down for personal health reasons. Mr. Rigolle is the former Chief Financial Officer of SES, the largest investor in O3b and following his appointment were the appointments of Jonas Mattsson and Christian Patouraux as Chief Financial Officer and Chief Product Development Officer, respectively.

Under Mr. Rigolle's leadership, the Company focused on strengthening its partnerships and announced an agreement with Viasat for the production of its full-motion tracking antenna systems and high-speed IP

trunking terminals at the end of the first quarter. The agreement with Viasat was another indicator that O3b will remain focused on leveraging the expertise of industry leaders to ensure its network delivers on all quality of service promises. According to O3b CEO Mark Rigolle, "Viasat's leadership in Ka-band satellite technology and antenna tracking provides additional confidence that we can meet our plans. This infrastructure equipment is a critical piece of our advanced satellite network, which will bring high-speed access to those who have so far been poorly served, or completely cut off, from the Internet."

The Company also enjoyed impressive commercial success in 2010 announcing multi-year, multi-million dollar deals with Telecom Cook Islands, Pak Datacom Limited, and Netcom Africa.

"We continue to build strong relationships with our customers and prospects around the world, in Central and Latin America, Africa, Central Asia, the Middle East, South East Asia and the Pacific. This is an achievement we are all proud of and is another important step forward, towards a bright, promising future for the organization" said John Finney, Executive Vice President of Sales and Marketing.

In the third quarter of the year, O3b announced the selection of Europe Media Port (EMP) — the world's fastest growing teleport in 2009 according to the World Teleport Association — to be the first provider of Gateway Teleport services for O3b's global



Artistic rendition of an O3b satellite

YEAR IN REVIEW — 2010

network. According to Executive Vice President and Chief Technical Officer, Brian Holz, “We are delighted about the agreement with EMP. With over 15 years of operational expertise at the Nemea facilities, the EMP team is an instrumental partner on our way to establish a seamless data service network for our clients. EMP’s services will further assist us in rolling out our new ground-breaking solution to provide fast Internet connectivity to billions of citizens businesses and organizations in previously poorly connected regions around the world.”

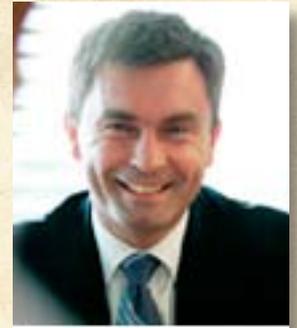
There was great progress made with other vendors, with Viasat completing the Preliminary Design Review for all systems on schedule as well as pattern design measurements for the gateway terminals. The O3b Space Systems team and Thales Alenia Space continued to meet milestones on the equipment design reviews as well. Additionally, MDA — the satellite antenna supplier — fabricated and completed RF characterization testing of two engineering prototype antennas in addition to the design and qualification testing of the engineering unit for the antenna control electronics. Spectrolab the satellite solar cell supplier also completed radiation testing while Arianespace completed the initial accommodation studies for the configuration, validating adequate clearances between the fairing, the first coupled load cycles integrating the satellite, preliminary dispenser design and launch vehicle models to validate mechanical design, expected loads and qualification margins experienced during launch.

O3b continued to receive support from SES, beyond its financial investment in the Company. One of the areas where SES WORLD SKIES is providing support to O3b is in leading the NOC integration project while Viasat continues development on the NOC monitoring and Control equipment.

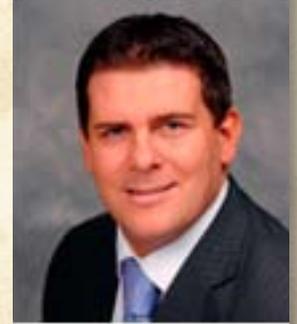
CEO Mark Rigolle said of 2010, “This has been big year for us, as an organization. We are pleased with all we’ve achieved in all areas of the business. 2011 will be another promising year for O3b. The Company will build on the progress of 2010 by focusing on securing landing rights in our coverage areas, developing more intimate relationships with our customers while ensuring our technical contractors remain on target. Look out for O3b Networks in 2011!”

For more information, please visit
www.o3bnetworks.com

Mark Rigolle is the Chief Executive Officer of O3b Networks. Prior to this appointment, Mr. Rigolle was Chief Financial Officer of SES. He joined SES in August 2004 from Belgacom, the Brussels-based telecommunications company, where he held various positions including those of Chief Strategy and Business Development Officer and of Chief Financial Officer.



John Finney is O3b Networks’ Chief Commercial Office and leads O3b’s global sales and marketing efforts. Prior to joining the Company, John served as Regional Managing Director for Ciena Corp., where he was responsible for Northern Europe, Russia, and the Middle East.



Brian Holtz is the Company’s Chief Technical Officer and leads the design and development of O3b’s constellation space segment, the launch of satellites and the development of satellite control centers.



Year 2010 saw remarkable growth in Pactel’s market share and profits. While maintaining our position as the leading telecommunications provider in the Pacific Islands, we have gained a significant portion of market share and enhanced our positions of managed communications services for the Government, Mining, Oil & Gas industries.



service, allowing end users to remotely access required information and monitor their sites on a continuous basis.

In the year ahead, plans are in place to supply a continuous high quality of service to our existing customers by establishing more worldwide presence as well vertically expanding into new resource sector markets. Overall, Pactel International is looking forward to another year of exciting growth.

Andrew Taylor is the CEO of Pactel International, who has more than 20 years of experience in the telecommunications industry.



In July, Pactel International successfully completed installation of the new DVB-S2 ACM system satellite hub in Hawaii. This upgrade enabled Pactel International to extend our Internet, Voice and GSM solutions into the Pacific Islands, Australia and Indonesia on a C-band system, as well as supply a continued quality of service to our customers by extending their existing services further on a more reliable, cost-effective platform. Since its official acquisition, we were able to implement the DVB-S2 ACM system by establishing a new satellite link between our US hub and the territory of Cocos Islands and providing an Internet radiocast service to the Cook Island's leading radio station, Matariki FM.

Earlier this year, we successfully used our Australian-based assets and implemented a large satellite IP trunk, linking the two French overseas territories of Wallis and Futuna to the International IP backbone via Australia. The installation onsite was performed by Pactel International's satellite communications specialists, who have enabled the adaptation of the FCR Earth stations to the new technology. The switchover was accomplished with a minimum downtime, allowing for increased capacity and better load balancing between the two territories.

2010 has been a year of investment that has enhanced Pactel's worldwide presence. With sales offices opening in Perth and Jakarta, the Company is now able to accommodate the increasing demand for mobile and fixed remote communications solutions in those regions. As the key service differentiator, Pactel continues to offer 24/7 remote network monitoring

2010 was an eventful year for Paradise Datacom, or should I say "Teledyne Paradise Datacom". As the name change implies, Paradise Datacom and its parent company – Inteltek PLC was purchased by Teledyne Technologies in July of this year. What does this mean for Paradise and its global customer base? With more than 80 business units worldwide and sales of \$1.8 billion, Teledyne has raised the bar for Paradise Datacom when it comes to commercial viability and global notoriety. The Teledyne logo is well respected in the US Defense industry in particular, an already significant and growing market focus for Paradise Datacom.

John Restivo, President of Paradise Datacom, sums it up well, "When two organizations with excellent reputations in the industry such as Teledyne and Paradise join forces, customers can expect great things as a result. Paradise Datacom is now

YEAR IN REVIEW — 2010



a member of a technologically driven family of companies and we expect this type of advantage to place us on a steeper growth curve. We've just begun to explore the host of potential synergies we can exploit as we continue to push the technology envelope and increase our overall value proposition to our customers worldwide."

2010 has seen major accomplishments on the technology and product feature front. Over the course of the past several years, Paradise has witnessed a major shift in the ratio of commercial to government/military business. A large portion of the Company's R&D budget has been allocated to the development of products that are targeted for military communications applications — specifically X- and Ka-band. Tangible results from these efforts have come to fruition with our recently introduced line of Ka-band SSPAs and Block Up-Converters (BUCs) as well as the expansion of the X-band RF products into the new Gallium Nitride-based technology, which allows us to achieve greater power levels as well as increased efficiencies and the ability to operate in higher heat environments.

2010 marked the year of our first deployments of PowerMAX, Paradise Datacom's soft-fail redundant SSPA system designed specifically to address applications needing significant levels of output power. Other SSPA milestone achievements were the release of the Compact Jr. SSPA that is based upon the legacy Compact Outdoor line of amplifiers but only half the size and weight and our line of microBUCs for incorporation into lightweight flyaway terminals.

The flagship satellite modem, QUANTUM, received a host of refinements and upgrades during 2010. Already one of the industry's most powerful IP platforms, TPD modems have received a technology update in the form of a higher-power IP processing engine making this product a great choice for 3G as well as any application for which IP is the transmission protocol. As is true for the entire TPD modem family, internal features negate the need for operators to purchase external boxes such as:

- » **RF Spectrum Monitor** – with peak hold, interfering carrier detection and use while carrying traffic
- » **Bit Error Rate Tester** – interfaces directly with Fireberd, operates via overhead channel and use while carrying traffic
- » **Constellation Monitor** – provides indication of link health, particularly beneficial when using high-order modulation schemes
- » **IP Performance Monitor** – displays packet throughput activity, successful transfer, dropped packets and so on

FastLink, TPD's version of low-latency LDPC was incorporated and released this year. FastLink allows users to optimize for latency or BER performance, depending on their unique link requirements. When used in conjunction with other link enhancing features such as Paired Carrier, satellite transponder usage can be maximized resulting in reduced operating expenditures or increased utilization. Thanks to the Company's teaming agreement with ViaSat, TPD has incorporated their patented Paired Carrier Multiple Access (PCMA) technology into the line of satellite modems, offering customers the possibility to achieve up to 50 percent savings on transponder costs by allowing transmit and receive carriers to be superimposed upon one another. The recent release of a GPS interface makes Paired Carrier applicable for maritime applications as well.

As 2010 comes to a close, the Teledyne Paradise Datacom team is hard at work preparing a host of new products for launch in early 2011. Stay tuned for new releases in the RF and modem product families in the coming weeks that will certainly generate a positive stir in the market.

John Restivo is the President of Paradise Datacom and was appointed to that position in April 2004.



capabilities as is our extensive satellite network. A number of key connections have been built with some of the largest fiber providers around the world, from BT in Europe to Verizon in the United States and PCCW in Asia, providing RRsat with local network presence everywhere. The value of these relationships could not be better illustrated than the live 3D event which we broadcast with BT this past summer between London and Tel Aviv entirely over fiber in 3D.

2010 has been a great year for RRsat Global Communications Network. We can proudly say that we distribute more than 550 TV and radio channels worldwide and payout more than 130 TV channels. Increased international demand for HD broadcast, the introduction of 3D television and the ever-increasing globalization of sports programming are all areas of the industry in which we have seen noticeable growth and feel the potential for the future. These are also all areas that more and more frequently are overlapping with each other in terms of end user demand and the technology needed to make those broadcast expectations a reality.

2010 has also been a year of important alliances for RRsat. In June, BT's Media & Broadcast division and RRsat entered into a ten year strategic alliance enabling our customers to benefit from high quality broadcast services over a deeper global reach – as well as being a catalyst to facilitate both companies growth in their global media businesses. The alliance will combine RRsat's world-class capabilities in content management and global distribution services to the television and radio broadcasting industries over satellite, fiber and IP with BT's Global Media Network and existing satellite portfolio. In October, RRsat and Chellomedia's Digital Media Centre (ChelloDMC), one of Europe's leading providers of digital media facilities, announced a new partnership focused on offering complete global payout and content delivery solutions. DMC and RRsat have combined capabilities and hooked up their networks, through a dedicated fiber connection, to offer a cost effective, global payout and delivery service with a range of global distribution solutions.

RRsat has always viewed global broadcasting from a hybrid perspective. The use of fiber is just as key in our broadcast

RRsat has also focused on building our internal fiber capabilities; this is particularly of note as we expand within the US market. This year marked not only the opening of our 111 8th Ave. POP in New York, but the transformation of our teleport in Hawley Pennsylvania into a full-blown IP head end.

