



## Satellite Manufacturing



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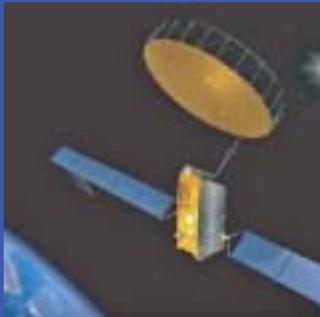
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NOTE FROM THE EDITOR

# NASA to Jump Start Commercial Development of Space Transportation



We have covered in this magazine developments in commercial space transportation such as the exciting award of the \$10 million Ansari X-Prize to the Burt Rutan design team that successfully carried out the first privately-funded commercial space flight in the Mojave desert last year. Some may ask how does the development of commercial space travel have any bearing on the satellite industry?

Plenty. As we all know the satellite industry is closely tied to the larger space industry. The technologies used are very similar especially in launch and electronic systems. So it is safe to say that any quantum leap in the space industry will benefit the satellite industry as well.

As it happens, NASA has finally decided to support a competition of its own to encourage private sector developed space vehicles for commercial space travel. NASA will provide the winning private companies with \$500 million in seed money to develop space vehicles. According to the LA Times some of the companies that have emerged as finalists includes companies that do a lot of satellite business such as El Segundo, CA-based SpaceX and SpaceDev of Poway, CA.

The \$500 million that NASA is putting up is just a fraction of the development cost if NASA were to do the job themselves. Not to mention the savings in time of development. Jump starting the private sector is an idea whose time has come and deserves all our support.

In this issue, we tackle the backbone of the satellite industry--the manufacturing sector. We have interviews of key executives from Boeing and Space Systems/Loral as well as another incisive look at this important sector from Bruce Elbert. Much of what has been written was largely drawn from the proceedings of the recently-concluded ISCe Conference and Expo last month in San Diego, California. That conference, if you missed it, has really developed into a must-attend event where major industry issues are tackled by key executives.

*Virgil Labrador*

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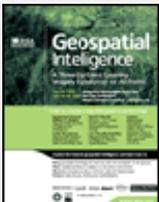
# CALENDAR OF EVENTS 2006

**July 10-11**, Miami, Florida, U.S.A.  
**3<sup>rd</sup> Digital Latin America Summit**  
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 Tel: +44 (0)207 841 0265  
 E-mail: [et@worldsummits.com](mailto:et@worldsummits.com)  
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**July 11-13**, Stockholm, Sweden  
**2006 SUIRG Interference Conference/Meeting**  
 Robert W. Ames Jr.  
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 Email: [bobames@suirg.org](mailto:bobames@suirg.org)  
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**July 19-23**, The Flamingo Hotel, Las Vegas, U.S.A.  
**NewSpace 2006 Conference**  
 Jeff Feige  
 Tel: 800-78-SPACE (800-787-7223)  
 Email: [jfeige@aerospacenet.us](mailto:jfeige@aerospacenet.us)  
 Website: <http://www.space-frontier.org/Events/NewSpace2006/>



**July 24-26**, Virginia, U.S.A.  
**Geospatial Intelligence 2006**  
 Tel: +800-882-8684 / Fax: +1-973 256 0205  
 Email: [info@idga.org](mailto:info@idga.org)  
 Website: [www.idga.org/na-2410-02](http://www.idga.org/na-2410-02)

**Aug. 22-26**, Beijing, China  
**BIRTV 2006**  
 Tel: +86 10 86093207 or 86092783 ext. 801  
 Fax: +86 10 86093790  
 Email: [birtv@birtv.com](mailto:birtv@birtv.com)  
 Website: [www.birtv.com/english/about.asp](http://www.birtv.com/english/about.asp)

**Sept. 7-11**, RAI Convention Centre, Amsterdam  
**IBC2006 Conference**  
 Tel: +44 (0)20 7611 7500 / Fax: +44 (0)20 7611 7530  
 Email: [show@ibc.org](mailto:show@ibc.org)  
 Website: [www.ibc.org/](http://www.ibc.org/)

**Sept. 21**, London, UK  
**1st European Mobile Satellite Radio Summit**  
 Chris Forrester  
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 Email: [chris@tvconferences.com](mailto:chris@tvconferences.com)  
 Website: [www.tvconferences.com](http://www.tvconferences.com)

**Sept. 26-28**, Hotel Lotte World, Seoul, Korea  
**APSCC 2006 Satellite Conference and Exhibition**  
 Tel: +82 2 508 4883~5 / Fax: +82 2 568 8593  
 Email: [info@apscc.or.kr](mailto:info@apscc.or.kr)  
 Website: [www.apscc.or.kr/event/apscc2006.asp](http://www.apscc.or.kr/event/apscc2006.asp)

**Oct. 19 - 21**, World Trade Centre, Mumbai, India.  
**Broadcast India 2006 Exhibition & Symposium**  
 Kavita Meer  
 Tel: 91 22 2215 1396/2215 2721 / Fax: 91 22 2215 1269  
 Mobile: 98200 56060  
 Email: [saicomtradefairs@vsnl.com](mailto:saicomtradefairs@vsnl.com)  
 Website: [www.broadcastindiashow.com](http://www.broadcastindiashow.com)



**Nov. 7 - 9**, Houston, TX, USA  
**Offshore Communications 2006**  
 Tel: 1 (772) 221 7720 / Fax: 1 (772) 221 7715  
 Email: [jpeterson@offshoresource.com](mailto:jpeterson@offshoresource.com)  
 Website: [www.offshorecoms.com](http://www.offshorecoms.com).

**Nov. 16**, London, UK  
**Personal TV Conference**  
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 Fax: +44-20-8940-6009  
 E-mail: [chris@tvconferences.com](mailto:chris@tvconferences.com) [www.tvconferences.com](http://www.tvconferences.com)

**Nov. 28**, New York, NY, USA  
**ISCe Satellite Investment Symposium NYC '06**  
 David Bross  
 Tel: +1-301-916-2236  
 E-mail: [dbross@hfusa.com](mailto:dbross@hfusa.com)  
 Web: [www.isis-nyc.com](http://www.isis-nyc.com)

**Nov. 29-30**, New York, NY, USA  
**Satcon 2006**  
 Tel.: 203-371-6322  
 E-mail: [info@jdevents.com](mailto:info@jdevents.com)  
 Website: [www.satconexpo.com](http://www.satconexpo.com)

# INDUSTRY NEWS

## Intelsat Completes Acquisition of PanAmSat; Becomes the Largest Satellite Services Provider

**WASHINGTON** — Intelsat, Ltd. announced on July 4 the completion of its merger with PanAmSat Holding Corporation. With the addition of PanAmSat’s video market expertise, advanced satellite fleet and blue-chip media customer base to Intelsat’s portfolio, Intelsat said the company has become the world’s largest provider of fixed satellite services (FSS).

Intelsat acquired PanAmSat for approximately \$3.2 billion with PanAmSat becoming a wholly-owned subsidiary of Intelsat. The total value of the transaction, including PanAmSat debt that was refinanced or remained outstanding, is approximately \$6.4 billion. Intelsat said the combined revenue backlog of both Intelsat and PanAmSat, which is based on long-term customer commitments of up to 15 years, was approximately \$8.3 billion.

The new merged company, which will retain the Intelsat name, will have a combined fleet of 51 satellites and a large terrestrial infrastructure including eight owned teleports, fiber connectivity and over 50 points of presence in almost 40 cities.

After the merger, Intelsat said it will now carry one out of every four television channels transmitted over fixed satellites; will support 27 DTH (direct to home satellite) platforms worldwide; be the number one provider of transponders for video programming worldwide; and carry more high definition (HD) programming than any other FSS carrier.

Established in 1964, Intelsat became the world’s first commercial satellite services provider when it launched its first commercial communications satellite in 1965.

Intelsat said the integration process already underway will ensure a smooth and seamless transition for Intelsat’s customers.

David McGlade will continue to serve as Chief Executive Officer and a Director of Intelsat, Ltd. The executive team of the company also includes James Frownfelter, formerly the President and COO of PanAmSat, as Chief Operating Officer; Phillip Spector, Executive Vice President and General Counsel; and Jeffrey Freimark, Executive Vice President and Chief Financial Officer. Joseph Wright, formerly Chief Executive Officer of PanAmSat, has been appointed Chairman of the Board.

The Bermuda based company, with headquarters in Washington, D.C., began as an intergovernmental organization with 11 participating countries. It became a private company in 2001 and is now owned by a consortium of four companies.

## Air Force Awards Boeing \$138-M NAVSTAR GPS Satellite Contract



**WASHINGTON, D.C.** — The U.S. Air Force has awarded Boeing Co., Navigation and Communication Systems of Huntington Beach, Calif., a \$138 million contract modification for the Air Force’s Navstar global positioning satellite program.

***As a result of increased civil and commercial use as well as experience in military operations, the U.S. Air Force is introducing new capabilities and technologies to the GPS IIF to sustain the space and control segments while improving mission performance.*** (Boeing photo)

Pentagon announced the contract award on June 22 providing for next generation of advanced NAVSTAR Global Positioning System Block IIF with enhanced navigation support for both military and civilian users.

The global positioning system IIF is an upgrade of the original GPS, which is a worldwide timing and

navigation system that utilizes 24 satellites positioned in orbit approximately 12,000 miles above the Earth’s surface. These satellites continuously transmit digital radio signals pertaining to the exact time (using atomic clocks) and exact location of the satellites. By referring to signals transmitted by four satellites, the GPS can be used to calculate longitude, latitude, and altitude.

The Department of Defense originally developed the GPS for all-weather military applications, but the system is available at no additional charge for civilians and commerce.

The contract calls for the production of three satellites (Space Vehicle 10 through 12) with an expected delivery date of January 2010.

## INDUSTRY NEWS

According to Boeing, its Huntington Beach campus will manage the new contract and provide engineering services while its Anaheim plant contributes electronic subsystems. The actual satellite bus will be built at Boeing-El Segundo.

### Air Force Awards L-3 Communications and Rockwell Contracts to Further Develop GPS Technology

**NEW YORK** — The U.S. Air Force NAVSTAR Global Positioning System (GPS) Joint Program Office has awarded U.S. Interstate Electronics Corporation (IEC), a subsidiary of L-3 Communications, a \$37 million contract for the first phase of the U.S. Air Force Modernized USER Equipment (MUE) Program.

The MUE program is funding the design and development of new GPS receiver technology to support future military GPS requirements. L-3 said IEC's System on a Chip (SOC) approach will become the primary feature of IEC's new line of TruTrak M-Code GPS receivers.

According to L-3, use of this technology will result in a significant reduction in production costs, and provide flexibility for a broad range of military applications including gun-fired projectiles, aircraft avionics and hand-held GPS data units. IEC's product architecture will allow the production of receivers and higher-level systems to be accomplished in unclassified production facilities, further lowering the final system cost.

In another contract award worth \$28 million, the U.S. Air Force has selected Rockwell Collins to develop the next-generation GPS technology as part of the MUE Receiver Card Development program.

Rockwell said the main objective of the program is to develop and demonstrate modernized user segment receiver cards, establishing first proof of design for the modernized GPS architecture. The current contract, to be executed through October 2007, supports preliminary design of the modernized receiver cards for ground and airborne applications. Completion of the receiver card development, test and security certification will be accomplished under a government exercisable contract option for these tasks, Rockwell explained.

This program, awarded by the U.S. Air Force Space and Missile Systems Center (SMC), represents the military user equipment

portion of a next-generation GPS system that adds a new military signal and security architecture. According to Rockwell, the new technology offers enhanced integrity, exclusivity and improved anti-jam capabilities.

### Boeing Braces for \$1.115-B Charges in 2Q for Delays on Airborne Surveillance Program and Tentative Legal Settlement

**CHICAGO** — Boeing Company said on June 29 it will recognize charges related to delays on an international airborne surveillance program and a previously disclosed tentative legal settlement with the U.S. government when it announces second-quarter 2006 results July 26.

Boeing said it expects to record a charge of between \$300 million and \$500 million pre-tax due to delays related to its Airborne Early Warning & Control (AEW&C) program for Australia and Turkey. In addition, the company expects to recognize a \$615 million charge to reflect a tentative settlement with the U.S. Justice Department related to the hiring of a former Air Force official and handling of a competitor's proprietary information. The total 2nd quarter charges could go as high as \$1.115 billion.

The expected charge for AEW&C program delays, Boeing said, will be finalized after ongoing reviews and will be recorded in the Precision Engagement & Mobility Systems segment of Boeing's Integrated Defense Systems business. The actual amount of the charge will be determined over the course of the next few weeks as the recovery plan is better understood and will be disclosed when Boeing issues its second quarter financial results.

This international airborne surveillance program, known as Wedgetail in Australia and Peace Eagle in Turkey, consists of the 737-700 aircraft outfitted with highly complex, integrated command and control and advanced radar systems.

Australia has purchased six AEW&C aircraft and Turkey has purchased four. Delivery of the first two Wedgetail aircraft and that effort's flight test schedule have been delayed up to 18 months because of development and integration issues with certain hardware and software components. Boeing said it now plans to deliver all six Wedgetail aircraft by the end of 2008 and is developing the Peace Eagle schedule with its Turkish customer.

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IDS has reorganized the AEW&C program, strengthened the management team and put additional oversight in place. The team is working with the customers and suppliers to implement a go-forward plan. That plan will target the talent and resources necessary to develop Wedgetail and Peace Eagle on realistic schedules compatible with the team's ability to deliver reliable, mission-ready systems.

On May 15 this year, Boeing agreed to pay the U.S. government \$615 million to settle two criminal investigations and related civil claims over stolen documents and hiring of a government procurement officer. The deal would put an end to over three years of government investigations into Boeing's recruitment of Darleen Druyun, a former senior Air Force acquisitions official, who served nine months in jail after pleading guilty of giving Boeing preferential treatment in exchange for a job and other favors.

