# SatMagazine

# InfoBeam

## Globalstar + SIA

**The Satellite Industry Association (SIA) has announced that Globalstar, Inc. (Globalstar) is the latest company to join SIA.**

Globalstar operates a LEO constellation of satellites and provides mobile satellite voice and data products and service packages to government, industry and consumer customers around the world.

The Company's products include mobile and fixed satellite telephones, the Sat-Fi satellite hotspot, Simplex and Duplex satellite data modems, tracking devices plus its subsidiary SPOT LLC family of consumer satellite products.

In September, Globalstar announced the appointments of *Dave Kagan* to the position of CEO and *Jay Monroe* to Executive Chairman of the Company's Board of Directors and earlier this year the Company introduced two new products, SmartOne Solar and the SPOT X 2-way satellite messenger.

**www.sia.org**

**www.globalstar.com**

# InfoBeam

## Arianespace launches BepiColombo

**Arianespace marked another mission accomplished for science tonight as the company's heavy-lift Ariane 5 successfully sent BepiColombo — Europe's historic first mission to Mercury, organized in cooperation with Japan — toward the solar system's smallest and least-explored terrestrial planet.**

Ascending from the Spaceport's ELA-3 launch complex at 10:45:28 p.m. local time in French Guiana — the planned precise moment of liftoff — Ariane 5 lofted its passenger during a flight lasting just under 27 minutes, with the multi-segment BepiColombo spacecraft deployed into an Earth escape orbit.

As the nearest planet to the Sun, exploring Mercury is key to acquiring knowledge of how terrestrial planets originate and evolve, as well as to understand how conditions supporting life arose in the solar system, and possibly elsewhere.

Mercury also is known as the "Swift Planet" because its orbital period around the Sun of 87.97 days is the shortest of all the planets in the solar system.

The BepiColombo mission is being carried out jointly by the **European Space Agency** (ESA) and the **Japan Aerospace Exploration Agency** (JAXA).

After arriving in late 2025, the spacecraft — built under the industrial leadership of **Airbus** — will examine the peculiarities of Mercury's internal structure and magnetic field generation, as well as how the planet interacts with the sun and solar wind.

With a liftoff mass calculated at 4,081 kg., BepiColombo consists of two orbiters: the Mercury Magnetospheric Orbiter (MMO) and the Mercury Planetary Orbiter (MPO); as well as two additional elements: the Mercury Transfer Module (MTM), and the Magnetospheric Orbiter Sunshield and Interface Structure (MOSIF).

BepiColombo is scheduled for a one-year nominal mission at Mercury, with the possibility for a one-year extension. It was named after Italian mathematician and engineer Giuseppe "Bepi" Colombo, who was known for his work related to Mercury.

The Ariane 5 launch — designated Flight VA245 — was the 23rd major scientific mission performed by an Arianespace family vehicle to date, following deployments of such high-profile passengers as (*cont.*)



*An Arianespace Ariane 5 ECA liftoffs the BepiColombo spacecraft from the Guiana Space Center (CSG) en route to the solar system's smallest and least-explored terrestrial planet: Mercury. Photo is courtesy of Arianespace.*

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## Arianespace launch (continued)

Rosetta, the Mars Express and Venus Express space probes, Gaia, Herschel, Planck and Aeolus. It also underscores Arianespace's primary objective to guarantee Europe's independent and reliable access to space.

BepiColombo is the 51st mission (and 73rd spacecraft) launched by Arianespace for ESA and is also the 121st Airbus-produced spacecraft lofted by Arianespace, which has a backlog of 22 additional satellites to orbit for this manufacturer on future flights.

As Arianespace's seventh launch of 2018, Flight VA245 follows other heavy-lift Ariane 5 missions performed this year on January 25 (carrying SES-14 and Al Yah 3), April 5 (DSN-1/Superbird-8 and HYLAS 4), July 25 (four Galileo satellites) and September 25 (Horizons 3e and Azerspace-2/Intelsat 38).

Also conducted earlier in 2018 was Arianespace's medium-lift Soyuz mission on March 9 (with four O3b satellites); plus a light-lift Vega flight performed August 22 (Aeolus).

At the completion of the BepiColombo mission, Arianespace's Stéphane Israël announced early November as the timing for the company's next flight, which will use a Soyuz launcher to orbit Europe's Metop-C polar-orbiting meteorological satellite for the EUMETSAT satellite agency.

In post-launch comments from the Spaceport, Arianespace Chief Executive Officer *Stéphane Israël* congratulated ESA and JAXA and underscored his company's continuing contributions to space research and science at the service of such institutions.

Israël then added that Arianespace's latest Ariane 5 launch was special due to the spacecraft's Earth escape flight profile, and that such would not have been possible without the European launchers 'dream team'. This launch showed the versatility of Ariane 5 and double congratulations are in order for all of the partners for this new success.

*Guenther Hasinger*, the ESA Director of Science, stated that the firm is standing on the shoulders of giants, and the giants are all of you [the participating companies]. He also thanked Arianespace for Ariane 5's exact on-time liftoff and the spacecraft's accurate deployment.

JAXA Senior Vice President *Shizuo Yamamoto* highlighted the excellent cooperation at the Spaceport launch site of Arianespace, ESA, the CNES French agency and the industrial teams that contributed to sending BepiColombo on its way to Mercury.

**www.arianespace.com**

*Artistic rendition of the BepiColombo spacecraft.*
*Image is courtesy of CNES.*

# InfoBeam

## Arianespace launch (continued)



*Artistic rendition of BepiColombo approaching Mars. Image is courtesy of Airbus Defence and Space.*

**The BepiColombo satellite built by Airbus for the European Space Agency (ESA) and Japanese Space Agency (JAXA) has embarked on the spacecraft's long journey of some 8.5 billion kilometers through the inner solar system, reaching our solar system's innermost planet in seven years.**

After arrival in 2025, for the first time two space probes will simultaneously observe Mercury and its environment. Plans include using cameras to map the planet's surface more precisely than ever before. Data collected from 16 scientific instruments will provide insights into the geological and chemical composition of the planet, along with its structure, the characteristics of its magnetic field and interaction with the solar wind.

"*This very complex mission is the result of a truly inspiring international cooperation among 83 companies from 16 European countries and Japan,*" said **Nicolas Chamussy**, Head of Space Systems. "T*his international effort, with Airbus teams from five countries, is the natural consequence of humanity's desire to discover more about this little known planet and the origins of our solar system. All great missions come with challenges: Airbus had to develop sophisticated thermal control solutions and even 'special' solar arrays, capable of tilting 75 degrees away from the Sun to limit the temperature. Now its challenge is to complete the journey safely and deliver the science we're all waiting for.*"

The Ariane 5 launched 'Bepi' into space at 'escape velocity' — the speed required for an object to break free of the Earth's gravitational pull. This will allow the space probe to enter a solar orbit similar to that of the Earth at speeds of around 120,000 km/h. During its journey to Mercury, BepiColombo will make several braking maneuvers to adjust its orbit, allowing it to make a slow approach towards the planet.

In order to achieve this, the control center — the **European Space Operations Centre** (ESOC) in Darmstadt, Germany — has plotted a sophisticated course through the inner solar system.

The spacecraft's "brakes" will be applied just 60 days into the journey to reduce Bepi's speed: an electric propulsion system and a total of nine planetary swing-bys (one of the Earth in April 2020, two of Venus and six of Mercury) will provide BepiColombo with the energy it requires.

A maximum of two of the four xenon-propelled ion thrusters will be employed at any one time during the long journey; these will be used on more than 700 days in total, up to four months of which without interruption. The thrusters will be powered by two 1.8 x 14-meter solar arrays. The ion thrusters, a further chemical propulsion system and the solar arrays are located on the Mercury Transfer Module (MTM), the propulsion module for the interplanetary voyage to Mercury.

With the journey totaling some 8.5 billion kilometers — the equivalent of traveling from the Earth to Neptune and back again — Bepi will actually travel 38 times the maximum distance between the Earth and Mercury.

After traveling for seven years and completing 18 orbits around the Sun, the MTM will be jettisoned in 2025. From that point onwards, the orbiters will power themselves using solar energy and their own propulsion system. The space probe will then swing into orbit around Mercury before each orbiter enters its own orbit and begins the actual scientific exploration of the planet.

*www.airbus.com/space/space-exploration/bepicolombo.html*

# InfoBeam

## *SSL ships two smallsats for Planet*

**SSL, a Maxar Technologies company (NYSE: MAXR) (TSX: MAXR, has shipped two Earth Observation (EO) satellites to Vandenberg Air Force Base where they will be launched on Spaceflight's first Sun Synchronous dedicated rideshare mission aboard a SpaceX Falcon 9 launch vehicle.**

SSL manufactured SkySat 14 and 15 for commercial EO company Planet, advancing SSL's leadership in the manufacture of innovative, small form-factor satellites.

The imaging satellites feature 72 cm. resolution and will be added to Planet's SkySat constellation, which currently includes 11 SSL-built smallsats. The SkySat constellation complements Planet's Dove constellation, with the most satellites on orbit from a commercial imagery provider.

Six of Planet's SSL-built satellites were launched in 2017 and five were launched in 2016. SSL continues to manufacture additional SkySats for Planet in its state-of-the-art SmallSat manufacturing facility, integrating improvements and increasing the cadence of delivery.

SSL combines a commercial mindset with a track record of reliability in building smaller form-factor satellites for both Earth Observation and communications. Blending speed and agility with space proven qualification and production processes



*Photo of SkySats 14 and 15 in SSL's smallsats manufacturing facility. Image is courtesy of SSL.*

provides satellite operators with high performance and best value solutions.

*Dario Zamarian*, Group President, SSL, said that the company continues to embrace innovation and elevate partnerships to meet the rising demand for small form-factor satellites. This has been rewarding to apply SSL's extensive expertise in the manufacturing of high-quality small satellites, solidifying the firm's leadership position and supporting the Planet team in achieving their objectives.

*Chester Gillmore,*VP of Manufacturing at Planet, noted that working alongside SSL on the company's Earth imaging fleet has been very successful. Adding two more SkySats to Planet's fleet will enhance daily monitoring to help customers gain valuable insights, understand what's happening on the ground and take needed and timely action.

**www.sslmda.com**

**www.planet.com**



*Artistic rendition of Planet's SkySat smallsat constellation.*

# InfoBeam
## Nine Search & Rescue systems

**Orolia has prepared a record nine search and rescue systems across five continents for commissioning through the Global Cospas-Sarsat Satellite Search and Rescue System.**

Orolia has been leading the development of global search and rescue programs for nearly 30 years, reaching a major milestone with the world's first operational Medium-altitude Earth Orbit Search and Rescue (MEOSAR) system in 2011, and completing all global MEOSAR system installations ever since. To date, 75 percent of the Earth's surface is monitored by Orolia's MEOSAR systems.

Cospas-Sarsat conducts an annual commissioning process for regional search and rescue systems that are being constructed or upgraded worldwide.

This year, Orolia has prepared a record nine global search and rescue systems for commissioning across five continents, which include five ground-based Local User Terminals (LUTs) and four Mission Control Centers.

These new, lifesaving search and rescue systems are in line to be commissioned in North America, Australia, Europe, Asia and Africa.

Through its McMurdo subsidiary, the most trusted name in emergency readiness and response and the world leader in the design, development and installation of search and rescue ground-based infrastructure, Orolia has equipped these systems with the very latest search and rescue technology to increase response times and save more lives worldwide.

Orolia's VP, Satellite Search and Rescue Systems, *Paul Zweers,* noted that at Orolia, the company is proud to achieve a new milestone in the decades of technology innovation that the firm has brought to global search and rescue operations. Orolia is the leading manufacturer to commission next-gen MEOSAR systems and this record number of global systems in line for commissioning reflects the company's ongoing commitment to delivering critical technology solutions, anywhere in the world.

*www.orolia.com/*



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# InfoBeam
## Microscope's passive de-orbiting

**CNES teams have achieved a first with the innovative passive de-orbiting of the Microscope satellite (MICROSatellite à trainée Compensée pour l'Observation du Principe d'Equivalence) after its two-year science mission and six months of valuable technology experiments.**

Microscope's mission has come to an end with the depletion of the nitrogen fuel reserves needed for the satellite's precise control microthrusters.

Without this fuel for its drag-compensation system, the satellite is no longer able to deliver science data.

Operations to passively de-orbit Microscope without expending fuel, performed by teams at the Toulouse Space Center since the start of this week, have proved especially innovative.

They began by passivating the satellite to make it safe for de-orbiting and ensure that no source of chemical, pneumatic or electrical energy will pollute outer space.

The next key step in the sequence involved deployment of IDEAS (Innovative DEorbiting Aerobrake System), a system designed by CNES consisting of two 4.5 meter inflatable booms wrapped in membranes to increase the satellite's atmospheric drag surface area.

It is the use of these booms in the real-life conditions of space that makes this passive de-orbiting sequence particularly innovative and unique.

Thanks to this system, Microscope should re-enter and burn up in Earth's atmosphere in approximately 25 years' time, as required by the French Space Operations Act (FSOA) effective since 2008. The estimated time it would have taken Microscope to re-enter the atmosphere had the IDEAS system not been used was 73 years.

Microscope is, therefore, the first operational satellite to be de-orbited in this manner. The satellite's retirement from service illustrates CNES's commitment to mitigating pollution and the proliferation of space debris in LEO.

After the success of this delicate de-orbiting phase, CNES President *Jean-Yves Le Gall* commented that CNES's teams have again demonstrated their know-how and expertise in passively de-orbiting Microscope, which is a truly remarkable feat. It follows this mission's unprecedented scientific success in applying an innovative operational technology to verify the equivalence principle. The Microscope science teams are continuing to analyze all of the data collected by the mission and their results are expected at the end of next year.

*cnes.fr/en/*

# *InfoBeam*

## *TCarta and the mangroves*
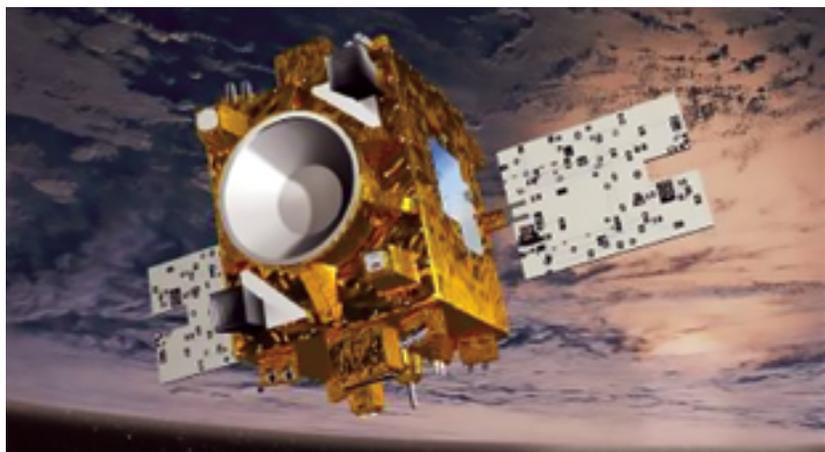
**TCarta has been commissioned by Environment Agency – Abu Dhabi (EAD) to carry out a landmark mangrove health assessment covering the entire Emirate of Abu Dhabi — the assessment contains mangrove condition information derived from high-resolution multi-spectral satellite imagery.**
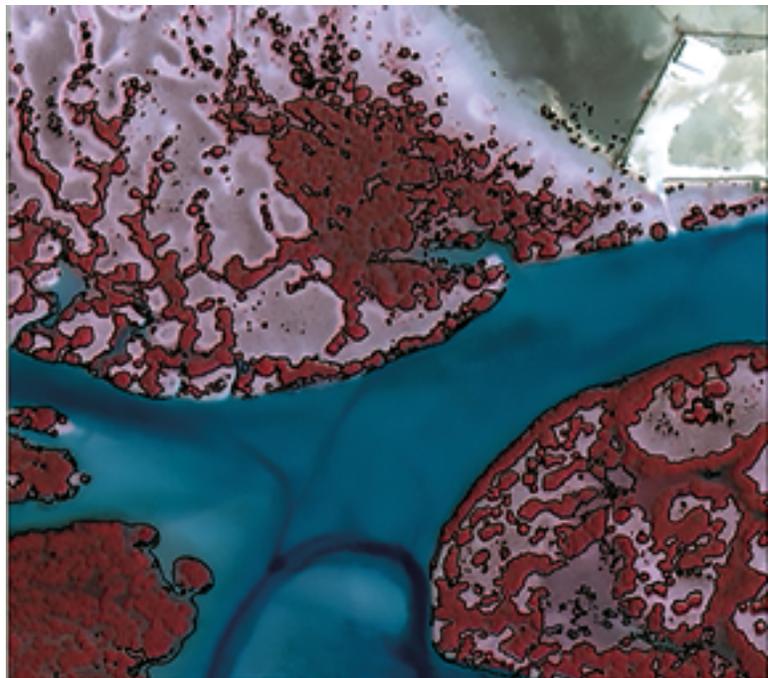


For EAD, the TCarta report delivered some promising results. With 80 percent of the Emirate's mangrove forests found to be healthy, this was encouraging news. The innovative project also enabled EAD to designate conservation areas for immediate protection. The data helped EAD to assess the relative success of existing schemes with the view to applying the lessons learned into practice for future endeavors.

