

*Worldwide Satellite Magazine*

*October 2014*

# *SatMagazine*

## *The Commercial Launch Sector and more...*

*A Four Payload Push*

*The Future Will Be Electric*

*SatBroadcasting™—Conference Fever*

### *Executive Spotlights*

*John J. Stolte of ORBCOMM*

*Curt Blake of Spaceflight, Inc.*

*Chris McCormick of Moog Space & Defense Group*

*How Satellites Will Fuel The Next Wave of Journalism*

*New Export Controls On Satellites*

*Major Moves for Maju Nusa Sdn Bhd*

*Energy Sector Communications*

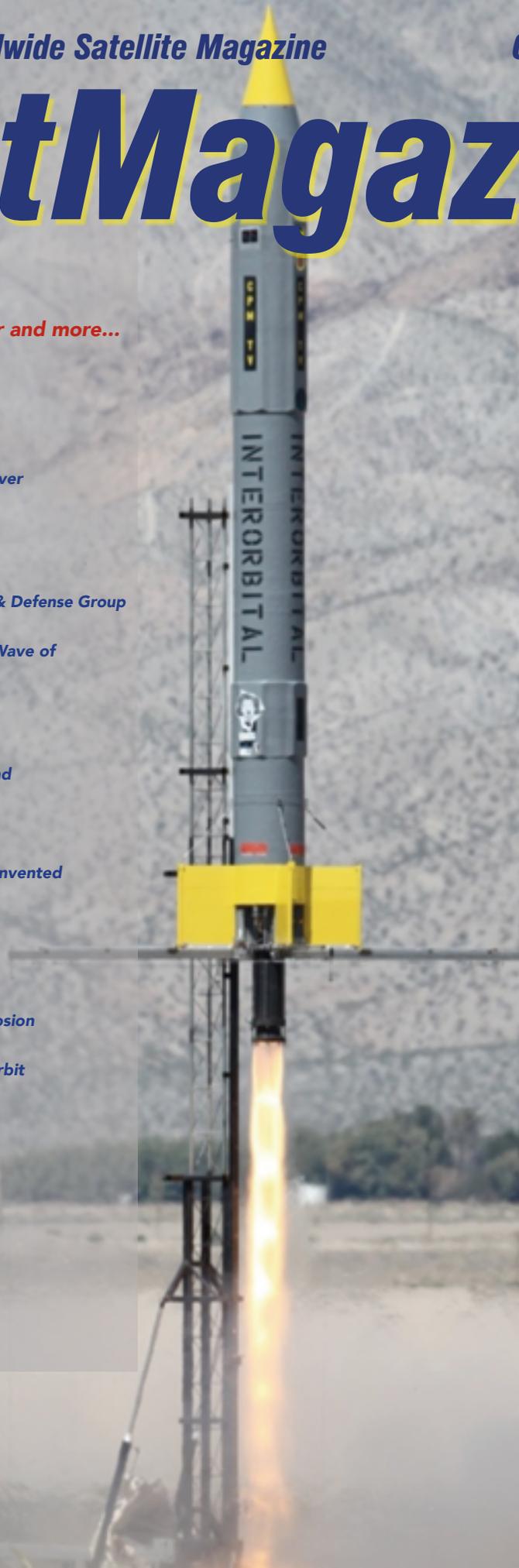
*New CubeSat Release Mechanism Invented*

*Proba-1 Fit and Well*

*Who Do You Work For?*

*The Coming 4K Mobile Video Explosion*

*Irwin Leads SATCON Into a New Orbit*



# SatMagazine

October 2014

## Publishing Operations

Silvano Payne, Publisher + Writer  
Hartley G. Lesser, Editorial Director  
Pattie Waldt, Executive Editor  
Jill Durfee, Sales Director, Editorial Assistant  
Emily Constance, Reporter  
Simon Payne, Development Director  
Donald McGee, Production Manager  
Dan Makinster, Technical Advisor

## Senior Contributors

Mike Antonovich, ATEME  
Tony Bardo, Hughes  
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Chris Forrester, Broadgate Publications  
Karl Fuchs, iDirect Government Services  
Bob Gough, Carrick Communications  
Jos Heyman, TIROS Space Information  
Carlos Placido, Placido Consulting  
Giles Peeters, Track24 Defence  
Bert Sadtler, Boxwood Executive Search  
Koen Willems, Newtec

## Authors

Emily Constance  
Gregory Emsellem  
Chris Forrester  
Hartley Lesser  
Andrew Matlock  
Randa Milliron  
Vince Onuigbo  
Brandt Pasco  
Jose Del Rosario  
Bert Sadtler  
Pattie Waldt  
Kyra Wiens

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SatNews Publishers  
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Interorbital Systems' CPM TV rocket in flight.  
Image courtesy of IOS.



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# InfoBeam

## A big deal about a small satellite



**Tyvak Nano-Satellite Systems, Inc., developer of nanosatellites and turnkey SmallSat solutions, has announced the successful completion of the development of the Cubesat Proximity Operations Demonstration (CPOD) vehicles and has officially received the approval to continue into the Vehicle Assembly Integration and Testing (AI&T) Phase.**

After undergoing multiple rigorous program reviews, the management team of the Small Spacecraft Technology Program (SSTP)

at Ames Research Center, Moffett Field, California, determined that the Tyvak's team is actively retiring all the foreseeable risks and is demonstrating the required technical and programmatic capabilities to successfully complete this phase of the project. SSTP managers also recognized that with Tyvak's continued success, the team will be in an excellent position to proceed with the final phase of the project leading to the on orbit operations.

Dr. Marco Villa, Tyvak's President and Chief Operating Officer, said, "Tyvak has established itself as a leader in the nanosats segment by recognition of its advanced technical capabilities, but it is great to also be acknowledged for our attentiveness and diligence towards program management and mission assurance."

With responsibility over the entire mission, from subsystems' design to operations, the company said they remain on-track with the original schedule and to expect a full vehicle integrated by the end of the year with Flight Readiness Review as early as May 2015.

The Cubesat Proximity Operations Demonstration (CPOD) mission will demonstrate rendezvous, proximity operations and docking using two three-unit (3U) cubesats. This mission will validate and characterize several miniature, low-power avionics technologies applicable to future NASA projects. The CPOD project is led by Tyvak Nano-Satellite Systems, Inc. of Irvine, California with funding from NASA's Small Spacecraft Technology Program. Learn more here.

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

## Two climb with fervor via Ariane 5



**Arianespace successfully launched two telecommunications satellites, MEASAT-3b for the Malaysian operator MEASAT, and OPTUS 10 for the Australian operator OPTUS.**

The launch was performed by an Ariane 5 rocket at 07:05 pm (local time) on September 25th from the Guiana Space Center in French Guiana.

The MEASAT-3b satellite is the third satellite orbited by Arianespace for the operator MEASAT Global, following Measat-1 and Measat-2 in January and November of 1996. The new satellite will offer telecommunications and direct TV broadcast services for Malaysia, India, Indonesia and Australia.



Artistic rendition of the MEASAT-3b satellite.

The OPTUS 10 satellite, which will provide direct TV broadcast, Internet, telephony and data transmission services for Australia, New Zealand and the Antarctic region, is the sixth satellite orbited by Arianespace for the Australian operator, the most recent being in 2009. Except for one satellite, Arianespace has launched the entire active OPTUS fleet.

Since being founded in 1980, Arianespace has boosted into Geostationary Transfer Orbit (GTO) two-thirds of the commercial geostationary satellites launched for the Asia-Pacific region. That represents 80 contracts already signed, including ten more satellites to be launched for Australia, India, Indonesia, Japan and South Korea.



Artistic rendition of the OPTUS 10 satellite. Image courtesy of SSL.

Shortly after the announcement that the satellites had been injected into orbit, Arianespace Chairman and CEO Stéphane Israël said, "Arianespace is very proud to have orbited two new satellites for operators in the Asia-Pacific, a region where we have always been very successful as shown by our market share, which now exceeds 60 percent. We are also pleased as this launch not only marks the 61st success in a row for Ariane 5, but also the 100th consecutive successful launch of a geostationary satellite in less than 12 years.

"I would like to thank our two customers, MEASAT and OPTUS, for continuing to entrust us with their satellites. I would also like to thank the French export credit agency, COFACE, which played a key role in financing the MEASAT-3b satellite, to the benefit of our customer, MEASAT, as well as the space industry in France and more largely in Europe.

"Finally, thanks to all the partners of this new success: Airbus Defence and Space, prime contractor of Ariane 5, the industrials working at the French Guiana Space Center, CNES-CSG, and of course the entire Arianespace team."

The Arianespace infosite is located at <http://www.arianespace.com/>

# InfoBeam

## China's "secret-experimental" satellite launched

**There is industry speculation that this series of Chinese satellites could be part of that nation's constellation of early warning satellites, most equipped with infrared sensors.**



A Long March-2C carrier rocket carrying the Shijian-11-07 experimental satellite launched from the Jiuquan Satellite Launch Center in Jiuquan, located in northwest China's Gansu Province, on September 28, 2014.

The first Shijian-11 satellite was launched on November 12, 2009, by a Long March-2C from the Jiuquan Satellite Launch Center.

The satellite, which was developed by China Spacesat Co. Ltd under the China Aerospace Science and Technology Corporation, will be used to conduct scientific experiments in space. This was the 194th flight of the Long March rocket series.

Shijian' means 'Practice,' and this series of satellites have been used in a variety of configurations and missions for scientific research and technological experiments.

## Attacking SATCOM industry roadblocks—Colloquium enlightenment



**The regulatory and legal aspects of the SATCOM industry are a miasma of sometimes contradictory information, processes and requirements that are clouded in legalese and roadblocks constructed by various agencies that can mislead, delay and otherwise obstruct business needs.**

In cooperation with Mansat and Dentons US LLP, SatNews is going to present a highly informative, one-day Space and Satellite Regulatory Colloquium that will be focused on emerging space law and the myriad regulatory issues that face the U.S. and international government administrations.

To be conducted at the W Washington Hotel in Washington D.C., the event is scheduled to start on 7:30 a.m. on October 23, 2014, with a breakfast, lunch and reception all provided to attendees.

The Colloquium will be in session until 5:30 p.m. At the close of the day, the reception will be held at the rooftop garden venue of the hotel.

To register for this timely and crucially-needed event, please visit

<http://www.satnews.com/space14.php>

## Presenting Astra Connect to German subscribers



**SES Broadband Services (SBBS) has expanded their partnership with the Internet Service Provider ORBITCOM to include the delivery of Astra Connect for communities in Germany.**

The new deal follows ORBITCOM's successful delivery of the Astra Connect service, which provides broadband Internet to individual households and businesses via a satellite dish.

The partnership, which has been in place since April, has now been extended to

include the marketing of Astra Connect for communities.

The solution uses a single antenna to provide an entire community with a satellite broadband connection, which is then distributed via a local network infrastructure, such as Wi-Fi. Users served by the networks will be able to browse the different packages offered online and then place orders through a dedicated website and webshop set up by ORBITCOM.

The ISP will also be responsible for the delivery of the equipment and customer support.

"Our Astra Connect for communities service provides a much needed solution for people who cannot be supplied with a high-speed

Internet connection via the terrestrial infrastructure," said Patrick Biewer, the Managing Director of SES Broadband Services.

"By expanding our partnership with ORBITCOM, we are able to extend and accelerate the rollout of this solution to villages and communities in Germany," Biewer added.

"With Astra Connect for communities, we can reach 100 percent of households where broadband access is insufficient. It is a quick and inexpensive solution for underserved communities," said Andreas Schmidt, the CEO of ORBITCOM.

For more information on Astra Connect, please visit <http://www.astraconnect.com>

## Perhaps there's more payTV In Brazil's future

**Being reported by Interactive Intelligence, Brazilian regional telecoms service provider Sercomtel is considering plans to launch a payTV service via satellite technology for DTH.**

It is understood the operator is also mulling over the introduction of IPTV services in its concession area in Parana state.

Sercomtel has been forced to close its MMDS operation in Brazil to comply with Anatel's wishes to use the 2.5GHz band for the

provision of 4G Long Term Evolution (LTE) services in the country.

Separately, Net Servicos—which is owned by America Movil (AM) and offers payTV and broadband services nationwide in Brazil—has unveiled its subscription service 'Net HD' in Cuiaba and Varzea, according to the local news journal Diario de Cuiaba.

The addition of a TV offer in these areas means that the AM-backed carrier is now able to provide triple-play (TV, broadband Internet and voice telephony) there, having previously been limited to just web and telephony services.

Sercomtel's infosite may be visited at <http://www.sercomtel.com.br/>

## RFPs for resupply initiated by NASA

**On the heels of awarding groundbreaking contracts to U.S. commercial space companies to ferry American astronauts to the International Space Station, NASA has released a request for proposals (RFP) for the next round of contracts for private-sector companies to deliver experiments and supplies to the orbiting laboratory.**

Under the Commercial Resupply Services 2 RFP, NASA intends to award contracts with one or more companies for six or more flights per contract. As with current resupply flights, these missions would launch from U.S. spaceports, and the contracted services would include logistical and research cargo delivery and return to and from the space station through fiscal year 2020, with the option to purchase additional launches through 2024.

The ability to continue commercial deliveries to the station is critical to continuing the use of the station as a platform for discovery that improves life on Earth, expands the commercial use of low-Earth orbit, and helps advance America's journey to Mars through high-quality scientific research and technology development.

This RFP is open to companies able to demonstrate safe, reliable launch and rendezvous capabilities with the station. The contract will fulfill NASA's need to procure cargo delivery services for pressurized and unpressurized cargo delivery, disposal, return or any combination, to the space station using U.S. commercial carriers after the initial Commercial Resupply Service contracts conclude.

The goal of the RFP is to foster a full and open competition that provides the most complete set of

services, providing the best value to American taxpayers. Proposals are due November 14. The awarded contracts will be firm-fixed price, indefinite-delivery/indefinite quantity. NASA anticipates making a selection in May 2015.

On September 16, NASA announced U.S. astronauts once again will travel to and from

the International Space Station from the United States on American spacecraft under groundbreaking commercial contracts.

For more information about NASA's commercial space transportation programs, please visit

<http://procurement.jsc.nasa.gov/crs2>

## Exelis makes the FAA smile



### **There has been a decrease in accident rates of more than 35 percent for ADS-B-equipped aircraft over non-equipped aircraft in Alaska.**

As the prime contractor responsible for the Federal Aviation Administration's (FAA) execution of the Automatic Dependent Surveillance-Broadcast (ADS-B) program, Exelis is delivering surveillance coverage requirements on budget and on schedule. ADS-B is the cornerstone pillar of the FAA's NextGen initiative to modernize the U.S. air traffic control system.

Awarded to Exelis in 2007, the 18-year, \$1.8B contract is for the design, deployment and operation of nationwide ADS-B ground infrastructure.

The system uses satellite-based technology, including GPS, and the ADS-B network of ground stations to transmit aircraft position information more frequently and accurately than ground-based radars.

Exelis has delivered the required network of ADS-B ground stations and has provided service delivery on budget and on schedule, meeting every major contract milestone. The deployed system is being operated and maintained by Exelis under FAA supervision which meets and/or exceeds the FAA's requirements for high-performance surveillance and aviation safety services, and has been verified through extensive flight testing.

Under the program, Exelis has deployed 634 complex ground stations across the continental United States and in locations in Alaska, Guam, Hawaii, Puerto Rico, Virgin Islands, and approximately 200 service delivery points in FAA air traffic control facilities.

Recent media reports citing "coverage gaps" and the necessity for some additional 200 ground stations are not part of the core ADS-B program requirements and refer instead to extended coverage beyond the baseline program. The extensions are intended to bring coverage to airspace not currently served by radar. The ADS-B contract has a baseline requirement to provide coverage comparable to radar, rather than a certain number of ground stations. Exelis has exceeded the coverage requirement while remaining well within the contracted cost.

- **Deployment of the ADS-B system in areas not previously covered by radar has already provided specific safety and efficiency benefits to the U.S. transportation industry including:**
- **Establishment of an ADS-B-only route over the Gulf of Mexico, which resulted in approximately nine minutes reduction in flight time between southern Florida and California.**
- **Decrease in accident rate of over 35 percent for ADS-B-equipped aircraft over non-equipped aircraft in Alaska.**

- **Increase of more than 300 percent for IFR (Instrument Flight Rules) low-altitude traffic in the Gulf of Mexico since 2009 as a result of ADS-B coverage.**

The ADS-B system is safe, secure and fully redundant. The system has executed the National Institute for Standards and Technology-based security authentication and certification program throughout its design, implementation and operation. Accreditation recognizes that the system has substantial information security features built in, including multiple stages of certification, encryption and testing used to ensure the accuracy of all data transmitted to the FAA, air traffic controllers and pilots.

Airline adoption of the nationwide ADS-B technology will improve the safety, capacity and efficiency of the U.S. aviation industry, while accommodating future commercial air transport growth. NextGen reduces flight delays, fuel use and carbon emissions and most importantly, improves system-wide safety for air passengers.

Read more about ADS-B benefits in a statement issued by Aerospace Industries Association President and CEO, Marion C. Blakey: *ADS-B Infrastructure: On Time, On Budget, On the Job*, at [http://www.aia-aerospace.org/news/ads-b\\_infrastructure\\_on\\_time\\_on\\_budget\\_on\\_the\\_job/](http://www.aia-aerospace.org/news/ads-b_infrastructure_on_time_on_budget_on_the_job/)

The Exelis infosite may be accessed at: <http://www.exelisinc.com/>

# InfoBeam

## Atlas V rocks and CLIO climbs



**While this satellite's mission remains under wraps, there's no secret that the launch of this satellite for the U.S. government was successful.**

A United Launch Alliance (ULA) Atlas V rocket carried the CLIO mission skywards for Lockheed

Martin Space Systems Company at 8:10 p.m. EDT on September 16, 2014, from Cape Canaveral Air Air Force Space Station, Florida.

CLIO marks ULA's 11th successful mission this year and the 88th successful mission since formation in 2006.

This mission was launched aboard an Atlas V 401 configuration vehicle, which includes a 4 meter diameter payload fairing. The Atlas booster for this mission was powered by the RD AMROSS RD-180 engine, and the Centaur upper stage was powered by a single Aerojet Rocketdyne RL10A engine.

"The ULA, Lockheed Martin, supplier, and government teams seamlessly integrated to ensure accurate delivery of the CLIO mission to orbit," said Jim Spornick, ULA vice president, Atlas and Delta Programs.

ULA's next launch is the Atlas V GPS IIF 8 mission for the United States Air Force scheduled for October 29, from Space Launch Complex-41 at Cape Canaveral Air Force Station, Florida.

ULA has successfully delivered more than 85 satellites to orbit that provide critical capabilities for troops in the field, aid meteorologists in tracking severe weather, enable personal device-based GPS navigation and unlock the mysteries of our solar system.

For more information on ULA, visit the ULA website at <http://www.ulalaunch.com/>

## A replacement for the RD-180



**ATK has provided the U.S. Air Force an American-made commercial solid rocket solution as a replacement for the RD-180 Russian-made, first-stage engine of United Launch Alliance's (ULA) Atlas V launch vehicle.**

The development of new technologies has led to innovative design improvements with solid rocket motors, resulting in higher performance and increased reliability and affordability. Over the past seven years, ATK has incorporated those new technologies in the development

of six new solid rocket motors—some developed in less than two years.

Blake Larson, president of ATK's Aerospace Group, said, "By combining our extensive experience with new technologies, we have provided commercial customers with low-cost solutions that progressed from design to flight qualification within months. Using a similar approach, ATK's propulsion solution will provide the U.S. Air Force with an RD-180 replacement rapidly and at a highly competitive cost."

Solid rocket motors are optimal for first-stage performance as they provide high lift-off thrust, allowing for more payload margin. They also require less ground and launch infrastructure, resulting in fewer launch scrubs. Due to unmatched reliability, solid propulsion is used

in every stage of America's strategic defense arsenal. New solid rocket motor technology has the capability to provide a smooth lift for payloads, which is especially important when launching critical payloads, sensitive satellites and crews. ATK has provided more than 1,900 commercial and more than 14,000 government solid rocket motors and integrated stages, all domestically built.

Manufacturing and testing of ATK's solution for the RD-180 replacement will take place within the United States using tooling and infrastructure already in place across the country.