The second investigation concerns possession by Boeing of documents from its rival contractor Lockheed Martin in connection with launch service contracts with the Air Force under the Evolved Expendable Launch Vehicle Program. Some officials believe the documents may have been used by Boeing to win additional contracts from NASA for 19 missions under its launch services contract. Some of Boeing's contracts were eventually rescinded as a result and awarded to Lockheed at higher cost, according to the Department of Justice.



**Boeing completes the first flight of a Delta IV rocket from Vandenberg Air Force Base, Calif. with the successful launch of the National Reconnaissance Office (NRO) satellite, NROL-22.** (Boeing photo)

Boeing said while the agreement is still being finalized, the charge will be recorded in the second quarter.

### Boeing's Delta IV Launches NRO Satellite from West Coast

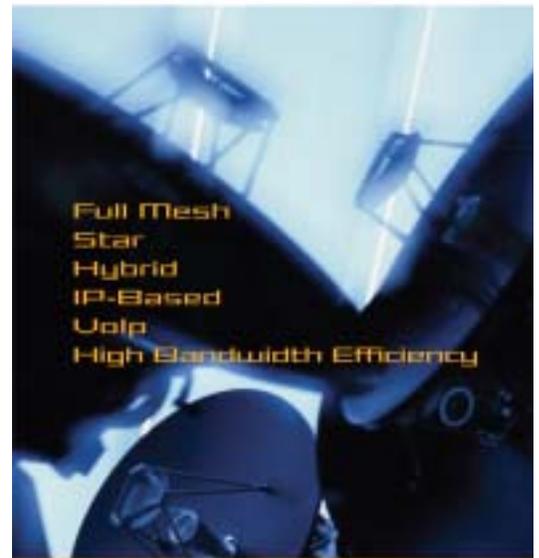
**ST. LOUIS** — Boeing completed the first flight of a Delta IV rocket from Vandenberg Air Force Base, Calif. on June 26 with the successful launch of the National Reconnaissance Office (NRO) satellite, NROL-22. The launch is the first West Coast mission completed for the U.S. Air Force Evolved Expendable Launch Vehicle (EELV) program.

Liftoff of the Delta IV Medium+ (4, 2) configuration vehicle occurred at 8:33 p.m. PDT from Space Launch Complex (SLC) 6. The payload was successfully deployed approximately 54 minutes later.



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SLC-6 is the West Coast launch site for the Boeing Delta IV family of launch vehicles that provides the Air Force the strategic capability to launch national security satellites to polar, Sun-synchronous and high inclination orbits. The new launch site can support all five configurations of the Delta IV family.

The mission is the first for the NRO aboard a Delta IV and the second aboard a Delta rocket. The first was the GeoLITE mission in 2001 aboard a Delta II.

The 132-acre SLC-6 features structures similar to Boeing's Delta IV SLC-37 launch site at Cape Canaveral Air Force Station, Fla., with a Fixed Umbilical Tower, Mobile Service Tower, Fixed Pad Erector, Launch Control Center and Operations Building, and a Horizontal Integration Facility. SLC-6 also features a Mobile Assembly Shelter that protects the rocket from adverse weather.

Launch vehicle hardware is transported from the Boeing factory in Decatur, Ala., to Vandenberg via the Delta Mariner ship that docks just south of SLC-6.

Boeing said the next Delta IV launch from Vandenberg is planned for late 2006 aboard a Delta IV Medium vehicle that will fly a mission for the Air Force Defense Meteorological Satellite Program, DMSP-17.



**A static test firing of the Zefiro 23 second-stage engine of Europe's new Vega launch vehicle was conducted on Monday 26 June 2006, at the Italian Ministry of Defense test centre in Salto di Quirra, Sardinia.** (Credits: ESA-S. CORVAJA photo)

### Europe's New Vega Launch Vehicle Second Stage Motor Roars to Life

**PARIS** — European Space Agency said on June 26 its Vega small satellite launch vehicle has made a new step toward its maiden flight, late next year, with the success of the first firing test on its second stage motor, the Zefiro 23.

The static firing was performed on Monday, June 15, at the Italian Ministry of Defense test center in Salto di Quirra, Sardinia. The 7.5m

tall, 2m diameter motor, featuring a carbon epoxy filament wound casing, delivered more than 100 metric tons of thrust (1,070 kN), burning some 24 metric tons of solid propellant in 75 seconds.

Numerous data were gathered during the test and are now under analysis to improve technical knowledge of the motor's behavior and refine the launcher's future performance. Also tested during the firing were various subsystems, including a thrust vector control system that will steer the motor's nozzle to provide flight control. After this success, the motor will proceed with its critical design review, at which stage its technical characteristics will be finalized.

Built by Avio in Colleferro, near Rome, the Zefiro 23 motor will be the basis for the second stage of ESA's Vega launcher. The first firing test with the third stage motor – the Zefiro 9 – was performed in December 2005.

Conducted on behalf of ESA's Vega development program, these two firing tests followed three static firings of the Zefiro 16 demonstrator in 1998, 1999 and 2000. Both the Zefiro 23 and Zefiro 9 will undergo an additional ground firing test each to complete their development and qualification.

### NASA Selects Ball Aerospace to Build Two Cloud Cameras on Glory Mission

**BOULDER, Colo.** — NASA has chosen Ball Aerospace & Technologies Corp. to design and build two cloud cameras for the Glory mission under NASA's Goddard Space Flight Center. The Glory mission is part of the U.S. Climate Change Science Program to improve our understanding of what forces influence global environmental changes and how to predict those changes.

Glory is a remote-sensing Earth-orbiting observatory scheduled to launch in 2008 for a three-year mission life. The mission will collect data on aerosols as well as radiant energy emitted by the sun.

Two instruments will be deployed in order to accomplish these objectives. They include the Aerosol Polarimetry Sensor (APS); and the Total Irradiance Monitor (TIM). The Ball Aerospace cloud cameras complement the APS instrument, being developed by Raytheon Civil Space Programs.

Ball Aerospace said that as part of the Aerosol Polarimetry Sensor package, the cloud cameras will distinguish between

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cloud fields and clear scenes over land and the ocean, in order to collect data on chemical, microphysical, and optical properties, and spatial and temporal distributions of aerosols.

### NASA's Micro-Satellites Complete Technology Validation Mission

**WASHINGTON** — NASA's three orbiting micro-satellites known as Space Technology 5 have completed their planned 90-day mission. NASA said the mission team is shutting down the spacecraft to conclude operations on June 29.

The mission primarily focused on flight testing miniaturized satellites in the harsh environment of space and evaluating their ability to make research-quality scientific measurements.

The satellites were launched on March 22. Each fully fueled satellite weighed approximately 55 pounds when launched and

is about the size of a 13-inch television.

A major milestone of the mission was reached when the spacecraft assumed a constellation formation on May 24. The satellites lined up in nearly identical orbits, like three pearls on a necklace, approximately 220 miles apart. Reaching formation required seven maneuvers using miniaturized micro-thrusters. Each spacecraft has a single micro-thruster the size of a quarter to perform both attitude- and orbit-adjustment maneuvers.

NASA said the mission demonstrated the benefits of using a constellation of spacecraft to perform scientific studies of the beautiful auroral displays that occur near Earth's polar regions. The spacecraft simultaneously traversed electric current sheets and measured the magnetic field using miniature magnetometers. **SM**



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# EXECUTIVE MOVES

## Loral Names Patrick Dewitt CEO of Space Systems/Loral; John Celli to Become President, COO



**Patrick DeWitt**

**NEW YORK** — Loral Space & Communications Inc. has promoted Patrick DeWitt to chief executive officer of Loral's satellite manufacturing subsidiary, Space Systems/Loral (SS/L). John Celli has been promoted to president and chief operating officer of SS/L.

DeWitt, 60, was most recently president of SS/L, where he has led the company through one of its most successful periods in the company's

history. Since 2003, SS/L has booked 12 new commercial satellite awards, more than any other satellite manufacturer. He has held senior management positions with SS/L and its predecessor companies since 1973. DeWitt earned his degree in business administration from San Jose State University.

John Celli, previously executive vice president of the company, will succeed DeWitt as president of SS/L.

With nearly 30 years of experience, Celli, 57, is a veteran of the satellite industry. Starting in 2001, Celli served as SS/L's senior vice president of engineering, manufacturing and test operations, where he was responsible for the development, manufacturing, testing and procurement for all SS/L satellites, as well as managing the company's materiel, information systems and facilities organizations. He originally joined the company in 1981 as an antenna mechanical engineer and has held increasingly important roles with the company.

Before joining SS/L, Celli held various engineering and project management roles with the Space and Ground Systems division of Alenia S.P.A. In addition, from 1975 to 1980 he taught mechanical engineering at the University of Rome. Celli holds a master's degree in mechanical engineering from the University of Rome.

## ESA Director General and other Directors Reappointed

**PARIS** — The Council of the European Space Agency has renewed the appointment of Jean-Jacques Dordain as director



**Jean-Jacques Dordain** (ESA photo)

general of ESA for a further period of four years.

Dordain was appointed ESA director general in December 2002 and took up his post in July 2003. Dordain held a number of positions at the Office National d'Études et de Recherche Aérospatiales before joining ESA in May 1986.

At ESA he started with heading the Space Station and Platforms Promotion and Utilization Department, and then, following a reorganization, the Microgravity and Columbus Utilization Department. In 1993 he became associate director for Strategy, Planning and International Policy and in May 1999 was appointed director of the Strategy and Technical Assessment Directorate. He subsequently took up the post of director of launchers in February 2001.

Since taking over as ESA director general, Jean-Jacques Dordain has been instrumental in building the future of European space activities for the benefit of all citizens, doing much to ensure the success of Europe in the process and in reinforcing the Science activities of ESA. He has fostered closer relations with the European Union and has been one of the driving forces behind the elaboration of a European Space Policy.

## Hughes Completes Board with Appointment of 3 Independent Directors

**GERMANTOWN, Md.** — Hughes Communications, Inc. has appointed three independent executives to complete its eight member board of directors. Stephen Clark, venture partner with Intersouth Partners, Gene Gabbard, private investor and Lawrence J. Ruisi, advisory consultant, assume their positions immediately.

Stephen Clark has more than 30 years of general management experience in high growth companies in the telecommunications, technology and manufacturing sectors. Most recently, he served as Chairman and CEO of SpectraSite Communications which was sold to American Tower Corp. in August 2005.

Gene Gabbard is a private investor who has a long and successful track record in the telecom industry. A former executive vice

## EXECUTIVE MOVES

president and chief financial officer of MCI Communications Corporation, Gabbard also served as chairman of the board and CEO of Telecom\*USA. He was one of the original founders and president of Digital Communications Corp., a Maryland start-up that eventually became Hughes Network Systems, and holds numerous patents in the field of digital communications.

Lawrence Ruisi is the former president and CEO of Loew's Cineplex Entertainment Group. While at Loew's he was responsible for the strategic direction of the company, as well as theatre operations, marketing, financial management and investor relations. Mr. Ruisi has over 20 years experience as a senior executive in the entertainment industry, including Sony, Columbia and Tristar Pictures.

### Northrop Appoints Ronald Smith, Susan L. Cote and Mark A. Rabinowitz as Vice Presidents



**Ron Smith**

**LOS ANGELES**— Northrop Grumman Corporation has appointed three new vice presidents in its corporate organization: Ronald Smith as vice president of corporate competitive excellence; Susan L. Cote as vice president of corporate contracts and pricing; and Mark A. Rabinowitz as vice president and assistant treasurer.



**Susan Cote**

In his new position, Ron Smith will lead the company's continuing effort to drive process improvement and enhance performance across the corporation. He was most recently vice president of Six Sigma for Northrop Grumman's Space Technology sector.

Smith joined Northrop Grumman Space Technology in 1982 and has served as director of electrical



**Mark Rabinowitz**

processes and products in engineering as well as several other technical and managerial positions related to the development of electrical communications hardware for satellite systems. He earned a bachelor's degree in electronic engineering from California Polytechnic State University, San Luis Obispo, with post-baccalaureate studies at California State University, Long Beach.



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## EXECUTIVE MOVES

Susan L. Cote, in her new role, is responsible for maintaining an effective risk-review process, providing corporate-wide policy, direction, training and oversight of contracts and pricing matters and ensuring that all of the company's sectors meet acceptable performance standards in these areas. She most recently served as vice president of contracts, pricing and program business management for Northrop Grumman Space Technology.

Cote joined the company more than 15 years ago in the contracts department of the Defense Support Program. She has worked on NASA, U.S. Air Force, commercial and classified satellite programs. Prior to joining Northrop, Cote held various contracting positions within the Air Force. She holds a bachelor's degree in political science from Principia College in Illinois, and a master's degree in public administration from the University of Arizona.

Mark Rabinowitz, in his new role as corporate vice president and assistant treasurer, will be responsible for the development and implementation of Northrop Grumman's capital deployment strategy including the execution phase of merger, acquisition and divestiture transactions as well as capital deployment analysis and recommendations to address credit profile, dividends and share-repurchase activities. He is also responsible for the company's banking relationships and management of the company's borrowing, investing and its public debt. He has been corporate director and assistant treasurer of banking and capital markets since 2003.

Rabinowitz joined Northrop in 1982, and previously served as director of contracts and pricing at the Airborne Ground Surveillance and Battle Management Systems business area of the company's Integrated Systems sector in Melbourne, Fla. He earned a bachelor's degree in economics and government from Cornell University, and attended the Program for Management Development at Harvard Business School.

### Navy Admiral Murrett Nominated as NGA Director

**BETHESDA, Md.** — The National Geospatial-Intelligence Agency bid farewell to its director, retired Air Force Lt. Gen. James R. Clapper Jr., who departed on June 14 after almost five years at NGA's helm.

Clapper was the first civilian head of the agency and also its longest-serving director.

NGA will operate for the next few weeks under the leadership of Lloyd B. Rowland, NGA acting deputy director. Rowland previously served as the NGA business executive and recently assumed duties as the acting deputy director.