Mangroves are shrubs or small trees that grow in the saline and brackish tidal marine ecosystems along coastal zones in tropical regions throughout the world. Considered vital to the environment, the dense root systems of mangrove forests protect estuaries and coastlines from erosion, and the leaves sequester carbon. They are, however, susceptible to damage from offshore dredging, onshore development, and climate change.

For the assessment, TCarta obtained high-resolution multi-spectral imagery acquired by the DigitalGlobe WorldView-2 and -3 satellites during the months of December through March. Computer algorithms were applied to the Coastal Blue, Visible Green, Visible Red and Near Infrared bands to differentiate mangroves from other vegetation across the Emirate. A total of 155 km2 of mangroves were identified and mapped.

Next, TCarta analysts obtained coarse-resolution Landsat imagery from 1987, 2001 and 2017 to chart mangrove coverage over three decades. The combination of WorldView and Landsat data analysis clearly showed where mangrove loss had occurred over time. From this, TCarta generated the Disturbance Index correlating health to external factors, such as urban development.

Based on the success of the Abu Dhabi project and accuracy of its results, TCarta is now offering the satellite-derived vegetation mapping and health assessment technique as a commercial service available worldwide.

**www.tcarta.com/**

# InfoBeam

## Integrasys + Advantech Satellite Networks

**Advantech Satellite Networks has integrated the VSAT commissioning tool from Integrasys, Satmotion Pocket, with the firm's ASAT™ VSAT Network System — the integration is part of a project for a major European customer.**

Satmotion Pocket is a unique and award winning VSAT auto commissioning tool, available as an easy-to-use mobile app.

The product greatly reduces the deployment time and effort, as well as minimizing the risk of errors such as **CrossPol** and **Adjacent Satellite Interference**. Installers don't need to be experts in VSAT installations to handle VSAT commissioning using Satmotion Pocket.

The Advantech Satellite Networks ASAT™ VSAT Platform is a scalable multi-service VSAT network system, allowing operators to serve diverse link needs, from narrow MF-TDMA links to high-throughput dynamic SCPC trunks.

Satmotion Pocket is configurable to support tens to hundreds of thousands broadband terminals. ASAT™ supports GEO High-Throughput-Satellites (HTS) as well as wide-beam satellites.

The combination of the ASAT VSAT Platform with Satmotion Pocket enables simple, automated deployment of high-quality services across diverse site installations.

This means that customers can ensure accurate and high-quality site commissioning and optimum space segment utilization, regardless of link type and antenna setup, even if the installer is not trained in VSAT installations, something which is especially required for military applications worldwide.

*Alvaro Sanchez*, CEO, Integrasys, said the company is extremely proud to be working together with Advantech Satellite Networks to enable a simpler and more automated deployment for customers. This integration enhances availability, performance and time to market as well as saves users significant operational cost. Advantech's ASAT VSAT Network System has proven to be extremely flexible, enabling easy integration, with great results.

*David Gelerman*, CEO and Founder, Advantech Satellite Networks, added that the company is excited to have integrated Satmotion Pocket with the ASAT VSAT Platform. Satmotion Pocket's capabilities will provide customers with faster and more accurate remote site installations, as well as operation and remote site audit capabilities to enable them to make the most of their satellite resources.

**www.integrasys-space.com**

**www.asatnet.com**



C7700 ASAT II™
VSAT Router



C8000
all-outdoor terminal



C8200 IoT / M2M
all-outdoor terminal

*Advantech Satellite Networks' ASAT™ II router and terminals*
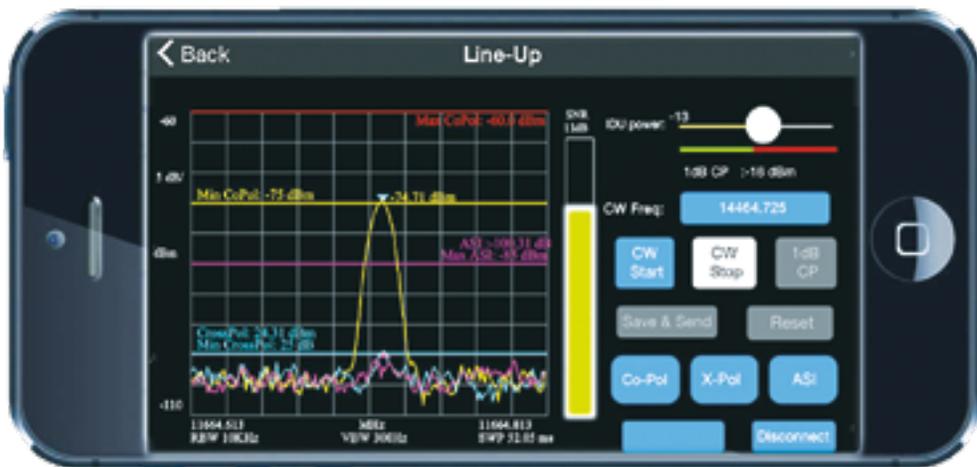


*Satmotion Pocket from Integrasys.*

# InfoBeam
## Significant award for Satellite Vu

**Satellite Vu has been awarded the title of Best International Start-Up at the Supernova Challenge, part of the Future Stars event held during the recent GITEX event in Dubai.**

Satellite Vu was invited to attend by the UAE's Mohammed Bin Rashid Space Centre (MBRSC) as part of their Innovation Challenge.

MBRSC aims to encourage the development of technologies related to space manufacturing and applications that can be used to ultimately improve the quality of life on Earth.

Satellite Vu is preparing to provide a disruptive service that will enable governments and organizations to take on the enormous challenge of plastic pollution in our marine environment.

As humanity faces the prospect of more plastic than fish in our oceans by 2050, Satellite Vu is offering a sustainable solution that will provide frequent, precise and actionable data so that the origins and routes that plastic waste travels can be monitored and acted upon.

Satellite Vu will launch a series of seven satellites with specially developed payloads that will produce high resolution infrared imagery, at less than five meters.

This imagery is interpreted and converted into timely data using unique algorithms that end-users can readily access.

Data produced by Satellite Vu can also be overlaid onto other forms of data such as social media, mobile phone and proprietary information. This results in another layer of intelligence from which new business insights may be generated.

The satellites will re-visit a target site every hour, throughout the day and night, and produce imagery so that constant, near-real-time monitoring is possible.

The judges' criteria focused upon the originality of the idea, its potential in terms of longevity, actualization and profitability, the team, the functionality of the product or service and its impact on social, cultural and environmental issues.

*Anthony Baker,* the CEO at Satellite Vu, is pictured to the right with the results of the award. He thanked MBRSC and GITEX Future Stars for this great opportunity. This recognition is extremely important to the Satellite Vu team as the company continues to work toward addressing the scourge of plastic pollution — and ultimately making a real difference to the future of this planet.

***www.satellitevu.com/***

# InfoBeam

## Twin successes for SingTel

**The World Teleport Association (WTA) has announced that Singtel (Singapore Telecommunications Limited) has achieved full Tier certification of their BukitTimah (Tier 4) and Seletar (Tier 4) teleports under WTA's Teleport Certification Program.**

These facilities become the first teleports in southeast Asia to achieve full WTA certification and bring the number of fully-certified teleports around the world to 23 in number.

Since the program's introduction at IBC 2015, the Certification program has quickly grown in popularity. Starting with one certified facility in 2015, the program has added more than 40 in three years, and currently has 10 teleports engaged in the quality evaluation process.

Certifications have been issued to teleports operated by **Eutelsat**, **du**, **COMSAT**, **Signalhorn**, **Optus**, **Globecomm**, **Horizon**, **Media Broadcast**, **Elara Comunicaciones**, **GlobalSat**, **Talia**, **Telenor**, **Vivacom**, **Cyta**, **Batelco**, **Singtel**, **CETel**, **Etisalat**, **Hawaii Pacific Teleport**, **Intelsat**, **Speedcast**, **Telstra**, **AXESAT**, **Telespazio** and **Arqiva**.

The industry has quickly adopted the transparent, independently verified standards as a means for teleports to differentiate themselves and for customers to choose the price-performance level suitable for their applications.

Full Certification under the WTA program is the result of a comprehensive data-collection and inspection process.

A teleport operator completes a +170-item questionnaire and submits it to WTA. The Association analyzes the data based on standards established by its Certification Committee and issues the Provisional Certification based on the self-reported information.

The teleport then has six months to achieve Full Certification. To achieve Full Certification under WTA's program, an auditor is dispatched to visit the teleport, provide independent validation of the data submitted in the questionnaire, and identify additional factors that may positively or negatively affect the score.

Full Certification is issued at a Tier number from 1 through 4, of which 4 represents the highest degree of excellence, and remains in effect for three years.

WTA's Teleport Certification Program serves both teleport operators and their customers by creating an objective, transparent, and internationally accepted method for teleport operators to document the quality of their operations for customers and strategic partners. It also provides a means for customers to select teleport vendors delivering the price-performance level that is appropriate for their applications.

Mr. *Ng Kheng Ghee*, Head of Satellite at Singtel, said that the firm is delighted to be awarded the coveted Tier-4 WTA certification for the firm's teleports in BukitTimah and Seletar. This achievement underscores Singtel's commitment to providing customers the highest quality of security, infrastructure and operational standards to meet their communications needs. The certification will spur the company to constantly deliver the best managed satellite solutions to customers across Asia, Middle East and Africa, offering them reliable satellite connectivity and secured managed ICT solutions.

The Executive Director of the WTA, *Robert Bell*, added that Singtel is a regional leader in high-value transmission services for broadcast, maritime and other industries where Singapore plays a leadership role. As the number of certified teleports grows, the WTA is seeing satellite operators and end-customers including certification as a question in their RFPs, which increases the value of the program to teleport operators.

*worldteleport.org/*

*www.singtel.com/*



*SingTel's BukitTimah teleport.*

# InfoBeam
## ORBCOMM's win...

**ORBCOMM Inc. (Nasdaq: ORBC) has been selected by Chief Express LLC to provide in-cab solution for their trucks and the trailer monitoring solution for their dry van fleet.**

To manage its dry van fleet, Chief Express is using ORBCOMM's ruggedized trailer monitoring solution along with FleetManager to access live and scheduled status updates whether their trailers are in transit or in the yard.

ORBCOMM's solution also provides Chief Express with the unique ability to see precise data on distance traveled by each trailer so they can
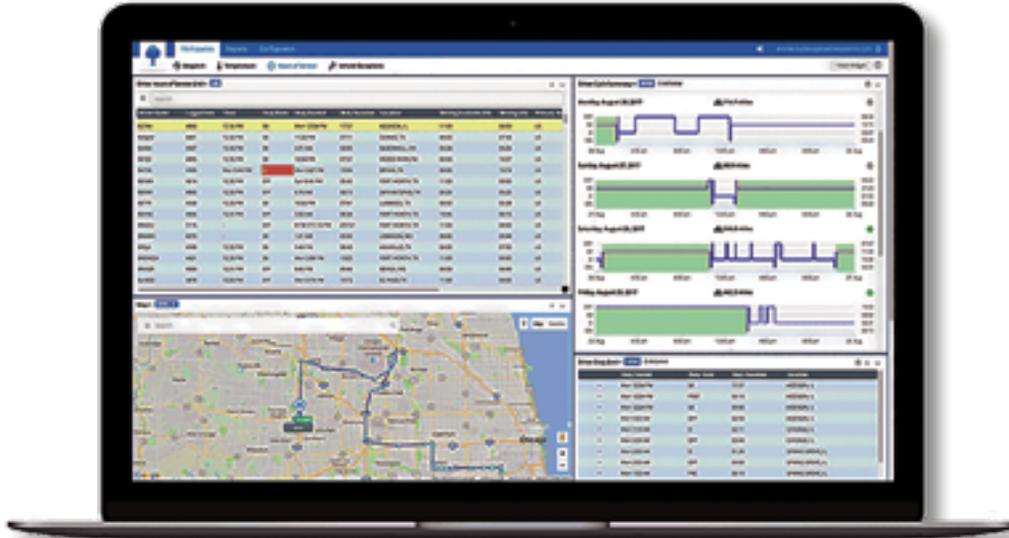


*Screenshot of ORBCOMM's FleetManager at work.*

ORBCOMM's end-to-end solutions provide wireless connectivity through its industry-leading hardware and integrated Cloud-based analytics platform and information management engine for optimal fleet management.

Chief Express is using ORBCOMM's driver-friendly, in-cab solution to gain complete visibility, monitoring and management of their drivers and trucks.

ORBCOMM's in-cab solution delivers GPS fleet tracking and connects to the truck's CANbus to seamlessly collect important data from the engine, brake systems, fuel tanks and more, providing access to deep analytics and reporting via FleetManager, ORBCOMM's newest web platform.

By automating hours of service calculations, ORBCOMM enables Chief Express to comply with the Electronic Logging Device (ELD) and FMCSA Hours of Service (HOS). ORBCOMM's in-cab solution also helps Chief Express improve driver safety by providing live, on-board driver performance scoring and correcting unsafe driving behaviors that lead to accidents, fines and higher insurance.

ORBCOMM's platform enables Chief Express to decrease operating and maintenance costs and improve productivity through real-time asset management, reduced risk of fuel loss and preventive maintenance as well.

accurately schedule trailer servicing and inspections based on odometer readings or time elapsed for maximum asset utilization.

In addition, Chief Express is using an integration that links ORBCOMM's FleetManager data from its truck and trailer assets to its McLeod Software dispatch and enterprise management solution for a centralized view, further enhancing workflow productivity, communications and customer service.

*Marc Eisenberg*, the CEO of ORBCOMM, said the firm is pleased to have won both the in-cab and trailer business for a leading truckload carrier like Chief Express, which reaffirms the company's unique competitive advantage and leadership in this market to provide telematics solutions for nearly every transport asset class through one integrated platform.

*Kennan Hill*, President and Owner of Chief Express LLC, added that ORBCOMM's advanced telematics solutions for trucks and trailers are better than anything the firm had seen on the market and their fleet management portal and driver-friendly in-cab product are light years ahead of the competition in terms of features, functionality and usability — the company is already seeing bottom-line benefits by improving ELD compliance, driver performance and overall operational efficiency.

*www.orbcomm.com*

*chiefexpress.com/*

# InfoBeam
## SSTL receives international award

**Surrey Satellite Technology Ltd.'s international exports track record, totaling £1.15 billion ($1.5 billion) over a 30 year period, has been honored with an International Board of Trade Award.**

The award was presented to SSTL's Managing Director, *Sarah Parker*, by the UK's Secretary of State, The Rt. Hon. Dr. *Liam Fox* MP at the first international Board of Trade Awards ceremony held on board HMS Queen Elizabeth in New York on October 22, 2018, and hosted by Admiral Sir *Philip Jones* KCB ADC, First Sea Lord and Chief of Naval Staff.

Since the Company was founded in 1985, SSTL has grown from four to 500 employees and now has 40 percent of the world's small satellite export market, with an annual turnover of £100 million. With the launch of seven satellites this year, SSTL has now launched 57 satellites on 34 launches from eight launch sites around the world and has also provided 18 space development and training programs for international customers, including the US, Kazakhstan, Nigeria, Chile, Thailand and South Korea.

SSTL specializes in the design, manufacture and operation in orbit of smallsats, with full capability through the design, build, test, launch and operate phases of a mission. Customers include commercial organizations, space agencies, national governments, academia and research institutions and SSTL's spacecraft are used for Earth observation and science, navigation, telecommunications, exploration, and technology demonstration in LEO, MEO, GEO, and beyond Earth's orbit.