We also worked alongside Eutelsat to broadcast the ten-day sporting event, EuroSport, live in 3D. As 3D technologies in the home expand the demand for sports broadcast in 3D will also increase, holding events such as these with BT and Eutelsat have proven we are capable of providing for these growing expectations. Through our own networks and business relationships RRsat is now able to deliver 3D sporting events (and other 3D broadcasts) any where in the world, whether it be by fiber, satellite, or a combination of both.

In April, RRsat launched iConcertsHD with our DVBS2 platform on the MEASAT 3A satellite. In October, BT and RRsat launched Sky News HD on the same platform. BT and RRsat are providing an end-to-end managed fiber and satellite service using fiber from BT, satellite uplink and teleport services from RRsat and leased capacity on the MEASAT-3A satellite. A fiber network from the BT Global Media Network carries Sky News HD from the Sky News Centre in Osterley, England, to RRsat's Global Network and teleport facility, where it is uplinked onto the MEASAT 3A satellite and distributed to customers throughout the Middle East and Asia. Additional HD channels were



YEAR IN REVIEW — 2010

launched by RRsat this year including Fashion TV over Latin America and the first HD channel of Indian Bollywood Movies, launched in Israel.

Other sports events of note include the broadcasting of live HD content in MPEG-4 format for the international broadcast of the 2010 NFL season, the US Open, and the PGA Championship together with our long-term partner, SM2 Sports Media Solutions. In addition, RRsat began the distribution of FOX Sports via the Eurobird-9 satellite in MPEG-4 format providing the FOX Sports Television Group with increased, yet cost-effective, coverage within Europe, the Middle East and North Africa. As demand for live international sporting events grows, MPEG-4 capabilities, particularly those in HD, will be crucial in meeting viewer and client expectations. As a result of sports and news events broadcasting growth, RRsat has now reached 60,000 hours of occasional use programming.

As we have worked on expanding into the North American, South American, and Asian markets we have brought on high level talent to help us meet those goals. Eric Larsen was named the senior director of sales in North America. David Aber was named the Chief Financial Officer. Meidad Katz was hired as the new VP of Engineering and Professional Services and Ziv Mor was promoted to VP of Business Development in addition to his Chief Technology Officer responsibilities. Additionally, Shlomi Izkovitz, Deputy VP for Sales and Marketing, was named as a recipient of The Society of Satellite Professionals International's 2010 Promise Award.

The coming year is promising to be an even greater one for RRsat. We are on the verge of additional alliances that will make our fiber and satellite reach even greater, specifically within the U.S. We are in the process of building off our accomplishments with 3D and HD broadcast this past year to allow for a larger international access to programming in these formats. Live sports broadcasting in both 3D and HD will be a continued focus of our growth as the demand for it is insatiable. 2010 has been focused on laying the seeds to expansion with 3D, HD, Fiber, Satellite, MPEG-4, DVBS2, (international growth in North America, South America, and Asia, and internal growth in POPs, teleports, and our brain trust, 2011 is set to be the year we take all of these new and

extended capabilities and continue to grow them to stay on the edge of broadcasting expectations and demand.

Lior Rival is the Deputy CEO and Vice President of Sales and Marketing for RRsat



In 2010, SatLink continued its leading role as an important global teleport gateway delivering content to every corner of the globe. The Company's strategic geographically located facilities in the Middle East have significant reach throughout Europe, Asia and Africa to enable flexible transmission solutions offerings over multiple Satellite Platforms, Fiber and IP, in a worldwide network covering five continents.

SatLink once again achieved ranking among the World's Top Twenty Independent teleports, and among the top 10 Fastest Growing Teleports, according to the World Teleport Association, the industry's professional organization that publishes these lists. This is an honor to be recognized among the world's top players in the teleport market and is a tribute to our team's abilities to maximize infrastructure, products and relationships to deliver superior service to our customers and partners for long-term results.

During 2010, SatLink ably increased sales by providing value added services for channels, broadcasters, networks, IP providers, satellite operators, governments and other content providers to assist them in enlarging their reach around the globe. Once again, the amazing capabilities of the creative team of professionals enabled clients to meet (and often exceed) their business goals and find the right audiences to engage their businesses to new levels. One of the most recent additions made at SatLink was to upgrade the data infrastructure with a new network. The importance of this arm of the



You only had to walk around the show floor at IBC this year to realize that, along with 3D, 2010 was about convergence and three-screen delivery. The broadcast environment is rapidly evolving with new and exciting technology and products being brought to the marketplace, enabling more and more opportunities to reach consumers via different platforms.

business, in conjunction with the Company's satellite and broadcasting services, is growing as telecoms and satellite operators roll out new ventures to combine both content and data. With the new iDirect infrastructure, SatLink will have an excellent answer to any VNO or hub hosting needs and requirements.

Consumers are expecting improved quality and choice on each of these platforms. They want to be able to sit at home and enjoy the latest programs on the TV, but they equally want to connect to the Internet via their laptop, on the move and catch up with the latest action from a sporting event, or spend their lunch-break watching a drama, for example.

HD was, once again, a star for SatLink. With a full set of 12 simultaneous HD streams, including encoding, decoding and multiplexing, the Company has become a major gateway for sports, news, and special occasional events. Broadcasting UEFA and Champions' League soccer to Asia continued as well as a long-term agreement with Eurovision was signed to provide HD and SD turnaround services for contribution feeds to and from Asia. And SatLink led the world with the first live HD broadcast of underwater filming from the Red Sea. The addition of HD has been an excellent move for the firm and has added a layer of technologically advanced services.

Until relatively recently the third screen — mobile, was a less attractive alternative for consumers. The technology has existed to deliver good quality mobile TV for some time, but the handsets have only recently become powerful and reliable enough to turn those feeds into a quality, enjoyable, mobile TV experience. The recent advances in handset technology with the iPhone and other smartphone devices, as well as tablet devices such as the iPad is revolutionizing the mobile TV experience and consequently driving consumer demand for more and more compelling content delivered to the mobile environment.

This year has been exciting for SatLink and all are positive that the global scope of the infrastructure, partnerships and ability to provide comprehensive satellite and fiber — and now data capabilities to networks, broadcasters, telecoms, IP providers and governments from around the globe — will successfully drive our business forward and into the future.

Indeed, over the past year, SatStream has very much witnessed a rise in the demand for three-screen delivery, and we have had numerous requests to encode feeds ready for delivery to the Internet, mobile devices, and even connected devices. We have always remained technology, format, and platform agnostic, meaning we can provide signal acquisition and transcode into any format, such as Flash, Windows Media, Silverlight, Real, and QuickTime, and have those feeds compatible with any delivery platform.

David Hochner is the CEO of SatLink Communications



YEAR IN REVIEW — 2010



One such project putting that to the test this year was for CERN, the European organization for nuclear research. SatStream was involved with the live webcast of its latest Large Hadron Collider experiment. SatStream acquired the satellite downlink and transcoded the footage for delivery both to the Internet and to mobile handsets. We also produced a video postcard of the event using Adaptive Streaming technology, meaning that the viewers would get a seamless experience, without buffering, whatever their viewing conditions and available bandwidth.

Another trend we have witnessed this year is the way in which niche broadcasters are coming on board with Internet TV and the benefits it offers for reaching a wider audience. Using our latest product, ChannelStream, we have been streaming a number of live channels and have found that this kind of service is especially poignant for region or culture-specific channels targeting expatriates residing across the World.

As we move into 2011, the trend for multi-screen delivery will continue. Mobile smartphones such as the iPhone and tablets, such as the iPad will very much drive a rise in mobile TV, and the proliferation of Internet-enabled devices will again offer broadcasters, content providers and operators more vehicles to deliver compelling content to the consumer.

**Alan Mercer is the
Operations Director at
SatStream**



From contribution to distribution, satellite technology has and will continue to play a vital role in delivering video from the camera to the home. Recognizing the power of advanced technologies to maintain a competitive edge, content providers and broadcasters are leveraging DVB-S2 and MPEG-4/H.264 to build cost-effective new systems from the ground up, as well as improving existing networks by enhancing service quality and enabling the addition of SD and HD services.

At SENCORE, 2010 has been a time to prepare for technology advances and changes in the industry, to extend the Company's global reach and reputation in the video delivery sector, to invest in core product and service offerings, and to rededicate ourselves to meeting the needs of our broadcast, cable, and satellite customers.

This year, for example, witnessed the introduction of ProCare customer support and professional service options, which help customers plan, install, operate, maintain, and troubleshoot their video delivery business, based on the industry's best practices and on the customers' individual requirements. Also launched was a new website featuring user friendly and readily accessible customer support tools. The engineering focus of the entire sales team has been refocused to provide best-in-class solutions. Finally, the SENCORE brand has been rebuilt to raise awareness of core competencies in HD video delivery and high-quality signal transmission.

Our customers' needs inevitably respond to larger economic and financial trends — product offerings have been realigned with this in mind. For example, given the approximately \$200+ million cost of launching a satellite, it's no surprise that organizations want to do more with the bandwidth already available. Consequently, cost-effective and bandwidth-conserving technology is in increased demand — provided the technology also supports delivery of a consistent, high-quality viewer experience.



SENCORE recognizes that the customers' overarching goal is to attract more viewers or subscribers, which translates into more revenue, in part by taking better advantage of the revenue sources new delivery platforms promise. This goal, in turn, requires broadcasters and content providers

to deliver uninterrupted high quality video, lest annoyance causes viewers to go elsewhere. Ways to deliver media to a variety of devices is required through the deployment of new formats and methods. To accomplish this, technology and technical support are sought that will help keep capital and operating costs in line.

Today's video delivery systems are a complex mix of technologies that must allow customers to support a variety of signals, interfaces, standards, and formats. The future will see the introduction of additional, next-generation delivery platforms as well as increasingly complex networks that are accompanied by further bandwidth constraints and a higher probability of signal issues.

With all of this in mind, SENCORE has made a major commitment to R&D that has yielded significant accomplishments on the product roadmap, including state-of-the-art multi-format devices that are dense, efficient, and interoperable. Experienced R&D teams have developed, refined, and perfected the Company's revolutionary dual-channel SMD 989 DVB-S2 modulation platform, the high-density TXS 3453 "any to any" multi-channel transcoding platform, and several new receiver-decoders and IP monitoring solutions.

As you may already be aware, the Company played a vital role in providing highly reliable and interoperable compression products and engineering services that were crucial to the digital and HD transition in the U.S. The close of this transition leaves us ideally positioned for the future with a mature solution set for video delivery and HD video signal processing in both global contribution and distribution applications.

In 2011, SENCORE looks forward to bringing these solutions and capabilities to the rest of the world with a focus on expanding international efforts. Because of the complexity of the video delivery system, it takes years of real-world testing to deliver a useful piece of gear with the off-the-shelf reliability found in our devices. With our unique heritage in digital video and experience with real-world build-outs of HD services, SENCORE is able to provide proven, exceptionally reliable products, a fact that's attested to by our reputation.

With our multiple operational products for satellite video delivery, we are familiar with the handshake points among products and are able to make those that work seamlessly within the signal-flow, even when that includes legacy devices. For example, the IRD 3000 Series of receiver decoders are 3D ready and also versatile enough to operate over a wide variety of parameters, including DVB-S and low symbol rate applications.

At the same time, these devices can demodulate any DVB-S2 modulation scheme including 16-APSK and 32 APSK and can support multi-stream ISI applications. Quite simply, SENCORE's proven product line — including these cost-effective integrated receiver decoders — allows customers to provide the highest quality of video delivery available today — customers say, "SENCORE products just work!"

Throughout this year, and most recently at IBC 2010, the team heard renewed optimism across all segments of the professional video delivery industry. Content providers are finding new revenue streams, adding new media services to existing networks, and delivering more HD content, while at the same time controlling operating expenses by increasing bandwidth efficiency and deploying new content delivery models.

YEAR IN REVIEW — 2010

All of this makes SENCORE optimistic about the company's prospects as well as those of our customers and this exciting industry.

We're committed to being your engineering partner of choice and invite all to call us to learn more about SENCORE products to help your business.