The ATK infosite may be accessed at <http://www.atk.com/about/business-groups/atk-aerospace-group>

## Unique solar panel design testing meets with success for Iridium



**Iridium Communications Inc. has completed an extensive testing program for qualification of its new solar panel design for the Iridium NEXT constellation.**

The innovative array that powers the Iridium NEXT satellites, expected to begin launching in 2015, contains four solar panels and will span 9.4 meters when fully extended, developing more than 2 kilowatts of power over a demanding charging cycle in Iridium's LEO.

The panel was developed by Spectrolab and Mitsubishi Electric Corporation (MELCO). These companies are part of the Iridium NEXT Mission Team, led by Iridium's prime contractor and European satellite manufacturer, Thales Alenia Space.

The solar arrays are powered by new, larger triple-junction (XTJ) solar cells manufactured from six-inch wafers which yield 50 percent more solar cell surface area than cells used in Iridium's current constellation and deliver higher performance, while reducing costs.

Working closely with Spectrolab, the new design was put through a grueling life test and qualification program to ensure it works to specification using representative sections of the actual panels.

The design verification test represented every mechanical and electrical configuration and was tested with a simulation of the rigorous LEO charging environment into which the arrays will be deployed.

The solar array was tested to 1.5 times its planned lifespan in space to ensure it can meet and exceed the expected lifetime of the satellite.

The solar cells were put through 75,000 thermal cycles, each one representing the Iridium NEXT satellite's movements in and out of the sun's radiating heat as it orbits the Earth.

The Iridium NEXT satellite network will consist of 66 on orbit satellites and a number of on orbit spares. The constellation will offer continued high quality service for Iridium customers, as well as greater bandwidth and data speeds when fully operational in 2017.

"The successful completion of qualification testing for the solar panel design marks yet another important milestone on our journey to launching Iridium NEXT," said Iridium COO Scott Smith. "The innovation at the heart of the solar panels demonstrates how we're fundamentally rethinking the design of every aspect of our constellation with improved efficiency, performance and longevity in mind."

For more information on Iridium NEXT, please visit the Iridium infosite at <http://www.iridium.com>.

## Launch of Nigerian indigenous satellite set for 2018



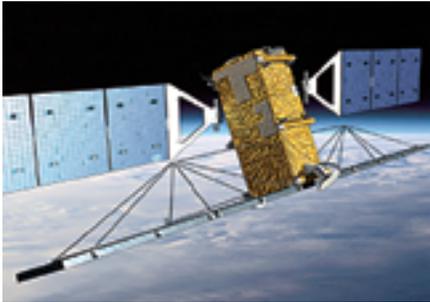
**The News Agency of Nigeria (NAN) is reporting that the Nigerian Minister of Science and Technology, Abdu Bulama, has said that Nigeria would design, fabricate, test and launch its indigenous satellite by 2018.**

Bulama stated this while inspecting facilities at the Obasanjo Space Centre of the National Space Research and Development Agency (NASRDA). The minister said the center had the mandate to launch Nigeria's first indigenous satellite by 2018, and described space science and technology program as an important component of the Nigerian dream. According to him, the satellite program has a positive role to play in the transformation agenda of President Goodluck Jonathan's administration. Bulama directed that the assembly, testing and integration center, and the Synthetic Aperture Radar Satellite, which are under construction, be completed by 2015.

Earlier, the Director-General of NASRDA, Seidu Mohammed, who conducted Bulama

around the facilities, said the agency could boast of world-class technology in terms of facilities. Mohammed said that about six million U.S. dollars (about N1 billion) annual budgetary allocation to NASRDA was inadequate, given the huge development expected of the agency. The director-general also said that no serious country allocates less than 100 million U.S. dollars to its space agency. According to him, NASRDA pays N1.6 million monthly to an Israeli company to maintain facilities at one of the centers of the agency. He said the Emergency Management Project of the agency could be used in tracking kidnapped victims, car theft, pipeline vandalization, fire outbreak, flood and accidents.

## Alerts to continue for disaster management for Thailand



RADARSAT-2

**MDA's Information Systems group (MDA) has renewed its contract with the Geo-Informatics and Space Technology Development Agency (GISTDA) to continue to downlink of RADARSAT-2 data that will be used to support critical infrastructure serving Thailand's various resources management and disaster mitigation applications.**

GISTDA has been receiving and processing RADARSAT satellites data imagery to support various applications since 2000.

RADARSAT-2's specific mission related features and benefits include the following: Finer resolution for improved object detection and recognition; Range of resolutions, swaths, and incident angles; Three polarization modes for higher-value data products; 12-24 hours programming lead time for routine acquisition; 4-12 hours lead time for emergency acquisition; Near-real time processing and product delivery.

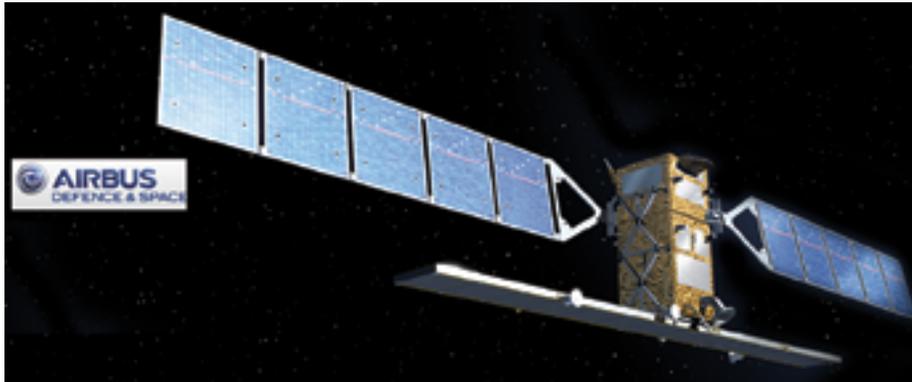
The RADARSAT-2 satellite has global high-resolution surveillance capabilities that include a large collection capacity, high accuracy, and wide-area coverage that is extremely useful in imaging the vast tracts of territory. The satellite acquires data regardless of light

or weather conditions, provides frequent re-visit imaging options, and is supported by ground receiving stations that provide near real-time information delivery services. This versatility makes RADARSAT-2 a reliable source of information for resource and disaster management programs.

MDA operates the satellite and ground segment that includes a Mission Control System, two Telemetry, Tracking, and Control Station Systems, two Canadian Data Receiving Facilities, a Canadian Data Processing Facility, and an associated data archive containing every image the satellite will capture in its operational life.

Learn more at  
<http://www.mdacorporation.com/>

## Airbus Defence & Space's satellite and maritime SATCOM biz + Marlink, go on sale...



**Airbus Defence and Space is divesting its commercial SATCOMs business, including its maritime SATCOMs division and subsidiary Marlink, to focus on their core aerospace and defense work.**

Bernard Gerwert, head of Airbus' Defence and Space unit, issued a statement: "After a detailed and comprehensive portfolio assessment, Airbus Defence and Space has defined Space (Launchers & Satellites), Military Aircraft, Missiles and related Systems and Services as its future core businesses. These are the areas in which the Division will further invest to strengthen its leading position.

Some business areas are identified as divestment candidates as they do not fit the strategic goals and for which the company sees possibilities to increase their development potential in different set-ups."

This decision was described as the "next logical step" following a 2013 meeting of Airbus Defence and Space's Group's Strategy Review, and the company believes business areas such as commercial satellite communications services, "will have better chances for growth and market success in different ownership structures."

The news comes two years after the German government blocked a merger between Airbus, then EADS, and Britain's BAE Systems. "Given the tight budgetary situations in our home countries and increasing competition on global markets, the portfolio review is an essential element to further develop our defence and space business and to ensure its competitiveness. "We have identified those segments where this is an achievable target and those where we should explore alternative options. In short, the portfolio review is a logical next step in the overall transformation process.

I want to make clear that this is not just about cutting more jobs or closing more sites. Quite the contrary, we're focusing on certain businesses and are looking for someone who's willing to develop and invest in these businesses.

It will strengthen Airbus Defence and Space's business core, unlocking its full potential to drive the defence and space industry forward, particularly on critically important international growth markets."

Mr. Gerwert added that discussions with the company's employees on the implications of the move would be conducted "in a fair and open way." Learn more about Airbus here.

The Airbus Group acquired satellite communications provider Vizada in 2011 at a cost of almost \$1 billion, adding the business to its Astrium division, which was subsequently renamed as Airbus Defence and Space.

Vizada itself was created through a merger of the France Telecom Mobile Satellite Communications and Telenor Satellite Services (including Marlink), after those two businesses were acquired by Apax Partners in 2007.

Airbus Defence and Space's announcement of this intention to sell has not included any indication of potential buyers—industry speculation for possible buyers includes Inmarsat, who currently hold a major share of the VSAT market.

Sale of the businesses, with combined annual revenues of EUR2bn (\$2.6bn), is expected to generate between EUR1.5bn and EUR2bn, according to figures from one Wall Street Journal report.

## Successful launch for Luch and separation for this Russian Proton-M mission



**Russian relay satellite Luch, launched by the Proton-M carrier rocket from Baikonur space launch facility early on Sunday, has separated from the Briz-M rocket booster and reached the calculated orbit, the press service of the Russian Space Agency (Roskosmos) has reported.**

"The space apparatus has separated in scheduled time," the press service said. The Proton launch vehicle carried a classified payload known as Olymp ("Olympus") as well as Luch ("Beam"), which belongs to the Russian Ministry of Defense.

This was the fifth launch this year using the Proton carrier and the first launch after the recent accident with the carrier. Sunday's mission was previously scheduled to lift off at the latter half of May 2014. However, following the loss of another Proton rocket on May 16, it was postponed to July 8. The Express-AM4P communication satellite was lost some 545 seconds into the flight. The experts investigating that accident said it was caused by disintegration of a bearing assembly in the turbo pump of the Proton's third-stage engine.

Previous to that on August 23, 2013, a Proton rocket with several GLONASS (Russia's version of the Global Positioning System) cartwheeled across the sky before slamming into the ground in a massive fireball. It was later determined that a sensor was placed upside down and doomed the \$1.3 billion mission.

The Luch spacecraft is another satellite of the Luch Multifunctional Relay System which is being developed under the 2006-2015 Russian federal space program.

The Luch relay system is intended to provide the Russian segment of the International Space Station (ISS); low-orbiting space devices; boosters and upper stages with communication with ground-based facilities.

The Russian segment of the International Space Station (ISS) can communicate directly with the mission control centers in Russia and in the U.S. for 2.5 hours a day. For communication outside the time limit, Russia buys services of the U.S. Tracking and Data Relay Satellite System.

The previous Luch spacecraft, Luch-5B, was successfully placed into orbit on April 28 of this year.

## Rumors of a Sea Launch sale to Israel are refuted

**The head of Sea Launch, an international spacecraft launch service, has denied recent reports of plans to sell the company to an Israeli company.**

"The reports that an Israeli company is planning to buy the Sea Launch project are not true. We have received no proposals on the Sea Launch purchase," the company's CEO, Sergey Gugkayev, told ITAR-TASS. Gugkayev confirmed, however, that Sea Launch, which launches Russian-Ukrainian Zenith-3SL rockets from a mobile platform in the Pacific Ocean, is in talks with an Israeli firm on "cooperation in the sphere of launching spacecraft. But this is not the only company manufacturing satellites with which

we are holding negotiations on possible joint work," the Sea Launch consortium CEO said, commenting on the reports. A director of information policy department at Russia's United Rocket and Space Corporation, Igor Burenkov, said "various options for developing the Sea Launch project are being considered, in particular, in the interests of Russia."

A source in the Russian Defense Ministry told ITAR-TASS that Sea Launch is currently holding negotiations with Israel Aerospace Industries (IAI), a major Israeli aerospace and aviation manufacturer. Earlier media reports said, citing unnamed sources, that a leading Israeli company in the space sector is expected to hold talks in the coming days

aimed at discussing the possible sale of the Sea Launch consortium.

The reports said that Russia's space agency, Roskosmos, and the United Rocket and Space Corporation, have refused to buy the consortium, and efforts have been made to search for a foreign customer.

The International Sea Launch consortium headquartered in Nyon, Switzerland, was founded in 1995 and re-organized in 2010. Its majority shareholder, Energia Overseas Limited (EOL) owns 95 percent of shares. Three percent of shares belong to the American airline company Boeing, and two percent to Norwegian Aker Solutions.

# A Four Payload Push Debuts Commercial Launch Services

By Randa Relich Milliron, Co-Founder and CEO, Interorbital Systems

**On March 29, 2014, Interorbital Systems' (IOS) Common Propulsion Module Test Vehicle (CPM TV) thundered off the mobile launch unit on the rocket's maiden flight. The 7,500-lb thrust engine performed flawlessly, propelling the 1200 lb. rocket to Mach 1.5 within seconds over the remote Mojave Desert of California.**

The 30-foot long CPM TV rocket is a boiler-plate test version of the identical rocket units that will be bundled together to create Interorbital's modular orbital launch systems.

This unguided, fin-stabilized version of the CPM TV was controlled at the start of the launch by a unique cable guidance system that uses guide-arms attached to the bottom edge of the fins. Cables attached to the guide arms are wound around pulleys and a common drum, allowing the cables to unwind at the same rate, keeping the rocket flying straight until the fins become effective.

This launch system is a low-mass equivalent of a 180 foot launch rail. The pyrotechnic guide-arm release system, which worked perfectly, is identical to the stage-release system that will be used by the IOS NEPTUNE orbital launch systems.

A standard CPM is designed to burn its hypergolic liquid propellants (nitric acid and turpentine) for up to 150 seconds, which is enough to carry a 320 pound (145kg.) payload on a suborbital flight to an altitude of 192 miles (310km.). Due to the maximum altitude restrictions at the launch site, the burn time had to be limited to 10 seconds and ballast was added to the rocket to increase its weight. The rocket reached 10,000 feet in a low-altitude test flight.

The following commercial payloads were on-board:

- **National Cheng Kung University (Taiwan) 2U CubeSat**
- **M2M2SKY/Boreal Space (Brazil/California) 1U CubeSat**



- **Google Lunar XPRIZE Team SYNERGY MOON (California/International) Payload**
- **John Frusicante's (Red Hot Chili Peppers) album ENCLOSURE (The Record Collection, Malibu/Loducca, Brazil)**

After a parachute recovery, all payloads came back alive—still functioning and intact. The rocket sustained minimal damage and will be re-used on the next test flight in which the CPM will be finless and guided.



*GPPE 7.5KN TA Main Rocket Engine Test (October 28, 2012). Luminous desert sand vortices reflect the extreme brilliance of the rocket plume.*

Chief Designer, IOS Co-Founder and President Roderick Milliron gave his insight into Interorbital's bigger picture strategies. "Interorbital continues to expand its rocket development and launch horizons, having recently responded to an Army RFI with a respected industry partner to create what would be a follow-on to the SWORDS launch vehicle. Our two companies have submitted a joint proposal to give the Army what they've wanted all along. Interorbital's expandable or 'additive' modular NEPTUNE rockets organically evolved—without the advantage of government funding—to meet or exceed all the original SWORDS requirements, albeit independently of that program.



Artistic rendition of IOS' Neptune-5 launch vehicle. Image courtesy of IOS.

After more than a decade of research and development, those engines—the GP7.5KNTA (General Purpose Rocket Engine 7,500-lb thrust Nitric/Turpentine Ablative) series—are now new to the market and allow for the creation of a nanolauncher perfectly sized for today's smallsat payloads and reduced budgets. Designer Milliron continued, "The rocket engine's unique injector and combustion chamber architecture yielded a specific impulse (Isp), averaging 245 seconds at sea level ambient pressure, which equates to a 305 second vacuum specific impulse. The high density of the concentrated white fuming nitric acid and turpentine propellant combination produced a density specific impulse at sea level of 323 seconds. High density specific impulse substantially reduces the weight of a rocket's propellant tanks which leads to an overall reduction in the total rocket weight and a corresponding increase in payload weight."

With the orbital launch vehicle in mind, and the launch-licensing process is in the works, the IOS team used this first test flight to qualify systems that would be part of the NEPTUNE satellite launch fleet. Systems tested

included:

- **CPM Rocket Architecture**
- **Chemical Ignition in flight**
- **Propulsion System in flight**
- **Cable Launch Device (CLD) and Pyrotechnic Staging System (PSS) Telemetry**
- **Health and Recovery System**
- **Wireless-encrypted CPM controller**

With an invited FAA/AST agent present and observing the in-flight technology demo, Interorbital activated its multi-module launcher staging-mechanism in a flawless performance of the same device that will be used to jettison the four spent modules comprising Stage I of the N5 nanosat launcher.

IOS' Current NEPTUNE 5 Launch Manifest of TubeSats and CubeSats for Missions I through IV:

- **UC Irvine**
- **Google Lunar X PRIZE Teams EuroLuna (2U), Canada's Plan B, Germany/US Part-Time Scientists, and SYNERGY MOON (3U)**
- **FPT University, Vietnam**
- **Nanyang Technological University, Singapore (2)**
- **King Abdullah University of Science and Technology (KAUST) (3), Saudi Arabia/US**
- **NASA IV & V Facility (3)**
- **Institute of Space Technology, Pakistan**
- **Taiwan National Cheng Kung University (TARO-2U)**
- **Morehead State University (Kentucky Space)**
- **InterAmerican University of Puerto Rico**
- **University of Sydney (2) Aslan Academy**
- **Project Calliope (Space Music Project)**
- **Universidad de Puerto Rico / Marcelino Canino Middle School**
- **Naval Postgraduate School (3)**
- **Defense Science and Technology Lab (DSTL, UK)**
- **Austrian arts group mur.at**
- **United States Military Academy at West Point (2)**
- **Brazilian Space Institute/Ubatuba Middle School**
- **ULISES-I Sat, Space opera from Mexico**
- **TriVector Services (3)**
- **AKQA Ad Agency, SF**
- **La Despensa Ad Agency Spain**
- **The Golden iPod, Bishop, California**
- **Institute of Advanced Media Arts and Sciences, Japan(7)**
- **Galaxy Global Corporation**
- **Universidad de Chile, Santiago**
- **University of Sao Paulo, Laboratory of Integrated Systems, Brazil (2)**
- **David Lawrence K-8 School, North Miami, Florida**
- **Optimize-EduSat**
- **RADG Ad Agency**
- **OMNI LABS (Brazil)**
- **4-H/Ute Mountain Youth/Colorado State University Extension**
- **KEN KATO, Japan; Ryerson University, Toronto**
- **(US) Doyle's DOCTOR WHO TARDIS in Orbit**
- **Boreal Space (US)/M2M2Sky, Brazil**

- **Wayfinder-1 (2)**
- **Rufs the Space Lion, Sweden**
- **Uninova Instituto, Lisboa, Portugal**
- **National University of Singapore, RSPL (3)**
- **SpaceBooth, Belgium**
- **Manhattan Satellite Lab; RMC s.r.o.**
- **Popular SK, Slovakia**
- **Penn State University, Wilkes-Barre Campus**
- **Universidad Autónoma de Zacatecas, Mexico (2)**
- **DragonFly Astro**
- **MEDO South Africa, TubeSat**
- **Mission Miojo, Brazil/Japan**
- *and more*

IOS President Rod Milliron added, “The amazing array of science, art, music, academic, military, government, citizen-scientist, and advertising payloads already committed to launch beginning in 2015 demonstrates the broad-based acceptance and hunger for these new smallsats. For academic

programs, a satellite kit and launch can still start as low as \$8,000. What serious space experimenter could resist?”

### **Putting the Commercial Into Commercial Space**

To design and build a low-cost, high-performance rocket system that will smash the price regime of the global launch cartels, and doing it with little-to-no budget, is a true challenge. So-called ‘Commercial’ Space is far from it; most of the New Space companies are firmly attached to the government and are holding on for dear life, on the dole for their often short existence, and out of business when the hand-outs end.

Not so with Interorbital Systems (IOS). When it comes to staying alive, IOS has the war wounds to prove that building launch vehicles is not easy; much-maligned for what outsiders view as a slow start. However, IOS is now poised to play a dominant role in the small-satellite launch market.

Nearly every revenue stream is considered sanctioned, if it keeps the R&D running and the rocket engines firing. Interorbital has persisted in its quest to provide the world with the Holy Grail of launchers: modular and quick to mass-produce; capable of high-performance through relatively low-tech manufacturing methods; capable of orbital, on-demand launch—and designed to stand at-the-ready to access any orbit or inclination through a series of unconventional, ultra-lean mobile spaceports. Interorbital’s direct application of the Silicon Valley model of supporting a business on a golden undercarriage of advertising revenues has worked its magic when applied to the rocket world.