SSTL started the smallsat revolution back in the Eighties and has achieved a number of "Firsts" in the field of small satellite engineering, including launching the first satellite to have a web address in orbit (UoSAT-12, 2001), designing and manufacturing the first satellite in Europe's Galileo satellite navigation program (GIOVE-A, 2005) and, most recently, designing, manufacturing and operating the first satellite to demonstrate space debris removal technologies in orbit (RemoveDEBRIS, 2018).

SSTL's current order book includes navigation payloads for Europe's **Galileo** satellite navigation constellation, six satellite platforms for the **FORMOSAT-7** weather forecasting constellation, remote sensing satellites for **UrtheCast's** *UrtheDaily* constellation, a small geostationary platform for the Eutelsat Quantum telecommunications satellite, a 12U nanosatellite for Honeywell to test a new two-way VHF Data Exchange System (VDES) payload for the exactEarth advanced maritime satellite constellation, and an Earth Observation satellite for Kazakhstan.

*www.sstl.co.uk*

# InfoBeam

## A solution for "medical deserts"

**C-COM Satellite Systems has released a new white paper authored by** *Drew Klein*, **the company's Director of International Business Development, entitled** *The Case for a Global Telemedicine Vehicle Network.*

This is a call to Doctors, Government Health Workers, Hospitals, Universities, Vehicle/Coach builders, Satellite Operators, Satellite Service Providers, System Integrators, and all who are involved in the Telemedicine space.

Nearly 50 percent of the world's population have no access to basic health services. The vast majority of this population live outside cities, in peri-urban areas, where few hospitals exist.

Geographical areas with limited to no healthcare accessibility regions are called '*medical deserts*,' and they continue to expand as people move out of rural regions and into cities.

Medical deserts can be found in both developed and developing countries alike. In the United States, approximately 30 million people live more than 30 miles from a hospital that provides emergency care.

In Niger, more than 60 percent of the population (10 million people) live further than a one hour walk to a basic healthcare center.

While Africa is urbanizing, approximately 63 percent of the total Sub-Saharan population still live in rural areas.

Even France, often lauded as a prized model for national healthcare, has struggled with a steady decline in rural doctors, notably general practitioners.

Both the **CDC** and the **NIH** have confirmed that a direct correlation exists between distance to hospitals and an increased risk of preventable death.



*Nigeria Bayelsa Hospital telemedicine vehicle.*



# The Case for a Global Telemedicine Vehicle Network

In India, for example, it was estimated that 50,000 deaths (out of 72,000) from sudden abdominal conditions in 2010 could have been averted with better medical access. Those who lived more than 100 km. from a hospital were at the highest risk.

A 2016 study showed that only one in eight high income countries had developed a national policy on hospitals in rural or remote areas. Rural healthcare facilities have historically been a poor investment and their sustainability is concerning. Even in the U.S., 83 rural hospitals have closed since 2010 with another 673 vulnerable to shut down. The problem isn't likely to improve so long as the cost of building hospitals in rural areas remains prohibitive.

According to one Harvard study, for every $1 spent on mobile healthcare, there is a return of $36 to the healthcare budget.

Mobile surgical vehicles, mobile MRI/ CAT/Mammography/ Ultrasound clinics, mobile maternity, mobile primary health care (Medical/Dental/Vision), and many other types of telemedicine vehicles can be strategically circulated throughout the world's medical deserts, bringing healthcare to billions of people.

While healthcare costs vary dramatically from country to country, a sad reality is that it will never be economically feasible to build hospitals or health care facilities in all the world's medical deserts.

Providing mobile clinics to people who live in hospital deserts is both cost effective and efficient.

This white paper recommends the identification of the world's medical deserts and to create a **Global Telemedicine Vehicle Network** — build and deploy 216,000 telemedicine vehicles for the delivery of basic and specific health services to rural and peri-urban populations.

Download this informative report that focuses on a global vehicle network solution for telemedicine at:

*page.co/BQoY*

# InfoBeam

## Start-ups honored by Euroconsult

**During Euroconsult's annual *World Satellite Business Week*, awards were presented to the four most promising start-ups, as selected by an independent jury, after a pitch competition during the *FinSpace* cocktail reception at Euroconsult's Summit for Satellite Financing, which brings together the leading decision makers of the satellite-enabled business sector. FinSpace is supported by MAXAR and Global Space Ventures.**

One hundred and thirty companies were identified, after which 36 were shortlisted and 12 were invited to pitch. The four winners were selected from those 12 companies, based on the assessment of qualitative criteria, including innovation, existing and future customer base, amount of capital raised, level of maturity and market approach.

The participants had the opportunity to present their projects during the FinSpace event and cocktail reception and also received 10,000 euros worth of Euroconsult's research products and coaching from Global Space Ventures.

The jury, which had been in deliberation over the summer, was composed of leading figures from the satellite industry:

- *Jury President: Jean-Jacques Dordain, Member of Advisory Board, SpaceResources.lu*
- *Pacôme Révillon, CEO, Euroconsult*
- *Hélène Huby, Partner, Global Space Ventures*
- *Will Porteous, Partner, COO, RRE Ventures*
- *Serge Van Herck, Space Entrepreneur*

*Jean-Jacques Dordain*, Jury President and Member of Advisory Board, SpaceResources.lu, said that the success of the second edition of FinSpace is one of the many signals of "new space" taking momentum in Europe. Its growth involves more and more entrepreneurs and investors, more and more companies, long standing and new, big and small, from the space sector and from outside the space sector, all with the support of space agencies. The movement is now irreversible along a sustainable path paved with more and more clusters and ecosystems covering the total value chain. Congratulations and long life to the four winners.

*Pacôme Révillon*, CEO, Euroconsult, added that the future and growth of our industry will be shaped through innovative ideas and disruption. The FinSpace Awards recognize the most promising start-ups for their outstanding new concepts and initiatives, while at the same time facilitating exchanges and the formation of partnerships between them, established industry players and investors.



Best Newcomer: Akash Systems



Best Pitch: Hiber Global



Most Innovative Technology: Isotropic Systems



Entrepreneur of the Year: Rafael Jordá Siquier, CEO of Open Cosmos

# InfoBeam

## GOSAT-2 + KhalifaSat launched

**Mitsubishi Heavy Industries, Ltd. (MHI) and JAXA have successfully launched H-IIA Launch Vehicle No. 40 (H-IIA F40), which encapsulated the Second Greenhouse Gases Observing Satellite "IBUKI-2" (GOSAT-2) and KhalifaSat, a remote sensing Earth observation satellite — the launch occurred at 13:08:00 on October 29, 2018, (JST) from the JAXA Tanegashima Space Center.**



*Artistic rendition of the GOSAT-2 satellite on orbit.*

The launch and flight of H-IIA F40 proceeded as planned. The separations of GOSAT-2 and KhalifaSat were confirmed respectively at approximately 16 minutes and 09 seconds and 24 minutes and 15 seconds after liftoff.

GOSAT-2 developers enhanced the satellite's focused, target-point observation capabilities (target-point observation functionality), enabling the device to gather accurate readings from a broader range of target points — an ability that will be especially beneficial in evaluations of industrial areas, densely populated areas, and other areas with large quantities of greenhouse gas emissions.

*1 ppm is a unit that shows "parts per million"; 1 ppm is equivalent to 0.0001%.

*2 ppb is a unit that shows "parts per billion"; 1 ppb is equivalent to 0.001 ppm or 0.0000001%.

The IBUKI-2 is also capable of monitoring carbon monoxide concentrations. Whereas carbon dioxide not only comes from anthropogenic sources such as industrial activity and fuel combustion, but also has natural origins in forests and biological activity, carbon monoxide emissions are byproducts of human activity alone — not the natural world.

Analyzing combined observations of carbon dioxide and carbon monoxide will give researchers an effective means of estimating carbon dioxide emissions from anthropogenic sources.



*Photo of the MHI and JAXA launch of the GOSAT-2 and KhalifaSat satellites.*

Airborne PM 2.5 has also become an increasingly concerning health hazard. The GOSAT-2 will help monitor PM 2.5 by gathering the data that scientists need to estimate PM 2.5 concentration levels.

The KhalifaSat from the UAE's Mohammed Bin Rashid Space Centre (MBRSC) is the first satellite built by Emirati engineers and is the third remote sensing satellite owned and operated by MBRSC. This satellite will boost the UAE position and competitiveness in satellite manufacturing and operations around the world.

In a statement from Mitsubishi Heavy Industries regarding this launch, the UAE Mohammed bin Rashid Space Centre's (MBRSC) KhalifaSat satellite was successfully delivered into orbit via the H-IIA launch vehicle F40. The launch vehicle trajectory was executed as planned, and at about 24 minutes after liftoff, separation of the KhalifaSat satellite was confirmed.

This mission was performed along with Japan Aerospace Exploration Agency's (JAXA) Greenhouse gases Observing SATellite-2 "GOSAT-2" satellite, in which the separation of the GOSAT-2 satellite was also confirmed 16 minutes after liftoff.



*Artistic rendition of JAXA's upcoming H3 launch vehicle.*

Additionally, MHI holds the launch service contract for the Emirates Mars Mission (EMM spacecraft, planned to be launched in 2020), through which it hopes to build upon a strong and lasting relationship with the MBRSC and UAESA (UAE Space Agency).

The H-IIA launch vehicle is Japan's flagship launch vehicle and one of the most reliable launch vehicles in the world. This launch was the 41st consecutive successful H-IIA/H-IIB launch, with an accumulative success rate of 97.9.

The successor to the H-IIA — the H3 Launch Vehicle — has been developed by MHI and JAXA. The concept of the H3 is highlighted to be much more customer-oriented by offering affordable pricing, relaxing environmental conditions for satellites and drastically reduced preparation time from contract to launch.

The new launch vehicle will allow for more flexible and cost-efficient launch services, and is scheduled to make its maiden flight in 2020.

His Excellency *Hamad Obaid Al Mansoori*, Chairman of the Mohammed bin Rashid Space Centre (MBRSC), said that the successful launch of KhalifaSat; which bears the name of His Highness Sheikh Khalifa bin Zayed Al Nahyan, President of the UAE, marks a new milestone for the space sector in the UAE and the region. The first satellite fully manufactured in the United Arab Emirates at MBRSC facilities by Emirati engineers is in line with the directives of the leadership in transforming the UAE into a regional and international hub for space science and technology.

He added that with its five patents, MBRSC believes that KhalifaSat will play an important role in aiding organizations around the world in getting accurate data related to environmental changes and urban planning as well as support relief efforts at times of natural disasters. The company appreciates the valuable role played by the firm's Japanese partners and thank them for their support in all the stages of this major project, providing all the necessary facilities to ensure that KhalifaSat is delivered successfully into space.

*Naohiko Abe*, SVP and Head of Integrated Defense and Space Systems of MHI, expressed his appreciation to all involved in the launch campaign for the devoted support and cooperation. In particular, he greatly appreciated that UAE's Space Agency and MBRSC continuously supported and cooperated with the company throughout the three and half years since MHI received the contract in February of 2015. The UAE government is the third overseas customer for MHI's Launch Services. With the results of this launch, the H-IIA and H-IIB have achieved 41 consecutive successful, on-time launches.

Abe noted that MHI intends to expand their launch services business as the leading company of the Japanese space industry. Moreover, MHI is developing the H3 in partnership with JAXA. In succession of the H-IIA/IIB, the H3 will be a reliable and affordable next generation launch vehicle with a maiden flight planned for 2020 and the company expects to be awarded with H3 launch service contracts from potential customers in the upcoming days.

**www.mhi.com**

**global.jaxa.jp**

**mbrsc.ae/en**



*Artistic rendition of the MBRSC's KhalifaSat on orbit.*

# InfoBeam

## NSSLGlobal's three-year contract...

**NSSLGlobal has signed a three-year contract with offshore support vessel provider Wind Energy Marine — this contract is for the deployment of NSSLGlobal's FusionIP VSAT terminal in addition to the firm's Oceanic Dynamics system aboard Wind Energy Marine's new Crew Transfer Vessels (CTVs) that operate from Nordsee Farm, near Bremen, Germany.**

FusionIP will automatically switch between VSAT and cellular connectivity, while the Oceanic Dynamics suite will centralize vessel performance, and assess the impact and "push on forces" reported on offshore structures.

By combining the two solutions, the vessels will benefit from seamless connectivity provided by the *FusionIP* terminal, along with the comprehensive motion and impact analytics delivered by *Oceanic Dynamics*. They will provide Wind Energy Marine with an extensive set of tools to support maintenance and operation aboard its vessels.

A unique "antenna solution" was developed and specifically engineered in-house to enclose and protect two antennas ensuring the seamless transition between the networks.

According to the company, no other service provider offers a single radome solution combining both cellular and VSAT connectivity, allowing maritime vessels to automatically switch between 4G/3G and satellite networks. The FusionIP antenna dome is contained within a compact 60 cm. radome, ensuring that it can be installed on a wide range of vessel types.

Ensuring cost-effective and efficient fleet management, Oceanic Dynamics will provide Wind Marine Energy with the ability to monitor engine data, route information and GPS positioning, fuel efficiency, seasickness and whole body vibration HSE analysis, as well as passenger comfort and well-being analysis that allows vessels to contextualize cost efficiencies

and ensure total onboard awareness with the help of a CCTV suite. The new system will also allow Wind Energy Marine to maximize on cost savings by improving efficiencies.

*Paul Rutherford*, Service Engineering Director at NSSLGlobal, said that Wind Energy Marine has been building their presence in the market and NSSLGlobal is delighted that firm has decided to invest in the company's solutions to further strengthen their growth. A three-year contract is a real demonstration of its commitment to NSSLGlobal technology and the implantation of the a combination of two NSSLGlobal flagship solutions that will ensure seamless network coverage and efficient vessel performance.

*Andrew Bagshaw*, Managing Director at Wind Marine Energy, added that NSSLGlobal has demonstrated the expertise, experience and superior quality of solutions which the firm was seeking to support the company growth in the maritime marketplace. Oceanic Dynamics will be indispensable in terms of ensuring efficiency and consistent quality of Wind Marine Energy services, while the FusionIP terminal will allow the firm to stay fully connected to the company's shipping network at all times. The team at NSSLGlobal has also been extremely hands-on throughout the installation process, which was completed without a hitch.

**www.nsslglobal.com**
**www.windenergymarine.com**

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# InfoBeam

## Kratos gateways for JCSAT-18

**Kratos Defense & Security Solutions, Inc. (Nasdaq: KTOS) has been awarded a contract by SKY Perfect JSAT Corporation (SJC), to design and build gateways for SJC's new High Throughput Satellite (HTS) network — the JCSAT–18 HTS satellite, launching in 2019, will deliver broadband and mobile communication services to Asia Pacific and Eastern Russia.**

Kratos will design and build a state-of-art Ka-band multi-site gateway solution for SJC's new JCSAT-18 satellite. Kratos' breadth of gateway solutions are assembled and tested in Kratos' integration facility to enable rapid on-site assembly and commissioning.

This results in both higher quality and faster time-to-market than traditional piecemeal ground station deployments and protects SJC's investment by reducing complexity and risk.

HTS next generation satellites leverage spot beam waveforms to achieve approximately 20 times the throughput of previous generation satellites.

Successful delivery of these types of high-bandwidth services requires important changes to the current ground infrastructure which is designed and

optimized for traditional satellite operations. Kratos is leading this industry evolution by offering a broad portfolio of integrated Kratos products that provide satellite operators the most comprehensive and seamless gateway solution in the industry.

Kratos' gateway solution includes a broad array of ground station services from monitoring and control and network management products through high-performance antennas.

This enables satellite operators to maximize their HTS business model investment by reducing risks and costs while improving time-to-market.

The SJC contract award is for a multi-site gateway solution that will include Kratos' high-performance 13 meter Ka-band Turning Head Antennas and Compass® monitoring and control system.

The pre-integrated solution will be installed at various SJC locations with control equipment centralized in the company's Network Operations Center.

**www.kratosdefense.com**

**www.jsat.net/en/index.html**

# A Spaceflight Industries Perspective

## A historic year for rideshare

*By Curt Blake, President, Spaceflight Industries*

**Five years have passed since Spaceflight's maiden rideshare voyage on an Orbital Antares launch with a 3U cubesat.**

Since then, the market has evolved dramatically, largely due to the extreme growth of both smallsat developers and launch vehicle providers.