Meanwhile, the Department of Defense that Navy Rear Adm. Robert B. Murrett has been nominated for appointment to the grade of vice admiral and assignment as director of NGA.

Murrett is currently serving as director of Naval Intelligence, N2, Office of the Chief of Naval Operations, Pentagon, Washington, D.C.

### Boeing Names Jamieson Senior VP of Engineering, Operations & Technology

**CHICAGO** — Jim Jamieson has been named Boeing senior vice president of Engineering, Operations & Technology, expanding his previous responsibilities as Boeing senior vice president, chief technology officer, and head of the Boeing Technology organization.

While continuing his executive oversight of Boeing's Information Technology, Phantom Works and Intellectual Property Management organizations, Jamieson will now also be responsible for leading efforts to improve the efficiency and effectiveness of Boeing's engineering, operations and technology functions, including the technology planning, program management, quality assurance and supplier management functions.

In this new role, Jamieson will continue to report directly to Boeing chairman, president and CEO Jim McNerney and serve on Boeing's Executive Council.

As part of this organizational change, several other new assignments have been made to further reinforce the focus of the Engineering, Operations & Technology organization on achieving functional excellence across the enterprise. This includes assigning Bob Krieger, president of the Phantom Works advanced R&D unit, as Boeing chief technology officer, reporting to Jamieson.

### Lockheed Names Mark Valerio to Head Special Programs Organization

**DENVER** — Lockheed Martin Corporation named on June 8 Mark Valerio vice president and general manager, special

## EXECUTIVE MOVES

programs for its Space Systems Company. Valerio succeeds Thomas J. Scanlan, who is retiring June 30.



**Mark Valerio**

Valerio will lead one of Space Systems Company's largest lines of business, which comprises more than 2,200 employees, focusing on sensitive national security space system developments.

"Mark Valerio is highly qualified for this assignment. His career with Lockheed Martin spans 26 years, including significant program management experience in first-of-a-kind programs for a wide-range of customers," said G. Thomas Marsh, Space Systems Company's executive vice president.

In his previous role, Valerio was responsible for integrating processes and best practices across the entire special programs line of business. He also has served as vice president and deputy of the Space

Based Infrared System program, and he led the design, development and delivery of Lockheed Martin's first three A2100 satellites. **SM**

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## NEW PRODUCTS

### Hughes Grants License to MTI to Manufacture IPoS Compliant Ku-band Satellite Terminals

**GERMANTOWN, Md.** — Hughes Network Systems, LLC has signed an Intellectual Property License Agreement with Microelectronics Technology, Inc. of Taiwan. Hughes said the agreement grants MTI rights to manufacture the IPoS-compliant Hughes HN7000 series terminals, comprising the broadband router (indoor unit or IDU), the outdoor unit (radio or ODU) and the antenna assembly.

IP over Satellite (IPoS) is the first global standard to be ratified by the world's major standards bodies; TIA in North America, and ETSI and ITU in Europe.

Pradman Kaul, chairman and CEO of Hughes, said IPoS is the only air interface specifically designed for efficient delivery of broadband satellite services and offers the best means to expand satellite's addressable market worldwide.

### Globalstar Offers Seamless Satellite Data Coverage from Alaska to Chile

**MILPITAS, Calif.** — Globalstar said on June 28 its independent gateway operator in Mexico, Globalstar de Mexico, is expanding its simplex or one-way data coverage throughout all of Mexico and to areas of northern Central America.

With the enhancements, Globalstar simplex data customers will now be able to seamlessly access the company's satellite network from Alaska and northern Canada southward to parts of Brazil, Colombia, Ecuador, Chile and the Pacific coast maritime region of South America.

Globalstar said the capability to offer simplex data service and solutions throughout Mexico and the surrounding region is the result of additional hardware being added to the ground station or satellite gateway operated by Globalstar de Mexico. The satellite gateway is used to provide Globalstar customers with access to ground based public telephone and data networks via the Globalstar satellite constellation.

The new applique also paves the way for Globalstar de Mexico to complete the deployment of over 13,000 simplex modems that are to be used in Enciclomedia, a major educational project. The company and its customers have already installed close to 3,500 simplex data modems in elementary schools, primarily located in

the central region of the country, and is continuing to install units in schools throughout the Yucatan Peninsula and south Mexico.

### Freescale Supplies Hughes with ASICs for Next-Generation Satellite Broadband Modems

**AUSTIN, Texas** — Freescale Semiconductor said it has leveraged its semi-custom ASIC design capabilities and analog/mixed signal expertise to deliver an advanced satellite broadband ASIC solution to Hughes Network Systems, LLC.

Freescale said Hughes is using the ASIC in its HN family of high-performance satellite broadband terminals. The HN terminals, used in the provision of HughesNet services, deliver high-speed data, voice and video services over satellite to enterprises, government agencies, small businesses and consumers around the world.

Based on Freescale's standard-cell ASIC methodology and 90-nanometer (nm) CMOS technology, the satellite broadband ASIC solution combines wireless and analog technology from Hughes and Freescale. The ASIC device supports DVB-S and DVB-S2 standards, ACM and CCM modes. The device is designed to perform QPSK, 8PSK, H8PSK and 16APSK demodulation and decode (LDPC / BCH) functions. Key functional blocks include: DVB-S2 demodulator, DVB-S2 FEC, synchronization processor, legacy mode (DVBS) demod and FEC, stream/adaptor output interface and I2C interface.

### Quake Global Introduces New Iridium Satellite Data Modem

**BETHESDA, Md.** — Quake Global, an authorized Iridium Satellite value added manufacturer, has introduced a new, small-size low-cost modem taking advantage of Iridium's global short-burst data (SBD) service.

Quake Global said its new Q9612 is aimed at the emerging machine-to-machine (M2M) communication market, providing worldwide data links for asset tracking and monitoring applications. The small unit, which is about the size of a deck of cards, runs on 9-18V power, for easy integration into a wide range of telematics applications. The product has passed all certification tests, and beta units have been under trial by customers. Production units will begin shipment in July.

## NEW PRODUCTS

The Q9612 is a natural extension of our broad lineup of satellite communicators, bringing to customers the unique benefits of Iridium's global coverage and low-latency SBD links, said Polina Braunstein, CEO of Quake Global. "The Iridium-based product is ideally suited for a wide range of market sectors, including automotive, transportation, construction machinery, oil and gas production, supply-chain management and enterprise resource planning."

### Hughes' New Broadband Satellite Solution Optimized for Smaller Networks

**GERMANTOWN, Maryland** — Hughes Network Systems, LLC has announced the introduction of a new broadband satellite platform, the HX System, a cost-effective solution for smaller networks that provides high Quality of Service (QoS) and employs the most efficient implementation of the DVB-S2 industry standard with Adaptive Coding and Modulation (ACM).

Hughes said the HX System is compliant with IPoS (IP over Satellite), the first global satellite industry standard approved by TIA in North America, and ETSI and ITU in Europe. The HX System utilizes advanced bandwidth management techniques, enabling operators to provide their customers with a high quality of service while maximizing satellite efficiency. Optimized for smaller networks, the HX design builds upon a solid and field-proven foundation, leveraging many of the features and functionality of the widely deployed Hughes broadband satellite technology — with over 900,000 terminals shipped worldwide, according to Hughes.

The HX System supports high uplink channel rates, up to 3.2 Mbps, enabling operators to provide bandwidth intensive applications such as: Cellular backhaul, Maritime, Upstream oil and gas exploration and Video conferencing.

### Radyne, Raytheon and General Dynamics Troposcatter Modem Used in First Ku Band Link

**PHOENIX** — Radyne Corp. said on June 22 its TM-20 Troposcatter modem was employed successfully to establish an industry-first 20 Mbps Ku band Troposcatter, or "over-the-horizon" communications link.

Ku Band operation enables troposcatter communications to be

achieved using a single antenna in contrast to legacy large dual antenna systems. Ku band operation also enables the development of mobile combined troposcatter/satellite/line-of-site communication systems. In contrast, current field-deployable satellite/troposcatter systems require up to six transport vehicles while the system demonstrated is entirely contained on one vehicle.

The TM-20 represents the first significant advance in over-the-horizon technology in almost three decades. The use of modern signal processing techniques and a patented channel-directed-equalizer provides for link performance and configuration flexibility previously unheard of in Troposcatter systems. The TM-20's compact and power conserving design is ideal for mobile and flyaway installations, Radyne said.

The successful demonstration was conducted in conjunction with Radyne troposcatter partners, Raytheon Co. and General Dynamics.

### Loral Skynet Launches New Suite of Satellite-Based Contingency Services

**BEDMINSTER, N.J.** — Loral Skynet, a subsidiary of Loral Space & Communications, has launched a new suite of satellite-based Contingency Services designed to help businesses and government organizations minimize Internet Protocol (IP)-data network interruptions caused by large-scale natural disasters such as hurricanes, as well as protect against the everyday outages that frequently occur in multi-path terrestrial network links.

Loral Skynet said the new Contingency Services capability is the most comprehensive of its kind, providing world-class continuity and emergency restoration network solutions. These services assure the survivability of terrestrial networks via an automatic and seamless transfer of IP-data traffic to satellite connections. Skynet Contingency Services include:

- SkyReach Ensure: A business continuity network solution designed to provide pre-planned, continuous network connectivity for all vital business and government functions.
- SkyReach SAVER (Satellite Access by VSAT for Emergency Recovery): An emergency restoration network solution designed as a disaster recovery option where a

## NEW PRODUCTS

rapid response mechanism is built into a network to minimize downtime and loss of production.

### New Global IP VSAT Phone for Service Providers

TBC-Telematics Business Consultants, jointly with Viper Networks, is launching during the summer '06 a new Global IP VSAT Phone

solution for satellite service providers and satellite carriers. This USB Global Phone gives more options for clients who need to call the PSTN from IP VSAT terminals anywhere in the world.



How it Works

The main advantages of this VSAT Phone are: make calls to any fix or mobile lines in the planet from any VSAT anywhere in the world; global IP roaming with no charge and number Global Portability with voice quality; pre-paid services with rates starting with \$ 0.01 per min. (average \$ .03 per min. main cities in the world); calls between Viperphones are free (VOIP Call); receive calls from a US or European numbers at no charge anywhere in the world; activation and account set up via Internet browser in 3 minutes anywhere in the world; wholesale price start with less than \$40.00 per unit; pay only for the minutes used; no monthly fees, contracts or hidden charges.

The service is current available worldwide for carriers and satellite IP service providers. Further information available via email at [info@tbc-telematics.com](mailto:info@tbc-telematics.com) or call: + 1-949-552-6871.

### TV Vlaanderen Launches Full DTH Bouquet Via Astra

**BETZDORF, Luxembourg** — TV Vlaanderen has taken further capacity on SES Astra's prime orbital position 19.2 (degree) East to accommodate the official launch of Belgium's first direct-to-home (DTH) bouquet.

In addition to the channels of Flemish public broadcaster VRT, the bouquet of TV Vlaanderen now consists of all Flemish

private channels including VTM, Kanaal2, JIM, VT4, VIJFtv, Vitaya, and KanaalZ.

Alexander Oudendijk, chief commercial officer of SES Astra by signing-up both the Flemish public and private channels, TV Vlaanderen has a strong base for further growth. "We are confident that Flemish viewers will appreciate the benefits of the Astra satellite system as the most attractive reception mode for digital TV."

### Iridium Satellite Partners Offer Hurricane Equipt. and Service Packages

**BETHESDA, Md.** — With the U.S. hurricane season officially underway, Iridium Satellite said on June 12 many of its partners have introduced special emergency communications equipment and service offerings.

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## NEW PRODUCTS

Iridium said it is ideal for backup communications to replace land-based, cellular and radio telecom services often inoperable due to winds and flooding. In addition, unlike most other systems, Iridium is interoperable with all other emergency communications systems, including UHF and VHF radios, as well as others.

The following emergency response and business continuity solutions from Iridium partners are available to first responders and commanders, businesses, governments and citizens:

Blue Sky Network (BSN) offers solutions for responding organizations that allow them to maintain real-time knowledge of responders and assets. BSN provides global satellite logistics solutions for two-way linking and managing remote transportation assets. Using its interactive Web portal, "SkyRouter," with detailed mapping, BSN links enterprises to personnel and assets

anywhere on Earth over the Iridium satellite network. Its Federal Aviation Administration (FAA)-certified data and voice products enable users to customize features including safety and event reporting.

### Toshiba Expands High Power C-Band GaAs FET Product Line

**SAN FRANCISCO** — Toshiba America Electronic Components, Inc. (TAEC) announced on June 13 the availability of new C-Band gallium arsenide field effect transistors (GaAs FETs), which the company claims are the industry's first in each frequency range, and have the highest output power now available from a single device for that range. **SM**

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**COVER STORY**

# Satellite Manufacturing at the Crossroads

by Virgil Labrador

When David Cavossa, the executive director of the Satellite Industry Association (SIA) presented the SIA's annual "State of the Satellite Industry Report" at the recent ISCe Conference it did not sound too good for the satellite manufacturing sector. While all the other sectors of the industry were consistently posting healthy annual growth numbers, it would appear from the SIA's figures that the manufacturing sector is in decline.