Interorbital found that by embracing marketing and promotional projects that standard aerospace companies would look at with disdain, or simply not have the creative chops to execute, IOS could generate a cash flow from the same deep well that keeps Google, Facebook, and their ilk running on fully lubricated ad streams.

For IOS, its AD-venture program brought and continues to bring in solid revenue without having to ‘sell the farm.’ Interorbital’s founders maintain control and ownership of their company—a somewhat rare state of affairs in today’s business landscape, where the rush to cash-out, or to become a quick snack for VC-vampires is generally the rule of law.

Many founders have found themselves suddenly employees of someone else who’s running the company they built. In that nightmare scenario, with one’s company lost, vision dies, and there is no freedom to allow for a Steve Jobs-like ‘Think Different’ approach/ That ‘different’ is what Interorbital’s NEPTUNE rocket series is and, much to Interorbital’s founders’ delight, so is the firm’s funding landscape.

With just south of one hundred payloads (most made with IOS’ sat-kits) slated for launch on three sold-out missions, and one rapidly closing fourth orbital launch, and with two private spaceports in the works to augment the company’s ocean-based, rapid-response-to-orbit launch service strategy—something must be going right at Interorbital.

Interorbital’s interaction in marketing campaigns and ad sales with six agencies worldwide lifts much of the financial burden from the test-flight program. From this author’s perspective, as both CEO and Director of Marketing, “We’ve always been ‘creatives’—whether that’s in the arts sector



*IOS’ Common Propulsion Module Test Vehicle (CPM TV) in flight. Photo courtesy of IOS.*

or the realm of science—innovation and creativity pay off—we drill down into both worlds for the cash to advance our scientific goals—and it's pure 1,000-proof fun when we have the opportunity to use art, music, film, and hard marketing to achieve those tech goals."

Exercising this form of creative control means maintaining a tight-knit, core engineering team to move the technology ahead. Keeping it spartan is what works in the IOS world.

IOS achieves major flight milestone with successful rocket launch March 29, 2014.

Roderick Milliron, Chief Designer and Co-founder sees it this way, "The small design team has always been my preferred workforce—I've been an employee in huge companies and know their process of the warehousing of people who are hired for government contract head-count only; when it comes down to delivering the product or services, it usually depends on a core-group of five to 10 people who shoulder the work for 10,000 surplus non-performers, or the 'unassigned.' I like to be where the action is—leading the design group—getting things done."

This ultra-lean approach has paid off. With a core team of five to 10, and a budget so low that it would send chills of fiscal terror down the spines of conventional aerospace, Interorbital has accomplished the impossible. More than a dozen bipropellant liquid rocket engines and three launch vehicles down the design and flight-test path, IOS formally began launch operations by flying four commercial payloads on March 29th, 2014, with the inaugural launch of its CPM TV. Two of those payloads were signage and ad agency projects from Brazil's Loducca and the new and aggressive Tech4Y—with its signature 'Mother-in-Law' logo emblazoned on the side of the rocket.

### **From Red Hot Chili Peppers to Hot Spacey Noodles...**

Exactly what is the allure of space and rockets to advertising agencies? Space-branding is hot, hot, hot! As we've all seen on TV—every car is secretly a rocket; every sports shoe will allow the wearer to leap to the Moon, and every energy drink is really rocket fuel—rocket power by inference and image association—but what about using *real* rockets as part of brand promotion?

Sizzle guaranteed! It has been done before—WEST Cigarettes commissioned a German artist to paint an ad down the side of a Russian rocket in 1992 as a brand-promotion and as part of the first art exhibition in space; Pizza Hut's 2001 PR stunt of pizza delivery to the residents of the ISS was a new ad milestone; and going farther into the past, who could forget Hermann Oberth's promised rocket launch, for the film 'Woman in the Moon' in 1929? Today, space continues to work its magic and continues to exert its pull on the human mind.

In its latest AD-Venture, Interorbital Systems, partnering with Nissin/Ajinomoto, and F/Nazca Saatchi & Saatchi Advertising, and with the expert guidance of Chef Emmanuel Bassoleil, will engage in three progressively more difficult rocket cooking challenges, which culminate in what will be, to date, the hardest way to cook Ramen: taking the popular noodles beyond the Karman Line—the boundary between Earth's atmosphere and Outer

Space—and returning the dish hot and ready to eat—cooked by the friction of re-entry. The project page and video are available for reader access at <https://www.nissin.com.br/missaomiojo/>

The beauty of these high-ticket ad campaigns is the notoriety and buzz they generate as well as the capsule technology created for the project, which serves double-duty as a controlled cooking device as well as a test-unit for Interorbital's manned and unmanned missions.

Roderick continued, "The Mission Miojo pays for our entire flight test program and the development of a re-entry vehicle, plus giving us the added benefit of getting that punk-marketing back-flash and shimmer of being part of a very cool, on-going, episodic, buzz-filled promotional campaign. This mission funds Interorbital, advertises the company, and gives our brand a kind of 'ride-share' payload status that gets us to where we want to go, while we get the product, the customer, and the ad agency where they want to go—to the winner's circle!"

And speaking of winners: Loducca /The Record Collection, who masterminded the Red Hot Chili Peppers' John Frusciante SAT-JF14 promo, won gold and numerous other awards at this year's Cannes Lions for the entire ad campaign and associated mobile apps. Interorbital played a part by building the satellite and conducting the rocket launch on which SAT-JF14 rode. Golden Lions, no less...

A quick run-down of the RHCP project: John Frusciante's new album *ENCLOSURE* loaded on experimental satellite and launched into cyberspace. Fans to download SAT-JF14 app for free album preview.

The ad copy and rocket imagery worked their spell...

"At dawn on March 29th, 2014, at a remote High Desert location in California, former Red Hot Chili Peppers guitarist John Frusciante's new album *ENCLOSURE* was loaded onto an experimental CubeSat called Sat-JF14 and launched aboard an Interorbital Systems' NEPTUNE Rocket Module..."

John's fans from around the world were able to download the free, custom-built Sat-JF14 mobile application developed by Frusciante's longtime label Record Collection and leading Brazilian Creative Agency, Loducca. This app enabled users to track Sat-JF14's movement in real time and communicate with one another via an integrated social chat platform.

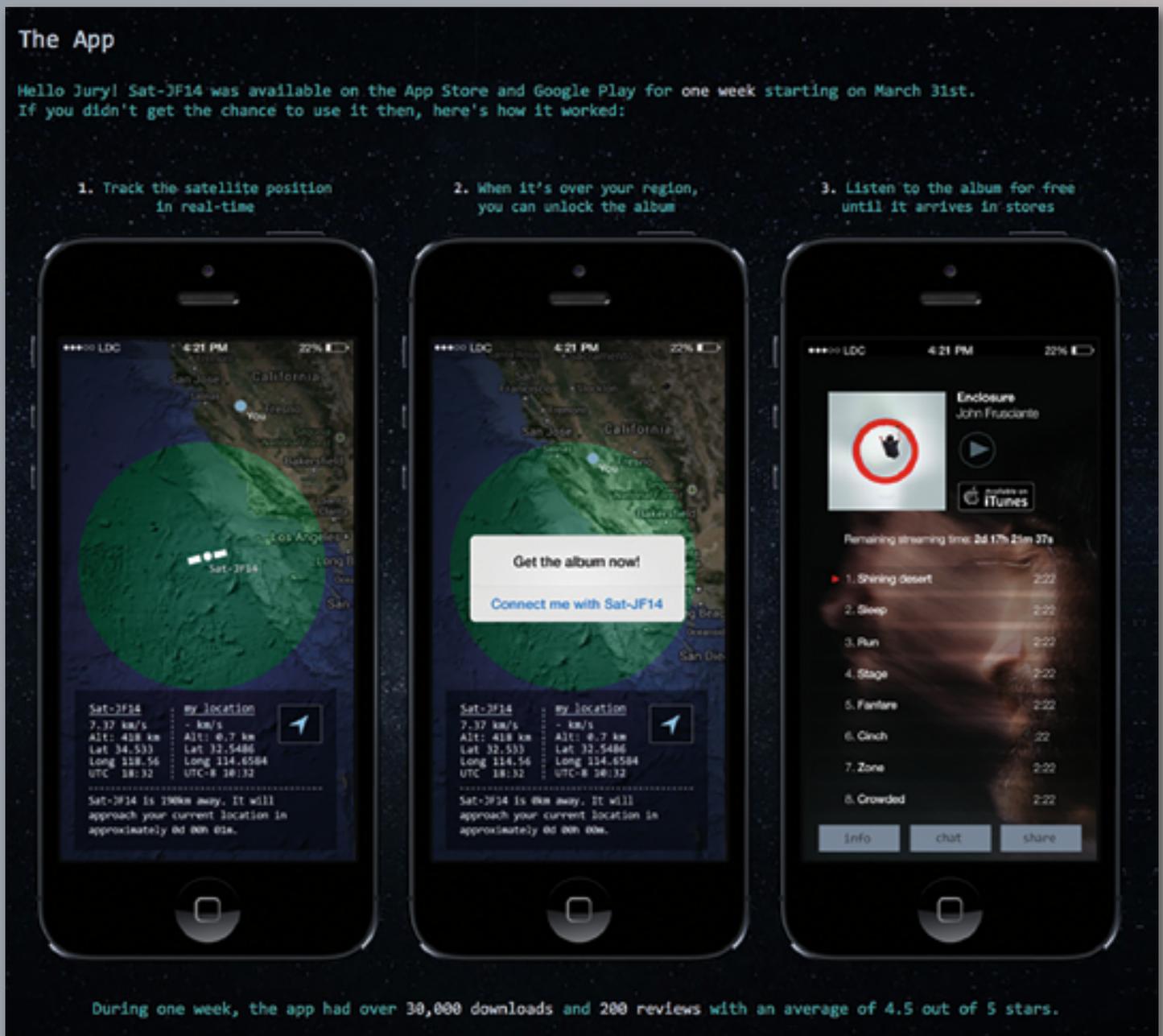
The story exploded and went everywhere, across all new and old media platforms. The promotion generated a little static among the space community because it wasn't an actual 'orbital' launch, but a launch into cyberspace with a live rocket launch component (courtesy of Interorbital) and lots of PR and show-biz wizardry.

"Starting on April 2nd, as the virtual Sat-JF14 hovered over a fan's region on the website map, *ENCLOSURE* would be unlocked, enabling users to stream *ENCLOSURE* at no charge on any iOS or Android mobile device. The album preview lasted until midnight on April 7th, at which point, Sat-JF14 ceased transmission." By the Cannes consensus: space-branding works at the world-class level.

The author enjoyed much publicity from the campaign, including quotes in *Rolling Stone Magazine*, a feature in *MALIBU* magazine, and mention in nearly every music website and blog of significance: "This partnership with John Frusciante and Record Collection represents a new chapter in our quest to further explore the cosmic relationship between science and art," said Randa Milliron, Interorbital Systems co-founder and CEO. "**ENCLOSURE** is a musical masterpiece and we're thrilled to be able to utilize our proprietary space technology to facilitate this unprecedented form of space-enhanced distribution." For more details on the campaign, please visit <http://1two3four5.com/sat-jf14/>

### Delivering Breakthrough Rocket Technology

Interorbital is largely self-funded and has been since its inception. The company has supported its own R&D efforts via a satellite kit; launch sales; with pre-sales of orbital tourism; with a NASA SBIR for Nanolauncher technology testing; and now with an increasing number of advertising clients from some six top level global ad agencies. From a practical perspective, IOS' test launches do double and sometimes triple duty, including proving its rockets can fly! In its first flight, the rocket completed three main goals: all hardware and software was tested in flight; Interorbital's commercial launch was inaugurated; and funding and visibility for the Interorbital brand was provided.



John Frusciante's album, **ENCLOSURE**, was launched into space as a payload aboard IOS' Sat-JF14 CubeSat. The tracks could then be download for one week to various mobile devices from the satellite.

Everything about IOS' rocket program can be considered a commodity, including an unexpected by-product: sound. During the March 2014 rocket launch, award-winning sound designer Hamilton Sterling of Helikon Sound conducted an elaborate sound recording of the launch event. IOS has worked with Hamilton on previous rocket sound applications for the films *War of the Worlds* and *Serenity*, proving that everything about a rocket launch can be monetized. The newest audio treasures gathered by Helikon will soon be heard in the sound track of an undisclosed new feature film.

Interorbital's Next Steps: following two more suborbital test launches, with one of those carrying the Mission Miojo Noodle Capsule to space-altitude, IOS will launch the three sold-out orbital missions. IOS' upcoming Rocket Diver program with famed skydiver Olav Zipser presents an ideal marketing platform and on-going high-action campaign for the right kind of advertiser.

This features a series of progressively higher, record-breaking, extreme-sport space dives by Olav from specially customized models of Interorbital's rockets. This will also be a science mission, to create and test-fly an orbital rescue suit and, as Olav puts it, "To have fun on the way down."

IOS is also re-igniting its AD-SAT service, chiefly because of new customer demand for orbital exposure. The on-orbit product-placement is a fusion of space and advertising—for use by forward-thinking advertisers as a glamorous differentiating alternative to conventional print and video product push. When it comes to putting their products in the public eye, clients should not settle for just a billboard on the boulevard... they can go all the way with real, out-of-this-world product placement: first in Earth orbit with AD-SAT; on to Lunar orbit, then to the surface of the Moon as part of upcoming IOS missions.

As part of all Interorbital's Google Lunar X PRIZE launches and on the company's own sample/return Lunar missions, one rule stands: every IOS NEPTUNE Rocket and VIRUS-1 Lunar Lander will bear a tiny good-luck sticker of author Robert Heinlein as homage to the ultimate Space-Marketer-in-Chief.

**About the author**

*Randa Milliron, a co-founder, CEO and marketing director for Interorbital Systems, is going to be chairing the Launch Architecture session of the October 7-10, 2014, Lunar Cubes Workshop in Sunnyvale, California.*



# The Future Will Be Electric... The Elwing Company Perspective

By Gregory Emsellem, Chief Executive Officer, The Elwing Company

**In the satellite business, there is always a sense of excitement—the competitive arena around choice orbital slots—the suspense surrounding a launch campaign—pushing the limits of new technology to get more out of what you already have.**

Outside the industry, the general business public doesn't fully understand this excitement. For those of us who are inside the satellite business, being aware of the immense financial interests at stake on each of those complex systems can get us worked up over the smallest success or failure, only without all of the drama.

The reaction depends on what part of the business you're working on.

My company works in spacecraft propulsion systems—electric propulsion, to be specific. You can imagine how we reacted two years ago when we released news of our partnership with OHB Sweden, just as Boeing announced contracts to build two pair of all-electric spacecraft, one each for Eutelsat Americas and Asia Broadcast Satellite (ABS).

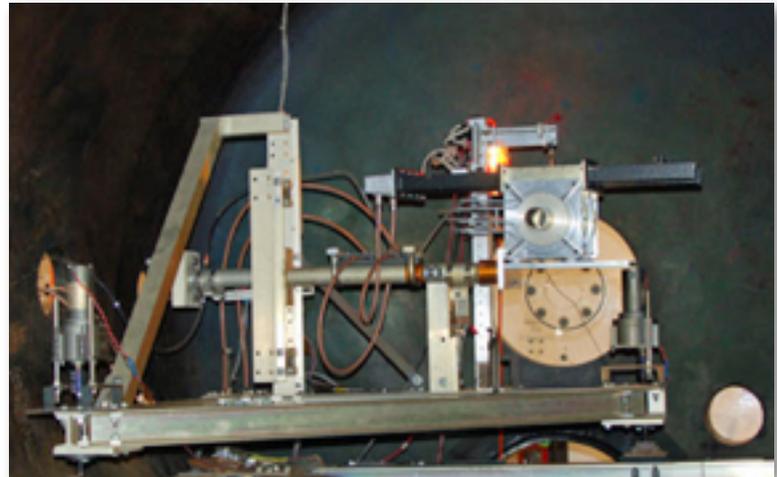
This news arrived soon after the U.S. Air Force and Aerospace Corporation saved the Advanced EHF spacecraft using electric propulsion. We thought our timing was rather fortunate.

We've always admired Boeing for being typically at the forefront of new technologies in commercial space systems and it's been interesting to see how other manufacturers are responding to these developments. The ELECTRA project, a partnership with SES S.A. and the European Space Agency (ESA), is one of the most noteworthy recent examples in developing a complete, all-electric propulsion platform.

Naturally, we're quite excited. We've seen the future and electric propulsion technologies will soon be at the core of in-space propulsion. This transformation will likely usher in a new era for satellite-based services by significantly expanding payloads aboard virtually any spacecraft.

We're a small company and we've spent more than a decade developing electric propulsion systems and believe that soon the scene will be set for this technology to take center stage. Our breakthrough technology, the Electrodeless Ionization Magnetized Ponderomotive Acceleration Thruster (E-IMPACT), is being brought to market on a solid foundation of more than 30 registered patents. Various testing in the U.S. and Europe have been extremely promising and a new technological horizon is rapidly approaching. The interest received over the last couple of years has exceeded our expectations. Propulsion has a major impact on the entire economics of the satellite market and new solutions are rare.

Indeed, in many respects, the interest in electric propulsion for orbit-raising is logical and expected. Boeing's 702SP bus is a true commercial endorsement of the critical advantages conferred by all electric propulsion

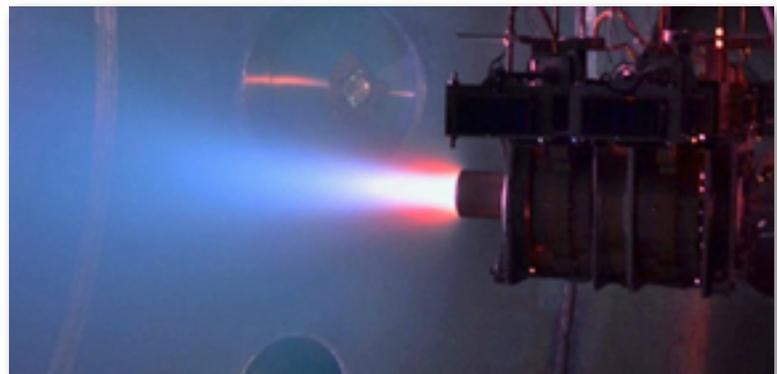


*Elwing's Electrodeless Ionization Magnetized Ponderomotive Acceleration Thruster (E-IMPACT) during testing at the Electric Propulsion and Plasma Dynamics Laboratory at Princeton University.*

and a prime example of future game-changing economics, that being more payload received for less overall cost.

The Boeing spacecraft for Eutelsat Americas and ABS, scheduled to launch in early 2015, are expected to weigh 1,800kg. and carry the same payload as some of the behemoths we've seen launch of late. Think about what this does for the design-build-launch side of the satellite business. Add in the revenues associated with bigger payloads, and the economic advantages are enormous.

There's always risk in the space business. However, Boeing's approach is only the start of this revolution. They spent a few years developing the propulsion system for the 702SP bus. However, one must consider the heritage this platform is built on top of—many years of experience with XIPS (xenon-ion propulsion system). Proven on orbit technology is one of the most significant qualities sought by customers. This flown technology is being used in a new



*Elwing's E-IMPACT thruster firing at NASA MSFC's Propulsion Research and Development Laboratory.*

way, applied to medium-sized spacecraft after proving itself for station-keeping many times over.

On the orbit-raising aspect, flight-proven electric propulsion systems do take a longer period of time to move the spacecraft into its useful service orbit. ESA's Artemis required 18 months from launch to the intended orbital location. That's correct, 18 months. The U.S. Air Force's AEHF spacecraft needed 14 months to be salvaged by its electric propulsion system after its main chemical propulsion system failed.

That's why we see opportunity for change in our industry, providing the technology for faster, higher-thrust, all-electric orbit-raising capability. We feel fortunate to have worked in electric propulsion for more than a decade and to now be at a point where we expect to meet the emerging and proven needs of the marketplace.

We are but one company out of many in the space business who are continually seeking better methods to accomplish projects. These are the leaders with whom we identify—and the quiet, inherent enthusiasm we feel in our space business partners have for their work.

I encourage all to seek out new technology. Embrace the technology and the challenges and share your vision of what's possible. The enthusiasm, competence and dedication I see every day is encouraging.

The new era in electric propulsion, of which Elwing hopes to be a part of, brings to mind a passage in Sir Arthur C. Clarke's essay *Space and the Spirit of Man* (1965)...