Rideshare was born as an innovative solution to benefit launch vehicle providers and satellite developers. Rideshare maximizes launch capacities, increasing revenue for vehicle providers, while decreasing costs for satellite developers and providing a stable cadence of opportunities to access space.

### The Current Market

According to industry experts, by the end of 2018, the market for smallsat lunches is predicted to reach approximately $1.7 billion.

That number is expected to grow to nearly $2 billion in 2019. While not all of the launches included in these forecasts will be rideshare launches (some satellite developers will seek dedicated launches, while others may be restricted from flying on rideshare missions), the belief is that approximately 40 percent of the predicted market value, roughly $780 million in 2019, will be derived from rideshare launches.

The industry is showing no signs of slowing down. Industry experts are predicting that spacecraft ranging from 1 to 50 kg. in size seeking launch opportunities will grow roughly 15 percent year-over-year through 2023.

These predictions are, in part, due to the decreased lifespan and increased production of satellites; however, it is also due to the increasing number of launch options available. The two elements are closely intertwined. The growth of smallsats has created demand for frequent and reliable launches, opening the door for rideshare, while also encouraging growth from launch vehicle providers.

### The Evolution of Rideshare

As demand for access to space continues to grow, rideshare options will also continue to grow and evolve. One large development is the emergence of dedicated rideshare missions, where a launch is fully dedicated to smallsats.

This year, Spaceflight will be executing the company's first-ever dedicated rideshare mission on a SpaceX Falcon 9 from Vandenberg Air Force Base. This historic mission, named **SSO-A: SmallSat Express**, will be the largest mission from a U.S.-based launch vehicle.

Spaceflight manifested this entire mission with more than 60 payloads from 17 different countries from across more than 30 organizations.

This will be an important and unique launch for Spaceflight. Increasing access to space has always been Spaceflight's mission as an organization, and rideshare represents a viable solution to the many hurdles present in accessing space, including availability, cost, and other factors.
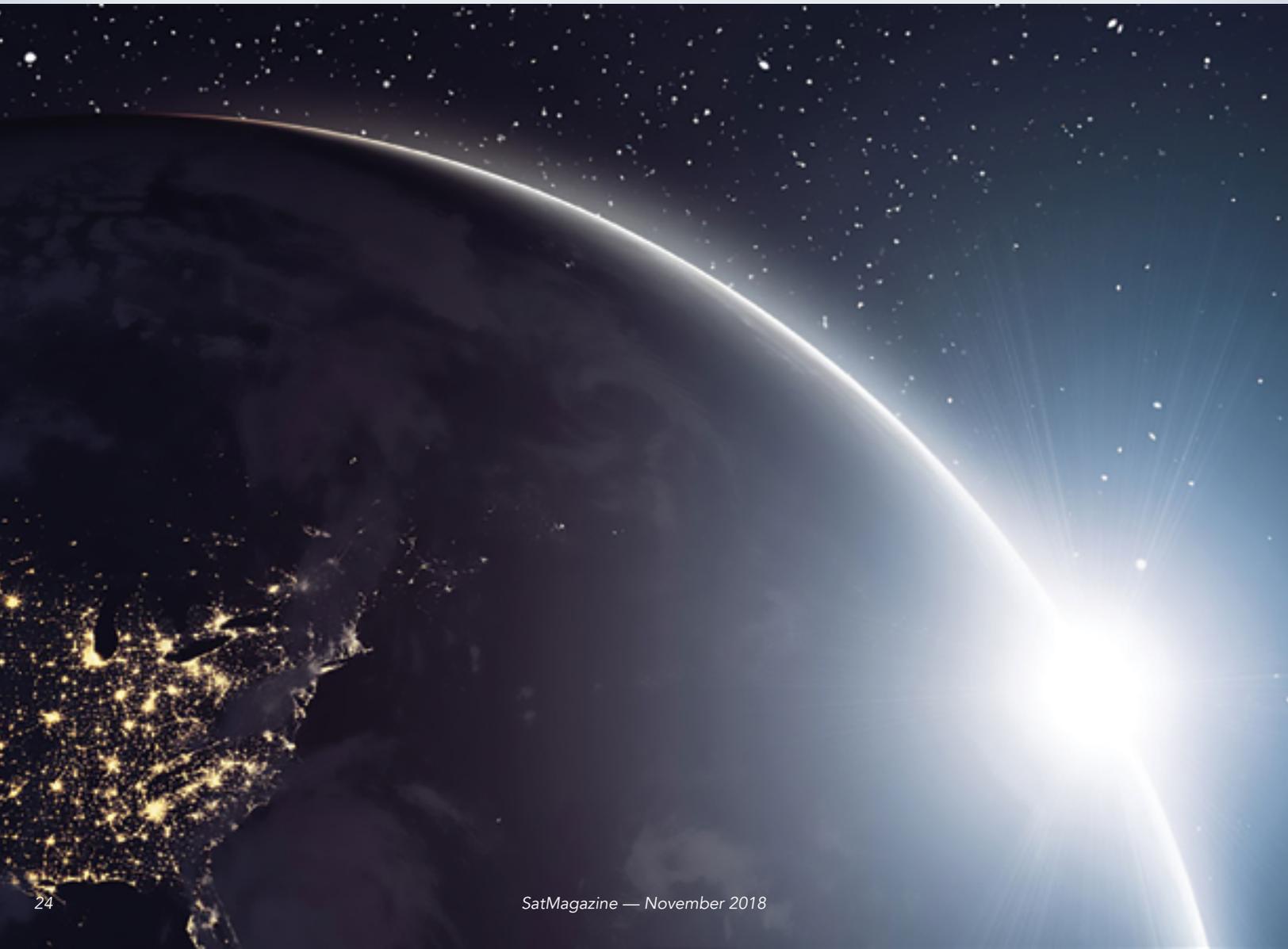
Dedicated rideshare missions address those challenges in an expedited fashion, flying large amounts of spacecraft to orbit at one time; the mission is also solely dedicated to smallsats.

### The Future of Launch
**While SSO-A: SmallSat Express has not yet launched, there are already several important lessons learned from this mission**

First is that a large number of satellites on one launch is an incredibly complex undertaking. Complexity touches every part of rideshare missions, including integrating payloads, placing multiple satellites on orbit, and managing regulatory needs. Now, with more than 60 payloads on a single mission, the complexities are amplified.

It's too early to completely rule out large vehicles for future dedicated rideshare missions; however, it is more likely that small- and medium-sized launch vehicles will become the vehicles of choice for future dedicated rideshare missions.

Another important lesson that is seen across all rideshare missions is the need for flexibility. Building satellites, launching a rocket and accurately placing spacecraft on orbit are complex processes.

Every aspect of accessing space presents different challenges and can lead to changes in a schedule. For instance, it's not uncommon to see a launch be delayed several times — it's possible that a rideshare payload needed to get on orbit by a certain time to begin profiting from its asset, creating a potentially detrimental situation.



*A SpaceX Falcon rocket launch.*

Alternatively, if a spacecraft is a secondary payload and is not ready by its launch date, then money is lost and the payload remains grounded.

In order to minimize negative impacts, rideshare providers have an opportunity to increase flexibility by approaching rideshare, much in the same way that airline ticketing is managed. If capacity is purchased on a launch that is then delayed, imagine being able to move that payload to another mission, even a different launch vehicle provider. Flexibility will be crucial to managing the unpredictability of the space industry.

While in many ways the new space age is still in its infancy, the last several years have been highly informative and have led to incredible innovation. This industry is continuing to grow and evolve at a rapid pace and the coming years will be critical to the industry's continued evolution and maturation.

**www.spaceflightindustries.com**

*Curt Blake, president of Spaceflight, has more than 25 years of executive experience in high-growth technology industries. Under Curt's leadership, Spaceflight has successfully negotiated the launch of 140 satellites on behalf of its customers and has secured contracts to deploy another 90+ satellites through the remainder of 2018.*

*Responding to the smallsat industry's growing demand for routine, reliable access to space, Curt oversaw the purchase of a SpaceX Falcon 9 in 2015 to expand Spaceflight's launch services to include dedicated rideshare missions. SSO-A, Spaceflight's first dedicated rideshare mission, is scheduled for November 2018 and will carry more than 60 payloads. Prior to moving into his role as president, Curt served as senior vice president and general counsel for Spaceflight, leading efforts to expand its global network of launch service providers while also building relationships with key commercial, civilian and defense customers. Prior to joining Spaceflight, he held a range of senior executive and general counsel roles at Microsoft, Starwave, Corbis and Aldus.*

## A Look at Blacksky...

*BlackSky is a wholly owned subsidiary of Spaceflight Industries and is an intelligence platform that delivers timely, relevant and actionable information upon which informed decisions are made.*

*BlackSky's planned constellation of 60 satellites — with four spacecraft on orbit by mid-2019 and 20 on orbit by 2020 — and will provide frequent revisit rates of more than 95 percent of the Earth's population.*

*BlackSky smallsats will provide color imagery at a resolution of one meter (1 square meter = 1 image pixel). Monitoring economic activity is easier than ever — see ships in ports, earthquake damage, or herd migration. These spacecraft will fly over most major cities and economic zones between 40 and 70 times a day, giving clients unprecedented access to the most current imagery available.*

*By fusing satellite imagery with real-time data, BlackSky will deliver fresher, more relevant insights. Whether tracking economic assets, monitoring illegal maritime activity, providing humanitarian relief, or securing troops and borders, BlackSky provides a holistic view of the situation.*

*At BlackSky, the timeliness of satellite imagery is a cornerstone of the firm's business proposition. Timeliness is driven directly into the design of every aspect of the system — Gemini was built, designed and implemented by the company's in-house team that orchestrated faster and more efficient planning and tasking than could be possibly accomplished by a team of human operators.*

*Timeliness starts in with BlackSky Platform products such as Spectra and Events. A customer can use Spectra anytime, on a tablet or a computer, to order a satellite image through an interactive a map of the Earth.*

Spectra then tells the user what satellites in the constellation will be passing over the location in the next few days and allows users to then place a tasking order. Spectra sends that order to Gemini, the internal name for the firm's cloud-based constellation orchestration system. No phone, no fax machine, no human — welcome to 2018.

Gemini learns from the platform where you want an image and then it finds the fastest way to capture that image and return that to the requester. The system takes all outstanding image requests, the location of the company's groundstations around the world, the orbits of all of the BlackSky satellites in the constellation and creates a plan. That plan includes which satellite will take that picture, which groundstation will task that satellite and which groundstation will downlink the image after it has been taken.

After the plan is complete, the satellite communication plan is handed off to the appropriate groundstation for the upcoming contact pass with the satellite. If weather or other factors prevent a contact pass from happening, the platform will automatically replan the image for collection or downlink at the next available opportunity.

No human involved in this process — the image tasking process and, if necessary, recovery is entirely automated.

The groundstation locations around the world were carefully selected with timeliness in mind, both in tasking the satellite and then downlinking the image after it has been taken. Each ground station operates "lights out".

The groundstation software takes the communication plan and controls the RF equipment and antennas before, during, and after the contact pass.

During the contact pass, the groundstation software talks to the satellite sending up new mission scripts for future image collection, downlinking images that were taken, and relaying health telemetry back to the cloud infrastructure. The system handles any minor communication anomalies and escalates to satellite operators anything it can't handle itself.

Throughout the contact pass, operators in the Missions Operations Center (MOC) can watch the automated contact pass and view satellite and groundstation telemetry in real-time — or see a report the next day on the contact passes that happened overnight while they were asleep.

As images are downlinked from the spacecraft ,they are sent back to the firm's cloud infrastructure and into the image processing pipeline. Here the images go through several steps in the custom pipeline to prepare the final imaging product, including elements such as geolocation and orthorectification. BlackSky's modular image processing pipeline was designed to scale out as the constellation grows to ensure timely processing of images.

Once image processing is complete, the images are sent back to Spectra which notifies the customer that their tasked image is available. The tasking-to-delivery round-trip time varies based on many variables (satellite orbits, daylight, image collection location, groundstation locations, etc.) but in many cases it is measured in hours, not days.

BlackSky was designed from the ground-up around automation with an explicit objective of getting humans out of the loop for day-to-day operations because humans just slow things down, and timeliness is money.

*www.blacksky.com*

# The Forrester Report

## OneWeb's "Valley of Death"

By Chris Forrester, Senior Contributor

**There are some anxieties over the state of play at the proposed mega-constellation OneWeb and their fleet of LEO satellites.**

Analysts at **Northern Sky Research** (NSR) in a report headline asked, "*Can OneWeb cross the Valley of Death*?" That's blunt, but OneWeb has given plenty of reasons **not** to be cheerful this past month or so.

The '*Valley of Death*' expression refers to a **Forbes** take (*see Figure 1 to the right*) on the famous Gartner hype-cycle illustration and its notorious "*Trough of Disillusionment*" and whether the industry is being altogether too pessimistic. The plan is challenging: *Greg Wyler*'s project aims to place some 900 satellites into LEO to supply the planet's non-served or under-served broadband consumers with gallons of extra capacity.

The downside news, much discussed on the sidelines at the Paris '*World Satellite Business Week*' conference in September, focused on missed launch dates, much higher prices for each LEO satellite, a new CEO appointed and the existing CEO moved sideways (who then resigned), and various funding risks and generally negative comments that add up to the $64,000 question whether or not the world really needs all this upcoming Ka-band capacity.

NSR forecasts that the world will see a huge number of these new, smaller satellites adding a net 25 Terabytes/second of additional capacity over the next ten years. In a world where 50 or 100 Gb/s of Ethernet traffic is considered fast enough, terabyte speeds are truly electric given their 1000 x 1 Gb/s capacity.

NSR, in their report issued on September 18, stated that these non-Geo satellites will also be generating annual revenues of $4 billion by 2027.

These new networks are offering a new set of attributes for customers, such as low latency, full mesh connectivity, or high-bandwidth per terminal, and will be the key to unlocking new, greenfield markets. However, NSR adds that the concepts are not without risk, saying the CAPEX exposure is massive and new revenue drivers might not be enough to pay back initial investments. The report states, "*Consequently, there is a risk of price disruption for the entire industry if these new players dump capacity to poach customers from legacy verticals.*"

As readers will have noted over the past few weeks with rumors of OneWeb's current challenges, NSR says the "*moment of truth*" is approaching for these new constellations.

"*According to their schedule, LEOs need to start offering concrete examples of progress, but results are still mixed,*" noted *Lluc Palerm*, NSR Senior Analyst and report author. "*Funding is still far from resolved and even the ones that have already attracted billions in investment still do not have a clear path to service. Delays and cost overruns plague many programs. Regulatory challenges are coming to light with first denials of access to key markets. Technology wise, there are still many questions to answer, beginning with user terminals. On the other side, progress continues in the form of testing satellites, new rounds of funding and establishment of baseband networks.*

"*Technology development has consumed most of the attention in the early stages of NGSO development. However, as we approach entrance into service, actors must shift their attention to commercialization. Constellations that can build a stronger position in key markets, both regionally and vertically speaking, will have higher chances of success. Partnerships between traditional GEO actors and new constellations are also proliferating. This creates a symbiotic relationship where GEOs can access new markets developed by NGSOs, while the new actors can leverage the long-standing customer heritage and sales channels of established operators,*" said NSR.



Figure 1.

Source: Forbes
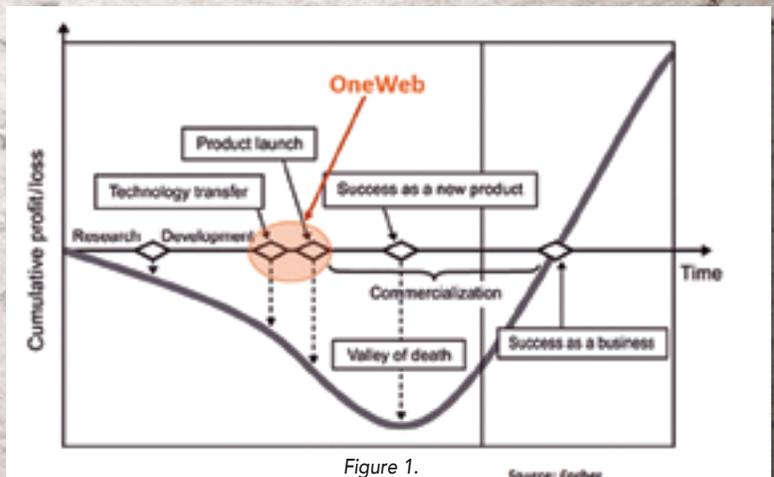
However, NSR in its slightly later September 20th 'Valley of Death' report examined these risks more closely and said that, in many ways, the future trends of the industry — directly or indirectly — depends on the success of OneWeb as that firm sets out to open new doors, raising confidence among investors in similar new ventures.