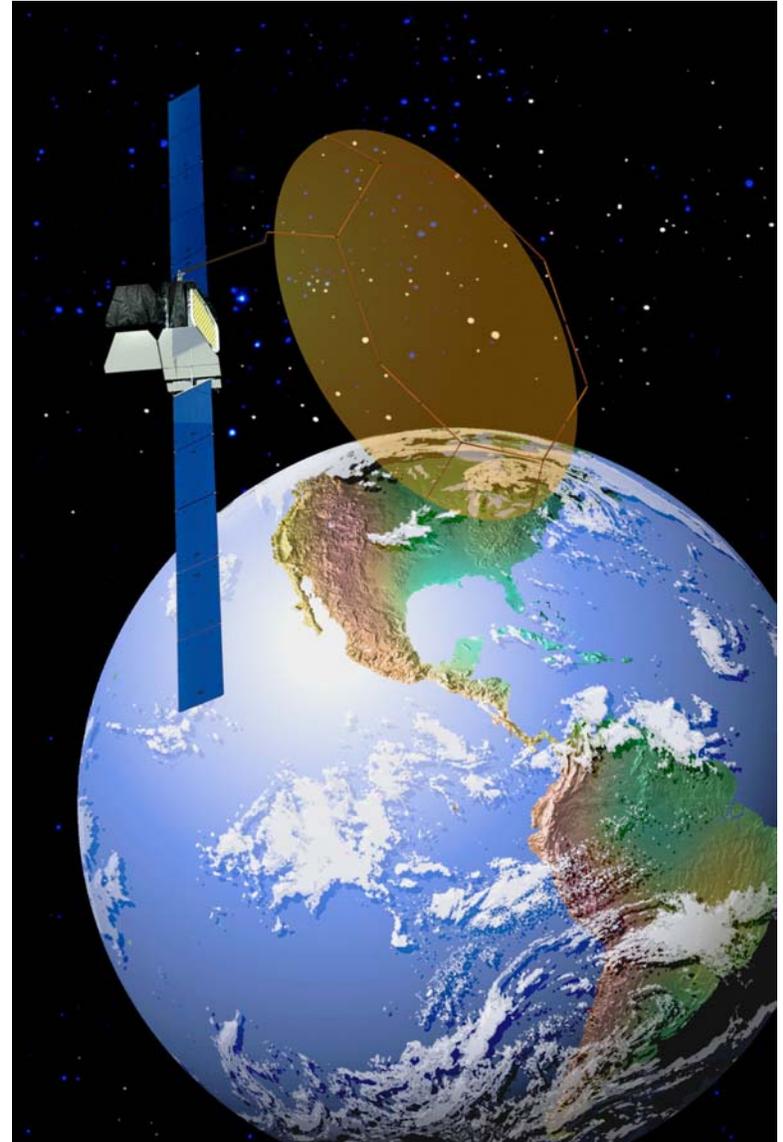
The figures of course, were quite deceiving, as Cavossa explained, because they only count satellite manufacturing revenues that after the satellites were actually launched. So the figures for 2005 were actually reflecting satellites ordered in 2002--one of the worse years for the satellite manufacturing sector. As Cavossa clarified, 2005 was actually one of the best years for the manufacturing sector with about 22 satellites ordered, so the manufacturing revenues were sure to pick up in the next few years.

Without a doubt, the satellite manufacturing sector has turned the corner. Space Systems Loral (SS/L), is probably indicative of the turnaround that the manufacturing sector has experienced. Emerging from bankruptcy of its parent company, SS/L scored four major contracts in 2005 (including the fifth XM Radio satellite which it wrested from rival Boeing, who built the first four XM satellites) and so far this has landed four contracts already just the first half of this year. "Both in terms of number of satellite wins and dollar amounts, SS/L is now the market leader in the satellite manufacturing field," according to its VP of Sales and Marketing, Arnold Freidman.

SS/L managed the turnaround according to Friedman by retaining its best engineers even during the downturn. "This is a knowledge business. It's a very complex product. I think the stability of our workforce and of our management is a key factor in our success," said Freidman.

Meanwhile other US manufacturers such as Boeing Satellite Systems announced recently one of the largest contracts to date with the order of three of its high powered 702 series satellites by Mobile Satellite Ventures (MSV) for its hybrid satellite and terrestrial global wireless communication services.

Another noteworthy development is the rise of smaller manufacturers. In 2005, Orbital Sciences Corp. scored four contracts for the smaller satellites that they manufacture. Also, CAST of China, Melco of Japan, NPO M of Russia and Israel



**Boeing will build three high-powered Geo-Mobile satellites for Mobile Satellite Ventures that will create the world's first commercial wireless communications service using both space and terrestrial elements. (image from Boeing)**

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Aircraft Industries have been making a serious dent in the slice of the satellite manufacturing pie. Countries such as Vietnam and Venezuela have recently ordered satellites spurring demand. Venezuela's decision to go with a Chinese manufacturer is indicative of the increasing demand for alternative manufacturers.

## COVER STORY

### Excerpts from Interview with Boeing Satellite Systems, VP for Business Development Jim Simpson



*Q. It has been reported that Boeing is abandoning the commercial satellite sector to concentrate on the government sector. Is this true?*

Well, not quite. We've thought all along that there is synergism between the government and the commercial sector. You can look at it like we are a microcosm of the macro Boeing which has the commercial sector with the aircraft business and a government sector with the IDS (Integrated Defense System). The objective is for the businesses to complement each other, so that if there is a downturn in the commercial side, then it can be complemented by the government sector and vice versa.

Frankly, two of our product lines the 376 and 601 series of satellites have effectively reached the end of their life from a commercial perspective. The only satellite we have viable right now is the 702 series and that satellite's niche is in the higher power class anywhere from 12 -20 kw. So what you're seeing is Boeing is focusing its commercial strategy on where our niche is. That means we are not going to be bidding on every FSS or BSS satellite that comes out in the commercial market .

*Q. How are you finding the demand for your high-powered satellites?*

We have been extremely encouraged by the activities in the mobile satellite area which really drive the kind of power and processing

requirements that we have for our 702 class of satellites. In addition to that in 2004 we were awarded the DirecTV satellite, which the High Definition TV application really requires the higher power and bandwidth that we are able to provide. So we see the HDTV continuing to evolve as well as Digital Audio Radio services and we are also very excited about the broadband activities that has happened such as the Anik F2 satellite that we deployed last July. We are also about to deploy the Spaceway F3, which is truly a router in the sky and that's another incipient business which we feel we have a strong handle on with our higher power satellites.

*Q. You built the first four XM satellites and everyone thought that you will be getting the contract for the fifth XM satellite. What happened?*

Boeing is at it's best when we are building end-to-end type systems where we effectively are breaking new frontiers in satellite development. The XM system we developed from scratch and the extra power that we were able to provide them really helped in their development. When the digital systems matured to the point where it becomes more of a commodity, then it becomes more of a price-based activity and the features and benefits that makes us unique aren't as effective and the customer made a decision from a financial perspective to go with the other company.

*Q. Are there any regulatory barriers that you are facing?*

I think it's safe to say that we will not be competing for any contracts in mainland China. Frankly, I think ITAR exists for a reason. What we found that as long as we work very rigorously with the US government and we explain in great detail what we are trying to do, we've actually been quite successful in being able to offer our systems wherever we want to. It's been less of a barrier than most people think.

*Q. What applications will be driving satellite demand?*

Broadband will eventually drive a lot of the satellite requirements. What we've seen with satellite television where there is now a requirement to cluster a package with internet, telephony and television in one system and it may require a hybrid terrestrial and satellite solution but the bottom line is the bundling of those packages will become more and more important.

## COVER STORY

This development of smaller players competing against the established big three manufacturers in the US—SS/L, Boeing and Lockheed Martin and Alcatel Alenia and EADS-Astrium in Europe, was underscored by key executives participating in the recently-concluded ISCe conference.

Despite increasing competition, the major players think there is enough business for everybody. So much so, that the much anticipated consolidation in the industry which has been talked about for years never materialized. Instead of a one-size fits all, the satellite manufacturing sector is developing into a number of niches that has room for both the major, more established players as well as smaller manufacturers. In perhaps an illustrative case in point of cooperation between major players and the new emerging players, EADS-Astrium announced recently that it will be partnering with India's Antrix to bid jointly for smaller satellite orders.

"I think there is a niche for a very non-complex, bent-pipe satellite system that is becoming more commoditized. Countries capable of providing that type capability for a very low price will become attractive. That's a marketplace where we have chosen not to pursue," said Jim Simpson, VP of business Development of Boeing Satellite Systems.

Contrary to reports that is abandoning the commercial sector, Boeing assured that it is still very much in the hunt for commercial opportunities, albeit its strategy is focusing on the market for their high powered 702 series satellites (see interview with Jim Simpson in the previous page). According to Simpson a much improved 702 B series of satellites with more modular functions will be introduced in 2009. So don't count out Boeing yet.

The market is so bullish that even the regulatory barriers such as the ITAR regulations in the US that control exports of sensitive technologies has been dismissed by manufacturers as a non-issue. The demand for satellites is such that regulatory barriers are easily surmounted.

The demand for satellites is being driven by broadband and other applications with increasing bandwidth and processing power demands from satellites. The launch of WildBlue broadband service in the US and the IPStar broadband satellite in Asia last year proved the viability and potential of broadband services. High Definition TV and Satellite Radio are also driving the demand for satellites. Still to be seen is whether the much vaunted "Triple Play" (voice, data, video) services will take off and further increase demand for satellites.

### Excerpts from Interview with Space Systems Loral, VP for Sales and Marketing, Arnold Friedman



*Q. How do you see your company's position in the satellite manufacturing market today?*

Both in number of contract awards and in terms of sales dollars since our satellites tend to be larger than others—we are actually very dominant in the industry. We are now the world's leading provider of commercial satellites.

I expect the rest of the year to be very good. I see that our market will be very good for the foreseeable future and we will be maintaining our leadership in years to come.

*Q. What's driving the demand for satellites?*

The biggest part of our business is the FSS fixed services satellite market the satellites launched between 1995 and 2000 are now starting to come up for replacement. So there is a substantial replacement market. In addition to that there is growth in both television services and mobile radio services. That business segments are very strong around the world and we see continued growth in the television and radio market plus in the mobile satellite business. In the U.S. the FCC agreed to augment the frequencies with ATC which gave the opportunity to maintain the ubiquitous mobile coverage we have.

*Q. Do you think there are too many players in the satellite manufacturing sector?*

We are able to get our sufficient share to be a very strong satellite provider. And even with several manufacturers, we still have a dominant market share and we can't drive what other people do, we can just continue to perform. We also during that period delivered nine satellites last year and we also won nine satellites.

*Q. Are you facing any regulatory issues?*

We have worked very hard to meet the US requirements that provide open access to our customers within those guidelines. A customer like Asiasat is one that has been very vocal in the past about export control issues and we are able to satisfy them and the US authorities. Basically, we just feel that in general export control is not an issue.

## COVER STORY

“Programs are already underway that are driving the development of new generation of mobile spacecraft, said D.K.Sachdev, President of Washington, D.C.-based SpaceTel Consultancy. “Broadband applications using two pathways: mobile delivery systems or through Ka-band satellites will be the main drivers for the satellite industry in the next few years,”he added.

This view is supported by International Telecommunication Union which recently published a paper entitled “Satellite and Beyond 3G.” The ITU noted that beyond 3G systems would lead to a convergence of services, including fixed and mobile service, telecom and broadcasting, as well as a hybrid of satellite and terrestrial platforms. These systems all required bit rates of up to several hundreds of megabits per second, resulting in a need for more spectrum and the perennial conflict between terrestrial and satellite interests, according to the report.

It would appear that satellite manufacturers will be kept busy in the next few years and a very robust future lay ahead for both the big operators and smaller emerging ones as well. **SM**



Virgil Labrador is Managing Editor of SatMagazine and is responsible for all editorial activities of Satnews Publishers worldwide. He is co-author of the book, *Heavens Filled With Commerce: A Brief History of the Commercial Satellite Industry*. He can be reached at: [virgil@satnews.com](mailto:virgil@satnews.com)

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# FEATURE

## Directions for Spacecraft Manufacturing

**Bruce Elbert**

President, Application Technology Strategy, Inc.

Mid-century style, which is in vogue today, can include outer-space elements such as furniture from the Jetsons and icons like stars, rockets and artificial satellites. Our editor, Virgil Labrador, recounts in the SatNews book on the history of the industry he co-authored, *Heavens Fill with Commerce*, that the iconic



**Telstar 1** (courtesy of NASA)

Telstar was known as much for the first live intercontinental TV transmissions as for an instrumental tune of the same name by a group called the Tornadoes. Built by AT&T Bell Laboratories and launched by NASA on a Delta rocket precisely 44 years ago this month, this small spacecraft began the age of commercial satellite communications. A medium-earth orbit (MEO) satellite at an altitude of approximately 11,000 km, Telstar had to be actively tracked by big ground antennas on both sides of the Atlantic Ocean. Subsequently, the geostationary Earth orbit (GEO) proved to be the most effective, in spite of its greater range that results in the quarter of a second one-way delay and free space loss that increases by 20 to 30 dB. The design and construction of these GEO spacecraft has become the cornerstone of a formidable industry.

The international nature of our industry, including on the spacecraft manufacturing side, was made clear at the recent ISCe Conference in San Diego, organized by Hannover Fairs. While the US is still a leading force in the technology and applications areas,



**Telesat F2 Satellite**  
(Courtesy of Telesat Canada)

European and Asian companies showed their accomplishments and growing market share. The ISCe Conference honored JSAT, a Japanese satellite operator, with its prestigious Leadership Award. Previous recipients include DIRECTV, News Corp and SES Global; the fact that an Asia company was honored is quite noteworthy. Reviewed below are key developments and directions that involve spacecraft manufacturers and operators worldwide

### Spacecraft of Today

Any organization seeking to purchase and launch a new spacecraft must consider a range of possible configurations and suppliers, including ones that were unknown as recently as 10 years ago. Today's spacecraft designs seem to fall into the following

categories, which match the size and capability.

### "Big Bird"

These are the largest satellites currently built and deliver up to 20 kW of power to support a diverse range of high-capability communications payloads. Examples include the Boeing 702, Loral 1300, Lockheed Martin 2100AX and EADS Astrium/Alcatel Alenia AlphaBus. One of the first to purchase and launch one of these trophy satellites was Telesat Canada with its Anik F2, a Boeing 702 with no less than three payloads – C, Ku and Ka; the Ka payload, in fact, contains analog and digital processing elements.