*"...we cannot predict the new forces, powers, and discoveries that will be disclosed to us when we reach the other planets or can set up new laboratories in space. They are as much beyond our vision today as fire or electricity would be beyond the imagination of a fish."*

Quite clear now is the fact that, to many, the future of in-space propulsion will indeed be electric propulsion technologies. Chemical propulsion is not going away—there will still be many missions using it. However, electric will swiftly become the mainstay, just as the rise of airplanes have not made all sea-faring vessels disappear.

This evolution will certainly deeply reshuffle the global shares of the various space companies. Most likely is that the majority of satellite manufacturers will decide to no longer produce their own propulsion systems and they will rely, instead, on specialized industrial partners.

Most importantly, this change in the root of the technology underlying all satellite services will probably alter the entire industry, enabling new services and/or new players to emerge (think lower cost of bandwidth, for sure, as well as asteroid mining or satellite servicing, which could not be viable without advanced propulsion technologies).

The future will be electric and far more diverse. For the time being, no flight-proven electric technology to date is able to cover all of the needs of all of the missions. Even as new technologies become available, the requirements of satellite and space probe missions are varied and call for diversified solutions.

The future belongs to electric propulsion and it will greatly improve the space-based services we receive here on Earth.

For further information about The Elwing Company, please visit

<http://www.elwingcorp.com/>

#### **About the author**

Gregory Emsellem is the Chief Executive Officer of The Elwing Company and is a plasma physicist. He specializes in propulsion systems research and development and possess in-depth knowledge of the satellite markets and business operations.

Earlier this year, The Elwing Company, through its European affiliate Elwing Europe, announced a formal agreement to further develop breakthrough technology for commercial aviation propulsion.

Xavier Morin, a Luxembourg physicist and entrepreneur, developed the Thermal Ohmic Reaction Engine (ThOR engine), which proposes to remove entirely all carbon-based fuel used by commercial aircraft—representing a revolution in aviation. Using electric power from advanced plasma processes instead of jet fuel, it would produce heat at the heart of turbofan engine. An ingenious technological arrangement, it would require only minor changes to current airframes and their operation, realizing a fuel cost reduction by as much as 30 percent. Most of the technologies required, except the new combustion engine themselves, have already been successfully demonstrated in laboratory testing.

The Elwing Company has been successful in gathering financial support from private investors to further its work in pioneering breakthrough electrodeless propulsion technology and testing the technology comprehensively at multiple facilities in the U.S. and Europe, earning more than 30 patents in the process. Variants of this breakthrough technology are currently being considered by several major satellite manufacturers for their future "all-electric" platforms.

"Words cannot adequately express how excited we are to contribute our competence to this joint venture and the prospect of a carbon-free airline industry," said Gregory Emsellem, CEO of The Elwing Company. "The opportunity to apply our experience of rapid development of advanced propulsion technologies, along with our knowledge of plasma technologies, to quickly raise its technology readiness level is truly great. We have been impressed by the thoroughness of Mr. Morin's preliminary studies, by his personal energy and his proposal's selection in the EDF Pulse electric technology game changer competition, and we are similarly impressed by his MIT TR 35 selection for young innovators under 35."

As part of this agreement Mr. Morin will join Elwing to accelerate the development of its technology and build a prototype. "I am very honored to join the Elwing Company, a well-distinguished innovator in the field of plasma technology, with a brilliant history of raising private capital to support and accelerate the development of breakthrough industrial technology. I am certain that their mastery of plasma technology, along with their extensive network within the aerospace industry on both sides of the Atlantic, will substantially increase our chance to rapidly and effectively bring this all-electric propulsion technology for airliners to market."

Elwing is intent on being leaders in Electric Propulsion 2.0, the next generation in spacecraft propulsion, opening the way for faster electric orbit-raising, leveraging exclusive, patented technological breakthroughs.



## SatBroadcasting™ Conference Fever... Reasons To Be Cheerful

By Chris Forrester, Senior Contributor

**F**or the satellite and broadcast industries, this is definitely a busy time of the year. Summer, and hopefully a restful holiday, leads into a frantic conference season that has already experienced Euroconsult's Paris World Satellite Week.

However, while Paris has provided plenty of opportunities for senior staffers to meet and greet, to grin and grip, with rivals, bankers, insurance folk, launch specialists and perhaps even a few journalists, it could be that the real future of the industry is being decided—not in Paris—but in Berlin (at IFA), at IBC2014 in Amsterdam and even a month later at the giant MIPCOM programming market event in Cannes.

The key question for each of these conferences, at least for satellite operators working in the broadcasting and payTV sphere, is the shape and speed of take-up for 4K, and perhaps even 8K video broadcasting. An early ramp-up, and positive take-up of Ultra-HD by consumers, and the operator's bandwidth forecasts are safe. A slow take-up and such forecasts

might prove to be overly-optimistic and could damage the already fragile growth predictions for the sector.

This batch of conferences has—at least—thrown up a huge number of thought-provoking (and business impacting) studies.

One somewhat negative report from researchers at The Diffusion Group on August 14th: (TDG: Forecasting the 4K Video Ecosystem, 2014-2025) said that while 4K will ultimately reach the mainstream, it will be a niche market for at least another five years, with widespread viewing of 4K content arriving in 2019 and growing quickly beyond that date.

Joel Espelien, author of the new report, notes that short-term viewership of 4K video will be driven by consumer purchases of smart TVs with 4K functionality. However, the diffusion of 4K televisions will occur more slowly than many believe due to poor consumer awareness, high set prices, and a lack of 4K content. That said, the emergence of 4K-enabled devices will help to fill this gap.



A crowded 4K viewing theatre at MIP-TV in Cannes focusing on Ultra-HDTV content from the BBC.

For example, Espelien predicts that ISTBs (Internet Set-Top Boxes) from companies such as Amazon, Apple, and Roku, will join smart TVs in supporting 4K streaming from OTT services. "This will create a 'halo effect' around broadband video quality and provide a strong differentiator for OTT services such as Netflix and Amazon," noted Espelien. "This will be a valuable tool in recalibrating consumer perceptions of video quality and reinforcing the value proposition of broadband streaming services."

### The Japanese 4K Move

*Japan has made a major commitment toward 4K broadcasting. The country already has a 4K 'best of 4K' channel on air (which went live on June 2nd) under the auspices of Japan's 'NexTV-Forum' and representing all of Japan's broadcasters, public and private.*

*Japan's broadcasting authorities in September announced their latest roadmap towards full 8K broadcasting, which calls for three 4K channels to be on air in 2016, as well as one 8K 'Super Hi-Vision' channel on satellite.*

*That's just the start. By 2018, the roadmap calls for Japan's public broadcaster to have its own dedicated 4K channel as well as five commercial broadcasters to be transmitting a 4K channel.*

*Moreover, the technical specification calls for the highest resolution, including a wider color gamut, dynamic range as well as high frame rates. Each of these will help guarantee the 'Wow' factor needed to persuade viewers to buy into the new broadcasting standard.*

According to TDG, iSTBs and Blu-ray players will each account for almost one-fifth of all 4K video viewing in 2017. While physical discs will enjoy only short-term success, the use of 4K ISTBs will be propelled to even greater heights due to several factors, including support from the 'Big 4' (Apple, Amazon, Google, and Microsoft); a one to two year replacement cycle (versus seven to eight years for TVs); and a sub-\$100 price when they arrive in market. As such, 4K-ISTB diffusion will remain strong throughout the forecast period and surpass 4K smart TVs to become the single most-important platform used to view 4K video aside from legacy payTV operator STBs.

While OTT streaming video will be the most notable short-term driver of 4K video, payTV operators will also play a defining role. Beginning with on-demand 4K offerings, payTV operators will slowly add live 4K support as the ecosystem matures. As Espelien noted, "Regardless of the timing of market entry, and irrespective of the availability of alternatives, the sheer strength of legacy payTV and the ability of operators to deliver must-see live events, such as the Super Bowl and the Olympics, will propel operator 4K-enabled STBs to a dominant position."



*A view of the San Francisco waterfront area in Ultra High Definition (UHD).*

*"We are a way from any early adoption by [U.S. over-the-air] broadcast."*

**Clyde Smith, Fox TV**

In fairness, and for balance, there are a slew of much more optimistic predictions available, which we might all favor. However, the fact remains that the next three to four years will be a worry for those operators who have to create extra capacity with a similar construction and launch time-lag.

One well-regarded group of analysts at Futuresource Consulting anticipates a more positive take-up, especially following on from a flat (no pun intended) 2013, when flat-panel sales disappointed the market. Futuresource Consulting said, "Flat panel saturation in developed markets has resulted in oversupply and has been exerting downward pressure on vendor profitability," said Jack Wetherill, Senior Market Analyst at Futuresource. "Moreover, the stimulus provided by the switchover from analogue to digital in the years up to 2012 did not carry over into 2013.

"However, in among last year's global market weakening—with TV revenues down to \$104 billion at trade—we did see pockets of profit. The Chinese market grew strongly in 2013 after an underwhelming 2012, to reach 47 million units, with a government subsidy program bolstering a particularly strong H1. Latin America and MEA also enjoyed growth, with flat panel volumes up 3 and 6 percent, respectively.

"As we progress through 2014, we're going to see the global TV market grow by around 1 percent to exceed 230 million units, with the majority of growth being derived from Latin America, Middle East & Africa (MENA) and emerging Asia Pacific (APAC). Value will be driven even higher, with forecasts of nearly 2 percent, on track to exceed \$105 billion."

This is all well and good, but what about 4K, you might ask. Futuresource's view is much more positive than that of TDG. To generate higher margins, panel makers and TV vendors are beginning to push new generation 4K TV sets, and Futuresource forecasts show that 4K sets will account for 5 percent of the global TV market this year, rising to 42 percent by 2018.

In addition to attractive pricing, the industry is hoping that the ability of many of the sets to upscale from HD will encourage consumers to buy the sets in advance of the content industry gearing up for widespread 4K content capture and distribution. The larger screen size segments are now

expected to migrate rapidly to 4K, predominantly as the result of upstream competitive pressures and efficiencies in panel manufacturing.

But just to return to TDG for a moment—their study has a very valid point, which is that consumers are confused by the technology—and fazed by the high prices. Every reader of Inside Satellite TV knows only too well that the 'chicken and egg' situation is also affecting take-up where there is simply no content being aired, other than few series on Netflix and other download services (and the movies packaged in with high-end Sony and Samsung displays).

TDG research indicates that more than eight in 10 adult broadband users have never heard of, or are unfamiliar with, 4K/UltraHD televisions. That's hardly a favorable environment for those OEMs looking to grow unit sales. According to TDG President Michael Greeson, "The industry is counting on 4K/UHDTV to be the solution for slow television sales and declining unit prices."



*LG Display combined the world's largest 105-inch screen Ultra HD color definition, resulting in the 105-inch Curved Ultra HD (UHD) TV. Photo courtesy of LG Electronics.*

All of the major TV OEMs have 4K/UHDTV sets in the market, with prices generally ranging from \$1,500 on the low end to as much as \$10,000 on the high end. Unfortunately, even among those familiar with the technology, TDG's research suggests that prices are still too expensive for many consumers.

At a retail price of \$1,499—the midpoint of the three prices evaluated—only 6 percent of adult broadband users are moderately or highly likely to purchase a 4K/UHDTV. "This explicitly quantifies just how poor the demand for 4K/UHD televisions actually is," explained Greeson, "and clearly demonstrates that current prices are too high to stimulate new sales."



"To illustrate how rapidly this demand evaporates relative to price, only 3 percent of adult broadband users are moderately or highly likely to purchase a new 4K/UHDTV set at \$1,999 a unit, a modest increase in price of \$500 that results in a 50 percent decline in demand at \$1,499," said TDG.

There is little doubt that prices are coming down and technology promotion is occurring. The likes of Sony, Samsung, LG and others are pushing the technology and there's not a high-end electrical retailer that is not evangelizing 4K and the benefits of what lies just around the corner.

And broadcasting—at least via some technologies—is just around the corner. In addition to the already mentioned Netflix-type streaming of 4K, there are now broadcasters around the world desperately seeking content for their 4K plans. Mike White, CEO at DirecTV, has promised to start streaming 4K services this coming winter, and broadcasting 4K a year later (by winter 2015-16). DirecTV will not be alone.

However, terrestrial transmission is a major problem for most networks, other than Japan and possibly South Korea. Here are comments from Clyde Smith, Fox TV's head of new technology, "I suspect when we do start 4K, we will all again be surprised at how long, and close, people will look at the screen. When we started in HD, people were almost glued to their sets. And they watched the HD commercials! But in those days, the audience measurement systems were not that sophisticated. Now they are. Then, we could not monetize the improvement in viewing quality. Now we can do so, and the industry needs to move to a census-type ratings system so that we can monetize 4K.

"But we are in a whole new experience. For most people, the first time they ever saw HDTV was via a broadcast signal. Now, 4K is being watched today on Netflix and other streamed services. On-line is first, then cable and satellite will follow, and poor old broadcast will be last.

And in the USA, because of the broadcast regulations, it might be a way off. The ATSC is drafting its ATSC v3 specification for the end of 2015, which will then take six months for ratification, and then the FCC has to act on that, and they're not the speediest of organizations because of what they have to go through. So, we are a way from any early adoption by [U.S. over-the-air] broadcast."

As mentioned, DirecTV (and quite possibly NHK, Sky Germany, NTV Plus in Russia and others) will be at MIPCOM this coming October to seek out that content. MIPCOM, again, is doing its best (with Sony's help) to push producers to consider 4K in their future transmission plans, and plenty are. Some examples include...

- **Atlantic Productions, working with Sky UK**
- **BBC Natural History Unit, active in 4K**
- **NHK, shooting in 4K**
- **RAI Italy, Commissioning in 4K**
- **Sky Italia, building its 4K portfolio**
- **Sky Germany, Europe's 4K pioneer**
- **France Televisions, experimenting**
- **4KMedia4U, Germany, building a 4K archive**
- **Red Bull Media, shooting in 4K**
- **Trator Films, Brazil, shot the FIFA 4K film**

In other words, the production community is thinking ahead about Ultra-HDTV. Indeed, some are already shooting in 5K and 8K. That satellite delivery is going to be hugely important is clear to everyone, and the payTV sector will lead this charge. It just needs to happen.

#### **About the author**

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

## **Executive Spotlight: John J. Stolte of ORBCOMM Executive Vice President, Technology and Operations**



**J**ohn Stolte joined ORBCOMM in 2001. He has more than 20 years of technology management experience in the aerospace and telecommunications industries.

Prior to joining ORBCOMM, Mr. Stolte held a number of positions at Orbital Sciences Corporation, the most recent being Program Director where he was responsible for the design, manufacturing and launch of the ORBCOMM satellite constellation. From 1982 to 1990, Mr. Stolte worked for McDonnell Douglas in a number of positions, including at the Naval Research Laboratory where he led the successful integration, test and launch of a multi-billion dollar defense satellite.

### **SatMagazine**

*Good day, Mr. Stolte. You have gained a great deal of experience within this industry at a number of leading companies and organizations... what led you to embark upon a career path in SATCOM?*

### **John Stolte**

After graduating from the University of California, Davis, I started my career at McDonnell Douglas, where I was given the opportunity to work on many different aerospace projects, ranging from F18 fighter jets to Delta launch vehicles. After I witnessed my first Delta launch on a rocket I worked on, I got "the space bug." However, instead of just working to get the satellites into orbit, I wanted to work on the satellites themselves. This led to my transition to the Naval Research Laboratory (NRL) to work on classified space missions.

As a young engineer at the NRL, working side by side with true space pioneers, the experience was incredible. But the pace for launches was



*The launch of ORBCOMM's six OG2 satellites from Cape Canaveral, Florida, via a SpaceX Falcon 9 launch vehicle on July 14, 2014. Photo is courtesy of SpaceX.*



An ORBCOMM technician prepares OG2 satellite for electromagnetic compatibility testing. Photo courtesy of Sierra Nevada Corporation.

relatively slow and I wanted to work on both the production side and the commercial side of the space industry.

One of the upstarts in the commercialization of space was Orbital Sciences Corporation and I jumped at the opportunity to work there. Orbital was on the cusp of entering the satellite industry and had just conceived the idea to build a constellation of communications satellites, which we know today as ORBCOMM. ORBCOMM was the perfect combination of the production and commercialization of space, which is where I wanted to be—since then, I have never looked back.

### SatMagazine

While at Orbital Sciences Corporation, what prompted you to move over to ORBCOMM?

### John Stolte

Joining ORBCOMM was an easy decision. I was drawn to the ORBCOMM program because the work environment was extremely fast paced and

cutting-edge, and clearly fed my passion for commercializing space and creating a truly ground-breaking production line for small satellites. I've also been most fortunate to work with an outstanding group of energetic, motivated and highly talented engineers.

### SatMagazine

Who is ORBCOMM partnering with to launch its next generation OG2 constellation?

### John Stolte

We have been working with a premier team on the OG2 program. Our partners range from long-time space innovators to relatively new entrants into the space industry, all of whom are focused on continuing to revolutionize space technology. What's even more exciting is that OG2 is built solely upon American innovation. The entire OG2 system, from engineering, launch and operation, are uniquely performed and supported by US-based companies. Sierra Nevada Corporation (SNC) designed and manufactured our state-of-the-art OG2 spacecraft and has led all development and integration efforts from their Louisville, Colorado, facility. Boeing manufactured the robust communications payload on-board the OG2 satellites and has worked hand-in-hand with SNC on integration. Moog provided critical hardware and support services, including a complete propulsion system and modular satellite dispenser, which allows us to launch as many as 12 OG2 satellites on a single mission.

Our launch provider, SpaceX, is truly advancing the boundaries of the space industry. SpaceX did an outstanding job with launching our first six OG2 satellites aboard their upgraded Falcon 9 rocket on July 14, 2014, from Cape Canaveral, Florida. The OG2 satellites were inserted within a fraction of a kilometer of their intended orbit. Each of the six satellites separated, deployed their solar panels and antennas properly, and they established connectivity at ORBCOMM's Gateway Earth Stations around the world. This was a nearly flawless launch and a true testament to the capabilities of our team of OG2 partners.

### SatMagazine

How are the pre-launch activities taking shape for the launch of the next 11 OG2 satellites?

### John Stolte

The next set of 11 OG2 satellites for OG2 Mission 2 is progressing well. SNC has completed all of the satellite buses and Boeing has completed all the payloads. SNC has optimized the integration and test process for the satellites, which is currently underway at SNC's Colorado facility. We expect SpaceX will launch our 11 OG2 satellites early next year (2015). Starting this month (October, 2014), SpaceX expects to maintain the pace of completing roughly one launch per month from Cape Canaveral Air Force Station in Florida leading up to our OG2 Mission 2 launch.

### SatMagazine

What are the advantages of a Low Earth Orbit (LEO) satellite constellation?



ORBCOMM's launch team installing the OG2 satellites on Moog's ESPA ring dispenser. Photo courtesy of SpaceX.

## John Stolte

Our LEO satellites orbit at roughly 500 miles above the Earth's surface and require only 100 minutes to circle the globe. The satellites are arranged in multiple planes for providing optimized worldwide coverage to enable two-way data communications anytime, anywhere. With multiple planes of satellites and the rotation of the Earth, the "look angle" to a satellite is constantly changing. This allows customers to send messages regardless of their location—behind hills or buildings and in urban canyons.

In general, LEO satellites are much smaller and lighter when compared to geostationary (GEO) satellites. A LEO satellite's low mass allows operators to launch multiple satellites on a single rocket. For us, that means we can launch 11 satellites on a single Falcon 9 rocket as part of our second OG2 mission, which will complete our next generation constellation.

Our OG2 satellites also have a fully reprogrammable software radio that allows us to continue to develop and upload new services while they are in orbit. In addition, LEO satellites are quite cost-effective. Our entire OG2 constellation of 17 LEO satellites was approximately the same cost as a single GEO satellite.

## SatMagazine

*Would you please explain the updated technologies or other included features of the OG2 satellites when compared with the initial OG1 satellites?*

## John Stolte

Each OG2 satellite will offer up to six times the data access and as much as twice the transmission rate of an existing OG1 satellite. Each OG2 satellite is the equivalent of six OG1 satellites, providing faster message delivery, larger message sizes and better coverage at higher latitudes, while drastically increasing network capacity. Additionally, the higher gain will allow for smaller antennas on communicators and reduced power requirements, yielding longer battery lives.