Among other players in this domain (past and present), OneWeb has accomplished a significant feat by raising the most funding — $1.7 billion — offering the company a tremendous benefit over other, similar LEO constellations. However, despite this notable monetary amount, the question remains — is it enough to support and sustain this mega constellation, or is it just buzz and hype?

Let's be clear: OneWeb is, in theory, extremely well backed. The company has the might of Japanese media conglomerate **SoftBank**'s wealthy 'Vision Fund' as a major investor and is also financially supported by the likes of **Airbus**, **Intelsat**, **Virgin**, **CocaCola** and India's **Bharti**.

Nevertheless, there are skeptics. Initial concerns are the delays encountered with the first batch of 10 satellites that are under construction by Airbus at that company's Toulouse facility. These satellites are already late by many months and will not now launch much before February of 2019, although OneWeb officials at September's World Satellite Business Week in Paris reportedly said they are not overly worried by the delay.

This test-batch of 10 satellites were also hoped to prove the 'production line' capability of eventually building up to 900 satellites and at a target price of about $500,000 per craft. There are now suggestions that the price could be as high as $900,000 per unit. In the absence of hard news from OneWeb regarding this pricing, the rumors will — no doubt — see the price per satellite rise.

There is also uncertainty over OneWeb's initial funding, which specialist trade publication *Space Intel Report* states has been variously quoted at $1.2 billion, or $1.7 billion, or more than $2 billion. This round of cash is much less than the amount required to build and launch the fleet of satellites, which the company has variously said would need a total of some $3.5 to $6 billion — not including the costs of getting the business established with consumers.

This has led to questions over how that funding — whatever the amount — is flowing into the business and the importance of the banks and lending institutions. This has provoked additional questions, not least of which is over the role of the French export credit agency (**Bpifrance**) which is said to want to see more customer commitments before they cough up their cash. Much of the funding is earmarked for the construction of OneWeb's j-v satellite facility (with Airbus) near Cape Canaveral in Florida where two side-by-side production lines are being built to start production of some 900 satellites needed for the constellation.

There's talk now of how many rival satellite constellations might actually be needed. One suggestion (also in Space Intel Report) is that revisions are possible — instead of OneWeb's all-Ka-band proposal, the company might pair with Canada's **Telesat**, a company that also has their eyes on a super-constellation of 292 craft. OneWeb could, conceivably, combine Telesat's Ku-band with its own Ka-band aims onto a single satellite and thereby slash build and launch costs, or simply merge the schemes.

Merger or not, any problems — financial or operational — with OneWeb are being seen as a threat to the other proposed broadband and Internet of Things (IoT) systems under development, whether from *Elon Musk*'s **SpaceX** ('Starlink', also reportedly on hold), **LeoSat**, **Kacific**, **Boeing**, and plenty of other actors

Russia's Baikonur launch facility also let it be known that they are making significant improvements to their ground handling of the LEO satellite they are contracted to launch. Russian news agency **Sputnik** reports that floors in the main assembly hall and testing facility are being replaced in order to limit dust and improve air quality. The facility's ventilation system and electricity are being examined by the specialists, according to the source.

The report also confirms that OneWeb's Baikonur launches will only occur "*six months after a qualification launch*" of the first of OneWeb's satellites — expected from French Guiana in mid-February 2019.

NSR stresses that most projects go through this 'Valley of Death' phase. "*This is the period when the start-up idea starts to move from conceptual phase to the implementation stages. NSR considers OneWeb is currently placed between the technology transfer and product launch phases and will soon enter the said valley.*" (*See Figure 2*.)



Figure 2.
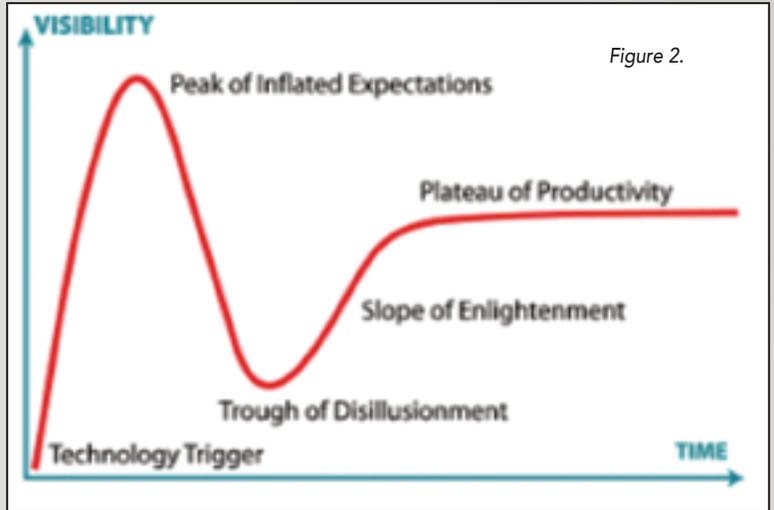
To put it bluntly, NSR is also skeptical of the funding that is said to be required for operations. NSR initially estimated a total CAPEX of over $5 billion for OneWeb — which is $2 billion over the originally expected total CAPEX of around $3 billion.

"*Considering this CAPEX value, a total available funding amount of $1.7bn to date and a valuation of capacity as well as service revenue streams from various applications, NSR estimates a negative ROI over the next 10 years, which is attenuated further with the recently announced (and later retracted) confusing news of a $6 billion associated CAPEX. This analysis, for both cases, also assumes additional financing — enough to keep the cash flow positive during the forecasted time-period — at a 5 percent annual interest rate.*

"*In addition to the (relatively) easily quantifiable challenges, OneWeb also faces obstacles related to mass production. OneWeb's optimistic plans to launch its satellites every 21 days also creates added risks such as loss of a substantial part of their system in case of launch failures, as well as potential delays due to launch constraints. The dismissal of landing right requests (such is the case in Russia) also poses a significant threat to the success of OneWeb, as does the heavy recurring cost of fleet replenishment every seven to ten years,*"

NSR's 'bottom line' stated, "*Projects like OneWeb aspiring to create new standards, and, in the process, help create and boost new business models and industry trends (such as higher efficiency propulsion systems and cheaper launch solutions) are a refreshing and vital change in a traditionally conservative industry. Achieving its full potential can not only provide affordable Internet access to remote areas of the world and offer benefits in education and healthcare, but also help open new doors in both upstream and downstream segments of the industry. However, it is imperative that lessons learned from previous unsuccessful attempts are considered to refine OneWeb's and similar ventures' future business models, and in the process, cross the Valley of Death to become a successful business.*"

*Senior Contributor Chris Forrester is a well-known broadcast 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.*

# Innovation:
# Newtec

## Reliability and efficiency for Oil and Gas connectivity

*By Jo De Loor, Vice President, Market Development*

**The oil and gas (O&G) sector operates in a unique and challenging environment and, like many other industries, OPEX savings are sought whenever possible.**

Companies must drive down costs while increasing productivity and maintaining a happy workforce. The O&G sector has adopted satellite connectivity, mainly due to the locations this industry must operate in — remote, hostile, unconnected environments that are an integral part of their business.

### Multi-Layered

The sector incorporates many different stages and operations, from exploration and production to retail and, therefore, O&G communications needs vary greatly.

As in every other industry, there is a digital transformation occurring within O&Gs and, as a result, the demands on connectivity solutions are increasing. High data rates and reliable connectivity are essential to support on-site and centralized operations, backend systems, cloud services, IoT and crew welfare.

Satellite forms an important part of any O&G communications portfolio. Recently, however, the industry has hit difficult times, and though the requirement for connectivity continues to rise, the O&G sector is a conservative one and is cautious about change. Historically, reliable C-band has been used; however, advances in satellite technology are making businesses in the industry re-think their connectivity approaches.

For O&G companies, the focus for investment has always been on their core business. When it comes down to connectivity and communications, there is reluctance to take a risk on new technology. However, faced with increased bandwidth needs and tight budgets that companies are unprepared to invest on connectivity, the industry recognizes that something must be done to alleviate their concerns.

### Satellite is Key

**Satellite communications solutions are going through an evolution in terms of their capabilities.**

The introduction of High Throughput Satellite (HTS) and the move toward Ku- and Ka-band services has resulted in much higher link throughputs with smaller terminals as well as the need to occupy less precious space on board offshore platforms. HTS brings improved cost-per-bit and, therefore, helps considerably O&G company budgets.

A combination of unstable pricing and end-user asset oversupply has impacted the O&G industry. In April, Northern Sky Research released a report entitled 'Energy Markets via Satellite, 7th Edition', which explains the need for communications change.

"In turn, O&G companies, mining players, and electrical utilities have all re-analyzed how they do business — putting pricing pressures on suppliers and introducing more technology-centric workflows into remote operations," said Brad Grady, NSR Senior Analyst and Lead Author of the report. "Satellite service providers have been at the forefront of this dynamic change, helping customers introduce HTS in both GEO and Non-GEO to provide throughput and cost advantages, while leveraging capacity pricing changes to keep sight of their own financials."

### The Newtec Approach

**Newtec has been delivering services to the O&G market for many years and recognizes the unique challenges that the sector faces in terms of connectivity.**

This understanding has enabled Newtec to bring efficiency, flexibility and, above all, reliability that addresses all O&G requirements in Upstream, Midstream and Downstream activities, with very high throughput all the way to narrowband IoT/SCADA reliable services.

Using a combination of highly efficient technologies developed in-house such as DVB-S2 and DVB-S2X, Mx-DMA®, FlexACM®, Clean Channel Technology® and Cross-Layer-Optimization, Newtec delivers a service that exceeds many other technologies on the market.

This blend of technology enables Newtec to provide customers with guaranteed bit rates and the flexibility to allocate the bandwidth to the site that needs it, eliminating the requirement for dedicated bandwidth on each rig.

Newtec's platforms have a scalability that caters for all requirements, from a few sites on a traditional satellite beam to global networks serving thousands of sites across different beams and/or satellites.

The same platform can support a wide range of use cases, including exploration and production, offshore oil rigs, vessels, and even large-scale low data rate M2M/SCADA connectivity for pipelines and points-of-sales.

Newtec's patented Mx-DMA return link technology combines the benefits of SCPC and TDMA technology.

SCPC requires dedicated satellite bandwidth per site, but provides high throughput and efficiency.

TDMA allows bandwidth to be shared between sites but requires compromises in throughput and efficiency.

Mx-DMA allows the best of both worlds, delivering real-time, on-demand bandwidth across all sites without compromise to performance or reliability. Mx-DMA doubles the throughput capability in the same satellite capacity.

A concern for those operating in harsh weather conditions, as is frequently the case with remote offshore rigs, is the maintenance of the link. Reliability is absolutely key to the O&G industry.

The links that service O&G platforms are mission critical and downtime simply cannot be tolerated. Any interruption in services could mean millions of dollars lost. For this reason, IT managers are looking for solutions that maintain the highest reliability while adding efficiency, throughput and flexibility.

Newtec's auto-adaptive modulation technology, FlexACM, can be found in Newtec modems and hubs. Newtec's Cross-Layer Optimization technology also allows service priorities such as video, data and voice and QoS (Quality of Service) policies to be adapted on-the-fly.

Newtec Dialog® is a scalable, flexible, multiservice platform that allows operators to build and adapt their infrastructure as their business evolves.

The platform empowers operators to offer a range of services, supports bandwidth efficiency using the most optimal modulation and bandwidth allocation for any given service offering.

The Newtec Dialog platform supports 500 Mbaud wideband DVB-S2X ACM transmission from hub to terminals

As well as containing Mx-DMA technology, the platform also contains an advanced network management system for configuration, monitoring and supports private networking combined with advanced QoS.

## Solutions for an Ever-Changing Environment

The evolution of satellite communications into Ku-, Ka-band and HTS services has much to offer O&G end-users.

By lowering the cost-per-bit, increasing throughput and performance and reducing terminal size, without compromising on reliability, this tackles some of the most pressing connectivity challenges faced by O&G companies. By taking the very best that its technology has to offer, Newtec takes these advanced services

and enhances and optimizes them to ensure that O&G customers get the very best from their satellite link — and the most reliable service possible.

*Jo holds the position of VP Market Development at Newtec. Next to developing the HTS and enterprise markets and assisting to large project sales, he shares his expertise in broadband and VSAT within the Newtec organization. In his previous role as Product Manager, he was responsible for the product definition and market launch of Newtec Dialog®, Newtec's scalable, flexible and bandwidth efficient multiservice platform. It gives operators the power to offer a variety of services on a single platform while assuring the most optimal modulation and bandwidth allocation.*

# The Mars Helicopter and Lessons for SATCOM Testing

## Innovation: Kratos Defense

**In 2020, NASA will launch their next exploratory mission to Mars — this mission centers around a nimble, six-wheeled rover that is packed with instruments to search for the evidence of life, assess the climate and geology of the planet, and to prepare for future human exploration.**

This robotic explorer is incredibly advanced; however, there is one element the rover cannot do well — plan an ideal route across the rocky terrain. The vehicle's cameras extend only a few feet into the air, so it can't see over hills and large rocks.

NASA engineers dreamed up an ingenious solution to this problem: pair the rover with a flying scout that can peer over the terrain. Once per day, an owl-sized helicopter will take flight and photograph the nearby area, sending imagery back to the rover to aid with the route planning. NASA expects these route optimizations to triple the distance the rover is able to cover each day, increasing the vehicle's opportunity for important discoveries.

But, this innovative plan is fraught with risks and challenges. NASA has never flown a helicopter on Mars, where the atmosphere is a small fraction of the Earth's air density.

Maintaining a communication channel between the rover and the scout is also difficult. An Ultra-High Frequency (UHF) radio link is the lifeline for imagery, command and control, and relay back to Earth. If this RF link fails, the consequences could be dire: the scout could collide with the rover, fly out of range, or crash and end its usefulness to the mission.

Failure is not an option for this $2 billion mission, so the team at NASA's Jet Propulsion Laboratory (JPL) is minimizing the risk by running an interesting battery of tests on their RF equipment.
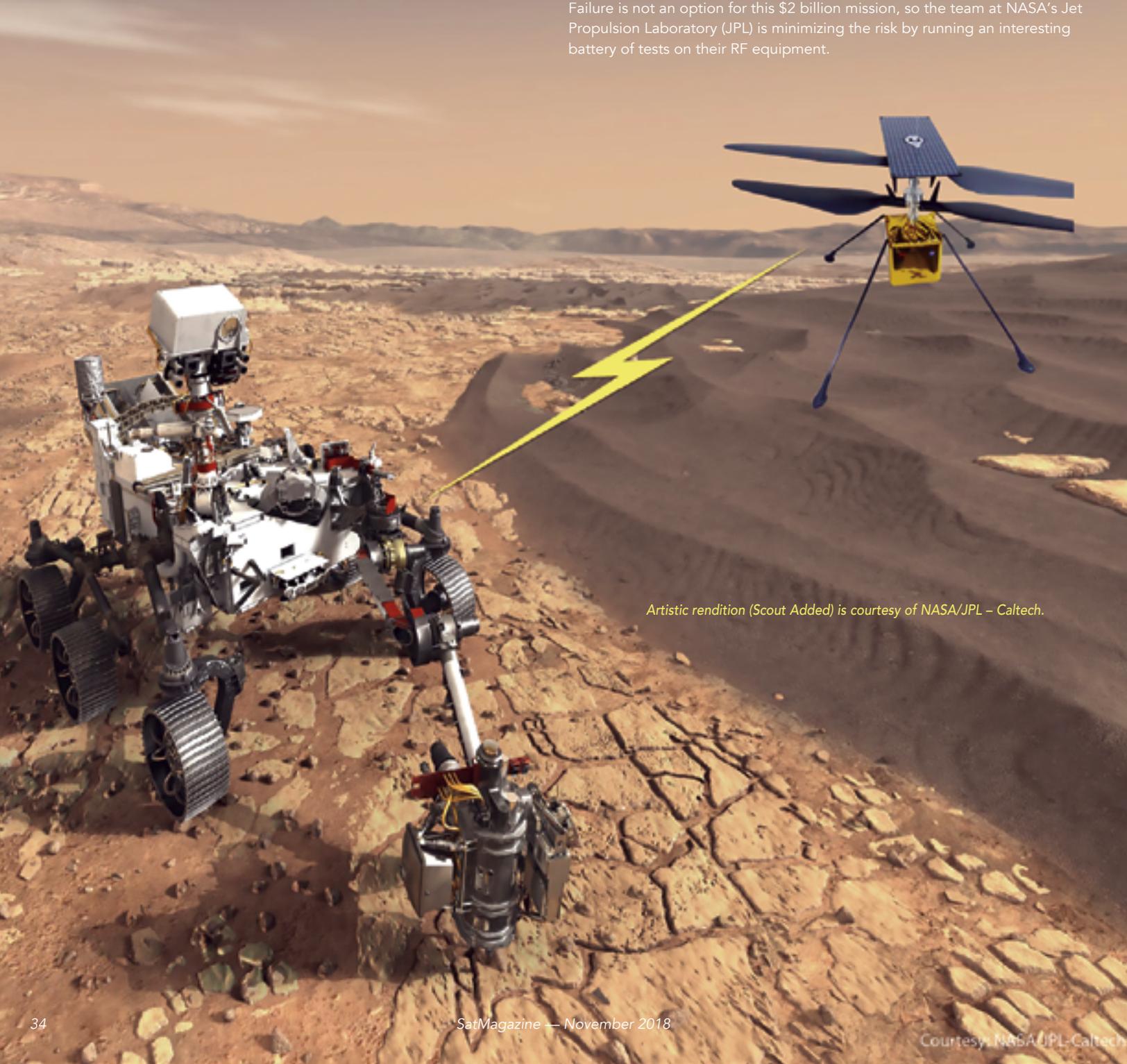
*Artistic rendition (Scout Added) is courtesy of NASA/JPL – Caltech.*

## Applying Mars Rover Test Methods to SATCOM

You may well be thinking... "*This doesn't apply to me; what does Mars have in common with the satellite systems orbiting Earth?"*

Surprisingly, far more than you may initially believe... the common thread is how to test to assure mission success. In that regard, NASA's test environment has striking applicability to SATCOM testing on Earth. The foundation of NASA's testbed is a device called a **Channel Simulator**. Think of the Channel Simulator as an RF environment creator. NASA connects the rover and scout radios with the Channel Simulator in between those units (*see Figure 1*).