The benefits of a large spacecraft include the following:

## FEATURES



**Echostar IX BSS Spacecraft** (Courtesy of Space Systems/Loral)

1. Higher transmit power capability across a wide footprint, useful for the broadcast of digital content direct to the user
2. More transponders, to reduce the cost per transponder as a means to maintain an attractive business
3. More frequency bands at a given orbit position
4. Complex payloads with digital on-board processing and multi-beam antennas

These benefits bring with them the greater cost of constructing and launching the satellite; operating costs are not much different since the spacecraft has only one control system. On the other hand, the insured value of a big bird is at the highest point. Satellites of the big bird type often require a fair degree of customization to accommodate the various functions and frequencies. In some instances, the purchaser may be able to justify a requirement for as many as two or three under the same contract, but this raises the financial bar significantly

### “Six Pack”

This is a model first used by PanAmSat in their purchase of six nearly identical Boeing 601HP satellites, each with the capability of 48 transponders and a total power of about 7 kW. Such a production run allows the manufacturer to purchase the necessary parts and subsystems in bulk, and construction and testing

can be run more like an assembly line. The satellite design is nearly standardized as a result, but this may not be an issue for the typical FSS/BSS operator who needs to replace nearly identical satellites as they reach end of life.

An additional economy results from the widest range of launch options, including dual launch by Ariane 5. This is also attractive from an insurance perspective due to lower satellite value. The totality of these characteristics makes the six pack the most popular type of satellite, considering also that most manufacturers produce them. Loral, Lockheed Martin and EADS Astrium have been successful at selling six pack

type satellites to FSS/BSS operators like Echostar, SES Americom and Eutelsat, respectively.

### “Economy Size”

Our last category includes spacecraft with somewhat limited capability but designed to meet a specific need at moderate cost. A classic example is the dual-spin Hughes (now Boeing) 376, which was the most purchased spacecraft in history. Several of these are still in operation; however, the cost/effectiveness of this particular design has been superseded by a number of the smaller three-axis spacecraft produced by Orbital Sciences and ISRO.

In a bold move, PanAmSat relied on the Orbital platform to replace a number of single-band dual-spin satellites that were nearing end of life. Their approach has been very successful and other buyers are considering this option when the requirements can be met with an economy size vehicle. Illustrated below is the Horizons 2 satellite, which is a joint venture of PanAmSat and JSAT International. It soon will replace the dual-spin SBS-6 at 74 degrees West Longitude.

### Applications that Drive Requirements

During ISCe, a highly-experienced panel of satellite technologists gave their views on how they would address



**Horizons 2 Satellite** (courtesy of Orbital Sciences Corp)

## FEATURES



**The MUOS Spacecraft** (courtesy of Lockheed Martin)

over 60 dBW of EIRP across the continental US.

The other three members of this panel represented leading manufacturers of large spacecraft. Manny DiMiceli, VP at Lockheed Martin and program manager of the Mobile User Objective System (MUOS), which will replace the UHF Follow-on system currently in operation for the US Navy and other DoD users, talked about the vital need in government circles to push

advancing requirements for better end-user communications. The panel was led by DK Sachdev, formerly Senior VP of Engineering and Operations at XM Satellite Radio and author of Artech House book *Business Strategies for Satellite Communications*. The first to speak was Stuart Cox, VP of Advanced Applications at XM Satellite Radio. In his prepared remarks, he provided the following success factors that contributed to making XM into the world's DARS leader:

- Own the technology and the standard: drive the development of the end user device with proprietary architecture and protocols
- Accelerate the introduction of breakthrough technology and applications

Mr. Cox described how his group of XM engineers produced 100% of the design for all products, including the recently introduced combination satellite receiver and MP3 player. Such is made possible by the "big bird" spacecraft built by Boeing and that deliver

technology ahead while maintaining services to legacy ground equipment and locations. MUOS will provide multi-beam communications using the wideband CDMA technology popularized for 3G cellular networks. The spacecraft will support 9.6 kbps voice and data services to handheld devices using a transponder-type satellite and ground processing. It's interesting that this is basically the same approach taken by MSV in their commercial ATC system. Mr. DiMiceli, who was also Lockheed Martin's IRIDIUM program manager, contrasted the new Navy handheld service to that of the Iridium system, which provides 2.4 kbps telephone service. MUOS will give potential throughputs of up to 384 kbps and employs "the lower UHF spectrum which will operate in the wide spectrum of environments that the military might see itself in."

The MUOS spacecraft design is on the high end of performance for GEO satellites because it must carry not just the W-CDMA payload with its new "waveform" but also a legacy payload to

address the needs of the current system of users. According to Mr. DiMiceli, the GEO approach has the advantage that you don't need to launch an entire constellation at once, as was required before IRIDIUM could start service. Instead, with GEO, you can "build a little, sell as little... for communications, GEO has a much bigger market."

Michel Le Moine, VP and CTO at EADS Astrium, reviewed the new Inmarsat 4 series satellites that facilitate the Broadband Global Area Network (BGAN), supporting bi-directional data rates of typically 300 kbps into a compact unit smaller than a laptop computer. It was clarified that all of the L-band systems, including BGAN, require a clear un-obstructed path to the satellite and in-building coverage would need to come from terrestrial base stations. Inmarsat 4 is a specialized type of spacecraft capable of providing more than 230 beams and 630 broadband channels, which can be modified by ground command to move beams and increase power in a given beam. Mr. Le Moine also mentioned that EADS Astrium supplied 15 Eurostar 3000 spacecraft that to FSS/BSS operators such as Eutelsat. These are usually purchased like the six pack previously mentioned, i.e., a cost-effective and timely production of very similar designs. EADS Astrium has moved into the economy size vehicle through a recently-announced partnership with ISRO. Mr. Le Moine explained that this strategy employs ISRO's existing spacecraft vehicle combined with payloads supplied by EADS Astrium. To pursue other big bird class opportunities, EADS Astrium has teamed up with Alcatel Alenia in the development and production of the high-end AlphaBus, which would produce 12 kW of power or more and contain a variety of flexible payload capabilities.

## FEATURES

EADS Astrium has special capabilities in processing payloads, Inmarsat 4 and a video system called Skyplex being good examples. Mr. Le Moine went further to talk about processor technology under development that would cut power consumption from 1.5 kW down to less than half a kilowatt while reducing physical size to smaller than a shoe box. They are also pushing a new generation of active antenna array composed standardized elements that reduce size and cost. In answer to a question from the floor, Mr. Le Moine stated that the number of beams could increase from 250 on Inmarsat 4 to upwards of 500 beams.

Our final speaker on this veteran panel of spacecraft technologists was Marc Pircher, CTO of Alcatel Alenia Space, which produces the Spacebus 4000 vehicle offering a range of 5 to 12 kW. Mr. Pircher explained that power in excess of 12 kW will rely on the AlphaBus, being developed and offered in conjunction with EADS Astrium. Several points were made about the importance of spacecraft manufacturers meeting buyers' demand for good hardware reliability and high service

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availability. The seller will need to prove on the ground that the spacecraft will work and that risk will be acceptable to both the buyer and insurer. Mr. Pircher stated that “we started years before” to build qualification models and added that the risk of a new spacecraft design is reduced by the fact that the best of the best are doing the work and testing; subsequent to that, downstream production depends on good workmanship.

From a technology perspective, Mr. Pircher reviewed how Alcatel Alenia Space is advancing a flexible payload architecture that allows a 15 year FSS/BSS satellite to adapt to the market as it comes. The components that provide this flexibility include the following:

- A Traveling-wave Tube Amplifier (TWTA) in which the saturated output power can be stepped from a low of 90 watts to a high of 150 watts, presumably without sacrificing DC-RF efficiency. This matches downlink EIRP to rain conditions and bandwidth requirements.
- Frequency plan adaptation in the uplink and downlink, to change transponder characteristics
- Steerable and power adaptive beams, done first for the military in Europe and now to be offered commercially

One requirement introduced from the audience was the thought of putting packet switching on board the spacecraft as opposed to the ground hub. Mr. DeMiceli pointed out that this involves overhead of as much as 30 to 40%, suggesting that the ground might be the best location for this type of complexity. In response to a suggestion that satellite life might be reduced to less than 10

years to facilitate quicker technology introduction, Mr. DiMeceli admonished that the “infrastructure” to design a new satellite is costly and time consuming. His concern is that this would not leave sufficient time, particularly for the DoD with its 15 year development cycle. Mr. Pircher added that construction in 20 to 24 months is feasible but not possible if a totally new satellite is to be developed. Another important point mentioned by Mr. Le Moine is that financial analysts care about return on investment, in which case it’s more effective to divide the investment value by 15 years rather than, say, five.

The previous comments from the CTOs of several major technology companies generally reflect the industry view. Thus, it is likely that had Space Systems/Loral and Boeing Satellite Systems taken part on this panel, they would probably have added more fuel to this fire. For example, SS/L has been very successful at the six-pack business - Echostar just announced the selection of SS/L for their next BSS satellite. Boeing has recently been concentrating on the 702, relinquishing both the six-pack and economy size to others. Orbital, on the other hand, appears to be sticking to its economy-sized knitting, producing compact spacecraft as replacements for many of the former Hughes/Boeing dual spinners.

### Matching Product to Need

The supplier side of spacecraft construction is robust and technology is advancing at a reasonable pace. We don’t see much in the way of new non-GEO activity; in fact, Sirius Satellite Radio ordered GEO satellites from SS/L and appears to be moving away from its current 24-hour highly elliptical orbit. For now, spacecraft manufacturing is very much a GEO game, as outlined by Manny DeMiceli of Lockheed Martin.

Spacecraft will continue to come in three basic sizes that are designed for the application and business model of the satellite operator. The objective of matching spacecraft design to the actual user market is more at the center than ever before. Multi-beam satellites with processors are a larger segment but should not dominate the launch manifest over traditional bent-pipe architectures. Demand for Ku band is strong with C band fairly flat; L and S bands are highly prized for mobile services to commercial and military users. And finally, Ka band is definitely with us and likely to grow as a means to accommodate Ku saturation. **SM**

**Bruce Elbert** has over 30 years of experience in satellite communications and is the President of Application Technology Strategy, Inc., which assists satellite operators, network providers and users in the public and private sectors. He is an author and educator in these fields, having produced seven titles and conducted technical and business training around the world. During 25 years with Hughes Electronics, he directed major technical projects and led business activities in the U.S. and overseas. He is the author of *The Satellite Communication Applications Handbook*, second edition (Artech House, 2004).  
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 Email: [bruce@applicationstrategy.com](mailto:bruce@applicationstrategy.com)



## CASE STUDY

# Telenor Used for Distance Learning Project in the Amazon Rainforest

**By: David Freeman**

Director  
The Wilderness Classroom Organization

**The Wilderness Classroom Organization sent photos, video clips and data to schools around the world during its six-week Project Peru 2006**

**P**roject Peru 2006 was the Wilderness Classroom’s 8<sup>th</sup> online educational expedition and employed satellite technology to communicate with students and teachers from remote parts of the globe. Telenor’s Global Area Network (GAN) service allowed Project Peru’s five member international team to communicate with over 30,000 3<sup>rd</sup> to 8<sup>th</sup> grade students and teachers during their six-week canoeing expedition through the Peruvian Amazon. During the 2006 expedition, Web site traffic increased more than 20% over 2005 usage.

The Project Peru 2006 team spent much of April and May 2006 exploring a remote section of the Peruvian Amazon Rainforest by dug out canoe. Our five member team of scientists, writers, photographers, and educators traveled to the rainforest to gain a better understanding of how plants, animals, and people survive in the low land Amazon Rainforest. Our mission was to share our findings with approximately 30,000 3<sup>rd</sup> to 8<sup>th</sup> grade students in the United States who were in charge of directing the adventure by deciding where and how we traveled, what we studied, which foods we should try, and many other things. This interactive learning experience would not have been



**Online chat from a shelter in Peru**

possible without the Global Area Network satellite communications terminal and service provided by Telenor Satellite Services.

The area we explored is the largest protected flooded rainforest in the world called the Pacaya Samiria National Reserve. The reserve protects over five million acres of flooded forest, and

during April and May approximately 90% of that area is covered in flood waters brought into the park by the massive Amazon River. Because of this we often went for days with out seeing land because there was two to 10 feet of water covering the forest floor. “Camping” often meant hanging hammocks from trees. Most of the time we established our daily communications to the outside world by setting up the satellite terminal in a floating canoe because there was not land for miles. We found that tying the canoe to one or two trees stabilized the canoe enough to maintain a strong signal. The beeping sound that the phone makes when acquiring a signal made it easy for us to position the terminal in the canoe.

### **Communications for Video, Voice & Data**

Our team used three of Telenor’s GAN applications to update our Website and to communicate with students and teachers, friends and family, the media, and our co-workers back in the United

## CASE STUDY



*Peruvian Tree Frog*

States. We used the 64 kbps data service for uploading photos, videos, and text which we would zip together to reduce the amount of time necessary to upload the files. Second, we used the mobile packet data service (MPDS) to browse the Internet to get weather reports and check e-mail. We also used the MPDS service to communicate with students and teachers using a chat room. This is similar to instant messaging, and allowed us to answer students' questions in real time. We hosted one or two hour-long chats each week, and the \$8 to \$15 that we paid for each chat made this a fun, easy, and cost-effective means to reach thousands of students around the world. These "live" chats generated amazing excitement for the students when they found they were communicating with the exploration team in "real time" from their classroom computers. Online chat from a shelter in Peru

Finally, we used Telenor's voice service to call friends and family, and stay connected with the people manag-

ing the expedition. The ability to call your Mother on her birthday is priceless, and easy to accomplish via Telenor. I am not sure what mattered to my mother more, a call on her birthday, or the knowledge that if we ran into problems, we could call for help. As the expedition leader, the piece of mind that comes with knowing that a phone is available in case of emergence is extremely important.