John Suranyi is the CEO of SENCORE, Inc. John came to SENCORE from DIRECTV, Inc., where he served as president of sales and service. Previously, Mr. Suranyi was CEO of Cheetah Advanced Technologies, Inc., a Colorado ERP software developer.



With new satellite communication products and applications for commercial and military markets, InterSKY 4G for the commercial market and InterSKY 4M for the military market, the Company offers solutions to a full spectrum of satellite networking systems, for which it has been known throughout its history. Its world-class team of engineers has introduced innovations such as the first integrated L-band 256Ksps satellite communications modem in 1998, the introduction of InterSKY, the first Digital Video Broadcasting/Frequency Division Multiple Access ("DVB/FDMA"), broadband satellite communications system in 1999, and the first shared alternative to Single Channel Per Carrier ("SCPC").

In 2006, as DVB-S2 standards were accepted, Shiron once again was a leading innovator, adding DVB-S2 capabilities to its suite of InterSKY satellite communications systems and thereby further enhancing the capabilities and operating efficiencies of its customers. More recently, Shiron invented and incorporated advanced bi-directional Adaptive Coding and Modulation ("ACM") technology with integrated Automatic Uplink Power Control ("AUPC"), which delivers over 30 percent throughput gain improvement over competing ACM solutions utilized on DVB-S2 products. By adapting its techniques to application requirements, Shiron has been able to package InterSKY as a multi service solution, fitting many types of service providers' (Telcos, ISPs) backhaul applications including 3G, WiMAX, GSM and WLL systems.

The Shiron SATCOM Business Line, part of Elbit Systems Land and C4I-Tadiran, is a leading satellite communications technology powerhouse, dedicated to the design and production of network systems for cost efficient delivery of Broadband IP over satellite. Focusing on the delivery of Broadband IP over Satellite with emphasis on satellite space segment efficiency, scalability, and software configurable multi standard, best suited to serve the needs of satellite operators, governments, military, Telco's, ISP's, public and private companies.

To date, Shiron has deployed hundreds of broadband Hubs and tens of thousands of remote terminals, worldwide.

The InterSKY Family of Hubs



An example of a large scale successful project for the application of GSM backhaul over satellite is the use of InterSKY™ VSAT technology delivered to one of the largest cellular operators in Brazil, as part of the USO (Universal Service Obligation) contract. The Shiron InterSKY™ platform was successfully integrated with a leading Remote Base Station (RBS) vendor. The combined solution provided high level and reliable TWOWAY Satellite Broadband connectivity to maximize network efficiency and enabled cellular coverage in remote locations.

This GSM backhaul project, spanning more than 58 sites, presents a mixture of challenges for Shiron. These challenges ranged from strict requirements for efficiency and technical capabilities, maintaining the highest service quality and availability (as required in GSM backhaul projects), and ending with complex turn-key deployment demands, requiring Shiron to design, deploy and operate the project in under six weeks. As part of the project, the Company delivered a complete solution, supporting several key functionalities, including Multi-Vendor & Multi-TRX, BTS support (mixed vendor cellular infrastructure), flexible scalability which allows the same modem to support variable size BTSs and Integrated QoS mechanism to provide high availability and service delivery.

Dr. Shaul Laufer, CTO of Shiron SatCom Business Line, foresees in the following years, “a significant commoditization of the VSAT equipment and deployment process, which will enable further growth of the SATCOM broadband market. The VSAT will become a cost effective and simple installation process. Fewer cables effortless installation and easy antenna alignment processing will all help to reduce the installation costs. VSAT systems will become more efficient due to further integration of satellite communication layers with QoS, IP acceleration, compression and optimization, so that at all layers will be adapted to SATCOM specific conditions, thus enabling higher throughputs per Hz and optimized application support, thereby reducing the OPEX.

“We will also see further usage of Ka-band transponders that will increase the available bandwidth and reduce its cost. This will be achieved by maturation of the technologies required for extensive usage of Ka-band transponders, namely availability of low cost antennas, BUCs and LNBS for Ka-band. The availability of Ka-bandwidth and low cost fixed and mobile components will also enable the growth of the COTM (Communication On The Move) market which is a bandwidth hungry application due to the usage of small antennas.

“The growth of broadband mobile services, airborne, maritime, and terrestrial, will be enabled also by low cost, electrically steering antennas. In relation to COTM we will also witness improvements due to implementations of the new ETSI standard which defines mobile mode based on continuous carrier with spread spectrum rather than TDMA /MF-TDMA which is not efficient for broadband mobile COTM. The above commoditization process will thus yield better VSAT multi-service technology and improved SATCOM support tailored for varied application environments, new improved COTM support, all in parallel to lower VSAT deployment costs.”

Dr. Shaul Laufer is CTO and co-founder of Shiron Satellite Communications. Prior to establishing the company in 1996, Dr. Laufer founded in 1992 Shiron Advanced Communications, which led to the establishment of Shiron Satellite Communications. Dr. Laufer served as CEO of Shiron Advanced Communication during 1992-1996 and as CEO of Shiron Satellite Communications during 1996-1998.



YEAR IN REVIEW — 2010

For the Space Foundation, 2010 was a defining year. The nation's foremost space advocacy organization expanded its global reach, increased its already significant impact on science, technology, engineering and mathematics (STEM) education and teacher professional development, provided valuable research and education for policy makers and industry leaders, rolled out programs for young space professionals and held the largest, most comprehensive National Space Symposium in 26 years.

Long a proponent of international space cooperation and collaboration, the Space Foundation continued to expand its international reach in 2010. A visible participant in conferences and events in Beijing, Berlin, London, Paris, Prague, Shanghai and Vienna, the Space Foundation also provided support and counsel on global issues to the White House and to international space organizations:

- » *The Space Foundation continued to serve in an advisory role with the United Nations' Committee on the Peaceful Uses of Outer Space*
- » *Its Washington Office worked closely with embassies, the U.S. arms of international space agencies and visiting delegations*
- » *More than 150 people from 20 countries participated in the 26th National Space Symposium*

- » *The Space Foundation served as local host for an International Space University's Executive Master of Business Administration class in Colorado Springs last spring*
- » *Many 2010 successes focused on the Space Foundation's nationally recognized standards-based education programs for teachers, students, parents and communities.*

Developments at the Space Foundation Discovery Institute, which opened last year in Colorado Springs, included:

- » *The opening of the AGI Space Missions Simulator at the Space Foundation Discovery Institute, made possible through a \$3 million donation of software and equipment from Analytical Graphics, Inc. (AGI)*
- » *Grants from Honeywell, Boeing, Colorado Technical University and Kroger to serve teachers and students*
- » *Numerous community-related programs, including a Festival of Science featuring local organizations and talks by a former NASA astronaut*

The Space Foundation's education programs continued to expand in both scope and geography in 2010. Highlights included:

- » *Successful education partnerships with the Charles County (Md.) Public Schools; Colorado Springs School District 11; the Lyons Township Consortium of seven suburban Chicago school districts; Upward Bound; and Colorado State University – Pueblo*
- » *Rollout of a Space Across the Curriculum educator professional development course for teachers of Pre K-2nd grade students*
- » *Addition of 31 teachers to the Space Foundation's Teacher Liaison program, growing the group for space education advocates to 321 members; Lockheed Martin sponsored the program in 2010*

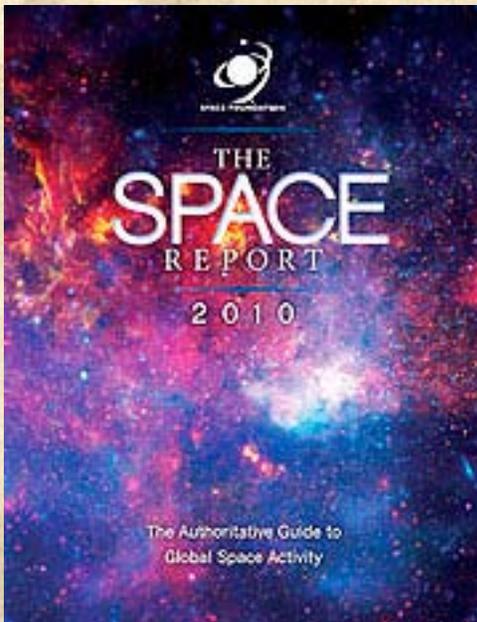


- » **Participation in major STEM education events including the inaugural USA Science & Engineering Festival in Washington, D.C., STEMapalooza in Denver, the Charles County Educational Exchange in Maryland and the Cool Science Festival in Colorado Springs**
- » **Special targeted education programs in conjunction with the Maui Economic Development Board in Hawaii, the Space Exploration Educators Conference in Houston and at the Space Foundation's annual National Space Symposium**
- » **Expansion of the number of universities that provide continuing education and/or graduate credits to teachers for Space Across the Curriculum courses; the list now includes Aurora (Ill.) University, CSU - Pueblo, Regis University and the College of Education at the University of Colorado at Colorado Springs**

Throughout 2010, the Space Foundation continued to serve as an expert on the industry for legislators, educators, industry and the media.

The flagship information source, The Space Report 2010: The Authoritative Guide to Global Space Activity, was published in March and has since been quoted extensively in the media, on the Hill, in classrooms and in presentations at major conferences. Print, CD and PDF format copies may be purchased at www.TheSpaceReport.org.

During the year, the Space Foundation published and presented White Papers on how space assets enable disease and pandemic early warning and space's role in faster, safer and greener commercial aviation. It also hosted a number of media and industry briefings with space thought-leaders and participated in the successful bid to change onerous space export regulations.



As the Administration and Congress worked through contentious and complex proposals on U.S. national space policy, the Space Foundation clarified the options through presentations, briefings and online publications, including a comparison of the new 2010 policy and the 2006 policy and a comparison of space-related legislation. Then, as the mid-term elections approached, the Space Foundation issued a guide to keep track of potential changes in space-related committee and subcommittee assignments.

The Space Foundation continues to expand its New Generation Initiatives, which provide professional development and education forums, programs, resources and opportunities for space professionals age 35 and under.

The New Generation Space Leaders Program at the 26th National Space Symposium involved more than 100 young-adult space professionals, who networked with the “who’s who” in the space world and attended Symposium presentations and programs about trends, technologies and career development.

In 2010, New Generation Initiatives were expanded to include events at the Advanced Maui Optical and Space Surveillance Technologies (AMOS) conference, the International Astronautical Conference (IAC) in Prague and events in Washington, D.C.

The 26th National Space Symposium, held in April in Colorado Springs, broke all attendance records - and, according to feedback from attendees, was a success on all levels:

- » **More than 9,000 people – the largest number ever – participated in the exhibition**
- » **The agenda included representation for all space sectors and included industry, civil and military leaders, New Generation participants and the largest-ever contingent of international speakers**
- » **The new Cyber 1.0 event, which explored the impact cyberspace on military operations, civilian life, national security, commerce and communications, featured presentations by senior Air Force Space Command and industry leaders, interactive displays, a policy-focused luncheon and networking opportunities.**

YEAR IN REVIEW — 2010

- » *The SES WORLD SKIES, USG Exhibit Center filled two massive halls*
- » *Cyber 1.1, the New Generation Space Leaders program events and the SES WORLD SKIES, USG Exhibit Center all sold out before the Symposium began*

Registration is already open for the 27th National Space Symposium, April 11-14, 2011, at The Broadmoor Hotel in Colorado Springs.

Steady, continuous growth helped the Space Foundation reach a milestone in 2010, when the number of corporate members surpassed 100 for the first time ever. The number of Certified Space Technologies continued to grow and the Space Foundation appeared on the agenda at a number of major space conferences, including the International Symposium for Personal and Commercial Spaceflight, the George Washington University Space Policy Conference, the AIAA SPACE 2010 Conference & Exposition and the AMOS conference, as well as numerous local and regional meetings.

As the foremost advocate for space, the Space Foundation performs many functions and serves many customers, all in the pursuit of its mission to advance space-related endeavors to inspire, enable and propel humanity. Great progress was made toward that goal in 2010 and the Space Foundation expects even greater accomplishment in 2011.

Janet Stevens, APRV, is the Vice President - Marketing and Communications of Space Foundation. She is responsible for the Space Foundation's marketing and public relations programs, including public relations and marketing strategy, media relations, brand identity, advertising and promotion, graphic design, web communications, social media, community relations, and public outreach.