The OG2 satellites will average from 100 to 140 passes per day, depending on latitude, which will provide near-continuous global coverage. In representative regions of the world such as North America, South America, Asia, Europe, Australia and Africa, typical message delivery speeds are expected to improve significantly, and average delivery times are expected to be less than three minutes.

The OG2 satellites are completely backward compatible and interoperable with our existing OG1 network so they will communicate seamlessly with the ORBCOMM devices already deployed in the field.

In addition, the OG2 satellites are equipped with an Automatic Identification System (AIS) payload to receive and report transmissions from AIS-equipped vessels for ship tracking and other maritime navigational and safety efforts. The OG2 satellites will dramatically increase asset visibility and the probability of detection for ORBCOMM's AIS customers.

These improvements will have a major impact on enhancing network service for our customers and increasing the M2M markets they can serve, while continuing to support the reliable mission-critical communications available today through our current OG1 network.



*A technician prepares an OG2 satellite for system level vibration testing. Photo courtesy of Sierra Nevada Corporation.*

## SatMagazine

*What are the secrets to maintaining the OG1 constellation?*

## John Stolte

Our existing OG1 constellation is nearly 15 years old, and the OG1 satellites continue to send and receive messages to support network capacity and message delivery. We have hired a top-notch team of satellite engineers and technical experts to continuously and closely monitor the health of our OG1 satellites and develop optimized operating modes to maximize performance. We've also built our satellites with the ability to perform comprehensive commands while they are in orbit and allow for us to update and/or change all on-board software from the ground to maintain full operational health and effectiveness.

## SatMagazine

*How will ORBCOMM integrate its new OG2 constellation with its existing OG1 constellation? What do legacy OG1 customers have to do to additionally engage or initiate new operations with OG2?*

## John Stolte

The first phase of the OG2 integration is quite simple. The OG2 satellites are fully backwards compatible with our existing OG1 network with improved results. Upon completion of the IOT process, the satellites are put into an operational mode that will enable all existing OG1 customers to start seamlessly using the OG2 satellites to send and receive messages for their M2M applications.

The first launch of six OG2 satellites was positioned to fill an existing gap in the OG1 constellation, which will significantly improve message latency and replenish the OG1 constellation. In addition, we have changed the orbit plane inclination for the OG2 satellites to provide better coverage over high and low latitude customers, such as those in northern Europe.



Photo courtesy of SpaceX Falcon 9 rocket fairing ready for ORBCOMM's OG2 launch.

**SatMagazine**

*How will ORBCOMM integrate its satellite and cellular services?*

**John Stolte**

ORBCOMM is an integrated multi-network provider offering connectivity services for three global satellite networks and six Tier One cellular networks. We have integrated all satellite and cellular device provisioning and services management via our new Management Portal (MP) under our Multi-network Access Point Platform (MAPP) architecture.

The MAPP interface enables our customers to manage their entire network of devices—satellite, cellular or mixed devices from multiple carriers—through a single, easy-to-use and customized interface. Some of the top features of the new portal include dashboard management of fleets and usage reporting and alerting. For added flexibility, ORBCOMM has provided provisioning features to allow customers to define, link and manage dual-mode (a blend of satellite and cellular) devices together as single subscriber units. We will be kicking off the commercial launch of the portal to our global customers this fall.

**SatMagazine**

*Given your work in the defense arena for eight years with McDonnell Douglas and the Naval Research Laboratory, how do you compare the commercial business SATCOM environs with the MILSATCOM world?*

**John Stolte**

The commercial SATCOM business requires a much more adaptive and flexible approach to meet the ever-changing market place. This is why ORBCOMM has decided to use a fully reprogrammable software radio. This allows us to easily change and/or update the services our OG2 satellites can provide. Additionally, the commercial side of SATCOM requires cost-effective solutions. The entire OG2 constellation of 17 satellites will be placed in service for approximately \$200 million.

**SatMagazine**

*Will ORBCOMM be committing additional resources to increase their tracking and theft prevention M2M work with government agencies and military commands?*

**John Stolte**

ORBCOMM is already a significant player in the government cargo security business. We are a leader in the tracking and security of containers coming in and out of Afghanistan as well as the monitoring and security of critical fuel shipments. As the war effort in Afghanistan subsides, we expect to continue to support the troops in this capacity and expand into other regions.

In addition, the \$102 million RFID-IV contract with our partner, Savi Technology, and our broad GSA schedule offering with our partner, CorpTen International, provide ready contract vehicles for government agencies to procure our industry-leading products and services. We expect our new and advanced OG2 constellation to offer satellite M2M services for both civilian government and military alike.

## SatMagazine

*What can we expect to see from ORBCOMM over the next few months as the OG2 constellation continues to expand in size and come online to further the M2M cause, especially in the crucial areas of Oil and Gas and maritime?*

### John Stolte

Our next generation OG2 satellite constellation will significantly expand ORBCOMM's reach across the global M2M industry, especially in the maritime and oil and gas markets. For the maritime industry, ORBCOMM's satellite-enabled systems offer advanced features and services to luxury recreational marine vessels and commercial fishing vessels, such as on-board diagnostics and other marine telematics, alarms, requests for assistance, security, location reporting and tracking, two-way messaging, catch data and weather reports.

In addition, each of the OG2 satellites is equipped with the capability to collect AIS data. ORBCOMM's AIS service tracks well over 130,000 vessels daily for commercial and government customers such as the U.S. Coast Guard, foreign Navies and other international maritime authorities. By using ORBCOMM's AIS service, security and intelligence departments around the world can know where nearly every large vessel is located, where it's going and when it will get there. These agencies can use this valuable data to quickly react to anomalies at sea such as suspicious movements, route deviation and other unusual behavior.

We will continue to focus on expanding into the new market sectors that could benefit from access to AIS data, including suppliers to the shipping sector, such as traders, brokers, insurance companies and support services. A potential new market involves combining AIS data with M2M asset tracking and monitoring solutions. We believe this creates the opportunity for ORBCOMM to provide complete end-to-end visibility of the shipment of goods throughout the global supply chain using an integrated information solution. This solution, once fully integrated into transportation management systems (TMS), has the potential to track and monitor individual shipping containers through the intermodal transportation system from origination to destination as it is transported on truck, rail and ship.

As for companies in the oil and gas industry, ORBCOMM services can be used to monitor productivity, manage inventory, increase security, minimize downtime and enhance operational efficiency. This can range from the tracking and monitoring of fuel shipments to managing and controlling the remote operation of valves and/or switches. Applications for automated meter reading, oil and gas storage tank monitoring, pipeline monitoring and environmental monitoring can also help companies reduce operating costs, including labor, fuel and on-site monitoring and maintenance.

## SatMagazine

*Why do you feel M2M is becoming a "must consider" technology for businesses? What has generated this increased interest?*

### John Stolte

As the adoption of M2M technology has continued to expand, what was once considered cutting edge, too expensive or impractical to deploy is now mainstream and within reach for small businesses. M2M is really becoming a requirement for competitive survival and a necessity for operating smarter and more efficiently in a fast-paced world requiring real-time information.

Leveraging M2M applications enables businesses to have critical information about their assets anywhere in the world—where and when they need it—which can revolutionize how they do business. They can significantly improve asset utilization and performance, gain operational efficiencies, reduce theft and unauthorized use and enhance customer service.

There's also a fast and sure return on investment, so it really becomes a matter of whether companies can afford *not* to deploy M2M technology. The best part is working with ORBCOMM—we offer everything companies need to launch a M2M solution—global satellite, cellular and dual-mode network services to devices (from turnkey solutions to OEM components), web reporting applications and device management platforms, the M2M industry's most comprehensive and unique service offering.

## SatMagazine

*Lastly, as you consider your career at ORBCOMM and elsewhere, what project or projects truly bring a sense of satisfaction to you?*

There are many—from the satisfaction of receiving telemetry from our newly launched OG2 satellites to improving the performance of our 15-year-old OG1 satellites. I'll always remember the night we first started collecting AIS signals from our first satellite with AIS capability. I was amazed sitting at my desk, looking at the location of thousands of vessels and thinking that there is no one else in the world seeing this data.

However, the true satisfaction for me is working with incredibly talented people. Every day, here at ORBCOMM, I'm surrounded by highly dedicated and astonishingly creative engineers that are able to work through some of the most challenging problems to ensure we provide our customers with the best M2M services possible. I want to give a shout-out to our Technology and Operations team at ORBCOMM to thank all of them for their efforts.

To digest additional information regarding ORBCOMM, please visit <http://www.ORBCOMM.com/>

# SatFinder

Satellite Database & Calculation Software

## DATABASE

Information on over 500 satellites (orbital location, frequencies, EIRP, G/T, SFD, bandwidth, programming etc.)

Information on 9,000 companies (address, tel, fax, web, products, services and contact names etc.)

Information on 19,000 executives in the commercial satellite industry.

800 hundred EIRP, G/T & SFD maps in color not published anywhere else.

## CALCULATION

Has full up-down digital link budget calculators with input provision for uplink power control (UPC), ALC, various interferences and multiple carriers.

Finds HPA size, uplink power requirements, bandwidth and power usage per carrier.

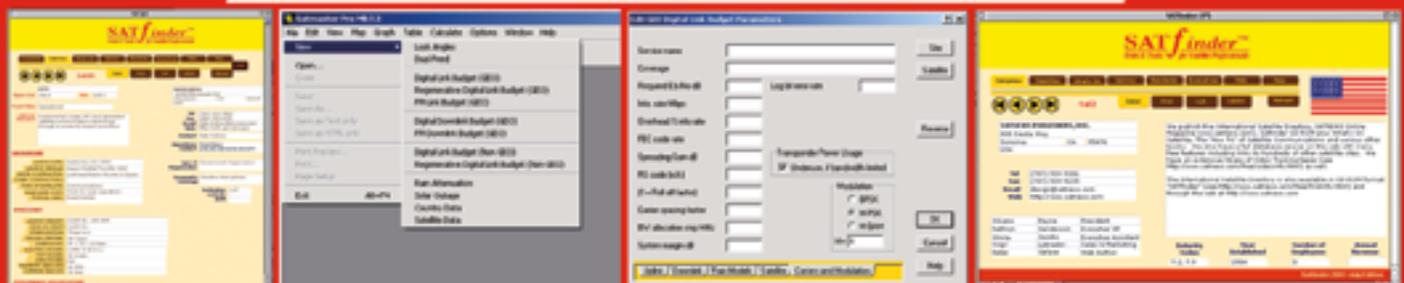
Calculates atmospheric losses and rain fade margins for any desired availability on uplink and downlink.

Handles BPSK, QPSK, M-PSK or M-QAM with any FEC code rate.

Determines power or bandwidth limited modes and calculates the power equivalent bandwidth, if appropriate.

Provision for RS codes or 'Turbo' modems. Option for rain up AND rain down scenarios where uplink and downlink are from/to the same city.

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# How Satellites Will Fuel the Next Wave of Journalism... A Thuraya Perspective

By John Huddle, Head of Media and Broadcast, Thuraya

**In recent years, major events such as the Arab Spring and the 2004 Indian Ocean earthquake have brought the role of citizen journalists into global prominence.**

As mainstream news outlets adapt to this emerging trend, professional journalists and average citizens alike can explore the use of satellite technology as a key enabler to delivering news from anywhere in the world. Without doubt, the rise of citizen journalism has transformed traditional means of newsgathering and dissemination.

A new breed of public citizens and independent media are leveraging the latest advances in digital technology to provide on-the-ground news updates. Independent news outlets around the world are gaining in credibility, especially in terms of providing alternative viewpoints and driving online news collaboration that is relatively free of censorship.

At the same time, the accelerated demand for breaking news content in today's digitalized world places more pressure on traditional news organizations to crowd-source and incorporate user-generated content into their news packages.

The increased trend of professional journalists working together with a network of citizen contributors—either to develop stories or to update a news report with the latest information—reflects how citizen journalism has already impacted the way major news organizations operate. This trend is evidenced by the growing number of major news outlets, such as CNN with its iReport initiative, that have successfully incorporated amateur video or pictures of breaking news stories into their programming mix.

Increasingly, broadcast and print journalists have to evolve rapidly beyond their traditional duties as news gatherers or gatekeepers, and take on more of the role of a news “curator”—using their experience to bring context, fact-checking and critical analysis to citizen-submitted content. Equally important, journalists today have to adapt quickly to the use of a diverse range of technologies at the scene of breaking news.

## **Impact of Future-Oriented Technologies**

The increased prominence of citizen journalism is synonymous with the rise of a new, technology-driven era of journalism.



The popularity of social media and online video platforms has revolutionized how news is being disseminated. Facebook and Twitter rank highly as online news sources today, and the sheer pervasiveness of YouTube has enabled citizens' video contribution to fuel the demand for real-time, interactive news updates.

Both public citizens and professional journalists alike are increasingly adept at using a wide range of social media, mobile apps and technology for reporting purposes. An example is how quickly Vine, the Twitter-owned mobile app launched only in January of 2013, has been embraced by journalists to capture instantaneous video clips and provide timely news coverage.

Consider how these developments have already impacted the everyday routines of print journalists, who are now expected to possess the capability to capture live video footage while covering breaking news on the ground—even in situations where they only have their smartphones at their disposal. Indeed, the breadth of mobile technology advances available today are staggering, ranging from smartphone video apps that enable reporters to edit their footage while on the move to equipment that can be easily deployed to set up a robust satellite connection from anywhere.

As digital tools evolve, journalists expect to have access to portable devices that are capable of delivering broadcast-quality content on par with that captured from remote broadcasting equipment. Major news outlets can also tap on the latest technology to facilitate news gathering in a more economical and less time-consuming manner.

No longer do they need to deploy an entire team of reporters and a satellite newsgathering (SNG) truck to deliver breaking news as it happens. Using his or her mobile device, a single journalist is now able to provide reliable news coverage and accommodate 24-hour news cycles without the need for expensive equipment.

In this respect, the role of satellite as a key enabler for journalists and public citizens to report and broadcast from anywhere cannot be underestimated. Satellite technology provides a significant advantage in allowing journalists to operate with Internet access when outside of cellular coverage, and to make use of their personal devices to stay connected at all times.

### **Pushing the Boundaries with Wearable Devices**

Another key development that underpins how new technology will continue to open up the possibilities of newsgathering is the advent of wearable devices among journalistic circles. Mobility is an important consideration for on-the-ground news reporting, and wearable technology such as Google Glass provide journalists with greater flexibility and new levels of technical sophistication.

Journalists have started exploring the broadcasting capabilities of hands-free wearable technology to capture breaking-news video footages without having to hold and operate a camera. As the next breakthrough in mobility, the wearable technology trend has already captured the imagination of many. In May 2014, CNN became the first news agency to embrace the use of Google Glass by its iReport network of citizen journalists to submit stories, photos and video content.



Another innovative feature of wearable recording devices is that they enable journalists to present a first-person perspective—to literally put the audiences at the scene of a street protest, for instance, experienced through the eyes of a reporter. To be sure, this cannot be achieved in the absence of connectivity.

Satellite has a pivotal role to play in empowering professional journalists to stay relevant in today's technology-driven media environment — regardless of devices, location, and the network they are operating on. Thuraya will continue working closely with our partners and solution developers to establish an entire ecosystem to foster new technology and applications for journalists to deliver breaking news from the most challenging environments.

Thuraya's infosite for additional information is located at

<http://www.thuraya.com>

#### **About the author**

*John Huddle, Head of Media & Broadcast, Market Development. With over 12 years' experience in the satellite industry, John leads the development and execution of Thuraya's MediaComms product line including global market strategy, pricing, and operating plans.*



## Executive Spotlight: Curt Blake President, Spaceflight, Inc.

**C**urt Blake has more than 25 years of executive experience in high-growth and tech industries. He previously served as senior vice president and general counsel for Spaceflight, leading efforts to expand its global network of launch service providers while building relationships with key commercial-, civilian- and defense-related customers.

Prior to joining Spaceflight, Blake held a range of senior executive and general counsel roles at Microsoft, Starwave, Corbis and Aldus. He is a current member of the Commercial Spaceflight Federation Board and contributor to numerous small-satellite conferences.

### SatMagazine

*Mr. Blake, what are the benefits of Spaceflight's services?*

### Curt Blake

We've modeled Spaceflight to be a "one-stop shop" for launch rideshare services, helping more organizations to move more satellites into space. Our approach is to arrange launch logistics and integrate customers' payloads onto the excess capacity of existing launch vehicles. This

model offers considerable benefit to both small-satellite customers and launch vehicle providers, improving our customers' purchasing power while bringing additional revenue to the launch providers.



For smallsat operators, we act as a single point of contact and coordinate with all stakeholders involved in a launch, guiding them through all launch phases from initial mission design to orbital deployment. We offer expert support around national and international regulations, support in contracting for space on launch vehicles, engineering support in payload integration and delivery as well as mission management. By making our pricing structures and launch calendars publicly available, we've also reduced the burden of project planning and budgeting risks for customers. At the end of the day, our customers receive turnkey smallsat integration, transportation services and access to our global network of launch vehicle providers at the best possible price.

*Spaceflight has integrated and launched 76 smallsats as secondary payloads on a variety of launch vehicles.*

### **SatMagazine**

*Would you please provide examples of how Spaceflight's customers are using its services?*

#### **Curt Blake**

We specialize in the launch of secondary payloads that range from very small cubesats to microsats weighing up to 300 kg. This makes our services ideal for organizations ranging from the U.S. government, foreign governments and space agencies to space startups, defense contractors, emerging space programs, universities and research institutions.

These customers use our launch services for any of a wide variety of purposes, including earth observation, remote sensing, technology demonstration and scientific research, which address a broad range of needs here on Earth. I feel really fortunate to be in a space with so many exciting, real-world applications.

We are becoming experts at launch services for CubeSat constellations, having launched the majority of Planet Labs Dove spacecraft. When you are looking at launching a large number of small satellites over a period of a few years on rideshare missions on multiple launch vehicles, knowing how each launch vehicle provider operates can be quite the daunting task. We give our constellation customers a menu of launch options and help dial-in which launch opportunities make the most sense for the particular customer and mission goals.

### **SatMagazine**

*What sets Spaceflight apart from its competitors?*

#### **Curt Blake**

Spaceflight has introduced a completely new approach for launching spacecraft, geared toward organizations in the emerging smallsat market. While most of our competitors focus only on CubeSats, we also operate in the 50 to 300kg. payload range, which is often more attractive to launch service providers. We offer access to a breadth of available launch vehicles worldwide as well as extensive expertise to help our customers navigate launch logistics. Through our new Spaceflight Networks line of business, we are also the only company able to provide a bundled package of satellite communications and operations services in addition to our rideshare launch services.

In addition to our business model, I think what truly sets Spaceflight apart is our commitment to excellent customer service. We provide a transparent launch schedule, competitive pricing structure, expert consultation and outstanding customer support at every point in the process. Our commercial pricing is also publicly available—something almost unheard of in our industry.

### **SatMagazine**

*How is Spaceflight able to provide its services at such a competitive cost?*

#### **Curt Blake**

Our competitive pricing structure is based on our unique "rideshare" business model. We use standardized payload accommodations, taking advantage of frequent flight opportunities on a variety of launch vehicles worldwide. By aggregating our customers' payloads onto the excess capacity of this network of partner vehicles, we are able to improve our customer's purchasing power.



*Spaceflight accommodates hosted payloads on its SHERPA in-space tug / satellite platform.*



*Spaceflight's partnership with NanoRacks resulted in CubeSat launches from the ORB-2 satellite.*

A typical launch for us to Low Earth Orbit (LEO) may cost anywhere from \$125,000 to upward of \$8 million. As a single standalone small satellite, our customers would not be able to gain access to a launch, but by grouping together on Spaceflight's manifest, we are able to lower the entry price and provide an adequate financial incentive for the launch vehicle provider.

### **SatMagazine**

*What growth have you seen in the small-satellite market and what do you see as the future of the industry?*

### **Curt Blake**

The global growth of the small-satellite market within the past decade has been phenomenal. Look how we've moved from massive computer mainframes to the PC—and now tablets and smartphones—the size of satellites has also drastically decreased and, with these smaller sizes, the costs and hassles of launching them has also diminished. This improved access to space has enabled new ventures by space startups, emerging space programs, universities, research institutions and other smaller players.