### **Emergency Communications Via Satellite**

We had a close call toward the end of our trip when Patrick, our film maker, put on his pants in the morning without checking them for insects. We always shake out our clothing in the morning to make sure nothing has crawled in to our boots, shirts, or pants during the night. One morning Patrick forgot to do this, and there was a Wandering Spider in his pants. After he had had his pants on for about 10 minutes he felt a stinging on his leg, he shook his pants, and quickly

stepped on the large spider the tumbled onto the floor. Using our satellite terminal, we called our expedition manager in the United States and had him research the spider on the Internet. We were able to verify that it was a Wandering Spider, and learn that its venom is over 15 times more poisonous than a Black Widow Spider. Our expedition manager provided us the signs and symptoms of a Wandering Spider bite which enabled us to monitor Patrick's condition for several hours and determine that the spider had not in fact injected poison into him. Luckily, this potentially life threatening situation turned out to be a false alarm, but the ability to get immediate additional information from the outside was extremely helpful. Plus, if poison had been released from the spider's fangs, we had the ability to call in a float plane to air lift Patrick to a hospital.

### **Satellite Communications Essential Part of Future Expeditions**

We could not have fulfilled our mission without the ability to communicate from remote locations around the globe, and Telenor equipment and services do a remarkable job of keeping us connected from some of the wildest

## CASE STUDY



places on earth.

Next year we are launching a seven-year program called the Trans-America Expedition. During this project we will educate thousands of students and teachers about the importance of protecting the worlds remaining forest by taking them on “live” expeditions throughout both North and South America. During this program, I will lead teams of scientists, educators, and explorers across South America by canoe and cross North America by dogsled. We will travel over 11,000 miles under our own power through some of the most remote places on earth. We can not imagine undertaking such a massive project without the rugged, reliable service that Telenor provides. **SM**

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FEATURE

# European Satellite Radio – Battle Lines Get Drawn

By Chris Forrester

It was only in February that we covered the European sat-radio scene, embryonic as it is, and suggesting that 2006 might be the ‘year’ for European DARS, and our words were more prescient than we imagined. But much has happened in the past half-year, with some good news and one or two items that are more negative in tone. However, much more is now known about the various would-be broadcasters that we felt compelled to return to the topic.

It is worth remembering that despite the huge, and justifiable, success of satellite radio in North America, Europe is a vastly different kettle of fish. Twenty-odd sovereign nations, at least as many languages, and a strong public broadcasting ethos in each market, let alone the fact that you could fit many of these countries into a corner of Texas, or California, is a portfolio of challenges that neither XM or Sirius had to contend with.

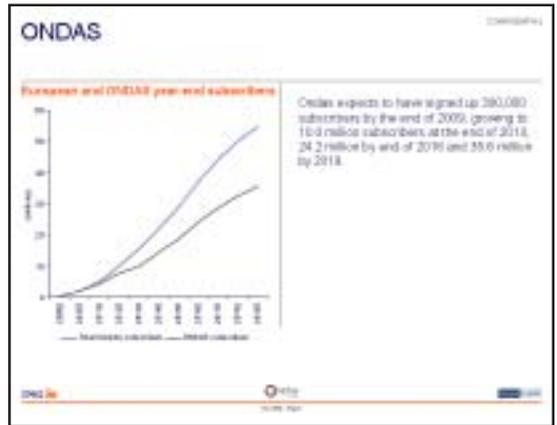
Two names now dominate our European report, both having raised their profile considerably. Washington-based Worldspace must take pride of place, as the older enterprise by far. In May Worldspace said it had been granted terrestrial re-transmission licences in Italy. Along with the “licence” Worldspace is permitted to market its service to pay-radio subscribers. The permit covers the 1479.5-1492 MHz band, and for the operation of the corresponding hybrid satellite/terrestrial network. Worldspace Italia is a majority-owned subsidiary of Worldspace’s

European holding company, Viatis Satellite Radio. Worldspace Italia’s other partner is New Satellite Radio (35%), an Italian company whose primary shareholder is Class Editori, a leading Italian financial, media and broadcast conglomerate based in Milan. Class Editori have similar jv’s with CNBC and Dow Jones. These Italian permissions make a major step forward for satellite radio in Europe.

Worldspace Italia says it anticipates launching Europe’s first satellite digital radio and data service to portable and vehicular devices next year, using one satellite already in orbit, and a terrestrial gap-filler re-transmission network to be rolled out in all major cities throughout Italy. The company intends to start rolling out this complementary network as soon as its installation plan, currently under finalization, is approved by the Ministry. At the service’s maturity, subscribers in Italy will have access to approximately 50 channels of sports, talk and commercial-free music programming. Italy will demand about 120 terrestrial repeaters.

IF Worldspace can get its service on air – and it is a big ‘if’ with its cash fast running out, then this decision effectively bars its rivals from using the spectrum. Worldspace longer-term plans call for a service to be launched in Germany and Spain.

Noah Samara, Chairman/CEO of Worldspace, said in May: “We look forward to working closely with our



partner. Italy is an attractive market for us. Our research shows it to be one of the two top markets for satellite radio in Europe. Worldspace is the sole player using the only harmonized 12.5 MHz spectrum for satellite radio in Europe. We continue to believe that the market for mobile satellite radio service in Europe is larger than that of the United States, where XM and Sirius have been hugely successful. Our strategy has been to roll out a European service on a sequential, country-by-country basis.”

The news, however, did little to lift Worldspace’s share price out of the \$6 doldrums – it has been as high as \$14.75 back in January. Kunal Madhukar of Bear Stearns, who tracks Worldspace closely, said in a May 10 note that while Italy represents a “significant” market opportunity (and it does), “Worldspace is yet to finalise the business model and would require additional financing to fund start-up losses”. He explains that Worldspace’s cash burn rate is currently running at about \$9m-\$12m a month, mostly as a result of its Indian expansion. And even in this area, which is virgin territory for pay-radio, Worldspace’s net additions were lower than expected. This, says the bank, brings their end-of-year estimate to just

# FEATURES

**“Samara is not known as the Houdini of this industry for nothing”**

375,000 subscribers (from 400,000) in India, and with a 1.4% per month churn rate. Worldspace will burn its way through around \$145m this year, which is at the higher end of previous forecasts, of which more in a moment.

Worldspace has also let go Andy Ras Work, its COO since March 2002, and replaces him with a pair of joint-COOs in Greg Armstrong who will oversee sales, customer care, technology and distribution functions, while Alexander “Sandy” Brown will be primarily responsible for new market development activities in Europe, China and other new markets. Brown joins in May (he was most recently CEO of CNBC Asia-Pacific), while Armstrong joined in June from Jupiter Comm’s, where he is EVP/COO.

Worldspace is sitting on cash and cash equivalents of \$47m (at the end of March) and probably less now. It also has, according to its latest FCC filing, “marketable securities” of \$201.6m. It burned through \$27.2m during the first 3 months of the year. Worldspace says it has sufficient cash for “at least” the next 12 months. They admit they will need additional cash to fully launch their business in China and Western Europe and to fund the cost to modify and launch their spare satellite.

In other words, even Worldspace recognises there are a few challenges ahead. You might also think that with a GEO satellite in orbit, and another sitting on the ground awaiting modification, the future would look pretty good for Worldspace. Not so, claims, Celso Azevedo, CEO of Madrid-based Ondas

Media. Azevedo tells us boldly that Worldspace poses no serious threat to his European plans. Moreover, Ondas says that satellite radio in Europe could over time prove to be as big a success as in the USA. In a recent article published by Spain’s El Pais financial newspaper, quoting Eugenio Fontan, VP at Ondas, says that taken over a 10 year period following launch it expects to have attracted more than 30m subscribers. XM in the US launched in 2001 while rival Sirius launched in 2002, and are seen as reaching 20m and 15m subscribers respectively on their 10th anniversaries of service introduction.

Ondas is looking to launch a 70-80 channel system in 2009, and bases its forecasts on a study which shows that Europe has an estimated 238m vehicles on the road (and 190m in its 5 country main markets), compared with 210m in the US, and 470m people, compared with 296m in the US. Ondas has a 304m-target audience in its “principal countries” of operation.

Ondas says it estimates a subscriber charge of some •12 a month. Speaking exclusively to us recently Celso Azevedo said his company will be issuing Requests for Proposals to satellite operators to gauge their interest in a European DARS system. Ondas already has RFPs issued to potential satellite builders. “There’s a lot happening,” said Azevedo, “although the news from the UK is really crazy.” Azevedo was referring to

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the recent UK regulator Ofcom announcement on L-Band (see panel). “It is simply a bad idea. For example, this bandwidth is covered by international agreement from the ITU. Congress in the US decided that the FCC could not auction bands that were allocated internationally, yet the British think they can operate unilaterally. Let’s say that the spectrum being used by SES Astra over the UK, beaming DTH signals into millions of homes, were auctioned by Ofcom. The UK had nothing to do with this bandwidth allocation, because it was internationally agreed to be a recognised Luxembourg filing. Ofcom could auction this band tomorrow, and it would be crazy, a disaster. Yet this is what they are proposing under their current L-Band plans.”

**“Now, seemingly when there is at least one company that is very serious about using the spectrum to some 600m Europeans, the UK seems determined to screw it up.”**

*Celso Azevedo, Ondas*

Azevedo said Ondas was strongly objecting to the Ofcom proposals. “I have not talked to a single satellite operator, or country or interested party, who does not object to these proposals, not a single one,” says Azevedo. He hinted that the only eventual winners in this situation might be the lawyers, inevitably drawn in to argue the merits of users of ITU-authorized spectrum, versus UK-licensed users, whether via satellite or terrestrial, high-power or low-power. “This band was allocated some 15 years ago by the ITU for BSS sound use. Now, seemingly when there is at least one company that is very serious

### Worldspace Italian statement\*

**“WorldSpace Italia S.p.A. has received approval from the Italian Ministry of Communications to launch a subscription satellite radio service in Italy. With this authorization, the Ministry has granted WorldSpace Italia the right to provide a subscription-based satellite radio and data service to consumers in Italy, and to use the frequency band 1479.5-1492 MHz for the operation of the corresponding hybrid satellite/terrestrial network.”**

*\*May 8*

about using the spectrum to some 600m Europeans, the UK seems determined to screw it up. What if every other European country adopts the same procedure? It is a major blunder. How would this decision affect Britain’s neighbours, the French, the Belgians, Dutch and Irish? The whole thing is ridiculous.”

His comments were echoed by the Brussels-based European Satellite Operators Association, which said it was lobbying heavily in an attempt to persuade Ofcom not to see off the L-Band spectrum.

We last spoke to Azevedo a month ago, since when Worldspace has announced its activity in Italy. “It is not a licence to operate,” says Azevedo. “It is a communication from the Italian ministry, and depends on co-ordination from the ITU, and other licence-applications that may be given soon. It is not a licence, and is far away from a licence. But unfortunately our friends at Worldspace tend to ignore this and instead give their own spin to the news. It is far away from a licence, and I could only ask that you be patient for our own news.”

Azevedo says that between now (June) and September this year there will be various news announcements, some

of which will cover financial arrangements, which “are well on track”. He added that the upcoming ‘operational’ RFP which would concentrate on partnerships with a separate operational structure looking at the core business plan.

Meanwhile, the objections to the UK’s plan to auction off its terrestrial L-Band spectrum landed on Ofcom’s doormat ahead of the June 9 deadline. A polite, but firm, objection came from the European Satellite Operators Assoc., via their Satellite Action Plan Regulatory Group (SAP). SAP argued that Ofcom’s proposals would not result in the most efficient use of spectrum, and worse, would raise a “de facto barrier to S-DAB entry in the UK”. Ofcom’s consultation period ended on June 9, and a speedy decision is now expected, certainly by this winter.

The SAP submission argues, “Hybrid satellite-terrestrial systems are ideally positioned to contribute to the development of innovative mobile multimedia services to consumers in Europe, by their ability to achieve unequalled nationwide coverage from their first day of operation. Among the various spectrum opportunities to accommodate such development, considering a wide range of possible technologies and services, the 1452–

# FEATURES

## ONDAS statement, June 1

**“It is not a licence to operate. It is a communication from the Italian ministry, and depends on co-ordination from the ITU, and other licence-applications that may be given soon. It is not a licence, and is far away from a licence.”**

*Celso Azevedo, CEO Ondas*

1492 MHz remains the only ITU allocation harmonised at global level for S-DAB, with the upper 12.5 MHz harmonised in Europe. Indeed, after the commercial success of S-DAB services in North America (with already more than 10 million subscribers in about 5 years of operation), S-DAB services are now developing in Europe on the basis of this allocation.” (read the full Ofcom documents at: [http://www.ofcom.org.uk/media/news/2006/03/nr\\_20060331a](http://www.ofcom.org.uk/media/news/2006/03/nr_20060331a)) and (<http://www.ofcom.org.uk/consult/condocs/1452-1492/>).

Worldspace was another strong objector, arguing strongly that the spectrum under review should be reserved for satellite use, and if auctions are to be considered then Ofcom should invite initiatives aimed at development of an S-DAB service in the UK. “[Worldspace} is currently developing SDAB services in Europe on the basis of the upper 12.5 MHz of the 1452 – 1492 MHz spectrum allocation, and considers that the UK market represents a major opportunity that we look forward to developing as soon as possible, in partnership with other UK-based stakeholders. We commend and fully agree with the timeframe offered by Ofcom to award spectrum rights in L

band, which could pave the way for the commercial launch of a UK satellite radio service in the early 2008 timeframe, following the deployment of the estimated 130 terrestrial gap-filler network necessary to complement the satellite network in urban areas.”

Ondas Media was another objector, and told Ofcom it is taking steps to raise the •1.6bn needed to put its plans into operation. Saying it has “grave reservations” about the Ofcom scheme, and states the plan is counter to a wider European responsibility. “Ofcom’s

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# FEATURES

## Ofcom's 1452-1492 MHz plans

Ofcom made a 'stakeholder' presentation in London on May 22nd, and proposes selling off 40 MHz of spectrum, with "incremental agreements already in place for broadcasting T-DAB use if required", with Ofcom proposing to award the spectrum without restrictions on use. Ofcom says the initial licence would be for a 15-year period, determined initially by auction and thereafter by fees based on either cost recovery or what Ofcom calls "Administered Incentive Pricing". The simultaneous award of all 40MHz of spectrum licences would be tradable, and spectrum packages and auctions can be designed to give bidders flexibility, says Ofcom.