Figure 1.

## Channel Simulator configuration
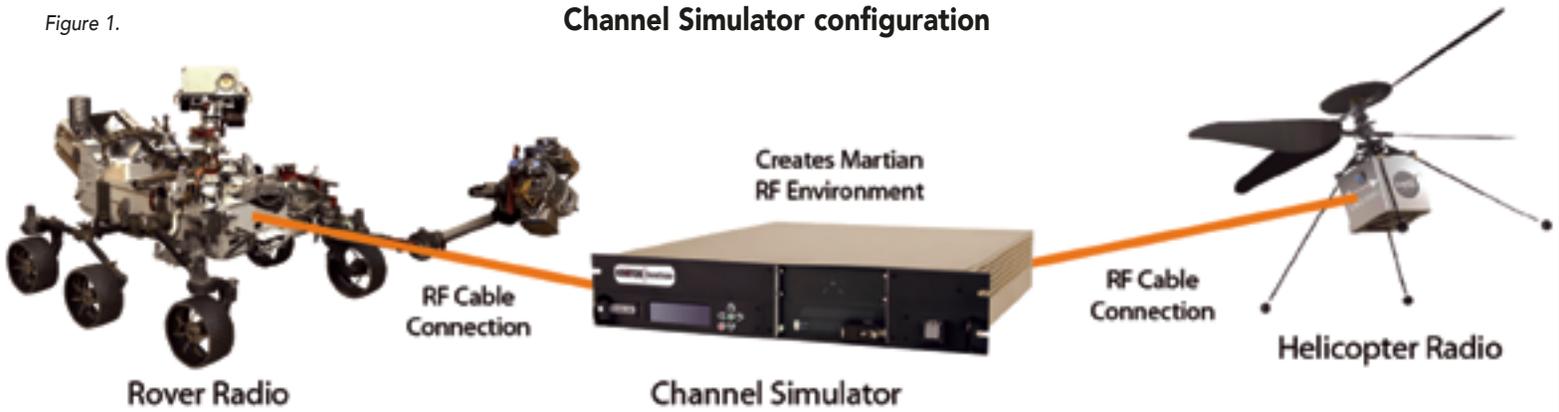
*NASA connects the rover and scout radios through the Channel Simulator in a hardware-in-the-loop configuration. Rover and Scout Images are courtesy of NASA/JPL—Caltech.*

This hardware-in-the-loop configuration gives the agency's engineers flexibility to program in a broad range of RF environments, from normal to worst-case. These include different helicopter flight paths, rover orientation, terrain blockages, and atmospheric conditions — anything that might impact the quality of the communication channel.

They virtually "*fly*" these scenarios in the lab before they launch such equipment to Mars. This testing ensures the equipment will work and the conditions are quantified that could cause link failure and should be avoided during the mission. Let's look at four specific test scenarios developed for the Mars mission and explore their utility for SATCOM missions closer to home.

### 1. Max Separation Between Rover and Scout = SATCOM Receiver Sensitivity

Before sending expensive robots across the solar system, NASA needs to understand just how far the helicopter can fly away from the Rover, while maintaining the communication link. Using the Channel Simulator, NASA engineers can virtually "fly" the helicopter away from the rover to quantify the point where the radios lose their lock.

As the distance increases, the received power level of the signal drops due to free space loss, and at some point the radios will not receive enough power to continue operating. This kind of test defines the maximum distance NASA might fly the helicopter during the mission to avoid any communication issues (*see Figure 2*). Any RF Engineers out there? If so, they'll quickly recognize this as a classic receiver sensitivity test. Sensitivity is a critical metric for any RF system as it determines



Figure 2.

## Max separation between Rover and Scout = SATCOM receiver sensitivity
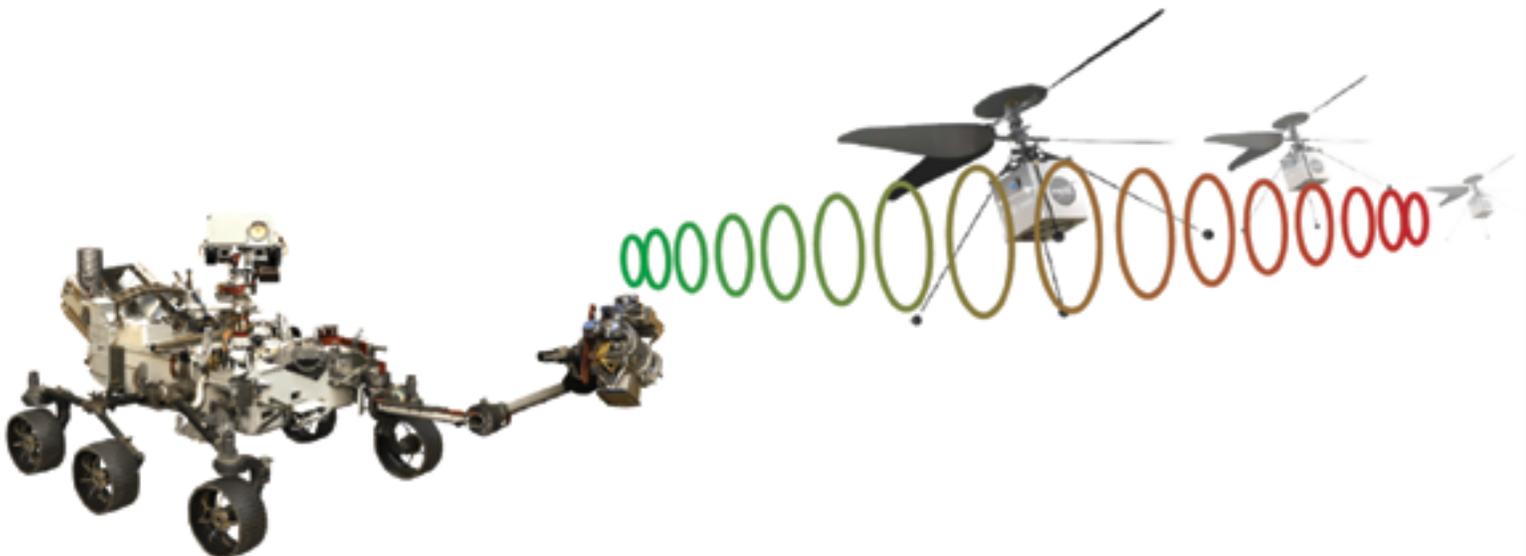
*Rover and Scout Images are courtesy of NASA/JPL—Caltech.*

how much power is required for the receiver to process the information. SATCOM and terrestrial systems on Earth must be characterized for their lowest receive levels — this ensures proper link budgeting, power transmit levels, and maximum distance between transmitters and receivers.

## 2. Dust Storms on Mars = Atmospheric Conditions on Earth

Mars is a dry planet, and dense clouds of dust can fill the air for weeks at a time. Using the Channel Simulator, NASA can create a virtual dust storm of varying intensity. As the particulate content in the atmosphere increases, the RF signal will experience increasing levels of RF attenuation and multipath scattering. NASA needs to understand how these environmental factors will impact the radio link, using this data to decide when safe flight is possible (*see Figure 3*).



*Figure 3.*

**Dust storms = atmospheric conditions on Earth**

*Rover and Scout Images are courtesy of NASA/JPL—Caltech.*

How does this apply on Earth? Satellite antennas may not operate in a region where dust storms are a threat, but every ground station must account for RF distortions caused by weather. Especially at higher frequencies, rain clouds can chop signal levels by 20 dB or more. Testing satellite communication systems for weather requires dynamic attenuation profiles that accurately reproduce the impact of changing weather conditions.

## 3. Dynamic Flight Paths on Mars = SATCOM-on-the-Move

The helicopter can follow an infinite number of flight paths, each with its own unique RF distortions. The Channel Simulator helps NASA determine safe parameters of normal flight paths. For example, as the helicopter rotates to different orientations during flight, its communication antenna points in different directions. This pointing angle can have significant impact on the strength of the received signals. Likewise as the helicopter makes maneuvers that change its velocity with respect to the rover, a Doppler shift is imparted onto the RF signal; the receivers must track the changing frequency. Tests such as this help NASA plan safe flight routes that ensure constant communication between the devices (*see Figure 4*).



*Figure 4.*

**Dynamic flight paths on Mars = SATCOM-on-the-Move (SOTM)**
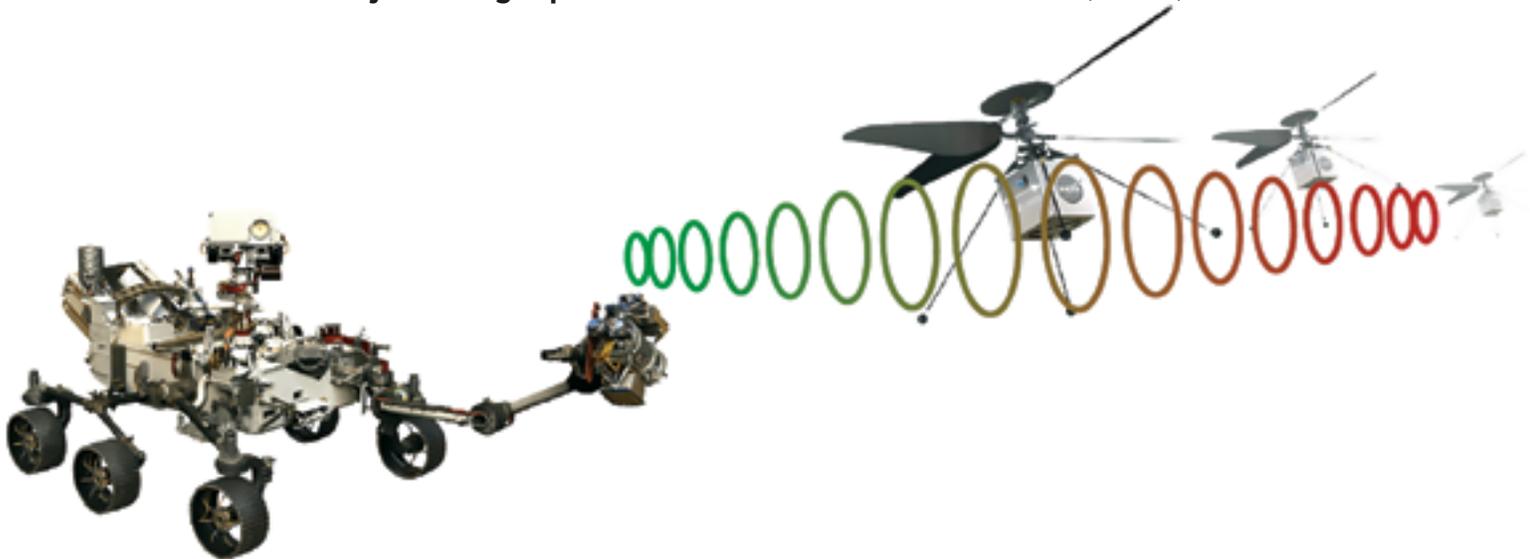
*Rover and Scout Images are courtesy of NASA/JPL—Caltech.*

These RF physics are no different when objects are in motion on Earth. An increasing number of SATCOM applications rely on mobile ground segment equipment, whether mounted to the roof of a Humvee or a commercial airline providing in-flight entertainment (IFE).

SATCOM channels are degraded by banking of the vehicles, shadowing from terrain and man-made structures, and Doppler shift caused by vehicle and satellite motion. These effects degrade the quality of service for users, and Channel Simulators quantify these impacts prior to deployment to enable successful SATCOM-on-the-Move (SOTM).

## 4. Multipath Fading on Mars = SATCOM in Urban Centers

Lastly, NASA uses their Channel Simulator to recreate the impact of RF energy reflected from the ground or terrain. Imagine the top signal in the image is the primary line-of-sight transmission between the rover and the helicopter. The RF energy is also transmitted out in other directions, and some of the energy reflects off of nearby rocks and terrain. When these reflected signals reach the helicopter, they look like a source of interference that can effectively jam or attenuate the primary signal, an effect called multipath fading. NASA's Channel Simulator includes a multipath fading module that tests the radios for resilience to this kind of interference (*see Figure 5*).

Figure 5.

**Testing for multipath fading**
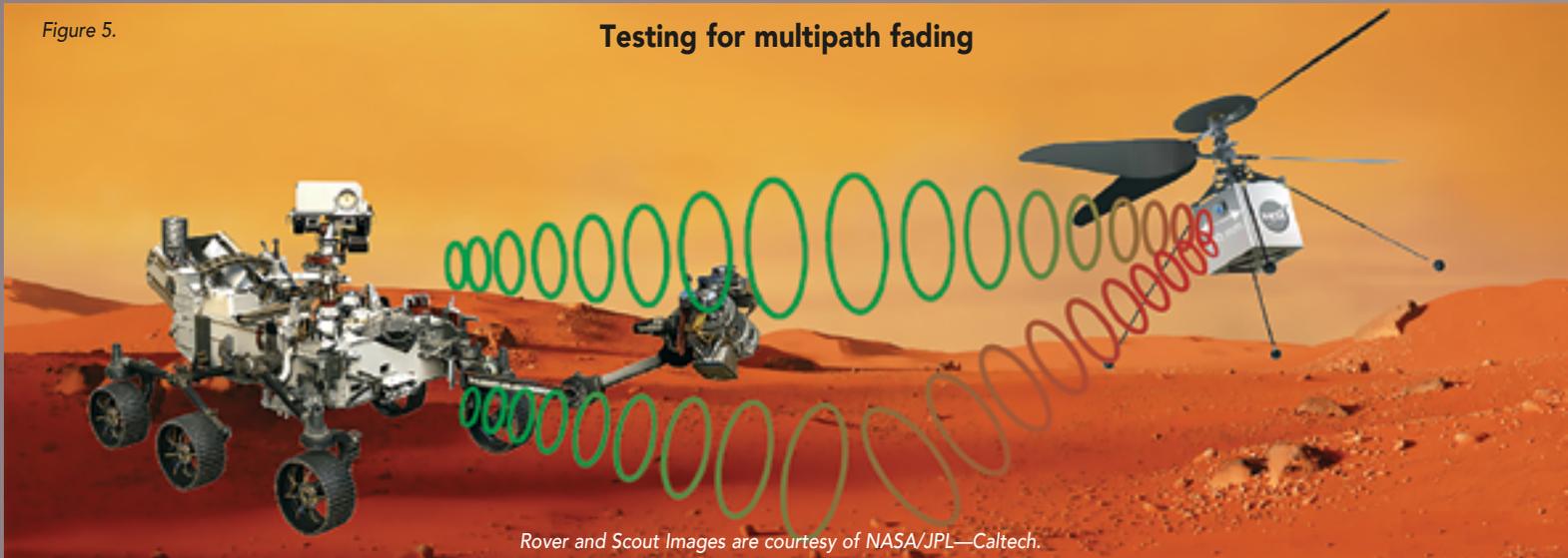
*Rover and Scout Images are courtesy of NASA/JPL—Caltech.*

Many readers have probably experienced multipath fading first-hand. Their GPS receiver has probably lost its position while driving near tall buildings at some point in time. RF signals bounce like pinballs through urban centers, and the GPS receiver is confused by the dozens of duplicate signals that are detected. Multipath fading also affects SATCOM ground stations when the antennas point at low angles relative to the surrounding terrain or water.