The ongoing miniaturization of satellites has ushered in new operating paradigms, such as the emerging satellite constellations. Companies such as our partner Planet Labs are now launching dozens or hundreds of satellites at a time, leading to exciting technological developments. We've optimized our launch and operations services for these emerging constellations, which are quickly becoming the industry norm.

Since Spaceflight's founding in 2009, the launch rideshare model has also become more mainstream. To date, we've launched 76 small satellites in partnership with companies like Planet Labs, MIT, and Southern Stars. I think this rapid progress will only continue as satellite technology continues to advance, access to space grows and launch and operational costs continue to drop. Ultimately, I see an industry that is open to more people and organizations—and we're doing everything we can to help it get there.

### **SatMagazine**

*Spaceflight recently announced plans for Spaceflight Networks, the company's new line of business for smallsat communications. What was the motivation for creating Spaceflight Networks and how does this program benefit customers?*

### **Curt Blake**

As smallsat use and popularity continues to grow, the challenge for developers and operators has shifted from gaining space access to retrieving satellite data. It's one thing to get your satellite into space, but it's useless unless you can effectively communicate with it.

In our two years of launching smallsats, we consistently heard from our customers that satellite ground-station communications is overly expensive and cumbersome, often requiring them to recreate the wheel for satellite radio and software and ground infrastructure.

We decided to create Spaceflight Networks to address this critical ground communications issue and to offer global connectivity at a most competitive price for small satellites. Through our dedicated operations center and global network of 11 ground stations, we can provide our customers and the broader satellite community with a convenient, turnkey solution for spacecraft communications and operations.

In contrast to satellite communications networks that focus on individual spacecraft, Spaceflight Networks will consist of spacecraft radios and ground stations that use common communications protocols and standards. Smallsat operators can simply choose from various communications packages based on their needs, either dedicated or ad-hoc antenna access. We have optimized the service for the emerging satellite constellations, and sighted each ground station to minimize communications latency and therefore maximize constellation throughput.

For additional information regarding Spaceflight, Inc., please visit <http://spaceflightservices.com/>



# New Export Controls on Satellites Bring New Compliance Challenges

By Brandt Pasco, Attorney, Kaye Scholer LLP

**On June 27, 2014, radiation hardened chips of crucial interest to the satellite industry moved off the U.S. Munitions List to the licensing jurisdiction of the Department of Commerce.**

That is, indeed, big news. However, much more sweeping change goes into effect on November 10, 2014, when most commercial satellites move off the Munitions List to Commerce.

For years, the European space industry has been working overtime to go "ITAR Free," eliminating to the maximum degree all U.S.-origin items which are subject to the International Traffic in Arms Regulations. With this transfer from the licensing jurisdiction of the Department of State to the jurisdiction of the Department of Commerce for most commercial satellites, including parts and components, much of the U.S. space industry is practically giddy at the prospect of is going ITAR Free first. Champagne corks have been popping as U.S. industry prepares for the new environment.

The celebratory mood is for good cause. Life under the strictures of the ITAR has not been kind to the U.S. space industry, and everyone understandably hopes to revive the glory days before Congress slammed space into the U.S. Munitions List in 1998. By some estimates, 80 percent of space related items are moving off the ITAR.

There is no question life going forward will be better. Much better. But one thing it will not be is pre-1998. These are not the regulations of 16 years ago. They differ in important ways, particularly with respect to scope and compliance. To understand what will be different, and what will be the same, it is critical to understand the changes which were made by Congress last year.

These regulatory changes implement the *National Defense Authorization Act for Fiscal Year 2013* ("2013 NDAA"), which President Obama signed on January 2, 2013. Section 1261 of the 2013 NDAA amended Section 1513 of the *Strom Thurmond National Defense Authorization Act for Fiscal Year 1999* ("1999 NDAA") by striking the requirement that all satellites and related items be subject to the export control jurisdiction of the ITAR.

The 2013 NDAA authorized the President, pursuant to section 38(f) of the *Arms Export Control Act* (AECA) (22 U.S.C. 2778(f)), to review Category XV (covering satellites) of the USML "to determine what items, if any, no longer warrant export controls under" the AECA. As a result of this change, a huge percentage of the space-related items which are subject to ITAR controls are moving off the U.S. Munitions List.

This shift to the Department of Commerce licensing jurisdiction means a highly visible change in licensing, especially for parts and components but



also for most commercial satellites. The use of license exemption Strategic Trade Authorization will allow many license free exports to 36 countries.

Furthermore, the de minimis rules mean that, provided the value of the U.S.-origin content is below 25 percent, foreign manufactured satellites — including Commerce-controlled U.S. origin content—will not be subject to reexport licensing requirements to most destinations. Many in industry have been rhapsodizing about the U.S. commercial satellite industry going ITAR free before European producers are able to get there.

This good news, the repeal of key parts of Section 1513 which put “all satellites and related items” on the U.S. Munitions List, has understandably received most of the press. The 1999 NDAA did more than put all of space on the U.S. Munitions list. Lots more, particularly with respect to compliance burdens and restrictions on exports to China and launch activities. None of these have changed, including:

- » *Sec. 1511 expressed the Sense of Congress on export policy related to satellites, including strict limits on exports to China.*
- » *Sec. 1512 requires presidential certification of exports of missile equipment or technology to China.*
- » *Sec. 1514 established stringent national security controls on satellite export licensing, including technology control plans, monitoring of foreign launches, licensing for crash investigations, and other measures.*
- » *Sec. 1515 requires reporting of various issues related to the export of satellites for launch by People’s Republic of China.*

This means that industry euphoria over moving satellites to Department of Commerce licensing jurisdiction needs at least a small splash of cold water to return to reality. With the regulations going into effect on June 27, some of the more burdensome ITAR licensing restrictions and compliance requirements are merely being transferred to the Department of Commerce regulations.

Twenty four countries which are subject to an United States or United Nations arms embargo are barred from exports of U.S. Munitions List items, a prohibition which is following former U.S. Munitions List items that migrate to Department of Commerce control. Most significantly for many, this includes a prohibition on exports to China.

In addition, anyone involved in the export or launch of satellites will want to carefully review the changes to Supplement No. 2 to Part 748 of the *Export Administration Regulations*. Supplement No. 2 includes requirements which were created by the 1999 NDAA, features which were previously unique to the ITAR, but which are being ported over to the Export Administration Regulations.

Under the new regulations, a license application to export a satellite controlled by the Department of Commerce to a country that is not a member of the North Atlantic Treaty Organization (NATO) or a major non-NATO ally of the United States must include:

- » *A technology transfer control plan approved by the Department of Defense;*
- » *An encryption technology control plan approved by the National Security Agency, or*
- » *Evidence of arrangements with the Department of Defense for monitoring of the launch activities.*

For license applications to export a satellite controlled by the Department of Commerce to a country that is a member of NATO or a major non-NATO ally of the United States, these requirements may be waived at the discretion of the Department of Defense.

Critically, whether a satellite is subject to the jurisdiction of the Department of State or the Department of Commerce, the ITAR controls as a “defense service,” the furnishing of assistance (including training) by a U.S. person to a foreign person directly related to the integration of a satellite or spacecraft to a launch vehicle or launch failure analyses. So even with the jurisdictional shifts, and as important as those changes are, with satellites the ITAR is never far away.

**About the author**

*Brandt Pasco is an attorney at Kaye Scholer LLP. Previously he was at the National Security Council Task Force on Export Control Reform, and is one of the authors of the satellite reforms being implemented. He can be reached at [brandt.pasco@kayescholer.com](mailto:brandt.pasco@kayescholer.com)*



# A Hughes Case in Point: Major Moves for Maju Nusa Sdn Bhd

By Vince Onuigbo, Senior Marketing Director, International Division, Hughes Network Systems, LLC

**T**he Malaysian government has made reliable telecommunications a top priority for every community within the nation's 329,000 square miles.

Indeed, the country's Universal Service Provision (USP) program was specifically developed to provide voice and Internet connectivity for people living in its two major land masses, Peninsular Malaysia and East Malaysia, separated by the South China Sea. But reaching the approximately 8 million population living in rural and remote areas presented a major challenge—as the cost of terrestrial networks is prohibitive, in contrast with the 20 million in metropolitan areas who are well-served by cellular 2G and 3G networks.

Enter Hughes and Maju Nusa Sdn Bhd, a premier Malaysian satellite service provider. Together, these companies have successfully solved the problem by implementing a novel and cost-effective Multiple Operator Radio Access Network (MORAN) solution. So named because the same infrastructure enables multiple operators to deliver services, MORAN is composed of a Hughes HX system with terminals co-located in each 2G/3G cell site, connecting traffic via satellite between the Base Transceiver Station (BTS) and the core cellular network. Unlike terrestrial solutions, for which costs are distance sensitive, employing the HX Satellite Backhaul system means uniform Capex and Opex costs, no matter where the cells are located.

The Malaysian government owns the network and contracts with Maju Nusa to manage all on a long-term basis. Maju Nusa resells wholesale services to the cellular operators, which include managing the radio, transmission, BSC, and RNC portions end-to-end. Cellular operators, in turn, resell cellular services to end users. The Hughes HX system has several key features that enable it to meet and exceed Maju Nusa's network requirements:

- **Low latency and jitter, making it ideal for cellular backhaul**
- **An optimized encapsulation scheme on the outroute and advanced Low-Density Parity Check (LDPC) coding on the inroute, for maximum bandwidth efficiency**
- **Integrated traffic management techniques, such as dynamic channel assignment and as-needed sharing of capacity between multiple sites, yielding best-in-class throughput and lowest operational cost on satellite links**
- **Interoperability with a wide range of cellular provider networks and technologies**

In addition, the HX system is easily installed by a single person and can be solar powered to increase versatility in areas with limited infrastructure.



## Maju Nusa Sdn Bhd

"We have been using the Hughes HX system for last three years for various services that include broadband Internet, maritime, and mobility services. It was last year when we were awarded this GSM deployment project, and we can proudly say that the HX system allowed us to connect remote parts of the country and offer cost-effective backhaul for cellular mobile services without having to worry about jitter and latency on the satellite network," said Faris Najhan Hashim, chairman of Maju Nusa.

Ramesh Ramaswamy, vice president of sales and marketing, international, at Hughes, said, "For people who live in these rural areas, this will be the first time they have cellular service in their communities. Hughes is deeply committed to delivering solutions that meet the challenge of providing cost-effective communications in rural and remote areas worldwide."



**About the author**

Vince Onuigbo is a Senior Marketing Director at Hughes, where he leads the technical marketing and business development for satellite backhaul of radio access networks globally. Among Vince's responsibilities are, liaising with engineering to deliver optimized satellite backhaul solutions for various cellular standards 2, 3 and 4G/LTE and scenarios—rural, urban and residential/enterprise deployments. In addition he leads the analysis and validation of prospective customers' backhaul business cases to ensure the most cost-effective systems design, and building of third-party partnerships that facilitate the best overall project delivery experience for operators. In early 2000, Vince played a leading role in the market development of Western Europe, Africa, and Middle East for Hughes Terrestrial Point-to-Multipoint microwave solution, used primarily for cellular backhaul.



Prior to joining Hughes in 1996, Vince held various technical positions at Motorola Cellular Infrastructure Group, including GSM /CDMA systems engineering and consultant to mobile operators for the planning of network roll-out. Vince is a published expert in the field of wireless access. He is a member of the IEEE and holds a BSc with honors in Electrical Engineering from Ahmadu Bello University Zaria, Nigeria and an MBA from Keller Graduate School of Management of DeVry University.

**About Maju Nusa Sdn Bhd**

Maju Nusa Sdn Bhd (Maju Nusa), incorporated September 1993, is a managed network service provider company based in Malaysia. MajuNusa has been involved in various businesses related to VSAT networks, mobile data and managed services to provide innovative, reliable, and cost-effective products and solutions to their customers using state-of-the-art technologies. Company information is available at <http://majunusa.com.my/>

**About Hughes**

Hughes Network Systems, LLC (Hughes) delivers innovative network technologies, managed services, and solutions for enterprises and governments globally. To date, Hughes has shipped more than 3.3 million systems to customers in more than 100 countries, representing greater than 50 percent market share. Hughes operates sales and support offices worldwide and is a wholly owned subsidiary of EchoStar Corporation (NASDAQ: SATS), a premier global provider of satellite operations and digital TV solutions. For additional information about Hughes, please visit <http://www.hughes.com>

With this important initiative, people across Malaysia will be connected to the global Internet marketplace and have the opportunity to help expand the country's economy, now the world's twenty-ninth largest and third largest in Southeast Asia, with steadily growing manufacturing, agriculture, tourism, and financial services industries—no matter where they choose to live or work.



# From Plant to Pump: Energy Sector Communications

By Andrew Matlock, Senior Vice President, Global Sales, NewSat

**Oil and gas operations are located in some of the world's most difficult and isolated environments, where even the simplest communication and logistical tasks present both complex and costly challenges.**

From exploration to distribution, access to anywhere, anytime communications is vital for the current and future operational success of the oil and gas (O&G) industry. As a result, connectivity requirements are growing significantly, with satellite the technology of choice to meet the operational demands of the energy sector.

Northern Sky Research's report (NSR) highlighted that the energy markets will be a critical consumer of satellite communications, forecasting a 1345 percent increase in bandwidth demand, TPEs (Gbps) from 2013 to 2023. NSR also noted an increasing trend to support tools and services for well-site monitoring, as well as VLAs (Very Large Array), WLANs (Wireless Local Area Network), voice, and video with crew and operational separations, increasingly driving bandwidth demand. This demand is what offers generous growth prospects for the satellite industry.

From auto-tracking satellite units to large and secure enterprise networks, satellite infrastructure supports O&G operations that range from on-site office requirements and employee welfare services to remote asset monitoring, back-up communications and security and safety systems enhancements. Satellite diversity and expansive footprints that enable anywhere, anytime communications with 99.99 percent availability, 24x7x365 technical support, and secure communications ensuring information privacy and business activity protection, are all of the major benefits of using satellite for the energy sector.

### **Head Office On Site**

One of the major benefits of satellite communications is effectively having head office facilities on site. During exploration, remote diagnostics is a key process that represents a significant opportunity for reduced operational costs and enables quick decision making.

Greater access and management of remote sites enables operators to leverage skilled resources, boost productivity and increase return on exploration and production investment. GE recently highlighted in *The Industrial Internet@Work* that; "mobility is playing an increasingly important role in workforce productivity. Wireless connectivity and the explosion of smart phones, tablets and related devices are putting real-time information and collaboration tools into the hands of workers everywhere from factory shop floors to hospital waiting rooms and offshore oil rigs. As the availability and performance of the global communications fabric continues to mature and expand the deployment of these technologies and the sophistication of the applications they support, continues to grow."

Management and technical experts can provide knowledge and real-time guidance regardless of individual location or site development, while data can be immediately sent back to a central location for monitoring and recording. Today's offshore rigs have more IP devices than ever before and 'new, sophisticated rigs continue to come to market that increasingly resemble a modern data centre, rather than a remotely located platform' (NSR, 2014). Subsequently, secure, reliable and fast connectivity is essential to deliver real time communications.

Transportation logistics is also a significant portion of energy sector operations and requires communications consideration. Ever advancing technologies and capacity availability is further driving innovative applications and flexible mobility requirements that enhance communications on the move.



## Employee Welfare

Employees working on remote sites demand a level of connectivity that enables constant communications to remain in contact with family and friends, keeping up-to-date with current events, and for entertainment, all essential in a location with minimal infrastructure and facilities. Employee welfare can also be enhanced through mobile tools and applications that provide critical information and instruction, improving employee safety, knowledge and training.

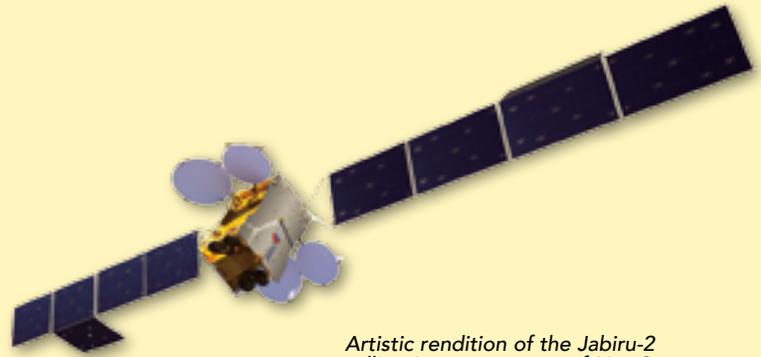
Most significantly, Annunziata and Evans (2013:31) stated; “workers will see their jobs become more rewarding as they will have easier and faster access to information and be better able to collaborate; they will learn and upgrade their skills at a faster pace, while becoming more efficient and productive.”

## Maximizing Operational Efficiency with Communications Partners

Today, oil and gas operators look for communications partners who are commercially and operationally aligned with their business objectives and possess the flexibility to meet their technical requirements while delivering a diverse range of solutions and platforms that can be implemented and deployed rapidly.

Partners selected NewSat to provide vital communication services to one of Australia’s largest resources projects, located in Western Australia. The size and nature of the project meant a diverse range of solutions were required to overcome the communication challenges large and remote resources projects encounter. As a 24 x 7 x 365 operation, the project required an always-on satellite service. Remote internet, voice, video and data services were implemented for operations, workplace health and safety compliance and back-up communications, as well as on-site staff welfare.

Prior to the project commencing, NewSat worked closely with the engineering and design team to ensure the venture had the best possible satellite service available and the greatest number of design options as the project matured. The final contract was a meshed satellite network, linking the on-shore production facility, the off-shore platform and the Perth head office. The wide range of satellites NewSat accesses provides line-of-site and satellite diversity, to ensure there is no single point of failure throughout the satellite network.



Artistic rendition of the Jabiru-2 satellite. Image courtesy of NewSat.

## Supporting the O&G Industry: Jabiru-2

As bandwidth demand continues to increase, there is a need for more satellites to support the sector. Jabiru-2 will provide coverage in and around Australia, Timor Leste, Papua New Guinea and the Solomon Islands and deliver highly concentrated bandwidth and EIRP and G/T, ideal for oil and gas requirements, preparing to meet the demand of today, tomorrow, and years to come.

As exploration, production and distribution continues, satellite communication partnerships will be an essential element for energy sector operators to maximise operational efficiency and achieve business outcomes.

For additional information regarding the Jabiru-2 satellite, please visit <http://www.newsat.com/jabiru-2>

### About the author

Andrew Matlock has a career spanning 25 years across telecommunications and technology sectors, much of it dedicated to building successful business teams and creating significant profitability and shareholder value. Joining NewSat in 2007, Andrew holds a Bachelor of Applied Science majoring in computer science and mathematics from Swinburne University, Australia. After a successful start as a computer programmer and analyst, Andrew then transitioned into sales and business management where he has created, developed and subsequently managed a number of divisional business units.





# CubeSat Release Mechanism for Solar Panel and Tether Deployment Invented

By Kyra Wiens, Public Affairs Specialist, U.S. Naval Research Laboratory (NRL)

**W**hen a satellite is launched into space, there's sometimes room on the rocket for a few mini satellites to hitch a ride, too. Adam Thurn, an Aerospace Engineer at the U.S. Naval Research Laboratory (NRL), has invented a nichrome burn wire mechanism for these CubeSats to deploy an object once in orbit.

"This is developed as a low-cost, simple mechanism that would do different deployables on a satellite like that," said Thurn. "We've done ones with solar arrays that are just on hinges and they come out. Another one we've done is tether deployment."

About 10 years ago, universities started using the relatively low-cost CubeSats for student-led projects; several companies now offer CubeSat kits. "They've become more advanced as people have realized the cost benefits of them," said Thurn. He points to a model on top of a bookcase near his desk. "A 3U CubeSat is about the size of a loaf of bread," he said. However, "Dealing with tiny stuff is difficult," he added.

A rocket launch is a prolonged, violent event. For decades, NRL has been figuring out how to tuck away the auxiliary pieces, such as solar panels, and engineer doors over instruments—then make everything come to life only when the satellite is safely in orbit.

With these new CubeSats, however, "You want to do all these deployables, but you start dealing with mechanisms and that gets complicated because you don't have the necessary volume," said Thurn. "Mechanisms tend to want to be a little bit bigger for their releases." Additionally, it's easier for electronics to overheat.

At a cost of \$160 each, Thurn assembled 10 mechanisms himself for testing and has given a few away to universities. He used all commercial parts, except for two aluminum pieces he calls "saddles" and had them made at a local machine shop. "The idea was to make it cheap and easy to use and easy to build so that students at universities could replicate it," he said. There are two steel rods or pins, "saddled" by two hard anodized pieces of aluminum with steel compression springs in between, and gold-plated ring terminals.