Spacecom moves forward on many different fronts during 2010, the most important being the move towards the long term goal of evolving into an emerging global satellite operator. This is the focus for the future, and 2011 and 2012 are filled with promise.

In 2010 we established our presence in Africa, with the positioning of the AMOS-5i satellite at 17 degrees East. This early entry into the market was decided upon to enhance pre-sales for the AMOS-5 satellite that is scheduled to launch in mid-2011. Indeed, this decision has helped cement into place significant pre-sales for the AMOS-5.

Also expanded was Spacecom's DTH anchors on the AMOS platforms at 4 degrees West with a fourth DTH service. This means the high fill rate on our capacity is maintained. Plus, staffing at Spacecom was increased to push forward the AMOS-4 and AMOS-6 satellites projects that are, respectively, in construction and development stages.

Revenue-wise, the economic storms circling the globe have been weathered and revenues continue to increase. In 2009, revenue reached \$70 million, a 35 percent increase over 2008, with this new level of sales maintained through 2010. Another revenue acceleration is expected following the planned Amos-5 launch in mid-2011.

2011 will be a busy year for Spacecom. The launch of the AMOS-5 satellite is expected in mid-year to the orbital slot at 17 degrees East with operations to start soon thereafter. Right now, the Company is pressing forward in pre-selling capacity and looking forward to penetration in the African market. Spacecom is continuing development of the AMOS-4, scheduled for launch in 2013 for a slot above Asia, and further into the future with the AMOS-6 and AMOS-7 satellites. Spacecom is moving closer to becoming far more than a regional player — with these new satellites, such efforts will produce a Spacecom that is a global satellite operator with expanded coverages and capacities.

On an industry-wide note, the communications and entertainment sectors remain prime growth drivers. Putting them together, or seeing their interconnectivity, whether through content or data, is taking the Company into new directions. With HD and 3D technologies becoming more and more prevalent, satellites will assist these technologies to mature and move satellite content distribution into new markets. Additional business from those applications will likely be sooner than expected, and Spacecom AMOS satellites will be on-hand to further such developments.

David Pollack is the President and CEO of Spacecom. Prior to joining the industry, Pollack served in the Israel Air Force where he held field and staff assignments as a commanding officer.



In 2010, although there have been mixed reports on the results of the economic recovery efforts, one thing that's remained stable has been Spacenet's focus on expanding capabilities and providing highly reliable networking solutions across both our core and expanding markets. This busy year included new customer deployments at thousands of sites across the U.S., product roll-outs and technology enhancements, merger and acquisition activities as well as a major grant award for broadband to home Internet access. Although it will take time for the economic situation to completely recover, Spacenet is taking initiative across all facets of our business including the enterprise, government and residential/small office markets.

In the government sector, Spacenet increased its efforts to meet the demands of federal and civilian agencies and state and local government clients with the launch of new products and services. Coverage of our satellite services was expanded to numerous agencies to support high-speed satellite based links for critical data and voice communications. Spacenet's recently formed subsidiary company, Spacenet Integrated Government Solutions (SIGS), has been making progress to meet the mission-critical requirements of the Department of Defense, Homeland Security, the Intelligence Community and other government agencies. A core executive team has been installed, and in 2010, Raysat Antenna Systems, a leading provider of Satcom On The Move (SOTM) antenna solutions, was integrated into the company. Comms-on-the-move capabilities are increasing in demand and Spacenet is providing more advanced satellite options for military and civilian government organizations. In addition, a new emergency communications service was introduced for first responders and public safety.

Raysat Antenna Systems (RAS), US Division, is now operating under Spacenet Integrated Government Solutions (SIGS) Management. RAS was acquired by Gilat Satellite Network Ltd. (NASDAQ: GILT), Spacenet's parent company, in 2010, and its US

YEAR IN REVIEW — 2010

operations have been integrated into SIGS. RAS provides low profile and light-weight antennas and complete system solutions to the rapidly growing SOTM market. Low profile antennas are critical in meeting the stringent requirements of the U.S. DoD and other government and military markets around the globe. The RAS family offers high speed, highly mobile communications for the military, emergency response organizations, and other markets that have a need for fast, flexible, on the move communications.

In October of 2010, Spacenet entered into a definitive agreement to acquire all of the outstanding stock of Wavestream Corporation. Wavestream's family of Ka-, Ku-, X- and C-band Solid State Power Amplifiers (SSPA) and Block Upconverters (BUC) provide systems integrators with field-proven solutions

designed for mobile and fixed satellite communication (SATCOM) systems worldwide. The company's products have been selected as key components in a number of DoD programs. The acquisition, which is expected to close by the end of the year, will further expand the product portfolio of Gilat/Spacenet, better positioning us to compete in the satcom market.

Spacenet also debuted a new Emergency Communications Service (ECS) via Satellite with 'Pay-as-you-use' service plan options. ECS is designed to provide a more cost-effective and flexible satellite solution with dedicated satellite bandwidth for readily available and reliable emergency communications. It is ideal for public safety and first responder agencies such as police, fire departments, and medical emergency teams as well as federal agencies such as FEMA and the Department of Homeland Security who require network continuity for disaster planning, but also face the reality of budget limitations.

SIGS and EchoStar Satellite Services L.L.C. worked together to deliver two-way satellite communications involving space and ground equipment to the

American Red Cross to aid in relief efforts following the devastating earthquake. The satellite services supported four relief sites with wireless Internet access, which allowed the 250 International Red Cross teams in Haiti to communicate their medical and personnel needs and requisition supplies. Spacenet and Echostar were presented a plaque and recognized for their contributions by the American Red Cross at their headquarters in Washington D.C.

In 2010, Spacenet continued adapting to a rapidly changing competitive landscape, and responded to the evolving needs of core enterprise customers with new innovative products, including Prysm Pro, and comprehensive managed network services. Managed network services were deployed at thousands of new enterprise locations in North America and abroad.

SkyEdge II's advanced technology enables Spacenet to offer an even broader range of service options for clients with high multi-megabit per second bandwidth requirements. The SkyEdge II platform is optimized for IP applications, VoIP networks and two way video; offers faster speeds than previous generations; provides higher availability (99.9 percent or better); and supports high-speed mesh services.

During 2010, Spacenet's CEO, Andreas Georghiou, accepted a Circle of Excellence award from Washington SmartCEO in recognition of the Company's product innovation. This followed the successful launch of the Spacenet Prysm Pro, a modular, scalable, off-the-shelf IP network appliance that provides support for managed network services.



Prysm Pro helps multi-site organizations meet custom application requirements, streamline corporate-wide network management processes, and provide centralized network security with automatic network failover in the case of a primary network outage. The Prysm Pro network appliance, which enables a fully PCI compliant managed network services solution, is also being provided to more than 7,000

Regis Corporation North American locations. Regis, the beauty industry's global leader in beauty salons, hair restoration centers and cosmetology education, is using Spacenet's managed network services and Prysm Pro network management appliance to provide integrated support and management for its business communication infrastructure. This infrastructure includes DSL, 3G, analog and digital voice, Wi-Fi and VPN networking at its beauty salon stores.

Spacenet announced in August 2010 that it signed a contract with Valero, the largest independent refiner in North America, to serve as a provider for broadband network managed services and offer connectivity to its nationwide branded wholesale locations. Valero will be offering Spacenet's broadband communications services to support their primary retail applications and network backup.

In addition to introducing our lowest price points for the StarBand line of broadband Internet services, Spacenet won an award of \$7.5 Million from the Rural Utilities Service to provide broadband Internet services to rural unserved areas of Hawaii and Alaska. Spacenet was awarded federal grant funding from the Rural Utilities Service (RUS) under the American Recovery and Reinvestment Act. The grant enables it to provide broadband service to rural unserved markets in Alaska and Hawaii through its "StarBand Open Skies" initiative, offering StarBand broadband-over-satellite service to these regions for \$0 down, including equipment and installation, and an entry-level monthly service fee of \$50, using custom versions of the Nova 1000 and 1500 products.



and Hawaii through its

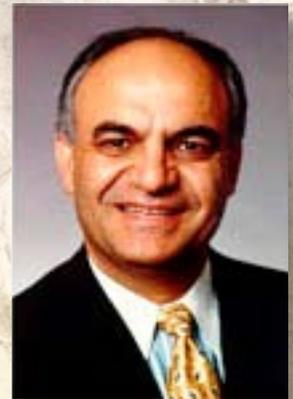
"StarBand Open Skies" initiative, offering StarBand broadband-over-satellite service to these regions for \$0 down, including equipment and installation, and an entry-level monthly service fee of \$50, using custom versions of the Nova 1000 and 1500 products.

Spacenet announced in August 2010 the introduction of a new offer, called StarBundle, for its StarBand satellite Internet services. The new StarBundle program currently offers satellite equipment and installation for \$0 after a \$150 mail-in rebate is applied, and is available with all new StarBand Nova services, including Nova 500, 1000 and 1500 purchases. The \$0 down offer after a \$150 mail-in rebate is applied eliminates the initial upfront

equipment and installation cost, enabling more customers across the country to have access to affordable broadband Internet service via satellite.

The Company is very optimistic about the changes made in 2010 and remains focused on keeping up this momentum in 2011. In the upcoming year, Spacenet plans to continue with the focus on managed services for the enterprise market, including enhancements to our award winning Prysm Pro product. In addition, we will continue to build on the significant milestones made within the government division to serve the needs of federal, state and local, and civilian agencies.

Andreas Georghiou is the CEO of Spacenet and brings more than 25 years of industry and leadership experience in the satellite and telecommunications sectors to the Company. Previous to Spacenet, Mr. Georghiou was the Chief Commercial Officer for SES Americom, and a member of Americom's Management Committee.



After eight to nine years of development, to experience first sales and field trials in 2008 and 2009 of STAR-ISMS™ Lite and the field trials of its main product, then building up an alliance on a technical partnership agreement in 2010, joint displays at airshows — all is a dream come true.

The Company started promoting the STAR-ISMS before it was on the drawing boards after a patent had been applied for — demos and discussions at every airshow, major manufacturers and leading airlines, MRO's, and more. After the first few minutes of, "can you really do that, how is that possible?," the WOW factor strikes home once the product was ready for marketing and for trials in 2007/8.

YEAR IN REVIEW — 2010

Doubts remained for the first few minutes after the product was displayed — thereafter, it was the WOW factor. Today, with actual aircraft flying with the Company's main and lite systems, the doubts have



The STAR server unit

dissipated.

Enough about the past — the future appears most promising. The industry is moving towards the Company's patented product. It is, indeed,

unfortunate that events such as the AF 447 disaster bring market awareness of STAR-ISMS. However, one thing for sure is that the future risks of airline crashes will be reduced once the Company's product is mandated and implemented.

“Saving one life is more important to me than all the money one can make in a lifetime.” says Viraf Kapadia acting Chairman of the Board and Chief Executive Officer. STAR-ISMS improves safety and security, increases efficiency, helps save maintenance cost, brings better maintenance and flight awareness into play, offers improved operational control, improved maintenance and more timely early warning analysis, reduces airliner downtime, presents historical trend analysis, optimizes fuel management, and much, much more. Additionally, implementation would reduce the carbon footprint — for every Kilogram of fuel saved, approximately 3.2 KG of CO₂ is not expended.

The future is bright — the Company expects to experience about 2,000 aircraft systems STAR-ISMS installed in five years. Star Navigation is this market segment for the long haul — the Company has many outside the box thinkers.

As 2010 closes, Stratos looks back with pride on a year marked by important milestones that further enhanced our position as a leading provider of mobile and fixed-site remote communications solutions.

This was the first full year of operation as a wholly-owned operating division of Inmarsat. As an independent subsidiary, the Company continues to demonstrate the commitment to being a multi-technology service provider, helping meet clients' complex networking requirements with solutions from Inmarsat, Iridium, and other leading companies. Stratos' 2010 growth strategy was successfully implemented by establishing new, substantial sales relationships with some of the world's leading maritime, energy, mining, government and defense organizations.