Ofcom admits that the top 12.5 MHz of the available spectrum has an element of uncertainty over its terrestrial use. The Ofcom consultation period closes on June 8, and sources suggest that objections have flowed into Ofcom's London office. The auction is proposed for Q1/2007 (probably in March), with a statement published this coming autumn ahead of the auction process. Current users operating within the band must vacate their frequencies by March 31st next year.

Ofcom supplied a comprehensive list of the technologies that could be used within the released spectrum, including DVB-H, T-DMB, S-DMB, DAB-IP, ISDB-T, MediaFlo, S-DAB, T-DAB, WiMAX, UMTS-TDD and 802.20-based services. (Readers wanting to know more can visit the Ofcom website at <http://www.ofcom.org.uk/consult/condocs/1452-1492/> )

## Ofcom's view of UK wireless opportunities

	Technology	Channel Width
Mobile multimedia	DVB-H	5, 6, 7 or 8 MHz
	T-DMB	1.7 MHz
	S-DMB	1.7 MHz
	DAB-IP	1.7 MHz
	ISDB-T	6, 7 or 8 MHz
Mobile audio	MediaFLO	5, 6, 7 or 8 MHz
	S-DAB	12.5 MHz
Broadband wireless	T-DAB	1.7 MHz
	WiMAX	3, 5, 5 or 7 MHz
	UMTS TDD	10 MHz
PMSE	802.20	1.25, 5 and 10 MHz
	Wireless cameras	10MHz

Ofcom cited assorted ITU Resolution 528 agreements along with EU (2003 decision) and the CEPT Maastricht 2002 Special Arrangements and ITU International Radio Regulations, as providing authority for the EU to act unilaterally. "The two arrangements that are of particular relevance to this award are the Maastricht Plan and ITU radio regulations," says Ofcom. Ofcom admits that it has to provide interference protection for satellite services [which] potentially constrain terrestrial use [of the proposed frequencies] in the UK. IT quotes 5 filings in existence and a further 120 filings "at an advanced publication stage, in the "top 12.5MHz" of the spectrum on offer. Most of the UK, because of these limitations, is rated to have "low" transmission power permission and using "short range applications".

duties include promoting competition and encouraging investment and innovation. Ofcom is also obliged to contribute to the development of the European internal market, the promotion of the interests of European citizens, the encouragement of service and network interoperability, and suitable standards for freedom of choice for consumers. These Community requirements are paramount as they override Ofcom's obligations with regard to spectrum management, where such obligations are in conflict with Community requirements. Because Ofcom's proposed

actions are in conflict with Community requirements, Ofcom should reconsider its proposals."

In other words we are in for a few months of uncertainty as far as the UK

is concerned. Meanwhile, both Worldspace and Ondas Media are pursuing their plans. It is going to be an interesting summer.

SM



London-based **Chris Forrester**, a well-known broadcasting journalist is the Editor for Europe, Middle East and Africa for SATMAGAZINE. He reports on all aspects of the industry with special emphasis on content, the business of television and emerging technologies. He has a unique knowledge of the Middle East broadcasting scene, having interviewed at length the operational heads of each of the main channels and pay-TV platforms. He can be reached at [chrisforrester@compuserve.com](mailto:chrisforrester@compuserve.com)

# FEATURES

## New Services - Satellite Bandwidth on Demand

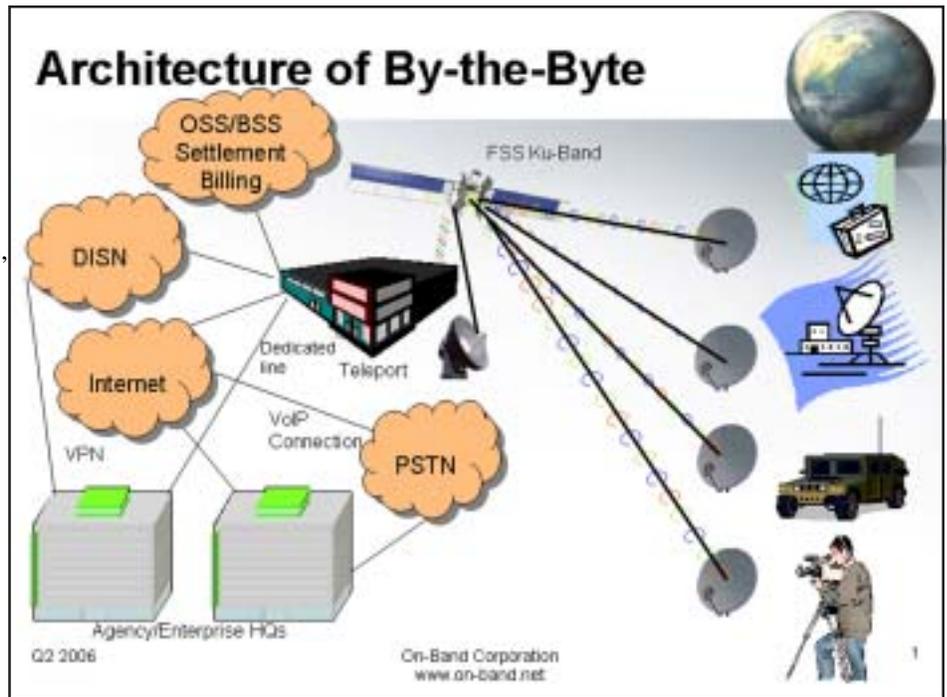
By Bernardo Schneiderman

The idea to have the option to obtain satellite bandwidth on demand for certain applications has been a long-standing requirement for various segments in the market as broadcast, emergency and disaster communications, business continuity and others.

Now with IP via Satellite the solution to provide bandwidth on demand in the global market has become feasible. One of the companies that are introducing this new concept is On-Band.

On-Band provides IP-based bandwidth on-demand and dedicated satellite network services. The company has VSAT hubs located in Sylmar, California near Los Angeles and in the outskirts of Cologne, Germany. The hubs are at Teleports with major connectivity to the Internet and to private lines to various customer locations. The services include network design, implementation and management. The services support VSAT, fly-away and other small aperture satellite terminals. VSAT terminals are usually deployed on the roof or next to offices or stores while fly-aways are packages of antennas and equipment used by Government and Broadcast customers that are packed in shipping cases that can be sent as baggage on a commercial airline.

On-Band's services are offered through a network of Resellers including service providers, equipment manufac-



turers and system integrators who deliver the service to the end user and may offer sales, support and maintenance of the terminals as well.

By-the-Byte<sup>SM</sup> is On-Band's global shared-use IP service that is delivered via On-Band's iDirect hubs at satellite teleports located in strategic parts of the world. On-Band arranges for space segment and terrestrial delivery circuits to the Internet, as necessary.

What Make up By-the-Byte Services

- High-Speed Data/Internet access to portable terminals on shared channels of 2x1Mbps

- On-Demand Availability (no bookings required)
- Global Roaming (anyplace, anytime) with automatically reporting, billing and clearing
- Usage-Based Billing by volume of data transmitted -Monthly minimum and then by the Megabyte

For a small fixed monthly fee that includes a minimum monthly data usage volume (varying with the type of plan chosen), customers of the service are able to access any of On-Band's committed space segment resources. These services are connected to the Internet backbone and client only is paying for the data they use – On-Band's "By-the-Byte<sup>SM</sup>" service. The

# FEATURES



business model is similar to that employed by many mobile phone operators with a base fee which includes some use of the network with additional use being charges on an “as used” basis.

The On-Band bandwidth on-demand, By-the-Byte, service is targeted at customers who require satellite-based delivery of mission-critical services on demand, from fixed or frequently moved sites. On-Band believes that this service satisfies certain segments of the market, particularly military, homeland security and broadcast customers, in establishing initial communications facilities from remote locations. In addition, other segments, such as insurance companies, financial institutions and large corporations use the service for temporary communications or disaster recovery and continuity of business.

During 2005, the company provided services in the Pacific Ocean Region to a United States Government customer, and supported Cisco Systems, FEMA, the Red Cross and other agencies during the Hurricane Katrina relief efforts in Louisiana and Mississippi. Additionally, On-Band also tested with major international broadcasters for coordination and support communications including telephone, e-mail and file transfer from remote news gathering sites.

One of the key aspects of the By-the-Byte service is the user’s ability to roam between satellites and regions without a requirement to schedule or book capacity, paying only the monthly fee and for any additional bandwidth used. This is achieved through investments On-Band has made in customizing its proprietary usage and billing system

software. This software enables the On-Band network control center to automatically identify and authorize remote terminals registered for the service, letting users log on or off at will. If a

terminal is registered as a transportable unit, (including auto-deploy systems such as Swe-Dish, NorSat, AVL or Motosat), the user is also free to roam anywhere in the coverage areas of the multiple By-the-Byte<sup>SM</sup> footprints as authorized by the satellite operators.

## Applications for On-Band Services

- **Continuity of Business**
  - By-the-Byte Backup for primary terrestrial services
  - Low monthly charges when used as insurance for the network
  - A major insurance company is using the service now
- **First Responders**
  - On-the-Go on the way to disasters for planning and coordination
  - By-the-Byte, By-the-Day and By-the-Month Before, during and after disasters
  - Cisco, FEMA, various police and other used the service after Katrina
- **Broadcasters**
  - On-the-Go on the way to SNG or remote events
  - By-the-Byte, By-the-Day and By-the-Month Before, during and after SNG or remote events
- **Government**
  - On-the-Go for on the move requirements
  - By-the-Byte, By-the-Day and By-the-Month Before, during and after remote events
- **Enterprise**
  - On-the-Go for on the move requirements
  - By-the-Byte, By-the-Day and By-the-Month Before, during and after remote events.
  - Aerospace/Defense Contractors are using the service to service airplanes down in the field

On-Band has established a standard specification for user-supplied remote terminal modem/antenna/RF combinations which are able to support By-the-Byte<sup>SM</sup> service of 1 Mbps inbound (to the hub) and 2 Mbps outbound (to the remote) anywhere within defined service areas. The company’s services are divided into two areas – Green where a standardized 1.8 meter terminal can be used and Blue where a 1.2 meter approved antenna system can be deployed. Smaller antennas have also been used on the system in various locations with the “hotter” satellite footprints.

Satellite Bandwidth on Demand will be expanding during the next years with the Satcom on the move terminal providing solutions for applications that are critical for Homeland Security and Satellite News Gathering teams. **SM**



**Bernardo Schneiderman** has over 20 years of experience in Satellite Communications and is the President of Telematics Business Consultants based in Irvine, CA. He can be reached at [bernardo@tbc-telematics.com](mailto:bernardo@tbc-telematics.com).

## VIEWPOINT

# ISCe 2006 Insights

**By Jimmy Schaeffler**  
Chairman, The Carmel Group

Eleven years ago, at The Carmel Group's inaugural Five Burning Questions conference in southern CA, an anonymous attendee stated a "law" that has since proved itself repeatedly: If you do not attend certain conferences regularly (even if you read the trades and talk regularly to peers), you will remain at least six months behind the latest industry developments.

That maxim proved itself yet again June 13, when 23 top-level industry representatives from Silicon Valley, Hollywood, Wall Street, Washington, DC, Denver's cable and satellite communities (to name but a few) — and many points in between — gathered in San Diego for the 11th Annual Five Burning Questions event, as part of the 5th annual ISCe conference, held at San Diego's Mission Bay Hilton Hotel.

Sessions ranged from the trademark CEO session at day's end, to those covering Content, Internet Protocol TV (IPTV), Broadband and Advanced Services. The overall ISCe 2006 show focused on military/government telecom applications, as well as enterprise developments. All were woven together by a "hybrid solutions" metric that also structured The Carmel Group's full-day track (covering consumer entertainment products and services). Within that consumer entertainment track, cable, telco, satellite and even electric utility operators and vendors were highlighted.

Content session panelists included The Outdoor Channel's CEO Andy Dale;



**Among the highlights of ISCe 2006 were the annual ISCe awards presented to leading companies such as Hughes Network Systems, JSAT and a Lifetime Achievement Award for Joseph Clayton (not in picture).**

USDTV's CEO Steve Lindsley; and Todd Goodnight, Sirius Satellite Radio's senior director of business alliances, product management, for the consumer electronics division. The author served as moderator. The major takeaway was that mobile content is one of two key trends that has morphed toward "Killer Application" status.

IPTV session panelists were Microsoft's director, marketing and communications – TV Division, Ed Graczyk; SES Americom's president, media solutions, Bryan McGuirk; Brad Siebert, Intelsat's director of business development; NDS' VP, market development, Ian Tapp; and Jeff Van Cura, Alcatel N.A.'s senior director, strategic solutions. As moderator, NYC satellite

and telecom financier, Armand Musey, from Near Earth LLC, extracted numerous key points from these five information-packed operators and vendors. Among those points was that the other "Killer App" among today's multichannel hybrid operators is IPTV itself, and specifically what the telephone companies do with it as they enter the competitive field filled by cable and satellite operators. Nonetheless, IPTV systems integration continues as a major challenge.