The key to deployment is a thin nichrome wire secured at the top of the pins with screws. "It's the same wire found in your toaster," said Thurn. When the spacecraft is in orbit and receives the command, "You send a controlled current through this wire and it heats up in vacuum to [about] 900 degrees Fahrenheit." The wire burns through a cable, which releases the deployable(s) with the force from the springs.

Aside from providing universities with drawings of the mechanism, Thurn has also given away schematics so they, "Can make up their own bread board, or circuit board, or whatever it may be for their project." He's also designed it to work both in a vacuum and in air, using the same electronics.

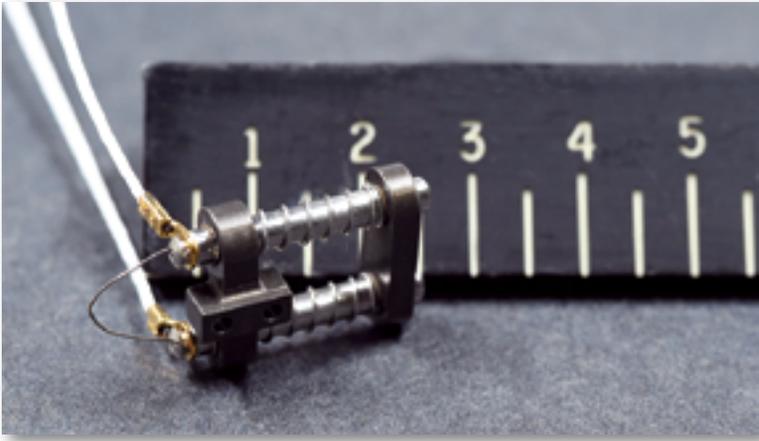


*Adam Thurn, an Aerospace Engineer at the U.S. Naval Research Laboratory (NRL), has invented a nichrome burn wire mechanism to deploy an object once in orbit.*

*Photo is courtesy of the U.S. Naval Research Laboratory—Jamie Hartman*

"That was done because a lot of universities don't have access to a vacuum chamber," he said, "and so if you can test your mechanism and your deployable in the air, that's hugely beneficial."

Thurn developed this mechanism in six months while under a Karle's Research Fellowship, after coming to NRL with an Aerospace Engineering degree from the University of Cincinnati.



*A mechanism invented by Adam Thurn of the U.S. Naval Research Laboratory will be used on a mission slated to launch in early 2015 to deploy a tether between two ends of a CubeSat.  
Photo: U.S. Naval Research Laboratory—Jamie Hartman*



*Thurn has invented a \$160 mechanism to give CubeSats a deployables capability.  
Photo: U.S. Naval Research Laboratory—Jamie Hartman*

"We changed a bunch of parameters [during testing] to figure out what was really important to the success and use of the mechanism, finding out that basically it's driven by current and spring strength. And the other 20 parameters we were changing didn't really matter, which is good, you only have to worry about a couple things then." His design is now patent-pending.

NRL plans to use six of Thurn's mechanisms for a mission slated to launch in early 2015, called Tether Electrodynamics Propulsion CubeSat Experiment (TEPCE). TEPCE will hitch a ride to the International Space Station, said Thurn, "And then the Dextre robotic arm on the space station grabs it and we deploy from there."

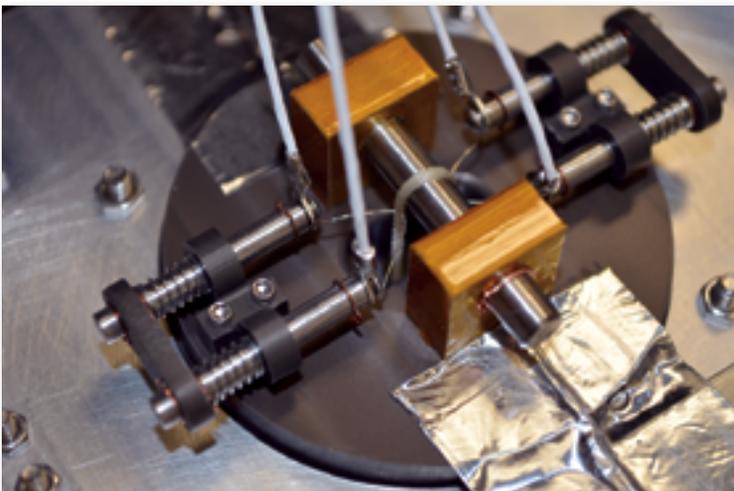
There's a stacer spring in the middle of the CubeSat and, when the cord is burned by the nichrome mechanism, "That spring shoots out and we deploy a one kilometer tether between the two end masses of the satellite. So we split that satellite into two pieces."

TEPCE preparations have been comprehensive-and creative. "To understand the tether deployment a little bit better, we actually dropped TEPCE from the ceiling and then, during free fall, we used one of these [mechanisms] to deploy the tether so it was in a near zero-[gravity] environment. And then we caught it in circus nets."

By running current through the tether, NRL hopes to create a reaction with the Earth's magnetic field that will change the orbit of the TEPCE satellite without using conventional fuel. "The main application would be to clear space debris," says Thurn. "That's the holy grail of what they're trying to do."

In addition to TEPCE, Thurn is now working on mechanisms for two spacecraft that will orbit the sun. "The mechanisms will deploy the door and then allow the telescopes to peek out over the heat shield and investigate solar activity." The two programs are Solar Orbiter Heliospheric Imager (SoloHI) and Wide-field Imager for Solar Probe Plus (WISPR).

"I love my job," says Thurn. "We get to do a lot of different things, from one-shot door deployments to bearing designs to motor designs to all kinds of different things. It's never boring."



*Shown are two burn wire release mechanisms, invented by Adam Thurn of the U.S. Naval Research Laboratory. They're installed on the TEPCE satellite, which will deploy the stacer tether system when the nichrome burn wire is heated with 1.60 Amps and cuts through the Vectran tie down cord holding the two endmasses together.  
Photo: U.S. Naval Research Laboratory—Adam Thurn*

**About the author**

Kyra Wiens is a Public Affairs Specialist for the U.S. Naval Research Laboratory (NRL). She's written about the lab's achievements in alternative energy, biochemistry, space science, and more. She's also an All American triathlete.



# A SPACEBEL Case in Point: Proba-1, Fit and Well, Once Again

**A**fter more than a decade in Space, ESA's Proba-1 (Project for On-Board Autonomy) began to show its age.

Originally designed for a two-year technology demonstration mission, the small satellite was launched on October 22nd, 2001, and is still providing images of our planet Earth.

Due to its extended lifetime, Proba-1's orbit parameters have changed little by little, which, over time, has had a significant impact on the number and quality of the images taken. As Proba-1 is not equipped with thrusters, the satellite's orbit could not be corrected. Another form of intervention was required.

SPACEBEL, who was in charge of the satellite's on-board software, was invited to define a software patch, which translates into a modification of the on-board algorithms to fix the problem—in this particular case, to correct the effects of the degradation of the satellite's orbit.

This was an operation that proved to be successful and allowed Proba-1 to become fully operational once again and to increase the number of high-quality images destined for the scientific Earth Observation (EO) community. This timely intervention also revealed SPACEBEL's ability to ensure proper maintenance of the software technology at all times.

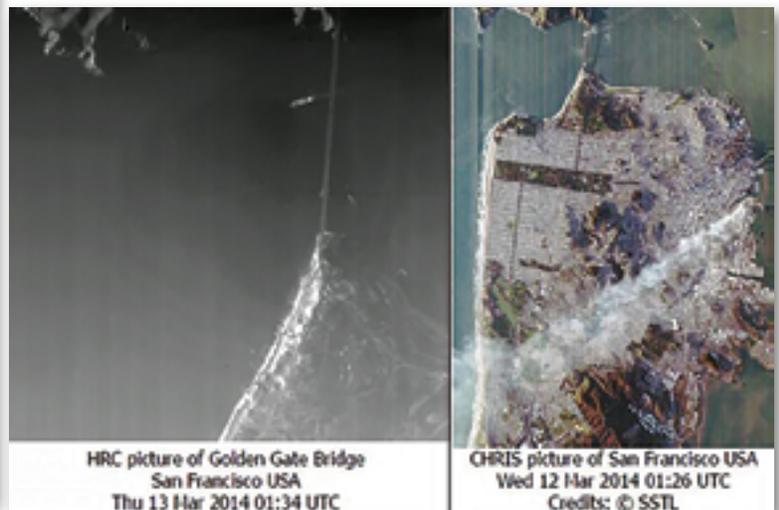


*Artistic rendition of the Proba-1 satellite on orbit.  
Image courtesy of ESA.*

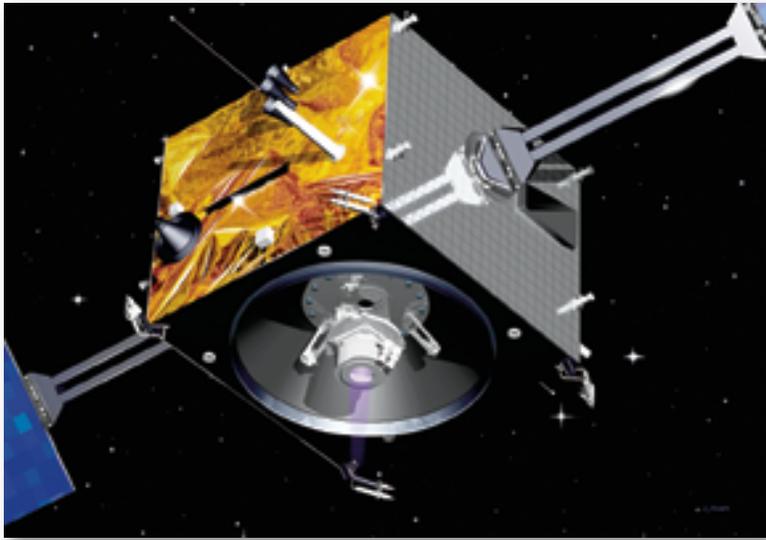


*As the satellite rolls in orbit, Proba-1 captures the desired images.  
Image courtesy of European Space Agency (ESA).*

Other examples of SPACEBEL contributions to satellite anomaly repair through software patch technology include saving ESA's SMART probe propulsion system. SPACEBEL was in charge of developing the control software of SMART.



*Proba-1 image captures of the Golden Gate Bridge and San Francisco in March of 2014. Photos courtesy of ESA.*



*Artistic rendition of the SMART-1 satellite on orbit, powered by an ion propulsion engine.*

SMART-1 is the first European mission to the Moon. After having conducted unprecedented lunar orbit science operations, the 367kg. spacecraft ended successfully its mission through a lunar impact on September 3rd, 2006.

As part of an industrial team led by Swedish Space Corporation, SPACEBEL, was in charge of developing the control software. Time constraints on this program were absolute. Six months was the timeline for the development of the software, including the design, the production and the tests.

This stringent requirement could only be met through the re-use of the data handling software that was previously developed by SPACEBEL for the PROBA-1 mission. The integration activities took place on the company's in-house ERC32 target simulator and the validation on a hardware test bench. SPACEBEL also developed the application software, the hardware-software interface layer, including driver and communication services, and the boot loader. The AOCS software was generated from MATLAB models. It was integrated following an application shell/core paradigm and integrated on the on board computer simulation.

During its long journey, SMART-1's electric propulsion suffered from radiations, which required a software patch to be downloaded directly to the probe.



Additionally, as a partner in the  $E = mc^2$  operation (Entreprises = métiers. compétences?) conducted by the association Planète Métiers, which carries the Cité des Métiers label, SPACEBEL was awarded the 2014 label *Operational Partner of the Liège Cité des Métiers*.

A total of 50 companies in the Walloon region of Belgium have opened their doors to young people who range in age from 10 to 25 in order to help them discover trades of different kinds through active and structured visits to the firms. The objective is to promote better vocational guidance to all participants, ranging from sixth grade primary school pupils, to high school students, to tertiary students, as well as from job seekers, to those in search of career reorientation or retraining.

SPACEBEL has already hosted several events for these future actors of tomorrow's economy in order for them to discover the world of business, all the while learning about SPACEBEL's trade and the space sector and, hopefully, for becoming inspired to pursue technical education paths.

For additional details regarding SPACEBEL, please visit <http://www.spacebel.be/>

**About SPACEBEL**

*By joining the European space programs in 1988, SPACEBEL decided to engage in demanding projects where mission critical solutions were needed, where performance and reliability were an absolute must, and where high added value ICT expert knowledge could be provided for the best results.*

*Such European space projects always contain a number of challenges, include technical necessities, cost analysis and risk mitigation. The company's reputation for flexibility and reliability was built on an everyday effort to be responsive to the needs of customers, whether they are technical officers or program managers.*

*Together with significant and long standing expertise in flight and ground software engineering, these assets are offered to partners with our customers, where it's all about building professional relationships on trust and on-time, viable deliverables.*



*Operational Partner of the Liège Cité des Métiers*



## Careers: The Road To The Future... Who Do You Work For?

By Bert Sadtler, Senior Contributor

**C**ompanies today must re-assess their talent needs in order to remain competitive and drive growth. The satellite communications industry

**faces challenges but remains ripe with opportunities. Great talent can make a huge impact. Employers need to get it right and make a "great hire" every time.**

To discuss career and leadership issues, we asked Bert Sadtler of Boxwood Strategies and Executive Search (<http://www.BoxwoodSearch.com>) to provide his insight. Boxwood is a management, consulting-recruiting firm with offices in The Greater Washington DC Region and The Tampa Bay, Florida Region.

**Who do you work for? Why is this such a critical question? Why is this a question that should frequently be asked?**

The obvious (and wrong) answer is that you work for the company whose name appears on the check they send to you. At every level of a business, the members of the company are working for that business. From leaders to the staff level, they all work for their employer.

To continue with the wrong answer, men and women deliver their services and the business benefits from the work produced. When those men and women are asked "Who do you work for?" the answer is always delivered with the name of the business that pays them. In fact, the person asking the question is expecting to hear a response that includes the name the business who writes the paycheck.

Many professionals define their business identity by feeling a higher degree of self-worth if they are employed by a "blue-chip" named business.

However, what about the less than obvious (and the correct) answer? What if we look at "Who do you work for?" in regard to the "who" being a person, and not a company?

- *Doesn't everyone report to someone?*
- *Who does the rank and file employee work for?*
- *Who does the supervisor work for?*
- *Who does the CEO work for?*

Isn't business about people and the ability for all to work well together? What about the loss of productivity when people don't work well together?



Think about the impact for potential change when you find that your employer has you reporting to someone new? Now the “new who” is someone that you report to but they did not select you for your role.

Think about what triggers professionals to consider a change of employment. A leading factor for employee departure is management change. Regardless of the level of seniority, when the person who you report to changes, you are now reporting to someone who inherited you. Professionals frequently overlook the significance of this moment.

- *Your new boss didn't hire you and may, or may not, have the same style and the same direction as your previous boss. There is a reason that your previous boss is gone.*
- *How did you feel about the manager who hired you? Probably pretty good. How do you feel about the new boss?*

Isn't “Who do you work for?” answered by the name of the individual to whom you report? (Yes, it is!) When you are thinking about your office and your place of employment, don't you think of it in terms of the people and the person you report to? Knowing who you work for is critical because it defines how well you fit your job.

- *Being really good at your work is always good*
- *However, the technical part of your work will change*
- *Having good chemistry with your manager and being a cultural fit is key*
- *Productive employees are usually found working for managers they get along with*
- *As a leader/manager, you want people reporting to you that fit within your team culture*
- *With changes in a manager, each team member should immediately recognize they are developing a new relationship*
- *With changes in a manager, each team member is informally interviewing for their job*
- *The informal interview is not about technical qualifications to perform the job, it is about the chemistry fit with the new manager*

Today's marketplace sees management change as a frequent event. Most professionals see management change as the normal course of business. Business professionals would be better served by taking more notice of “Who do you work for?”

Team members should be prepared to present and discuss their efforts and results with their new manager as soon as possible. They should be taking an assessment of what the new manager is looking for and the new manager's style. In most cases, it may be better to have several shorter conversations versus one long meeting. The multiple conversations offer a better chance to observe the manager's style and approach.

New managers are taking on their new role for a reason. Was their predecessor dismissed for lack of performance? Is this role due to company growth? Was there a promotion? Some managers have been hired as agents of change and can be expected to make alterations. All managers have been hired to be accountable for their team. As such, they need to quickly find out who on the team is a fit and who is not.

With new management, changes can be expected. If the change come as a surprise, the situation can become difficult.

- *As the new boss, you need to get results from the people you have inherited or deal with them as part of the problem you were hired to fix.*
- *As team members of a new manager, invest the time to figure out if you are a fit with your new boss.*
- *In the event there is a “miss-fit” that can be recognized quickly, the team member and manager may have the option of re-assigning the team member to another team.*

“Who do you work for?” has become a critical question in today's dynamically changing workplace. This question can be likened to keeping your eye on the ball.

Frequently ask yourself this question—make certain you know the answer and that the person who you work with is someone that you will get along with on the job.

#### **Good hunting.**

##### **About the author**

Bert Sadtler is the President of Boxwood Search and a Senior Contributor for SatMagazine. Contact Bert at [BertSadtler@BoxwoodSearch.com](mailto:BertSadtler@BoxwoodSearch.com) for more information.



# NSR Analysis: The Coming 4K Mobile Video Explosion

By Jose Del Rosario, Research Director, NSR Manila

In August 2014, Lenovo, the Chinese electronics giant, announced details of its Vibe Z2 Pro smartphone for a September release. Among its many features, the new flagship offers a 16-megapixel (MP) rear camera and 4K video recording.

Why should the satellite industry pay attention to this announcement? Basically because 4K in a mobile environment is the shape of things to come. While the satellite backhaul industry is still largely stuck in 2G or, at best, 2.5G mode supporting voice and SMS services in rural and underserved markets, the rest of the world, or users in urban areas, are moving to LTE and are looking at supporting applications that include 4K or UltraHD video. iPSTAR in Asia is somewhat of an exception where its SoftBank contract is supporting 3G services for relatively wealthy users in Japan.

Lenovo's latest is not the first to join the ranks of an elite category of smartphones with this capability. Sony's Xperia Z2, Samsung Galaxy S5, Galaxy Note 3 and LG G3 are all capable of recording 4K videos. In fact, Sony's Xperia Z2 edges the Lenovo Z2 Vibe Pro due to its 20.7MP camera. At the writing of this article, Apple's much-awaited release of its iPhone6 is rumored to launch 4K as well with a 13MP camera.

It is one thing to tap into the satellite industry's core backhaul market, which again, is the underserved population of the globe. Indeed, programs like O3b, the other 3 billion, aims specifically at doing just that—serving the other 3 billion—which has led to a healthy backlog. The business case of lowering bandwidth costs appears to be sound and other players such as Intelsat with EpicNG will target this proposition as well.

It is quite another matter, however, to tap into an emerging and nascent market, which could provide the industry with an unrealized, or yet unquantifiable, revenue stream. At a minimum, 4K recording on the latest flagship smartphones as well as upcoming iterations will lead to 4K content contribution and distribution to single users, multiple users and uploading to social media sites that will need to manage their own 4K video requirements as well.

Figure 1 provides the topology of a video offload network using a Wi-Fi bridge based on an all-terrestrial solution. The satellite industry can integrate into the network architecture by providing its own satellite-based Wi-Fi bridge offering.

In its latest market study, *Wireless Backhaul, Trunking and Video Offload via Satellite, 8th Edition* (<http://www.nsr.com/research-reports/satellite-communications/wireless-backhaul-trunking-and-video-offload-via-satellite-8th-edition/>), NSR conservatively forecasted the Video Offload via satellite market to account for less than 600 in-service units around the globe, and approximately \$75 million in annual revenue by 2023.