One of this year's most notable developments was the April introduction of Inmarsat's new IsatPhone Pro handheld satellite phone. IsatPhone Pro offers a competitive alternative to the handheld, fixed, and maritime phone solutions now available in the marketplace. The service offers high-quality voice connectivity via small, affordable equipment — which is ideal for remote workers in the oil & gas, mining, government, media and first-responder communities.



Prior to the product's introduction, Stratos already had received more than 2,000 advance orders and we were able to quickly meet customer demand after the June launch. In July, the first-ever IsatPhone Pro activation was accomplished for the Colorado Division of Emergency Management.

Mr. Viraf Kapadia is Star Navigation's acting Chairman of the Board and Chief Executive Officer. He brings over 37 years of executive level experience in Europe, Asia, Middle East and North America in the fields of accounting, aviation, steel and building industry.

In the maritime market, Stratos led all Inmarsat Distribution Partners in FleetBroadband activations, including important deployments by Thailand's Great Circle Shipping Agency and Taiwan's Evergreen Marine Corp. The Company recently reached a milestone of 6,000 FleetBroadband activations, as ship managers were provided with powerful office-at-sea capabilities and innovative crew-communications solutions to support the recruitment and retention of well-trained seafarers.

To further strengthen maritime communications offerings, two important services were introduced. In June, the commercial availability of AmosConnect 8 was announced, the latest generation of the popular AmosConnect solution that integrates vessel and shore-based office applications. (This year, a milestone of 250 million messages sent via AmosConnect was attained.) AmosConnect 8 enhances new broadband IP-based maritime satellite services which include FleetBroadband, Iridium OpenPort and the VSAT solutions OceanVSAT and StratosITek. Integration with these broadband services enables users to control their sessions and ensure optimal airtime use directly from AmosConnect.

That same month, also announced was the commercial availability of AmosConnect Crew CommCenter, the latest version of the all-in-one communication solution for crewmembers. AmosConnect Crew enables personnel at sea to stay in contact with home via calling, email and SMS at affordable, flat global rates — thus helping retain qualified seafarers. By adding features that enable web browsing, chatting with all major Internet communities, and access to global news services, the latest version of AmosConnect Crew becomes the industry's first complete, pre-paid onboard Internet café solution for crewmembers.

The strong penetration of the powerful BGAN service in the land-mobile sector continued to meet expectations, with key deployments in the media and mining markets. This year, BGAN from Stratos reached the milestone

of 15,000 activations, with perhaps the most notable new media-market deployment coming from the BBC.

In March, Stratos provided the UK broadcaster with an Inmarsat BGAN X-Stream mobile broadband satellite service to broadcast live coverage of Helen Skelton's record-breaking Amazon River kayak journey in aid of Sport Relief. The deployment of BGAN X-Stream to cover "Helen's Amazing Amazon Adventure" represented BBC News' first use of live 384 kbps video streaming from a remote location.

The 2010 FIFA World Cup also provided broadcasters with important ways to showcase BGAN's performance and reliability. In June, Cameroon's Equinoxe Télévision successfully deployed BGAN X-Stream to broadcast news and match results of the Cameroon national team from the World Cup in South Africa.

To increase the appeal of BGAN among broadcasters, Stratos also finalized joint-marketing agreements with Streambox and Quicklink to enable close cooperation between these codec developers and Stratos technical-support teams.

BGAN from Stratos continued to demonstrate its effectiveness in the world's most remote regions, with successful deployments by Ray Zahab's "Siberian Express for Water" and "Running Tunisia" expeditions and the Eddie Bauer First Ascent expedition team's historic Mount Everest expedition. The BGAN deployment on Mount Everest made full use of Stratos ChatCard Data, which enabled each BGAN user to expand the use of their prepaid Stratos ChatCard to include Internet access.

In the defense market, communication with the edge of the network became more vital than ever before. By delivering bandwidth-intensive applications to the



YEAR IN REVIEW — 2010

edge of the network, BGAN from Stratos continued helping defense organizations worldwide to improve their effectiveness and safety.

In January, the acquisition of Segovia, a leading provider of secure IP managed solutions and services to the U.S. military and government agencies, was completed. Segovia brings superb technical and customer service capability that has helped reshape the way the U.S. military solves its network-deployment challenges. Segovia operates as a separate subsidiary and is complementary to Stratos' existing government business. By adding Segovia's managed-services capability and secure network to our already strong position in the government market, the strategy of bringing essential mobile satcom solutions to the U.S. DoD, which is the largest customer for these services in the world, has been furthered.

More than ever before, in 2010 customers fully used and appreciated the benefits of the full suite of value-added services that are known as The Stratos Advantage, which make mobile satellite services easy to use and efficient to own. These services, including Stratos Dashboard, provide users with cost control, firewall management, full traffic information, pre-paid facilities, high security options, easy VPN access, messaging services and a full range of IP options. In fact, in April Stratos Dashboard for FleetBroadband was selected as a finalist for Technical Innovation by Seatrade Asia Awards 2010.

Customers in the energy industry continued to derive great benefit from a full range of remote-communications solutions. Forces were joined with a new Channel Partner— Zedi Inc. — to deploy the world's first large-scale, BGAN-based SCADA network. Stratos and Zedi have neared completion of that IP-based SCADA network for a major oilfield-services company.

Stratos also deployed its new StratosMAX II broadband WiMAX service across the Gulf of Mexico region. StratosMAX II provides last-mile radio connectivity accessing Stratos' industry-leading digital microwave network. It provides reliable voice service, high-speed Internet connectivity, Stratos Hot Spot WiFi service and a wide range of mobile communications applications to oil rigs, platforms and offshore vessels.

Looking ahead to 2011, Stratos expects to continue meeting customers' business-critical requirements by selling and supporting the latest remote-communications offerings. The Company is dedicated to helping customers achieve optimal performance and cost efficiency from these services.

As companies demand maximum value from their remote communications purchases, we expect they will continue to view Stratos as a true partner, equipped with the right combination of product selection, value-added services and ongoing support.

Jim Parm is the President and CEO of Stratos. He was appointed President and Chief Executive Officer of Stratos in 2003 where he oversees the strategic direction and global operations of this \$500+M global satellite service company. Prior to his position as CEO, Mr. Parm served for three years as Stratos' Chief Operating Officer.



For a company with a track record in broadcasting as long as that of Thomson, a corporate re-structure — while being a significant event — does not affect the core activities of developing technologies the world's broadcasters rely on. It does, however, provide a more favorable framework for our activities, and it was a notable event on the company's calendar for 2010. The creation of Thomson Video Networks and Thomson Broadcast was announced in September, and sets the seal on a streamlining of Thomson's business around two key areas of activity: the digital headend, and transmission.

For the satellite industry, Thomson Video Networks provides a portfolio of video compression and content processing solutions for the distribution chain and, despite the still-recovering economic climate in 2010, business was surprisingly strong. The contributing

factors for this expansion were the subscriber increase experienced by most broadcasters alongside accelerated High Definition (HD) introduction. Compression was again a hotspot for investment to make room for these new HD services. Better bitrate efficiency is the only part of the video chain that has a direct and quantifiable link to the operational cost of the organization, so it's an area of investment operators are keen to explore.

Some regions showed particular buoyancy, and in Latin America there was a lot of activity as key broadcasters pursued aggressive competitive upgrade programs. With Sky Brazil, Telefonica, and others all competing for market share and governments active in shaping the media landscape, there is considerable impetus and the region is coming out of its economic difficulties of the past few years. Double-digit growth has been seen in the satellite sector over recent years, with operators providing more services. The ViBE range of encoders is a core component of the infrastructure for these broadcasters as they seek to develop the most efficient platforms.

Inevitably, new technology drives growth forward, and the market's seemingly constant desire for something new means there's always new technology in the pipeline. 2010 has been the year when 3D has suddenly become a must-have for major broadcasters, with the first commercial service launch by Sky and a number of trials underway by others, we can expect around 30 3D channels to be launched through 2011 and 2012. Every large broadcaster is likely to develop a 3D channel, but technical standards are yet to be settled: the 'side-by-side' format can be deployed today with a standard HD encoder, and this is attractive to broadcasters with large existing deployments of HD set-top boxes, who want to stay within the bounds of existing infrastructure. Others will want to launch 3D at full-resolution to deliver the highest quality possible. Whatever consensus the market reaches will be influenced by the largest tier one satellite operators.

Large scale roll-out of HD is still a big differentiator for satellite providers, with the numbers of HD channels doubling every year, and 2010 seeing a particularly sharp rise. Most operators outside the United States (U.S.) have already or have plans for doubling the number of services from the current level about 10 channels. The U.S. is ahead of Europe in this but growth is strong and the spread of HD to terrestrial networks is following on from the momentum created by the initial satellite services. As more high-quality HD infrastructure comes online, the amount of HD content rises, and this in turn drives consumer acceptance. Broadcasters are working through the chain to upgrade equipment for the most efficient delivery of high quality pictures. So the application of the latest compression technology in the new generation of encoders is rolling through from the final encoder to include the contribution and distribution stages, and as a result, the improved compression performance is allowing more channels to be launched in available bandwidth.

Progress in compression technology has been remarkable — over the past three years we have halved the bit rate needed for high quality HD channels. Broadcasters are able to run at an average rate of one channel extra per year per transponder as a result, and this is a trend that will continue for the near future. The showcase for the latest compression technology in 2010 was the soccer World Cup, where all-new infrastructure meant that the picture quality for this event was noticeable higher than what is seen in the average HD content.



For satellite contribution, the MPEG-4 4:2:2 standard is starting to come into its own for the backhaul contribution links, and demand for Thomson's VIBE EM3100 is strong as a result. But there is a certain amount of inertia to be overcome in the industry before the majority of the infrastructure is upgraded. Satellite slots are still set up for older compression equipment,

YEAR IN REVIEW — 2010

so when renting space for coverage of ad-hoc events, operators can't necessarily save costs even with the improved bitrates available from new encoders. This is holding back investment in new equipment, and the satellite community is responding by allowing finer granularity in the transponder market to reflect the more efficient compression now available.

While the cost benefit of upgrading equipment such as cameras may be difficult to argue, a 15-percent bitrate reduction through improved compression performance leads to specific savings on the balance sheet. With a transponder typically costing USD 2 to 3 million a year to rent, and with the older generation of technology delivering 10 programs per transponder, that equates to around 200k per program, per year. A 15 to 20-percent reduction on that is a considerable cost savings. With larger operators spending upwards of USD 70 million a year, payback on new more efficient compression technology is very quick.

And it's not just HD where new compression delivers benefits. Booming sales of Thomson's EM2000 MPEG-2/4 SD encoder confirm the trend for broadcasters to create more space for HD services by upgrading to more space-efficient SD transmission infrastructure.

Refocused into its new business unit, Thomson Video Networks is geared to developing appropriate solutions for a rapidly-evolving 21st century media industry, with state-of-the-art offerings in hybrid and multi-format compression systems for all networks, outstanding strategies for migration to "All-IP" based video transport, breakthrough video server technologies, and comprehensive redundancy and monitoring systems. Evolution in the market is a constant, and technology innovations for the not-too-distant future will include solutions for new services, among them the new 3D channels. Expect a consensus on the standard in 2011, and integrated solutions to support the roll-out.

Christophe Delahousse is the President of Thomson Video Networks



The Inmarsat BGAN service continued to go from strength to strength in 2010, spurring the increased demand for high quality terminals, which was reflected in the volume of SAILOR FleetBroadband terminals shipped. By the middle of 2010, the Company had announced the shipment of the 5000th SAILOR terminal. However, by September, more than 12,000 terminals had shipped, which is something to be extremely proud of accomplishing.

The market introduction and take off from the older Inmarsat Fleet to the new BGAN based FleetBroadband is a fantastic story that should continue. The introduction and market penetration has been much faster than expected and overwhelming for all three SAILOR maritime terminals (150, 250, and 500). Another positive development this year was continued antenna development. Source tracking antennas in-house is now possible, which is fantastic news to the Company and maritime market customers.