Channel Simulators are key to creating these environments before a system is operational, allowing designers to optimize performance and ensure mission success, even in challenging dense urban environments.

## Know Before You Go

While the Mars 2020 mission is incredibly unique, the test approaches being used teach a great deal about assuring communication systems on Earth. Operational testing is always the best way to qualify hardware; however, few have the ability to test live systems under the exact RF conditions of their final deployment. Fortunately, any RF environments can be recreated with the push of a button using Channel Simulators.

**Testing varying RF environments with the Channel Simulator**

Original RF

Modified RF

Any RF system under development can benefit from this test approach. Consider a maritime traffic control system, relaying voice and position information through satellite; the same RF impacts seen on Mars, like multipath, weather fading, and antenna pointing angles, equally impact seafaring platforms and must be tested.

Likewise, satellite links for in-flight entertainment (IFE) and productivity are becoming ubiquitous on commercial airlines; engineers who build these networks carefully consider how weather, aircraft motion, and satellite coverage impact passenger experience by emulating the RF environment with Channel Simulators.

Plus, the range of military testing applications is virtually endless: surveillance drone communication, satellite TT&C, tactical radios, weapons systems — each of these is deployed into unique and complex RF environments.

NASA has a reputation for innovation and engineering leadership and continues to raise the bar with this creative RF test environment. The lessons gleaned from NASA's Mars 2020 test bed will help companies to ensure missions on Earth succeed, as well.

## HTS, UAVs, Smallsats and the Benefits of Channel Simulation in a Wideband World

Bandwidth requirements continue to grow rapidly with the increase in data volumes, imagery downloads and video streaming for applications such as HTS, smallsats, maritime, aircraft, missiles, and UAVs.



*The Kratos Channel Simulator supports testing for today's high bandwidth applications.*

In this new world of increasing bandwidth, the Channel Simulator is a key enabler for growth. Kratos' Channel Simulator supports high throughput links and addresses new space and connected device trends with testing on many simultaneous channels, highly dynamic channel models, and control that integrates with existing test suites.

The Channel Simulator is able to emulate virtually any of today's new space and wideband RF environments and tests an RF system's hardware, software and firmware to determine how they behave under realistic conditions. This can be done in a cost-effective lab environment, rather than a live scenario, where failure isn't an option.

The Channel Simulator helps overcome these common challenges during RF testing:

- *Replicating operational conditions without expensive over-the-air tests*
- *Creating repeatable, efficient simulations that minimize overall test time*
- *Ensuring defects are thoroughly flushed out during testing to avoid dangerous problems in the field*
- *Risking personnel injury or losing high dollar equipment in hazardous RF communication testing conditions*

Learn more about how the Channel Simulator can assist your RF mission by viewing additional information at:
**www.kratoscomms.com/channelsim**

Download the **Kratos Channel Simulator** white paper at this direct infolink:
**www.kratoscomms.com/channelsim-whitepaper**

# SATCOM Innovation in the Maritime Industry

### An NSSLGlobal Perspective

*By Sally-Anne Ray, Group CEO, NSSLGlobal*

**The maritime industry is undergoing a fast moving digital revolution. The speed of this change is unprecedented with ship owners and technology companies both rising to the challenge of market forces of supply and demand. Innovative communications technology breakthroughs are driving smart ships and connected fleets, redefining not just the way maritime organizations are managing their communications systems and digital infrastructure, but also revolutionizing their core business models.**

### From Ships to Connected Fleets

According to industry expert *Martin Stopford*, the model that has been in place for the last 30 years is one of trading ships, not cargo, i.e., of perceiving ships as business units.

What is needed instead is a new business model where maritime organizations manage transport, not ships. When this is achieved, sea cargo will be fully integrated with inland transport, opening up a new era of global trade.

This evolution taking place already — driven by the smart shipping model where fleets are connected via satellite in real-time and managed as a single unit rather than as a collection of individual units.

For the first time in maritime history, processes are becoming automated with shore side and shipboard personnel integrated into one team. In fact, satellite connectivity is enabling ships to become an extension of on-shore operations. Ships are becoming offices at sea, allowing maritime organizations to adopt electronic reporting, remote monitoring, diagnostics tools and information sharing.

### Flexibility and Innovation are at Connectivity's Forefront

Maritime (VSAT), the key communication system for vessel connectivity and digitization in shipping, has seen a strong increase in installations driven by broadband applications and increasing data usage. Maritime operators are demanding more from their VSAT providers, encouraging the development of higher throughput services and optimal ship-to-shore connectivity.

A gap in the market has recently been filled with the launch of an innovative service providing optimal connectivity in coastal areas. This service combines the provision of VSAT and cellular connectivity in one device enabling ships to automatically switch between mobile and satellite networks.

NSSLGlobal's **FusionIP** solution integrates terrestrial and satellite broadband, satisfying the ship operators' demand for optimum data speeds and cost efficiencies. A unique "antenna solution" specifically engineered in-house to enclose and protect two antennas ensuring seamless transition between the networks. FusionIP recently won the prestigious *Most Innovative Satellite Application Award* at the **VSAT Stellar Awards 2018** that acknowledge the solutions improving global connectivity.

It is such hybrid unified communications solutions combining satellite coverage and cellular systems that we will see increasingly in the future of maritime connectivity, especially in response to the ever-increasing appetite for fast and flexible access to internet services on board vessels.

In response to the demand for faster networks and digitization, NSSLGlobal is forging a reputation as an engineering powerhouse by expanding its Research and Development and global support capabilities.

By diversifying and through targeted acquisitions, such as the *SatLink Hub and Modem* technology, which is at the core of NSSLGlobal's world class award-winning VSAT network, it is setting the benchmark for the agile management and new disruptive technology needed. In addition to this, NSSLGlobal is expanding its value added services by including the increasingly important area of crew welfare, through its acquisition of **snap.tv** and its crew entertainment service *CrewVision*.

Developing leading edge applications is crucial in securing customer loyalty and attracting new clients and this is where NSSLGlobal is differentiating itself from other providers through the firm's next generation hosted virtual applications.

Vessel owners want streamlined ships, with less hardware and for their crew to specialize in on board real-time activities. NSSLGlobal's next generation appliance, *Cruise Control+*, is providing a cost-effective, single server solution for the seamless management of communications and IT services on board vessels. It enables the remote deployment and delivery of new value added services, the hosting of customer applications with no additional hardware, whilst providing an IT managed service if required through the virtual appliance capability. It is installed locally on board the vessel and is designed to help maritime customers manage their vessel, business, vendor and crew welfare networks.

Vessel owners are reluctant to have their crew spending time on extraneous activities which need up-skilling and training above their daily duties. With NSSLGlobal's new virtualized environment within the Cruise Control+ appliance, the company is now able to offer management of operating systems and applications.

NSSLGlobal has positioned itself to provide the essential core communications and IT infrastructure and to now provide customers options as to the selection and addition of leading edge innovative services — almost at a "pick 'n mix" level. Providers need to go beyond traditional airtime and hardware services. With NSSLGlobal's dedicated R&D arm (**NSSLGlobal Technologies**), the company is able to continuously review the capabilities as well as the customers on-going needs to future proof itself in a fast moving digital landscape.

### Supporting Crews' On Board Experience
Increasing access to cloud applications at sea means seafarers can use internet entertainment services and stay in touch with family and friends in their downtime — an important aspect of staff wellbeing during long journeys away from home.

However, with the penetration of smartphones among adults in developed countries forecast to surpass 90 percent by the end of 2023, and with an average of three devices per crew member, crew devices and their data-hungry applications (such as movie, TV and content streaming) are generating increasing pressure on vessels' bandwidth. Maritime organizations are facing a challenge to provide a robust network connection and fast internet access for a positive user experience, regardless of location.

While crew expectations are on the rise, budget conscious ship-owners have in the past been reluctant to invest in on board entertainment technology mainly due to the high up-front cost of additional video streaming hardware, IT support teams and the amount of capacity needed for on-demand video streaming.

NSSLGlobal's CrewVision is the company's proprietary ship entertainment service, offering a wide variety of viewing content which uses a dedicated multi-broadcast channel over the firm's VSAT network. Ship management can provide low cost, continually refreshed, high quality and appropriately licensed content such as movies, TV dramas, documentaries and world news without disrupting operational traffic or the crew's internet access.

In addition, the unique feature of NSSLGlobal's *VSAT IP@SEA* service ensures that the vessels' data speeds or voice quality are unaffected by the content downloads and also requires no additional hardware. Furthermore, content is continually refreshed using NSSLGlobal's network capacity, not the vessels', so there is no impact on the user experience. The result is an optimized, on-board user experience and higher staff retention levels.

### Security as the Ultimate Challenge
Approximately 50,000 vessels are at sea or in port at any one time. The maritime industry is, therefore, heavily exposed to cyberattacks, which can have severe repercussions for crew, ship-owners, supply channel partners and customers.

The latest victim, on July 25, 2018, was the Chinese shipping company China Ocean Shipping (COSCO). The company's network applications were affected and suffered failure, but the company's ships were, fortunately, not affected and continued to operate normally.

Vessels, however, do not need to be attacked directly because an attack can arrive via a company's on shore IT systems and penetrate the ship's critical operational systems. For example, if an attacker finds an open network interface, they can change GPS coordinates, settings, and upload malicious software, allowing for further compromise of the network and exposing an entry point to key control systems.

Cybersecurity is an issue but can be managed effectively if maritime companies approach it strategically, addressing and mitigating risks coming from the outside and within their organization.

Acknowledging the evolving threat landscape within the maritime industry and the increasingly connected world on board vessels, NSSLGlobal uses its decades of cybersecurity experience delivering secure solutions to the world's largest governments to ensure that critical security controls are at the core of all of its products, applications and services. NSSLGlobal's solutions are focused on ensuring customers are able to maintain control of their network with a robust secure infrastructure delivering voice, data and IT services and connectivity. From hub-side to vessel-side control, NSSLGlobal has a range of end-point infrastructure protections in place ensuring customers are cyber secure at sea.

Best practice also shows that any solution should have protections built into the core infrastructure, as well as at vessel level. For example, NSSLGlobal's Cruise Control+ can provide as a starting point six on-board networks enabling the separation of business and crew networks.

When selecting a SATCOM provider, maritime organizations should look for accreditation from relevant cybersecurity authorities, such as **Datenschutz** in Germany or the UK Government's **Cyber Essentials Plus** certifications.

### What Next?
Digitization of the maritime industry is well underway and the continued increase in the number of connected ships is revolutionizing the sector.

Ships are effectively becoming offices and homes at sea and an extension of on-shore operations. VSAT connectivity is enabling this, with innovative hybrid solutions that combine satellite coverage and cellular systems providing optimum data speeds and cost efficiency.

Larger companies are partnering to develop crewless transport vessels, such as **Rolls Royce** with **Intel**, and such collaborations will no doubt result in technological marvels combining the science-fiction vision and splendor of the "*Nautilus and the USS Enterprise.*"

The maritime sector is maturing and is providing opportunities and, importantly, is receptive to smaller, nimbler organizations to satisfy the practical everyday needs of vessel owners who are looking for faster connectivity, flexible packages, excellent customer service and cost-effective value add extensions.

The engineering expertise and vision to develop a single system that combines the best of VSAT and LTE worlds into a single radome and package is driving providers to develop disruptive applications such as FusionIP to give them the speed and quality of terrestrial voice and data connectivity. Governments continue to expect robust, reliable solutions suitable for the most extreme conditions and the commercial sector is exploding in its need for secure, customized, virtualized applications and managed services. However, what remains a constant across all sectors is the need for creative products as well as for products that meet the needs of the market.

Agile communications providers, such as NSSLGlobal, are seizing this opportunity to develop innovative products and enhanced services to fill the gaps in the market. Ship owners will be increasingly looking for providers that give them flexible solutions; the best SATCOMs network, hosted applications installed and managed remotely, helping them to focus on key on-board operational priorities.

What we can predict is that rising communications demand will continue to fuel significant growth in VSAT communications.

**www.nsslglobal.com**

# Executive Spotlight: Meir Moalem

## Chief Executive Officer and Co-Founder of Sky and Space Global, Ltd.

Mr. Meir Moalem is a Co-founder and CEO of Sky and Space Global Ltd. and has been its Managing Director and CEO since its establishment in 2015. Mr. Moalem is a jet fighter pilot, Lt. Col (Res.) of the Israeli Air Force. He has more than 20 years of experience in management, R&D and operation of state-of-the-art projects in Space Systems and Unmanned Aerial Systems, among those acting as a deputy squadron commander and leading the MEIDEX experiment on Space Shuttle Columbia (STS-107) as the project manager for Israel's first astronaut flight, Managing Israel's satellite projects (such as Ofeq, Tecsar) and more.

*Good day, Mr. Moalem. Would you tell us about your vision for Sky Space and Global Ltd.*

### Meir Moalem (MM)

Sky and Space Global (SAS) was established as a NewSpace company to connect the unconnected. We plan to build and operate a communications infrastructure based on small satellite technology using highly sophisticated software systems that we have developed.

The company's goal is to provide connectivity services to regions in the world where connectivity is a major problem, primarily in the equatorial belt where some two billion people live. To do this, we will deploy a constellation of 200 highly sophisticated smallsats over the Equatorial Belt.

The network of smallsats will provide around the clock affordable voice, data, instant messaging, M2M and IoT communications, enabling SAS to implement its vision to provide communication services to Anyone, Anywhere, Anytime.

*What is the main focus of the company's activities?*

### MM

We already have three smallsats in space that serve as the proof of concept. They were launched in June of 2017 and are used to demonstrate the narrowband network's capabilities for providing voice and data services at a fraction of current costs.

Over the past few months, our efforts have been focused on building the necessary infrastructure to support deployment of our constellation of some 200 nano-satellites that will provide equatorial service. This is a huge effort.

The use of smallsats, combined with our proprietary software, will enable SAS to be a market disrupter and deliver cost-effective communications infrastructure and connectivity services to those who need it the most.

*What can you tell us about the timetable for the project?*

### MM

Our goal is full deployment of our network by the end of 2020. We are planning to start dedicated launches of between 20 to 30 satellites every two to three months starting in 2019. By the end of 2020 we expect to have a full deployment of the entire constellation of nano-satellites.