Afternoon session panelists included HughesNet's GM, Paul Gaske; SES Americom's Andreas Georghiou, chief commercial officer; Sling Media's VP, market development, Jeremy Toeman; and Akimbo's CEO, Josh

# VIEWPOINT



Goldman. Another respected industry veteran, Harry Thibedeau, both moderated and reported a few recent developments from his company, the National Rural Telecom Coop (NRTC), where he serves as manager, industry and technical affairs. The Broadband panel audience left this session understanding that two-way internet broadband opportunities are expanding rapidly. These choices include the ability of providers and consumers to personalize the content they deliver and receive, how they receive it, and where and when. Infrastructure providers such as SES and Intelsat are building and launching ever-more-flexible satellites and payloads (e.g., more spot beams and new spectrums, such as Ka-Band). In addition, the growth of broadband allows users such as Sling Media and Akimbo more choices and business models to work from, including having their applications delivered by cable, satellite and telco operators,

An advertisement for Skynet IT. The background is a red-tinted world map with a grid overlay. In the top right corner, there is a satellite in orbit. The main text reads: "Skynet IT executive clients stay competitive with superior IP networks in high-growth markets like China. Do you?" Below this, it says: "Hundreds of the world's most successful organizations trust Skynet to help them stay on top." Contact information is provided: "Call or email info@loralskynet.com today to put Skynet expertise and experience to work for your organization." The address is "NORTH AMERICA, Bedminster, NJ (HQ), +1.908.470.2300". The logo for "LORAL SKYNET" is at the bottom right, with the website "www.ThinkSkynet.com" below it. A small copyright notice at the bottom left reads "© 2006 Loral Skynet, A Loral Space & Communications Company".

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# VIEWPOINT



“Innovator of the Year”; Toru Mizoguchi, from Japan’s JSAT, accepted his company’s “Leadership Award”; and the “2006 Lifetime Achievement Award” was presented to Sirius Satellite Radio’s Joe Clayton. Rounding out the evening were comments by keynote speaker Ed Horowitz, SES Americom CEO. Of special note, Horowitz highlighted the need for more industry innovation and for the U.S. — and the companies that make up the satellite and related industries’ cores — to push the U.S. government to create easier access to the U.S. for youthful talented immigrants (emphasis supplied). Horowitz concluded with his own new maxim, “Immigration laws must be constructed to allow the brightest students, teachers, engineers and scientists ready-access to this country. We need them. We always have.” **SM**

as well as installed into those ops’ set-top boxes.

Alan Young, CTO, SES Americom; Steve Kosac, VP, broadcast sales, Scientific Atlanta; Steve Condon, VP, marketing, Entriq; and Molly Freeland, manager, market intelligence, Intelsat, were the four panelists who made up the Advanced Services panel. Moderating duties were professionally maintained by veteran industry consultant and former PanAmSat exec, Steve Symonds. Worth identifying from this panel was the message that providing advanced services cost-effectively today requires careful attention to the assembly of a complex eco-system of inter-operable hardware, software, and middleware, which ideally supports the entire range of cross-platform services (e.g., IPTV, broadband PC, and mobile).

The CEO panel featured Movielink CEO (and former DirecTV co-founder), Jim Ramo; MovieBeam CEO Tres Izzard; and Buzztime president, Tyrone Lam. The session was also moderated by the

author. Among many subtle nuances, the key takeaways from this session were the intense competitiveness of today’s pay TV/multichannel biz, as well as the complexity involved in dealing with the daily and long-term technology, financing, marketing, legal, regulatory, and many other areas. All three executives mentioned the challenge of obtaining traffic for and an awareness of their new services.

Of additional note was the Wednesday night ISCe Awards Dinner, wherein HughesNet’s Pradman Kaul accepted the 2006 company honor as



Jimmy Schaeffler is the chairman and chief service officer for The Carmel Group, an eleven-year-old Carmel-by-the-Sea-based consultancy, publisher and conference organizer that focuses on the global telecom and multichannel industries. He can be reached at [jimmy@carmelgroup.com](mailto:jimmy@carmelgroup.com) and (831) 643 2222.



## MARKET INTELLIGENCE

# Global Satellite Industry Drives Disaster-Recovery Initiative in Support of Emergency Managers

By David Hartshorn

Secretary General  
GVF

**GVF Co-ordinates Program Involving Installation Support, Streamlined Regulations, and Emergency Notifications for Disaster Recovery Services**

In the aftermath of the recent earthquake in Indonesia – and one week following the start of hurricane season in the Gulf of Mexico – the global satellite communications industry, in co-ordination with the international emergency-management sector, has developed a comprehensive global programme that facilitates effective provision of fixed and mobile satellite solutions to address natural and man-made disasters.

The global disaster-recovery programme is being co-ordinated by GVF, the non-profit association of the international satellite communications sector, and it includes complimentary provision of four vital services:

- Access for emergency managers to the GVF Certified VSAT Installer Database;
- Delivery of VSAT Installation Training to United Nations aid-agency missions;
- Provision of GVF Emergency Notifications for satellite solutions; and
- Consultation on a UN disaster-recovery regime that eases regulatory barriers.

The versatility of fixed and mobile

satellite communications has long been recognised as effective for use in disaster relief and mitigation. But as a result of recent natural and man-made disasters in Indonesia, Pakistan, Sudan, the U.S., and elsewhere, the entire spectrum of emergency-management stakeholders has begun coordinating with GVF to optimize delivery of satellite-based services for humanitarian and aid agencies, the United Nations (UN), non-governmental organizations, governments, and others.

As a focal point for the initiative, GVF has developed an online Emergency Management Portal at [www.gvf.org](http://www.gvf.org) that provides the disaster-recovery community with free access to critical information and updates on a wide range of satellite solutions, including the following:

- The GVF-Certified Installer Database: Contact details for hundreds of GVF-Certified VSAT Installers are now available to the Emergency Management sector via [www.gvf.org](http://www.gvf.org). These technicians, all of whom have completed the GVF's rigorous Certification Program, are available to deploy satellite systems in every major region of the world. The GVF Certification Program has been endorsed by the International Association of Emergency Managers (IAEM) and the Satellite Users Interference Reduction

Group (SUIRG), and the satellite industry has begun requiring installers to complete the training.

- State-of-the-Art Technology: Direct and immediate access to the world's leading suppliers of satellite-based emergency-management systems and services is provided via an online One Stop Shop at [www.gvf.org](http://www.gvf.org). The GVF Members, which include 180 companies from more than 80 nations, provide the entire range of satellite solutions: Bandwidth, mobile systems, VSAT networks and equipment, fly-aways, ruggedised terminals, integration and installation, consulting, legal services, and more. GVF also posts emergency notices to the global industry for disaster-recovery requirements.

- Effective Regulation: Regulations often inhibit or prevent the industry's ability to rapidly provide satellite communications during and after disasters. To address this issue, the UN has co-ordinated the development of the GVF-endorsed Tampere Convention, which is designed to enable expedited use of satellite and other types of emergency communications within the framework of international humanitarian assistance. GVF, which has co-ordinated closely with the UN on the Tampere Convention for nearly a decade, is providing

## MARKET INTELLIGENCE

consultative services on how the process works and is promoting its use by governments, relief agencies and industry – most recently during the UN’s International Conference on Emergency Communications ([www.ICEC2006.com](http://www.ICEC2006.com)) held last week on 18-20 June in Tampere, Finland.

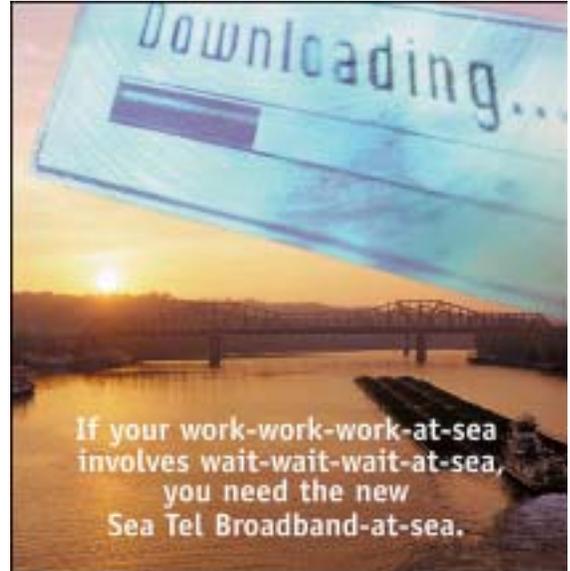
As part of the global disaster-recovery initiative, the association will be holding high-level Summits for emergency managers, who will meet satellite-industry leaders and learn how to take advantage of state-of-the-art systems and services. Two major GVF emergency-management events are scheduled for 2006; the first will be held in conjunction with the International Association of Emergency Managers’ Annual Conference and Emergency Management and Homeland Security EXPO (see EMEX 2006 at [www.iaem.com](http://www.iaem.com)) in Orlando, Florida on 12-15 Nov. 2006. The “GVF Emergency Management Communications Symposium” will provide state, local and Federal professionals with the information tools necessary to build communications into their operational plans. The GVF contact for this event is John Feneley, the GVF’s Canada Correspondent (Tel: +1 514 684 7026, [jfeneley@allstream.net](mailto:jfeneley@allstream.net)).

Two weeks later, GVF and JD Events, the organizers of SATCON 2006, are collaborating on the 8th Annual GVF Satellite Summit, which will be held on 28 November at the Omni Berkshire Place Hotel in New York City... the day immediately preceding the Satellite Application Technology Conference Expo (SATCON). This year’s pre-show event at SATCON builds upon the dialogue established during the 2005 GVF Satellite Summit, where government officials, executives of humanitarian & aid agencies, and telecom service providers identified key priorities

needed to advance the delivery of satellite-based disaster recovery and emergency management solutions. Entitled “Satellite-Based Disaster Recovery: Redefining the Critical Mission”, the 2006 high-level Summit is being endorsed by the International Association of Emergency Managers (IAEM), which represents more than 3,000 emergency-management professionals worldwide.

The Summit will address the increasing demand from these key sectors for satellite systems and services and examine how the industry can more effectively meet user requirements. The GVF Summit will include leading satellite users as well as operators, manufacturers, and analysts in hard-hitting discussions, revealing the latest commercial and market-access opportunities impacting today’s international satellite business.

Since last year’s tsunami in Asia, more than 300,000 people have died from natural and man-made disasters. The relevance of satellite communications to emergency managers throughout the humanitarian and aid sectors has never been higher, nor has there ever been greater recognition of the role to be played by the satellite industry. To join this important initiative contact: David Hartshorn, GVF Secretary General, Tel: +1 202 390 1885 e-mail: [david.hartshorn@gvf.org](mailto:david.hartshorn@gvf.org)



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Compact and rugged, the 4003 stands up to all conditions.

#### Airtime Cost Comparison

	WaveCall 4003	Internet 77	Internet 88
Download speed	812 Mbps	64 Mbps	64 Mbps
1 Month Download	256 mb	2,080 mb	2,080 mb
Cost/Mb	~1	~9,000	~9,000
Cost/mb	~1,000	~180,000	~18,700

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# STOCK MONITOR

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Company Name	Symbol	Price (June 30)	52-wk Range
APT SATELLITE	<a href="#">ATS</a>	1.40	1.12 - 2.10
ANDREW CORP	<a href="#">ANDW</a>	8.86	8.68 - 14.25
ASIA SATELLITE TELECOMMUNICATIONS (ASIASAT)	<a href="#">SAT</a>	16.85	15.91 - 20.55
BALL CORP	<a href="#">BLL</a>	37.04	34.16 - 45.00
BOEING CO	<a href="#">BA</a>	81.91	62.01 - 89.58
BRITISH SKY ADS	<a href="#">BSY</a>	42.49	33.59 - 42.96
CALAMP CORP	<a href="#">CAMP</a>	8.89	7.11 - 13.90
C-COM SATELLITE SYSTEMS INC.	<a href="#">CMI.V</a>	0.38	0.23 - 0.56
COM DEV INTL LTD	<a href="#">CDV.TO</a>	4.50	1.67 - 4.65
COMTECH TELECOM	<a href="#">CMTL</a>	29.27	25.67 - 45.65
THE DIRECTV GROUP	<a href="#">DTV</a>	16.50	13.17 - 18.04
ECHOSTAR COMMUNICATIONS	<a href="#">DISH</a>	30.81	24.44 - 32.41
FREQUENCY ELECTRONICS INC	<a href="#">FEI</a>	12.98	9.90 - 15.00
GLOBECOMM SYS INC	<a href="#">GCOM</a>	7.45	5.77 - 8.44
HARRIS CORP	<a href="#">HRS</a>	41.51	30.91 - 49.78
HONEYWELL INTL INC	<a href="#">HON</a>	40.30	32.68 - 44.48
INTL DATACASTING CORPORATION	<a href="#">IDC.TO</a>	0.195	0.14 - 0.31
INTEGRAL SYSTEMS	<a href="#">ISYS</a>	26.83	18.63 - 29.74
KVH INDS INC	<a href="#">KVHI</a>	11.66	8.77 - 12.08
L-3 COMM HLDGS INC	<a href="#">LLL</a>	75.42	70.64 - 88.50
LOCKHEED MARTIN CORP	<a href="#">LMT</a>	71.74	58.50 - 77.95
NEWS CORP	<a href="#">NWS</a>	20.18	14.76 - 20.57
NORSAT INTL INC	<a href="#">NSATF.OB</a>	0.64	0.60 - 1.47
NTL INCORPORATED	<a href="#">NTLI</a>	24.90	20.75 - 31.00
ORBITAL SCIENCES CP	<a href="#">ORB</a>	16.14	9.83 - 16.19
QUALCOMM INC	<a href="#">QCOM</a>	40.07	32.98 - 53.01
RADYNE CORPORATION	<a href="#">RADN</a>	11.38	8.59 - 17.85
SCIENTIFIC ATLANTA	<a href="#">SFA</a>	42.98	26.73 - 43.90
SIRIUS SATELLITE RADIO	<a href="#">SIRI</a>	4.75	3.60 - 7.98
SES GLOBAL FDR	<a href="#">SDS.F</a>	12.45	-
TRIMBLE NAVIGATION	<a href="#">TRMB</a>	44.64	26.64 - 49.86
WORLDSPACE INC	<a href="#">WRSP</a>	3.58	3.12 - 26.00
VIASAT INC	<a href="#">VSAT</a>	25.68	20.12 - 30.83
XM SATELLITE RADIO	<a href="#">XMSR</a>	14.65	12.77 - 37.31

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