Thrane & Thrane is hoping to expand this capability into various land and aero product offerings — that, however, rests in the future. The Company also unveiled a brand new SAILOR 900 VSAT Ku-band antenna this year and are looking forward to it entering this market alongside the existing series of maritime Ku-band antenna products, both for TVRO (television, receive-only or satellite TV) and VSAT (2-way data with stabilized maritime antennae); SAILOR 60 Satellite TV and SAILOR 90 Satellite TV, plus SAILOR 700 VSAT running on the unique mini-VSAT Broadband network.

It was an exciting year for aeronautical products too. An entirely new portfolio of SwiftBroadband products were introduced under the brand name AVIATOR, which has quickly been accepted by the industry. This activity highlights the focus and ability of the Company to develop new products fast. Also introduced was the world's first to the land mobile market with the new EXPLORER 325 terminal for on-the-move use. This



isn't the first vehicular-based terminal, but it is the first terminal to focus on price and its introduction has opened the market dramatically.

2010 was, of course, a tough year for most businesses, but there were many positive aspects, as well. Great contracts were signed, including a new deal with Maersk. There is now a greater Company will to invest in business opportunities as compared to last year, especially in the maritime and land sectors where there was some hesitance in the early part of the year. Internally, Thrane & Thrane has continued to focus on effectiveness and productivity, putting into place new processes and strategies to improve development, manufacturing, and delivery. Despite the challenges of delivering of components in due time, delivery capacity and effectiveness has been increased, greatly improving service to customers.

There are positive and promising signs for 2011 that the world economy has begun to improve. This will help businesses across the board. In shipping, there are more newbuild vessels, which expands

the Company's potential market space. However, caution rules as world trade has a direct impact on the number of vessels being built and sailing.

As the clear market leaders in terms of FleetBroadband terminals delivered, Thrane & Thrane still has plenty to offer in terms of new technology and quality developments. The new SAILOR 6000 GMDSS Series ships in January, which includes a brand new Inmarsat mini-C terminal — the Company is looking forward to seeing how this performs in the market. Likewise, the new Ku-band antenna will be an entrance to a larger part of the market and good results are expected within the marine and land arenas, with the aero sector to soon follow suit, especially as the technologically advanced, cost effective, and coherent SwiftBroadband offering is available.

Thrane & Thrane has signed a significant contract with aircraft manufacturer Embraer and will start delivery of AVIATOR products by the end of 2011. Positive expectations towards that collaboration and are confident of building similar partnerships with other manufacturers and operators is infused throughout the Company.

Overall, 2011 will be an exciting, but challenging year, for the SATCOM industry in all of its disparate sectors. Thrane & Thrane is positive about the coming year and we are positioned to react to the market and provide the technology that SATCOMs users need. Should investment continue as it did in the latter part of 2010, 2011 will be another successful year for Thrane & Thrane.

Svend Åge Lundgaard Jensen
is the CFO of Thrane & Thrane



YEAR IN REVIEW — 2010

Thuraya Telecommunications Co., a world leading mobile satellite services (MSS) operator, has made good progress in 2010 towards creating a vertical business client-base. The solutions it is offering and promoting today are increasingly designed for large corporate users, its distribution partners (SPs) are now more of those with strong corporate links and its marketing strategy is primarily driven towards vertical media and events. This is all in line with a revamped business strategy embarked upon and announced in mid 2009.

Under its commercial umbrella, the Company has several specifically targeted market segments: MarineComms, EnergyComms, MediaComms, DefenseComms, AviationComms and ReliefComms, which clearly set out the focus areas for its business operations. Each of these tags is augmented by a complete range of cutting-edge voice and data solutions.

Based on the world's smallest broadband solution, Thuraya launched an IP Starter Package which offers users of high-speed data services an ideal and economic solution. The Thuraya IP Starter Package is a flexible entry level package with a low activation fee as well as low monthly charges and pay-as-you-go billing.

Additionally, Thuraya introduced the SCAN Antenna which has been designed to enhance streaming speeds of Thuraya's IP terminal. Manufactured by a specialist firm, SCAN Antenna, it is the smallest in the market and provides 384 Kbps uplink and downlink streaming speeds reliably. This antenna is ideal for many market segments including the broadcast and defense.

Recent trends in the MSS industry have indicated that Communications on the Move (COTM) will be in demand in the years to come. To further extend usage of Thuraya IP, the Company introduced a new antenna solution allowing efficient usage of data communications in moving vehicles. The Thuraya

COTM antenna is very compact (it is the smallest in the market) and light-weight, which can easily be roof-mounted on any vehicle.

In line with prevalent market trends that indicate a strong demand for aeronautical communication services, Thuraya launched its satellite aeronautical service. Developed by SATSYS, the French-based aeronautical services specialists, Thuraya's aero solutions are the smallest systems in the market that enable voice and data communications onboard all types of aircraft. Branded as AviationComms, Thuraya's aeronautical solutions include a narrowband terminal which is currently available and a broadband internet terminal that is scheduled for launch very shortly. Thuraya's compact narrowband terminal provides voice, fax and data services. The broadband Internet terminal will provide higher data speeds as well as voice and optional GSM onboard aircraft services.

A major advancement to Thuraya's satellite maritime offerings is the partnership with Comtech that has led to the development of a broadband terminal complying with all maritime standards. This new terminal is set for launch next year. The solution will provide high-quality voice services as well as broadband and streaming services. The competitive features of the new solution are its compact size and cost-effectiveness.

At present, Thuraya operates in several countries in the Asia Pacific region including Korea, Malaysia, Hong Kong, Singapore and Australia. To grow its business in the region, Thuraya successfully acquired the license to operate in the Indonesian market through Thuraya's National Service Provider PTSOG which is a specialised radio and satellite communications company.

As Thuraya provides coverage over the Asia Pacific region, Indonesia is fully served in areas which have limited terrestrial networks including the waterways between the country's 13,700 islands.

The Company's offerings in the Indonesian market include data, maritime and voice services that will attract vertical market segments such as emergency services, government, NGOs, maritime and large corporations.

Thuraya has made great inroads in obtaining the license in China and expects to launch commercial operations in this market very soon.

In Australia, Thuraya appointed Indigo Telecom as one of its service providers on the vast continent. Presently Indigo Telecom is providing state-of-the-art satellite data and voice coverage across Australia and out to sea through Thuraya's world class network. Indigo Telecom launched Thuraya IP and the world's toughest satellite phone, the XT in the Australian market during this year.

Recently, Thuraya signed a new service provider agreement with Chunghwa Telecom in Taiwan. Chunghwa Telecom's, Taiwan's largest telecommunication operator will cooperate with Thuraya to provide the mobile satellite operator's services in Taiwan and the neighboring region.

To grow its direct sales network for business travelers in the Middle Eastern region, Thuraya's handhelds are now available at Duty Free Stores in Qatar and Bahrain Airports, as both are busy travel hubs. With this move Thuraya offers unique shoppers in need of mobile satellite services the opportunity to purchase the Company's leading handhelds on the way to their respective destinations. Other significant sectors such as oil and gas, government, large corporations and



media correspondents will also benefit from being able to conveniently buy Thuraya phones from both airport outlets. The Company will continue developing commercial relations with other airport outlets in Europe to attract a wider customer base.

Looking ahead, Thuraya will continue the same strategic direction of developing sustainable high-value vertical business. Maritime, aviation, media and energy communications comprise the majority of revenues today, as well as in the foreseeable future, for satellite telecom operators and providers. Thuraya will aggressively seek to gain a larger market share in these segments, benefiting from its ubiquitous 140-country coverage area, its dynamic satellite network, and a network of technology and distribution partners.

Mr. Ebrahim Khalil Ebrahim is the Vice President of Corporate Communications for Thuraya



YEAR IN REVIEW — 2010

Without a doubt, the past year has seen the external spotlight focused brightly on the Company's new high-capacity satellite technology and the nearing launch of ViaSat-1. And well it should be, as the bandwidth cost and service-quality transformation being created can be the single most significant new development in our industry in the past decade.

Also sharing that spotlight was the Company's acquisition of WildBlue Communications, a pioneer in Ka-band satellite Internet access. As a key piece of the high-capacity satellite puzzle, WildBlue immediately solidified the primary business plan for ViaSat-1 by bringing world-class distribution and network operations for residential broadband, as well as the expertise to help service providers around the world develop similar businesses.



Inside ViaSat, the focus has been on a diverse set of products, technologies, and services. That broad focus is how growth continues, and is the foundation needed to be able to create new ventures on the scale of ViaSat-1. Even prior to the launch, we generated more than \$800 million in new orders during 2010.

In addition to fixed and mobile satellite networking, major lines of business, including defense data links, networking and security, government SATCOM, and antenna systems, performed well in fiscal 2010 and are positioned for future growth. Through this unprecedented era of budget tightening — in both commercial and government markets — sales and new orders have continued to grow to set new company records.

Through continuous innovation, ViaSat offers customers a decisive advantage designing, customizing, and optimizing their networks. They gain the most network value from their dollars invested and position themselves to stay on the leading edge of communication technology when working with ViaSat.

Barrett already offers Xplornet satellite ISP services with Viasat's SurfBeam® system and Ka-band capacity on Telesat Anik F2 and F3. This year Canada's largest rural broadband provider expanded that relationship with an award for broadband gateway infrastructure and terminals to be used with ViaSat-1. Barrett also exercised its option to take the full 15 Gbps of ViaSat-1 capacity over Canada — more than all existing Canadian Ka-band satellite capacity.

O3b Limited, the new global, high-speed, fiber-like satellite service for telecommunication operators and ISPs, will also use Ka-band infrastructure from ViaSat. Gateway teleports and high-speed IP trunking terminals are being supplied to O3b Networks, including full-motion tracking antenna systems for Medium Earth Orbit (MEO) satellites, high-speed modems, monitor and control equipment, system development, and installation. The planned launch of the O3b service is in early 2012.

Against all odds, the Company unseated the incumbent by winning a \$477 million IDIQ contract to supply the next generation of high-speed, high-capacity, low-latency Blue Force Tracking (BFT) equipment to the U.S. Army. By engineering a faster, more efficient, and lower cost system, entry was gained to this new business area, part of the Force XXI Battle Command Brigade and Below (FBCB2) Program.

As an extension of the firm's high-capacity Ka-band strategy, an agreement was entered into with JetBlue to build the best in-flight broadband system for commercial airliners. This "in-flight broadband for the 21st century" is just beginning development and is designed to provide a completely new customer experience for in-flight broadband access and other services for customers on JetBlue's entire fleet.

ViaSat's worldwide mobile network subscription service continued its rapid expansion, including the addition of custom designed managed private services. Maritime and airborne subscribers are being added at a rapid pace coverage and available bandwidth is improved.

Major ongoing projects also kept us busy in 2010:

- » ***Tooway/KA-SAT and Yahsat — Along with ViaSat-1 in North America, an alliance of high throughput Ka-band satellite capacity around the world is being created. In Europe and Northern Africa, KA-SAT will be the first to provide coverage, with a launch scheduled for the end of 2010. In the Middle East, Yahsat will extend Ka-band coverage with the Y1B satellite scheduled for launch in the second half of next year. The SurfBeam system will provide common ground network infrastructure for each of these satellites, enabling availability for global and mobile Ka-band networks.***
- » ***RascomStar-Qaf — Based on ViaSat's custom satellite terminal development, the pan-African satellite operator Rascom will soon be delivering satellite systems for high-capacity infrastructure communications carrying telephony and data between regional and national capitals and for rural telecommunications access across Africa.***

Looking ahead, the transformational high-capacity satellite initiative is a potential driver of growth for almost all of the Company's businesses. Here's a brief explanation of how the satellite industry will evolve with this new technology at hand.