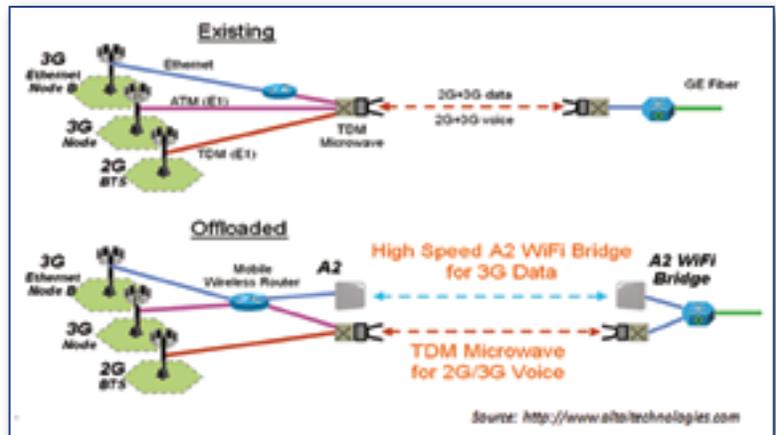


Figure 1.

Clearly, the satellite play is nominal based on NSR's market projections, likely tapping into a piggyback market proposition on top of future "all-satellite-based" wireless backhaul installations in high ARPU rural markets.

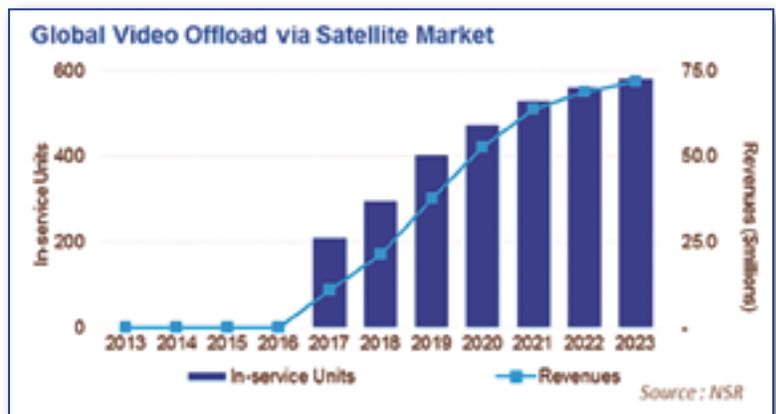


Figure 2.

However, the potential is much more—NSR sees video offload as a market "wild card," where in-service units and revenue streams can be exponentially much higher if the industry manages to figure out how to serve urban and suburban markets where the 4K or UltraHD mobile video proposition is about to explode.

The satellite wireless backhaul industry has been relegated to rural and underserved areas while other services, such as DTH, Video Distribution and SDARS, have successfully penetrated the highly lucrative urban markets.

In NSR's view, video offload in urban areas that is currently being implemented in Wi-Fi networks can become another service where satellites can compete effectively, due to broadcast economics that have worked well in DTH, Video Distribution and DARS.

Coming up with a product and service that competes with and/or complements terrestrial wireless and fiber is the key to unlocking the potentially huge revenue flows. With so much capacity expected to be launched in HTS and perhaps the possibility of an impending price war taking place, broadcast economics on HTS platforms may just be the solution that enables the 4K offload wild card.

The NSR infosite is located at <http://www.nsr.com/>



**About the author**

*Mr. Del Rosario is a senior member of the consulting team where he focuses his research on quantitative modeling, data verification, and market forecasting for the commercial and government satellite communications sectors. He conducts ongoing research with specialization in policy analysis, economic indicators, regulatory initiatives and end user demand trends.*

*In addition to authoring numerous syndicated reports in his areas of focus, Mr. Del Rosario has been involved in a wide range of strategic consulting projects. He has advised clients on market trends, implications, and strategies*

*on such diverse topics as high throughput satellites (HTS), hosted payloads, wireless backhaul, SCADA/M2M/LDR and multi-mission satellite programs.*

*Prior to joining NSR, Mr. Del Rosario worked with Frost & Sullivan as Program Leader of the Mobile Communications Group, as Senior Analyst & Program Leader of the Satellite Communications Group, and most recently as Country Manager for the Philippines. Other experience includes being the Development, Outreach and Communications Specialist at the U.S. Agency for International Development (USAID) in the Philippines where he contributed to USAID/Philippines' various programs in energy, environment, health, education, economic development and governance. He was also the Public Affairs Officer of the European Commission's Delegation in the Philippines, co-managing the Commission's programs on economic cooperation and development assistance. He performed economic and political risk assessment of the Philippines and ASEAN, for use by Delegation officials in the Philippines and in the Commission's headquarters in Brussels.*

*Jose also worked as a congressional aide for the Malaysian Embassy and as a telecommunications legal researcher for Irwin & Lesse in Washington, D.C. Mr. Del Rosario holds a Master of Arts degree in Applied Economics from The American University, and a Bachelor of Science degree in Political Science/ International Relations from the University of Santa Clara.*

# Executive Spotlight: Chris McCormick

## Vice President, Moog Space and Defense Group



### SatMagazine

Mr. McCormick, how did you ready yourself to work in aerospace? What advice do you have for those who may be contemplating a similar career path?

### Chris McCormick

In college, I was interested in many subjects; math came naturally for me. Studying aerospace was an easier way for me to graduate. The space industry in particular had plenty of development, exploration and discovery going on in the 1970s.

As for advice, get an engineering, applied math or scientific degree. Math and, in particular, the scientific process that supports the creation of new knowledge is essential. It is important, not just to acquire our past knowledge, but for learning the process to create new proficiencies.

### SatMagazine

From Multicomm/Mutual Broadcasting, to DARPA, to Spectrum Astro and then to running Broad Reach Engineering, what caused you to decide to move over to Moog?

### Chris McCormick

I worked at Multicomm, an offshoot of Mutual Radio developing new broadcast technologies, and then at Space Applications supporting the Advanced Space Program Office at DARPA. For DARPA, we improved components for spacecraft and new space communications applications in the late 1980s. I also worked on some of the first microsats used for remote communications; basically, it was an early version of "email" in the sky. We could communicate anywhere on the planet from three to 14 times per day using small radios. The new communications and applications were used around the globe during the Gulf War and by the government and the military for the clean up of Clark Air Base and Naval Base Subic Bay after Mt. Pinatubo erupted.

In the early 1990s, DARPA was removing themselves from the space segment. Spectrum Astro (Spectrum Research at the time) offered me a position helping in the development of small, remote-sensing spacecraft and then to work on Martin Marietta's Mars missions. When Spectrum Astro no longer had opportunities for space sciences, I started a company (with some smart friends) called Broad Reach Engineering to support space sciences and, in particular, develop high-end science and spacecraft avionics. As an employee-owned company, we decided to sell Broad Reach to Moog in 2013.

### SatMagazine

Did your work with DARPA prove to be an asset when moving into the commercial space in presenting product for the MAG world? What differences did you encounter when involved with a government agency to a private firm? Do you have any suggestions as to how the acquisition process may be improved?

### Chris McCormick

Unlike much of the space industry, which is risk averse, DARPA in the late 1980s taught that making progress required you to accomplish new things. Craig Fields, the director of DARPA at the time, said, "If the technologies you are managing are over 70 percent successful, you are not taking enough risk. If the technologies you are managing are only 30 percent successful, you are not being very smart."

I think the government can improve the acquisition process by mostly specifying on mission performance requirements rather than dwelling on the methods used to achieve the performance. We are, for instance, currently over specifying weather instruments versus the required improvements needed for weather forecasting models.

### SatMagazine

Moog has primarily been known for valves and TVC—how has Moog's work grown to encompass more than those family of products?

### Chris McCormick

Since 2008, Moog has acquired CSA Engineering in California; Bradford Engineering in The Netherlands; AMPAC/ISP in Niagara Falls, New York, California, Ireland and the U.K.; and Broad Reach Engineering in Arizona, California and Colorado. Moog has gone from making TVCs and thruster valves (actually, much more) to precision spacecraft and launch vehicle vibration damping, spacecraft control components, propulsion systems and radiation-hard avionics and flight software.

### SatMagazine

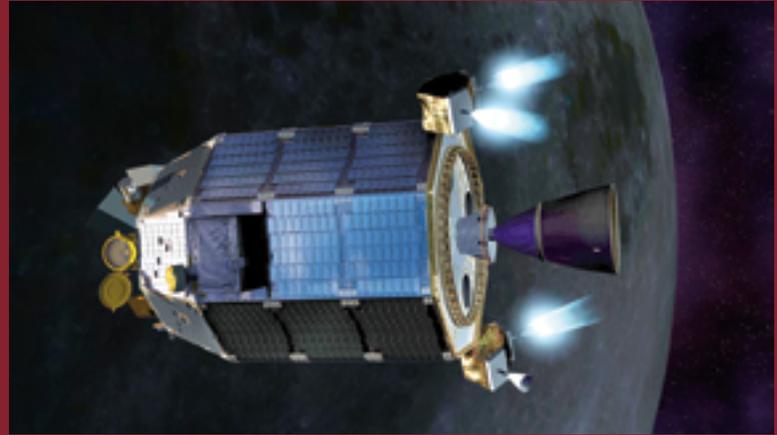
What has been the most-recent Moog partnership with NASA, and what has it entailed?

### Chris McCormick

There have been a number of missions, but the LADEE mission, in particular, probably best shows the diverse technology that Moog offers. A Moog SoftRide vibration isolation system reduced energy transmission between the Minotaur V and the satellite; attitude control system components made by Moog oriented the vehicle, and to establish and maintain lunar orbit, LADEE used our thrusters and latch valves, which were part of the spacecraft's propulsion system.



**Engineers at NASA's Ames Research Center, Moffett Field, California, prepare NASA's Lunar Atmosphere and Dust Environment Explorer (LADEE) Observatory for acoustic environmental testing. Image credit: NASA Ames**



**An artist's concept of NASA's Lunar Atmosphere and Dust Environment Explorer (LADEE) spacecraft firing its maneuvering thrusters in order to maintain a safe altitude as it orbits the moon. Image credit: NASA Ames / Dana Berry**

Moog's integrated avionics unit (IAU) controlled the spacecraft and interfaced to the four LADEE payloads. The Moog avionics unit includes a flight control computer and data handling.

Before the mission launched, we used our capabilities in environmental control system technology to protect LADEE, while a specially rigged truck moved the spacecraft from California to Virginia.

### **SatMagazine**

*What role did Moog play in this summer's launch of ORBCOMM's OG2 satellites? What systems originated with your company to provide satellite functionalities?*

### **Chris McCormick**

Moog built OG2's propulsion systems. Moog also made the "ESPA" rings that carried the satellites into orbit. The company also manufactured the launch vehicle adapters and helped install the spacecraft for deployment from the launch vehicle once in orbit.

### **SatMagazine**

*How has Moog moved from simply supplying components for space exploration to becoming involved with missions and payloads?*

### **Chris McCormick**

Moog has been involved in solving problems for space missions since the 1960s. These days, our Advanced Missions and Science (AMS) unit designs instruments and payloads and architects missions; some missions are with national labs and universities, some are done commercially on our own. We also have principal investigators, scientists and engineers dedicated to developing atmospheric phenomenology sensors and missions; we also collaborate with other organizations around the planet to help them develop their sensors.

### **SatMagazine**

*When we first visited Moog a few years ago at the then-named Space Symposium, the ESPA Ring had just debuted and was the center of attention at your booth. How has this secondary payload adapter evolved and what has the response been for companies interested in hosted payloads? What programs have included the ESPA?*

### **Chris McCormick**

The ESPA initially supported up to six secondary satellites, up to 181kg each, on a Delta IV or Atlas V launch vehicle. Since then, we developed a "stretch" version, called ESPA Grande, accommodating four 300kg secondary spacecraft on 61cm ports. We also offer a Propulsive ESPA, which uses Moog's propulsion components for missions. ESPA is a "standard" interface for smaller secondary spacecraft; this enables more missions to get into orbit. Notable ESPA missions include: STP-1 in April 2007, LCROSS in October 2009, OG2 (with two, stacked ESPA rings) in July 2014, ANGELS in July 2014, and DSX, which is planned for 2017.

### **SatMagazine**

*Are there also projects that move the ESPA into a primary payload adapter? If so, would you tell us about those efforts?*

### **Chris McCormick**

We have missions that use the ESPA ring as a flyable structure. ANGELS is one that has launched already; others, including DSX, are manifested. We have been approached for other mission ideas for a flyable ESPA with propulsion installed inside its volume.

### **SatMagazine**

*How does Moog support satellite launches and what type of on-orbit support are offered by the company?*

**Chris McCormick**

We build vibration and shock isolation systems between the launcher and the primary spacecraft, fuel monopropellants or bi-propellants, and help to install ESPA rings and secondary spacecraft as well as deploy the spacecraft.

**SatMagazine**

*What can we expect from Moog over the next year or so?*

**Chris McCormick**

We are growing in the commercial and government sectors in the U.S. and abroad via more mission content and, hopefully, new payload design capabilities.

**SatMagazine**

*How will High Throughput Satellites (HTS), hosted payloads, on-orbit servicing and repair, and other technologies provide the platforms for the ever-increasing demand for SATCOM services?*

**Chris McCormick**

The industry is getting more efficient in building and supporting what's needed for satellites and launch vehicles, so we are not at all saturated when it comes to developing and launching more missions. There are near-term bottlenecks with larger launchers and launch facilities, but I think Moog, and the industry, can supply many more if there is a commercial or government case for an increased number of space missions.

**SatMagazine**

*Given your more than 30 years of involvement within the industry, when you review your career, what project or projects bring a sense of satisfaction to you?*

**Chris McCormick**

Being part of any first-time-ever mission or technology development is exhilarating. The COSMIC mission (Constellation Observing System for Meteorology, Ionosphere and Climate) is probably the most satisfying. COSMIC improved by an order of magnitude the accuracy of the data on the Earth's atmospheric and ionosphere physics supplied to researchers and forecasters. The data made a large impact on weather forecasting accuracy and knowledge of the ionosphere's dynamics.

We are now supporting the COSMIC-2 equatorial mission and PlanetIQ, which is a large, worldwide commercial constellation version that we believe will make an even larger impact on weather forecasting. MACSAT was a close second; we were able to supply, store and forward "email" worldwide in the late 1980s. I traveled around the planet demonstrating the capabilities to government and scientific users.

**SatMagazine**

*What does the company's tagline, 'Be the reason for going to space,' mean?*

**Chris McCormick**

Moog has been (and still is predominately) a component and subsystem supplier to the aerospace "primes" and will continue to be driving this market segment. For much of my career, I have been involved, in some small way, in mission and spacecraft development tailored to accomplish a unique mission.

I'm a science facilitator. Whether at DARPA, Spectrum or Broad Reach, I tried to be a part of the development of an experiment, a one-off science mission, or a serial no. 1 mission or payload design capability. I'm continuing this at Moog with a large cadre of very talented scientists, engineers, technicians and staff.

We tell ourselves and our customers that we can supply the crucial components as well as assist in developing the missions and payloads. That's what we mean by: "Be the reason for going to space."

The Moog infosite is located at <http://www.moog.com/>



**Moog's ESPA products, top to bottom:**  
• ESPA baseline, six-port carrier for EELV—mods include ESPA Grande 4-port adapter and a Small Launch ESPA  
• Satellite Structure Bus  
• ESPA 6U Mount (ESPA SUM)  
• SoftRide Load Alleviation



# Event: Irwin Leads SATCON Into a New Orbit



**T**hanks to a devoted following of industry insiders and a recent strategic partnership with the National Association of Broadcasters, SATCON is poised to enjoy its biggest, most influential year to date.

In addition to her positions as President of Irwin Communications and Head of the U.S. Office for Euroconsult, Susan Irwin has served as SATCON's Chair since 2002. She recently sat down with SatMagazine to discuss the industry and what to expect at this year's event.

## SatMagazine

*Ms. Irwin, please tell us about your history with SATCON.*

## Susan Irwin

I've been involved from the very beginning—since 2002, when it was a small conference at the New York Hilton Hotel. Obviously, we've grown and changed quite a bit over the years! We are now part of a much larger exhibition, CCW (Content and Communications World).

CCW+SATCON incorporates several important vertical markets under one roof, and the Expo features the latest satellite, fiber, broadband, wireless and hybrid network technologies for government, military, broadcasters, telecommunications, enterprise firms, IP Networking, mobile communications and emergency response applications.

Last year, we had approximately 7,000 attendees and 300 exhibitors, and we

expect the same or more this year. This is also the debut for the event under the ownership of the National Association of Broadcasters (NAB), which is highly focused on the event's growth potential—and future.

## SatMagazine

*That dovetails nicely into the theme for SATCON 2014... NexGen Satellite Applications.*

## Susan Irwin

Absolutely. Because of advances in technology, both in space and on the ground, there's an opportunity for satellite to be used for applications that were never possible before. And that's important, as markets are changing rapidly, and nexgen satellites are making it possible to be responsive in terms of meeting new needs.

## SatMagazine

*For example?*



### **Susan Irwin**

The most significant development is in High Throughput Satellites (HTS), a whole new generation, which allows satellites to provide more bandwidth and to be more efficient. Because of HTS, satellites are becoming applicable to new markets, such as aeronautical and maritime, as well as more competitive with terrestrial fiber networks. Eighty percent of satellite industry revenue is from television and video, but the television industry is changing dramatically. The Internet, for example, is changing the way satellites are used for program distribution. HTS allows satellite to be used for fixed and mobile broadband applications, which are growing exponentially.

### **SatMagazine**

Can you tell us a bit about the educational sessions at SATCON 2014?

### **Susan Irwin**

Unlike other satellite conferences, many of our speakers are the people who make networks run, broadcasters, content owners, DoD, civil government—in other words, professionals who use satellites. This allows the sessions to focus on the end-user experience.

We are particularly pleased that Congressman James Bridenstine, House Armed Services Committee and the Science, Space and Technology Committee, Phil Liebrecht, Assistant Deputy Associate Administrator and Deputy Program Manager Space Communications and Navigation at NASA HQ and Colonel Chris Crawford, U.S. Air Force, Director of Space Policy Implementation, Office of the Secretary of Defense, will be joining us for *Assessing the Process*, a panel organized by the Hosted Payload Alliance and moderated by Al Tadros, VP, Civil and DoD Business at SSL. This discussion will help the commercial satellite industry and its supply chain better understand the strategic review policy, where we are in the process, what current steps are being taken and the subsequent steps that are planned—all with the goal of learning how to inform the decision makers.

We also have a very strong government track. Governments—U.S. and foreign—are major users of satellites. Just as the world is going to broadband, so are governments.

One element recurring throughout the conference is the exploration of the ways in which satellites are being used for mobile, consumer and enterprise broadband. In addition to changes to the satellites in space, advances in antenna technology are going to change the value, efficiency and flexibility of satellites and will be covered in the conference as well.

New for 2014 is a two-part government workshop, the **MILSATCOM Pathfinders Workshop**, featuring real goals and objectives for participants. Part one is focused on information assurance and cybersecurity, a major issue in government. Part two focuses on procurement issues involving the business of the government and working with the commercial satellite industry. About 80 percent of military satellite capacity is on commercial satellites, which involves a very complex procurement process, lending a whole new level of importance to SATCON's government track.

### **SatMagazine**

*How are the SATCON speakers connected to the industry?*

### **Susan Irwin**

We have an extraordinary line-up of speakers from the satellite industry, media world and government.

The SATCON keynote, Lt. General Tom Sheridan (ret.), was Commander of the Air Force's Space and Missile Systems Center and Air Force Program Executive Officer for Space. In his 35 years in the military, he was responsible for many of the space related acquisitions and requirements which are so critical to the commercial satellite industry today.



Other key speakers are from HBO, CBS, Viacom, ESPN and major content owners, cable and broadcast networks, as well as from the major satellite operators, manufacturers and service companies, all with many years' experience in the industry.

### **SatMagazine**

*Any other key features for this year's conference?*

### **Susan Irwin**

Yes, the **9th annual Future Leaders Dinner**, organized by the Society of Satellite Professionals International (SSPI), will be held the night before SATCON on November 11th in New York City. The **Promise & Mentor Awards** will be presented at the dinner, and the award winners will be featured on a panel with key senior executives in the industry at breakfast on Thursday, November 13th.

### **SatMagazine**

*What's the most surprising change you've witnessed in the industry and the conference over the years?*

### **Susan Irwin**

That's a good question; there have been so many! Satellites have been able to advance alongside fiber and wireless, and they've become a vibrant, critical component of government networks, Direct-To-Home broadcasting, and a host of critical services in emerging regions.

The Internet has changed the way we distribute and receive information, and the world is continuously hungry for more and more bandwidth. Satellite is a great way to help fulfill that appetite, whether as a complement to terrestrial and wireless networks, or as a way to deliver services where others cannot go.

For more information on CCW+SATCON, and to register for this leading event, please visit <http://www.SATCONexpo.com>.