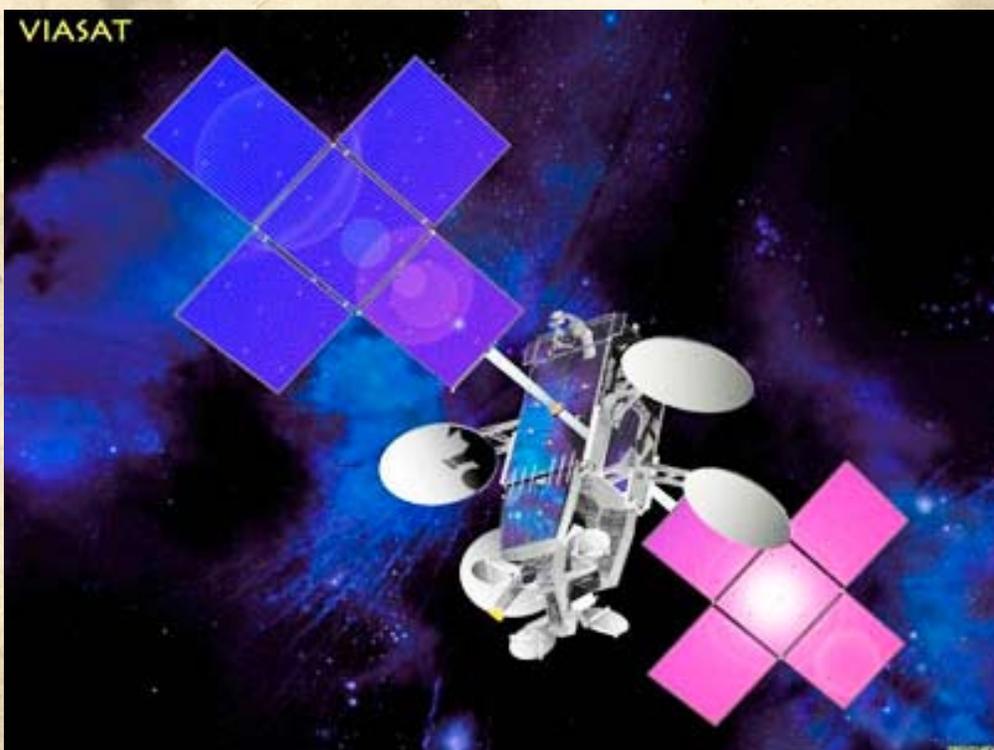
Traditional FSS satellite architecture has shown itself to be the Swiss army knife of satellite communications. At one time or another, FSS has been used for almost every satellite application. As a result of the success of FSS satellites, there has been very little incentive to innovate for about the past three decades.

However, while FSS satellites are relatively good at doing almost everything, they don't do a lot of things really well. They are built for broadcast when today's applications more often require two-way data communications. And, for broadband applications, "how much" data you deliver is just as important as "how fast."

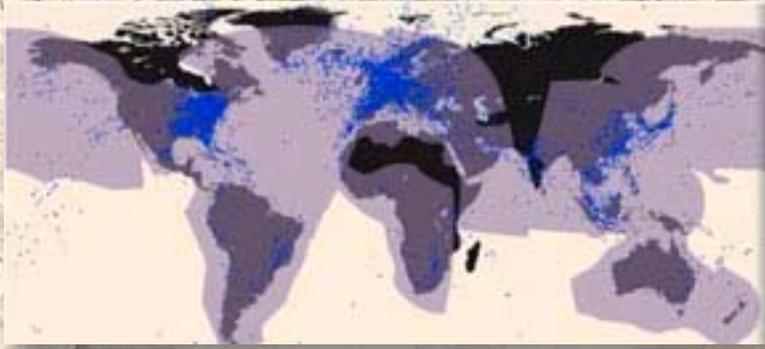
KA-SAT and our own ViaSat-1 are the first two satellites designed with a focus on total bandwidth throughput. Working with ViaSat, KA-SAT should achieve a total capacity of 70 Gbps and ViaSat-1 has shown in testing that its 130 to 140 Gbps throughput target is well within reach. That's 10 times more total capacity than any previous

satellite. The benefits are obvious for residential broadband, but the years ahead will also show those same benefits extending to enterprise, government, and mobile satellite services.

- » ***Enterprise — Satellite has been losing ground to terrestrial networking among enterprise users because of the high cost of Ku-band bandwidth. With high-capacity Ka-band, the economic model can be re-set and the inherent technology advantages of satellite – wide coverage, single service source, quick build-out, and tailored applications renewed. Recent live satellite demonstrations by ViaSat have shown just how good this service can be.***



YEAR IN REVIEW — 2010



YONDER Mobile Broadband Service Coverage

- » **Government** — *The U.S. military and Allied forces acknowledge a significant and growing “bandwidth gap” between supply and demand. Even with new U.S. Department of Defense-owned Wideband Global SATCOM and AEHF launches, the military is unable to keep up with increasing demand for SATCOM capacity. High-capacity Ka-band can make possible the economics, capacity, data speeds, and scale to accommodate the growing number of simultaneous users and widely-dispersed SATCOM terminals that the military needs.*
- » **Mobile** — *Today’s air-to-ground and satellite mobile services are already bumping up against lack of capacity as more users try to share limited bandwidth. For mobile broadband customers around the world, improved transmission speeds, greater volumes of bandwidth per user, and substantially reduced costs per Gbps are being developed.*

The ViaSat-1 satellite will be a catalyst in re-setting the current perception of what satellite communications can do across multiple markets. ViaSat-1 is just the initial breakthrough — it’s going to take a series of broadband satellites, with even more compelling bandwidth economics, to compete with the rapid improvements of terrestrial network technology. ViaSat believes the rewards of the Company’s work can pay great dividends for ViaSat and the entire satellite industry in the years ahead.

Mark D. Dankberg is a co-founder of ViaSat, Inc. and has served as CEO and Chairman of the company since its inception in 1986. Under his leadership, ViaSat has consistently been one of America’s fastest growing technology companies, reaching \$688 million in revenue and 2100 employees.



Jerry Goodwin is the Vice President of Government Systems for ViaSat Inc. He joined ViaSat in 1991 as a senior software engineer and has gone on to serve as program manager, networking and security products systems engineer, and group VP for the Information Assurance and Networking business.



The news in August that Inmarsat was entering the Ka- arena with a US\$1.2bn dollar investment is a very positive development. Although the new I-5 constellation won’t be operational until 2014, the announcement that a major player in MSS was investing and looking to expand into new sectors gave the industry a boost and kicked-off a greater feeling of confidence in the latter half of the year. Vizada will be maintaining a close eye on the development of the new constellation and looks forward to the opportunities that it will bring for the industry and the end-user.

At Vizada Networks, we have had a busy year, having successfully launched two new services and been engaged in an intensive technology upgrade program. Based on a sophisticated iDirect foundation, Internet Start is an IP broadband access service with guaranteed CIR and statistical burst rate that is ideally suited for customers with variable bit rate demands. It’s a turn-key offering specially designed for small and medium businesses in Africa who need a high reliability, true low

cost and predictable service for Internet access.

Internet Pro is an evolution of the Company's Taide Broadband services, which was introduced as a cost-effective and truly scalable Internet trunking solution optimized for large ISPs, GSM operators and medium to large enterprises in Africa, Middle East, Europe and Central Asia. Both services have had successful introductions with feedback from customers proving positive overall.

The technology upgrade program is based on the Vizada Networks proprietary JanUX platform and has yielded several improvements in the system, including significant efficiency gains as well as operational improvements. The first customer installation is scheduled before the end of the year and we will be following the new technology's progress very closely in 2011.

In addition, there has been a strong focus on Global Field Support Program, and have certified a significant number of field engineers this year, in addition to playing a part in Intelsat's I3 program, which is designed to support the industry's efforts in reducing satellite interference. In terms of customers and contracts, we've been employed to provide our services and solutions for a wide range of applications.

Highlights this year include major extensions within our corporate customer base, our continuing work with humanitarian organizations such as Oxfam and the signing of a framework agreement with the Norwegian Defense Logistics Organization, which we announced in May.

We're looking forward to a year of industry growth in 2011. Most of the markets we are operating in are growing. This should continue and accelerate as the impact of financial turmoil is expected to decline. We feel the SATCOM market will continue to be strong. The coexistence with fiber in emerging markets will drive bandwidth requirement in terms of volume but also in terms of reliability, so as the access to bandwidth increases, the deployment of business critical applications will increase, as well. ViaSat is very well positioned to meet this demand.

From the Vizada Networks point of view, we're eager to deploy our technology upgrade program across our existing customers' networks, in order that they may harness the improved services that it enables. Likewise, we expect to see our Internet Start and Internet Pro services grow in regions where they have already been well received and to enter new markets where customers have demand for high quality IP broadband and internet trunking solutions. And of course, although still sometime before operational, 2011 will bring plenty of interest in what Inmarsat is accomplishing in the VSAT market.

Stefano Vittor is the CEO of Vizada Networks. He has more than 20 years of hands-on strategic, business, and consulting experience in IT and telecommunications. He held several management, consulting, and executive posts in different divisions of the Telenor Group. Under his leadership, former Taide (now Vizada Networks) has grown into a successful business known for its high quality services and customer satisfaction.



On the commercial side of the industry, XipLink will remember this past year as the point when the WAN Optimization market moved fully into the satellite space with a vengeance. As the Company migrated the technology platform from a traditional TCP acceleration device to a more advanced WAN Optimization system targeted specifically at satellite link optimization, the overall market for protocol optimization over satellite is in full swing with the top five players showing growth.

YEAR IN REVIEW — 2010

The satellite WAN Optimization market also quickly segmented into three key areas: Traditional satellite TCP acceleration products (Mentat, etc.). Transparent Link Optimization products that include TCP acceleration at the core plus advanced optimizations, such as stream compression, combined with “horizontal” application support such as web optimizations and UDP/VoIP improvements (XipLink, etc.).

Layer 7 Application Optimization systems that include some transport acceleration capability plus sophisticated application spoofing technology for specific protocols unfriendly to higher latency networks like Citrix, CIFS and others (Riverbed, etc.).

Over time, many of the traditional TCP acceleration functions, such as Fast Start and Acknowledgement Frequency Reduction (AFR), have moved into the VSAT terminals as embedded systems with higher capacity requirements residing in external appliances.

During 2010, the market also started to move some of the more advanced Link Optimizations into terminals as added value. Companies such as Lufthansa, ARINC, Datum and others have moved standards-based SCPS acceleration plus streaming compression and some web optimizations into the CPE (terminal) using XipLink’s XE embedded software products.

Looking forward, XipLink expects more link optimizations to be combined into existing hardware systems, thus reducing box count and improving management simplicity for the end customer. During 2010, XipLink had many key events contributing to Company success, including:

- » ***Announcement and delivery of XipLink Hub Optimizations (XHO) that perform one-way, single device outbound web optimizations with no remote device deployments, relying on a standard browser for de-compression***
- » ***Deployment of embedded XipLink (XE) to Lufthansa for inclusion with their Mobile Access Router for certain types of business aircraft supporting VSAT, MSS and Cellular broadband connections***
- » ***Certification of XHO, XipLink X1/X2 streaming compression and SCPS acceleration technologies by Inmarsat for BGAN, FleetBroadband and SwiftBroadband networks***

- » ***First deliveries of XipLink Real Time (XRT) UDP optimizations to drastically improve packet per second throughput performance on VSAT terminals and significant bandwidth reduction for small packet applications, such as VoIP, Skype and Citrix***
- » ***Key strategic wins, validating the XipLink technology, at premier accounts such as Singtel, SpeedCast, SDN (Glaser Foundation), TAI Trading, Boeing, India Air Force and many others, increasing our account base by 40 percent***

On the military and government side of the industry, XipLink, as one of the first commercial developers of SCPS acceleration protocol since 2001, has always participated in the defense acceleration market while also promoting the Space Communications Protocol Specification. During the past year, military applications continued to be one of the top two verticals for our company as well as other WAN Optimization vendors in the marketplace.

Three key trends improved the market for SCPS acceleration in the defense sector during the past year. First, NATO military planners continued to push information and decision making closer to the warfighter. In addition to allowing for more rapid and informed decisions, the impact of this move was to place encryption devices very close to the outside edge of the network. Since the optimization process needs to run on the user side of the encrypted link, technology providers like XipLink are required to place the acceleration logic either on the user PC or provide a lightweight, portable optimizer to augment the PC.



In XipLink’s case, we delivered two solutions for this in 2010. The XipStick™ USB powered portable optimizer was successfully deployed in both MSS

and VSAT applications when high performance throughput is required without CPU or application performance impact on the PC.

Other important deployments USED XipLink's Embedded (XE) optimization system for portable "suitcase" terminals, thus eliminating external acceleration devices while reducing weight and providing the required SCPS acceleration on the move or pause.

The second trend was a dramatic increase in the use of UAV systems for surveillance and reporting. Most of these systems utilize satellite on the backhaul portion of the link once a ground control device has received feeds from the UAV. The use of unmanned aircraft continues to proliferate so the use of SCPS optimization appliances also increased due to this trend.

Lastly, due to heavy UAV demands on space capacity as well as insatiable demand for broadband data networks in theatre, space capacity continues to be a scarce commodity in the Middle East and Africa. The result was an increase in spending on optimization products to efficiently USE capacity.

New applications for XipLink wireless link optimization continued to evolve in 2010 for defense networks with key project wins at the Border Patrol (Canada Defence), ARINC (Airborne Defense), Boeing (Mobile Military), India Air Force (Operating Base Communications), Telespazio, 3Di, Agile Networks and several others

The Company expects defense to continue as a top vertical moving forward. XipLink thanks our employees, customers, partners and other friends for a wonderful year in 2010 and wish all SatMagazine readers great success in 2011!

Jack W. Waters is the CEO of XipLink, Incorporated. He joined the company in 2007 to help the firm spin-off from the former parent company, Xiphos Technologies of Montreal, Quebec (Canada), and to establish the company as a significant player for this evolving growth market.



Warfighters around the globe are demanding more and more satellite bandwidth to support their communication requirements, whenever and wherever their missions take them. Technology has ushered in an era of broadband satellite capabilities that include X- and Ka-band systems supporting command and control, imagery, streaming video and many other data-intensive applications. The U.S. military's Wideband Global Satcom (WGS) satellites have started to fulfill this increasing appetite for bandwidth. These satellites have also fueled warfighters' demand for broadband systems, demand that WGS cannot fully meet.

It's no surprise, therefore, that with all these critical new broadband requirements, governments are turning to commercial satellite resources to augment growing capacity that is coming on line, particularly at X-band. And the commercial X-band operators have stepped up to the plate, designing and launching high-power satellites to meet these specific needs. XTAR, LLC is one of two companies that operate and provide services in the X-band exclusively to fulfill the unique mission requirements of U.S. and Allied governments and military forces around the world.

X-band's high power supports all types of government users but perhaps the two most important and growing are:

- » ***High data rate users transmitting large amounts of capacity to support day-to-day communications to and from the battlefield, and for imagery and intelligence***
- » ***Users of small terminals like manpacks and comms-on-the-move (COTM), where high power spot beams are essential to yielding very high signal strength in a variety of environments, on the ground, at sea or in the air***

YEAR IN REVIEW — 2010

The first group is switching to X-band in large part due to growing congestion at Ku-band, where lack of capacity is driving the introduction of new frequency bands. The second group is using X-band owing to its unique ability to deliver high throughput to very small terminals.

Whether commercially or government operated, X-band works in the 7-8 GHz frequency band. This frequency range is ideally suited for military and other government operations in nearly all locations, including hostile environments. The X-band frequency is lower than Ku-band which means it is less susceptible to rain fade and other atmospheric interference. This technical strength and the smaller wavelength compared to C-band, enable X-band to support the use of smaller terminals, including manpack and COTM systems.

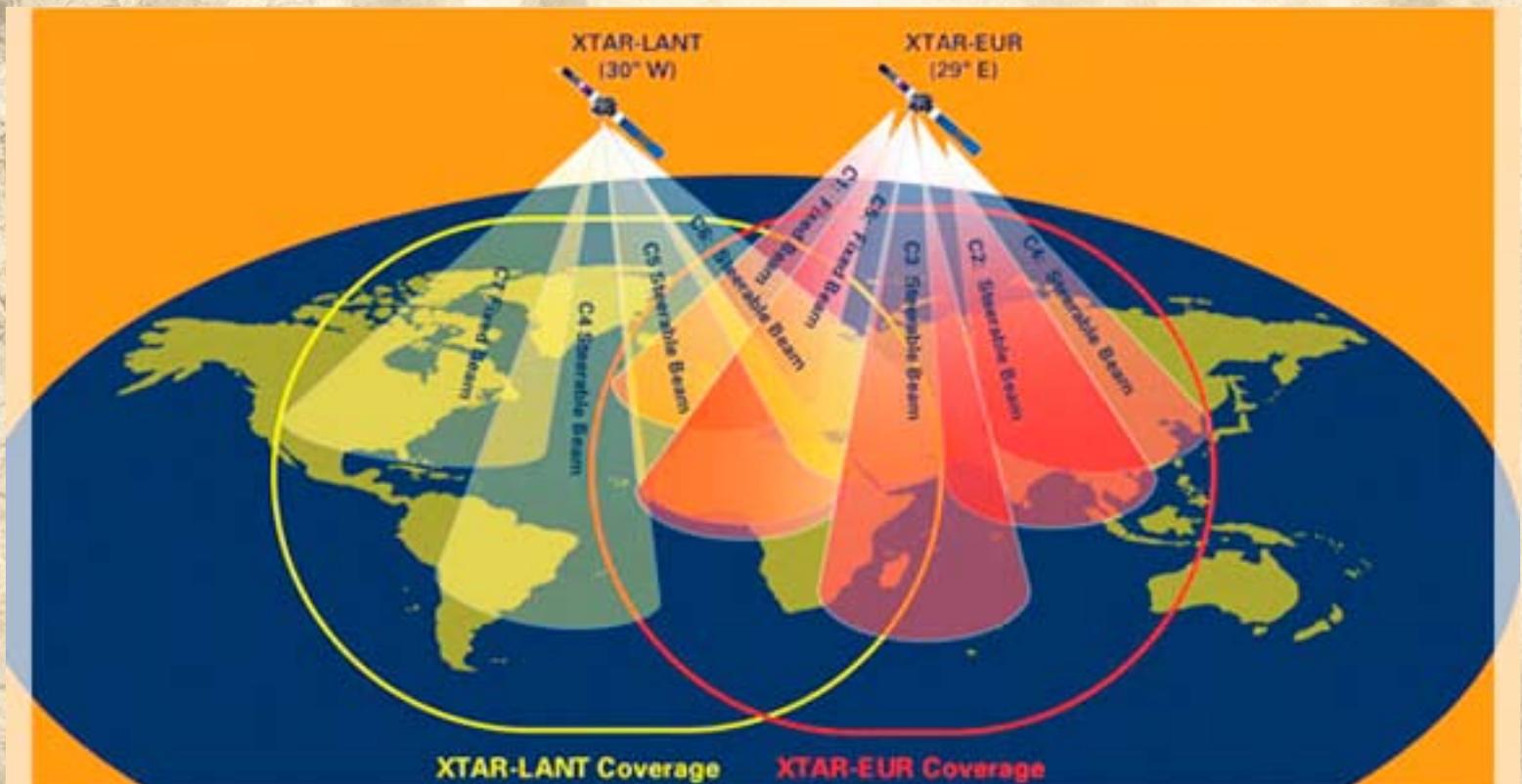
Another key advantage is that fewer X-band satellites are orbiting the Earth, decreasing the probability of adjacent satellite interference, enabling speedy isolation of local interference, and therefore, making smaller antennas more effective. Lastly, commercially owned and operated X-band satellites are compatible with the installed base of military X-band terminals, allowing the government to make the most of its X-band infrastructure investment.

X-band operators, such as XTAR, offer government users all these technical benefits together with a user-focused operational and commercial experience. Commercial operators have shown government users the benefit of nonpreemptive services, operational independence, and the flexibility to seamlessly transition between routine and surge applications.

Understanding that shifting from WGS to commercial X-band requires no equipment retrofitting, government customers have found that using commercially available X-band can help them better manage costs. Beyond these market-oriented benefits, XTAR and other operators closely adhere to the rule of offering commercial X-band systems only to government users.

Government users are increasingly taking notice of the benefits described above. New technology now coming to market is making commercial satellite communications available to more users to support their expanding applications. They see commercial X-band as a viable and sometimes, preferred option to meet their requirements. A number of these applications are worthy to note as demand drivers.

When looking at applications that increase government demand for commercial bandwidth, UAVs top the list. The requirement for commercial





frequencies, including X-band, grows incrementally wherever large UAVs are deployed, especially in specific regions of the world. Based on this significant requirement and the key roles for UAVs, a new platform, the U.S. Navy's new Broad Area Maritime

Surveillance (BAMS) UAV, is being developed that will drive X-band directly.

The BAMS mobile system, which can be used anywhere on the globe with little notice, can switch between commercial and WGS as necessary. It will use only X- and Ka-band frequencies. Commercial X-band systems will be perfectly suited to supplement government satellite capacity for BAMS where the government has insufficient capacity or is otherwise unable to meet demand. Consequentially, it is likely that commercially available X-band will be a critical complement to WGS capacity for the new BAMS platform.

The increased use of airborne, small terminals which circumvent air-to-ground links is another example of a high-bandwidth application that has become increasingly critical to achieving mission success. These airborne terminals allow reconnaissance aircraft to collect high-bandwidth intelligence data at a greater radius of operations and relay it back to HQ in real time.

Blue Force Tracking (BFT) is also driving demand for satellite capacity, including X-band capacity, by the U.S. DoD. Through the use of small terminals, BFT allows troops to cut through the "fog of war" and distinguish between friend and foe. When integrated into other systems, BFT can also be used to send and receive text and imagery messages, and has the mechanisms for reporting battlefield conditions. Earth station antenna manufacturers are responding

to these requirements by developing a small BFT terminal that is approximately 10 inches in diameter, and XTAR is assisting with this development.

Military and government demand for dependable, technically strong X-band satellite bandwidth will continue to grow. WGS resources may support prioritized functions like intelligence gathering, special operations and front-line communications. However, with limited availability of WGS today and into the foreseeable future, there is little doubt that commercial X-band satellite providers will continue to be called upon to support many of the military's critical communications requirements.

XTAR and other commercial X-band operators have already proven their ability to add value in support of these government missions. As demand for all satellite capacity grows in regions where demands are high, the benefits of commercial X-band will be increasingly evident.

X-band offers much needed capacity in a congested spectrum, and XTAR is committed to providing today's warfighters the highly-secure, reliable service they require and deserve in order to meet the unique mission requirements of governments worldwide — today and tomorrow.

Andrew Ruskowski is the Vice President of Global Sales and Marketing for XTAR. He was appointed to the position in September of 2010 and is responsible for the company's sales and business development initiatives with government and military customers in the United States and around the globe. Mr. Ruskowski was previously Vice President, North American Sales, for SES World Skies.



SatMagazine

Vol. 3, No. 10 — December 2010

Silvano Payne, Publisher + Writer
Hartley G. Lesser, Editorial Director
Pattie Lesser, Editor
P.J. Waldt, Associate Editor
J Durfee, Sales Director, Ass't Editor
Donald McGee, Production Manager
Simon Payne, Development Manager
Chris Forrester, Associate Editor
Richard Dutchik, Contributing Editor
Michael Fleck, Contributing Editor
Alan Gottlieb, Contributing Editor

Authors

Troy Brandon
Martin Coleman
Thomas Dippon
Mike Flaherty
Chris Forrester
John Inwanaga
Mariel John
Greg Jue
Paul Krzystoszek
Hartley Lesser
Pattie Lesser
Timothy Logue
Dan Ojennes

Published monthly by
Satnews Publishers
800 Siesta Way
Sonoma, CA 95476 USA
Phone: (707) 939-9306
Fax: (707) 838-9235
© 2010 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.

Advertiser Index

Advantech Wireless	03
AnaCom, Inc.	69
Asia Broadcast Satellite	49
AVL Technologies	75
Azure Shine International	33
Comtech EF Data	63
Euroconsult	09
GE-Satellite	15
iDirect	77
Integral Systems	73
Intelsat General	23
LDS Test & Measurement	06
Longbottom Communications / SSPI	83
Mansat LLC	29
Microspace Communications Corp.	67
Miteq Inc. / MCL	41
Newtec	07
O3b Networks	02
Paradise Datacom	81
RigNet	04
SENGORE	05
Space Foundation	61
W.B. Walton Enterprises	31
Wavestream	45