*Artistic rendition of Sky & Space Global's Pearl smallsat.*
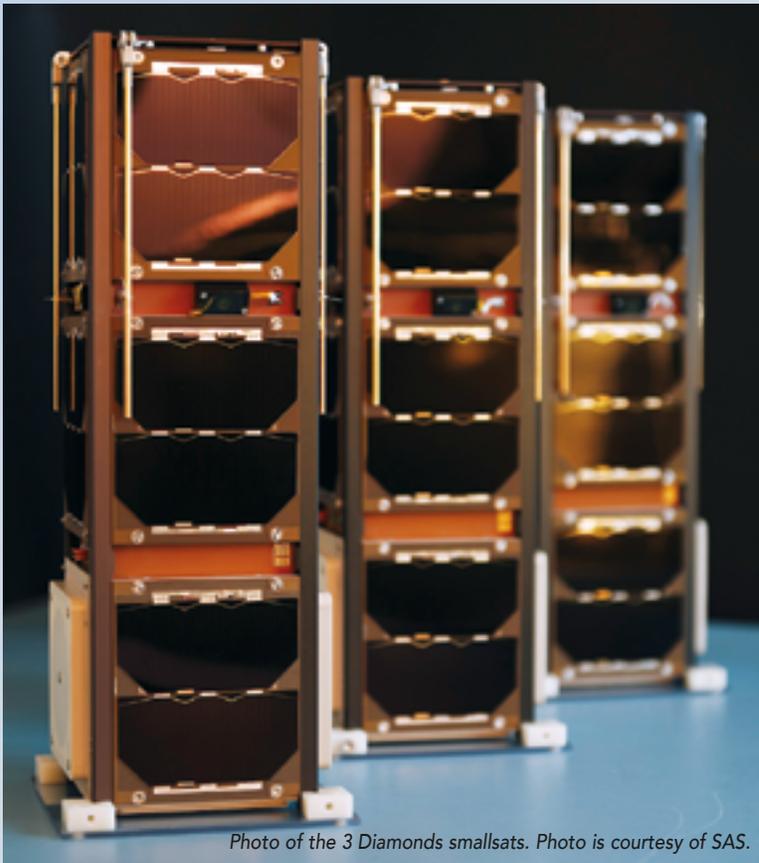
*Photo of the 3 Diamonds smallsats. Photo is courtesy of SAS.*

We will provide limited service from the first launch and will offer instant messaging, IoT (Internet of Things), M2M (Machine to Machine) and data transfer services.

Phone service will commence when a larger part of the constellation is deployed. The entire equatorial belt will be covered from the first launch and 24/7 service will be gradually phased in as more launches are conducted.

*Tell us about your philosophy about how nanosatellites can help to bridge the digital gap.*

**MM**
We are talking about approximately two billion people in the equatorial region of the world who have either no or limited terrestrial infrastructure coverage.

Terrestrial mobile networks cannot meet the huge growth in demand in outlying cities or sparsely populated regions. Residents of these regions are digitally excluded and can take advantage of few of the basic cellular services offered in the more developed parts of the world.

The high cost of deploying mobile networks means that this is not an option. Regular satellites are also not a viable option. A regular satellite connectivity is expensive, with device prices starting at more than 500 percent and calls for over $1 per minute — services like this are cost prohibitive and do not represent a viable solution.

Nevertheless, the residents of these regions want to be connected and desperately need connectivity. Governments and businesses in these regions also need service. Smallsats are the only existing solution for providing cost-effective service.

We are the first company to offer narrow band, inter-satellite capabilities in nano-satellite, for delivering voice and text messaging and for conducting financial transactions. Our goal is to connect the unconnected. Providing affordable connectivity is key for driving digital inclusion and economic growth in the developing world and for tackling poverty and improving education and healthcare.

*What are some of the technologies behind the company's nano-satellite network?*

**MM**
The technology is based on our software which is the core of SAS's IP and serves as the key element for operating the constellation of 200 nano-satellites.

The software is developed in-house by software engineers at our Cracow, Poland, facility. The smallsats are built to our design and specifications by GOMSpace, a Danish company with whom we have been working.

We are the first (and as of this writing, the only) company that use smallsats that weigh a mere 3 kilos for an entire range of connectivity activities. The key to our success is the software that has been developed and constantly updated for managing the constellation's communications network.

*What is your revenue model and how do you expect to make money?*

**MM**
The cost of full deployment of our network is estimated at $150 million, a fraction of the cost of terrestrial or other satellite options.

Our business model is based on B2B with SAS's customers being the local telecommunications providers in the equatorial regions of the world. We have already signed over a dozen service agreements with providers. End customers in these areas are currently paying on average between $10 to $20 a month but have extremely limited services.

The existing providers will now be able to sell to their existing and new customers by using our network. Nigeria is a perfect example of how our model works. The country has a population of 200 million and has approximately 160 million cell phones subscribers. That is a relatively high penetration rate, which means the customers are familiar with connectivity services and are willing to pay for them. However, service is very limited, and coverage is largely limited to the country's main cities.

The high penetration rate and poor service is exactly where we come in. In addition, our capabilities to offer coverage in vast uncovered regions will allow telecommunications providers to offer services for the first time to millions of new customers.

*How much has the company grown since the firm was established in late 2015?*

**MM**
The company has grown from five to more than 50 employees. SAS is based in the UK and has a substantial presence in Poland and in Israel.

In addition, the company has an office in Australia. Since listing in May of 2016, SAS raised A$35 million on Australia's ASX stock exchange. The company has future plans for raising funds to cover the cost of deploying its smallsat constellation.

**www.skyandspace.global**

# An NSR Analysis:

### *Finding relevance in the new video ecosystem...*

**Satellite has been the base infrastructure sustaining the media industry for decades. Either through a DTH (Direct-to-Home) offer or via video distribution to head-ends, the vast majority of broadcasts crossed, at some point or another, a satellite link.**

The core value proposition and distinct advantage of satellite point-to-multipoint economics allowed the industry to develop spectacularly and video still generates a dominant share of revenues for SATCOM.

This dominance is being challenged by new viewing habits. While broadcasting firmly dominated video delivery to the home's main screen, eyeballs are moving away from traditional TV sets to Smartphones and other IP-based devices.

These devices are conceived to receive content in unicast sessions, excluding traditional satellite broadcasting formats. Media platforms are adapting to this transition launching IP-based applications, reducing their reliance on satellite to reach end-customers. This ultimately translates into video platforms extracting less value from the use of satellite and, consequently, being less willing to pay for capacity leases.

While OTT (Over-the-Top) video delivery heavily leverages terrestrial infrastructure today, nothing precludes satellite from participating in the IP content distribution ecosystem. Actually, satellite key selling propositions including reaching large audiences, linking remote regions and offering an alternative where reliable ground infrastructure is not available, all still apply in the IP environment. Therefore, satellite has a lot of value to offer to (and capture from) the streaming ecosystem — it just needs to find ways to engage with IP-based devices.

## Traditional Video Losing Momentum

Video has propelled growth in the SATCOM industry for decades. Today, the majority of the industry's capacity revenues still come from video, accounting for 61 percent of the total according to NSR's *Global Satellite Capacity Supply and Demand, 15th Edition* report. However, the forecast for video verticals is to decline with revenues (as forecasted in the same NSR report), falling at 3.2 percent CAGR in the next 10 years.

Viewing habits are changing as consumers rapidly adopt Smartphones and other IP-centric devices. Consumers want to have access to their preferred content anywhere, anytime. To respond to these new requirements from their customers, numerous video platforms, which traditionally heavily relied on satellite as the main infrastructure to reach their customers, are now launching Video-on-Demand (VoD) and streaming services.

The list of DTH platforms that now have an OTT play grows every day. This trend started in the U.S. with **DirecTV NOW** or **Sling** but has rapidly expanded into Europe with **Sky Q** and others and will eventually reach emerging markets, such as **Claro NET NOW** in Brazil. Emergence of new actors such as **Amazon** (who recently acquired Premier League rights in the UK) or **Facebook** (aggressively pursuing Champions League rights in Latin America) only adds more pressure to the environment.

Satellite, once a critical piece of infrastructure for these platforms to reach customers, is now just another tool in the box (sometimes not even the preferred option as convenience of IP goes unmatched). Consequently, willingness to pay a premium for satellite capacity is degrading and, matched with stagnant TPE leases (growth in channel count will be offset by adoption of more efficient compression standards), revenues will move downward.

**10-Year Evolution of Satellite Capacity Revenues for Video**

*Source: NSR*

Having said that, terrestrial networks won't be able to serve all use cases alone. In this paradigm of content "everywhere, anytime," satellite's broad coverage is an advantage that should be leveraged in the form of content multicast.

Land-based networks suffer from congestion, sometimes leading to service denial during the "Big game." Broadband speeds are not always high enough to ensure the desired quality of video and, as consumers increasingly demand UltraHD and eventually VR formats, terrestrial networks won't be able to serve the massive amount traffic that is generated by these demands. Satellite has a

great deal of value to add in the IP content distribution environment if a way to create relevant solutions is found.

### Matching the Best of Two Worlds

The good news for the satellite industry is that, despite migrating to new screens, viewers still favor linear content.

According to the *Ofcom 2017 Communications Market Report*, live TV remains the central component of TV viewing. Satellite multicast advantages are still unmatched by any other means of content distribution and, as the number of concurrent viewers increases, satellite rapidly gains an economic advantage.

The cost of streaming via unicast sessions grows linearly with the number of viewers. Conversely, given the multicast advantages of satellite, the bandwidth

costs remain constant regardless of the number of viewers under the same footprint.

Even assuming aggressive pricing for terrestrial content delivery of 0.02 USD/GB and conservative pricing for satellite bandwidth of 1,000 USD/Mbps/month, the crossover point at which satellite is more cost effective than terrestrial can be as low as 900 average monthly viewers for an HD channel requiring 2 Mbps (considers four hours of daily TV consumption).

Given the opportunities emerging in the space, numerous actors are launching services to capture growth. **Territorial**, a service launched by *TricolorTV in partnership with Eutelsat*, **NEOTION** and **Broadpeak**, has experienced an early success in this emerging vertical.

Based on ABR multicast technologies, consumers nearby one of the WiFi hotspots can access a set of 50 Tricolor TV channels without consuming their mobile data allowance, while owners of cafés and other commercial outlets attract more customers. **Quadrille**, another technology company in this space, owns a similar solution for IP multicasting. On the other hand, **Sat>IP**, an industry-wide alliance, follows a different approach retransmitting from DVB standards to IP.



**Monthly Bandwidth Cost per Channel**

Crossover point at which Satellite is more cost effective than Terrestrial

— Terrestrial HD Streaming Bandwidth Cost
— Satellite HD Streaming Bandwidth Cost

*Source: NSR*
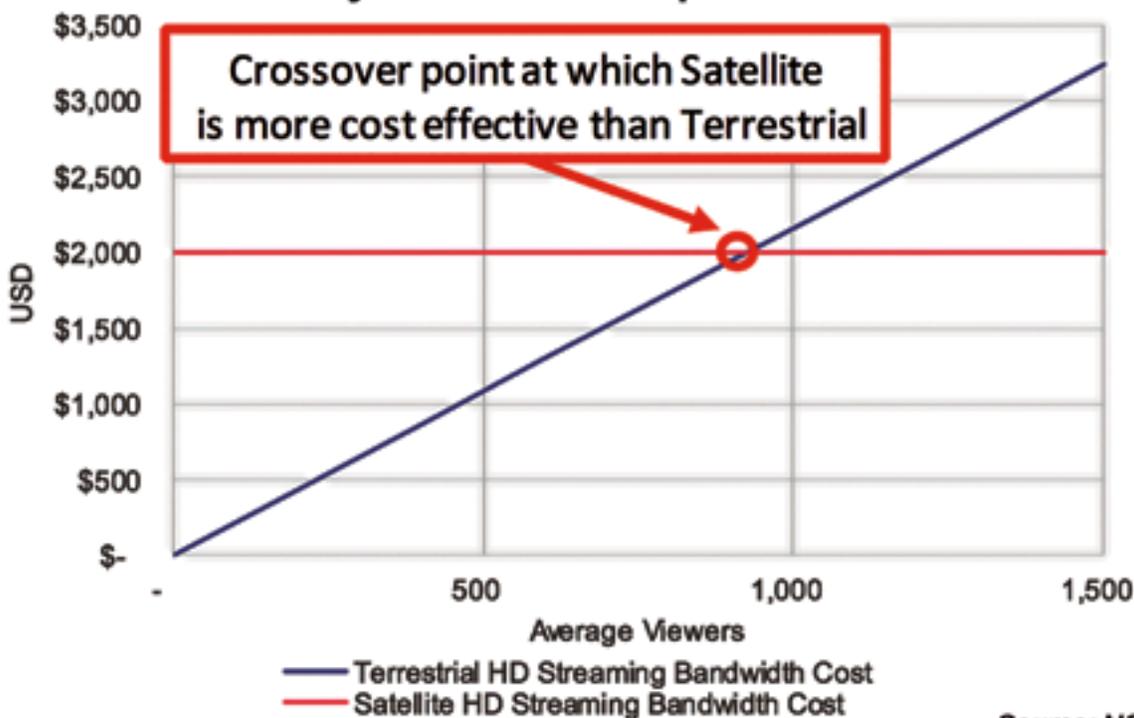
## Global In-Service Units- IP Content DIstribution



Source: NSR
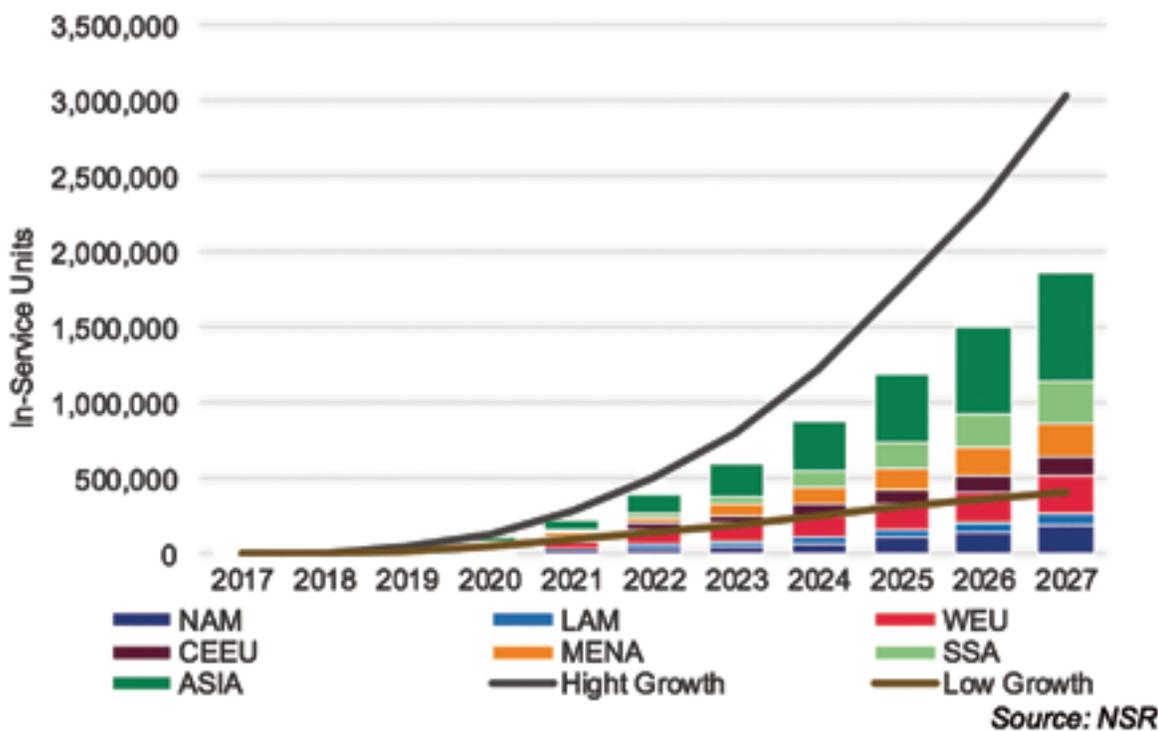
**Ericsson ConsumerLab**'s *TV and Media report for Nigeria* shows that, even with poor mobile broadband coverage and expensive data packages, Nigerians are consuming more content on mobile platforms (Smartphones and Tablets) than TV. Similarly, entertainment is critical to offering a pleasant experience to passengers confined for hours and even days in aircrafts, ships, trains or buses. Wide adoption of IP devices mixed with the ubiquity of satellite makes IP streaming over satellite solid choice for delivering content to unconnected spots and mobility platforms.

A new class of STBs capable of delivering content in IP-formats would solve key challenges for the satellite industry such as multiscreen or increased time spent on IP-devices. On the one hand, this would allow traditional DTH operators to engage with these emerging screens while ensuring quality standards for the viewing experience.

This could eventually be combined with land-based networks where the most popular content is multicasted over satellite and the most dispersed audiences are served over unicast sessions over terrestrial networks.

### Bottom Line

**Video has been the key pillar for growth in the satellite industry for decades. Even today, it still represents the majority of satellite capacity revenues.**

However, this is being challenged by the adoption of IP devices (Smartphones, Tablets, Smart TVs, etc.). Media platforms are less dependent on satellite to reach customers and, consequently, they are less willing to pay the premium for capacity reducing revenues for the satellite industry.

However, terrestrial OTT has its own challenges. Inconsistent network speeds and reliability, network saturation or insufficient coverage, to name but a few of the challenges, restrain the quality and the reach of terrestrial streaming solutions.

No technical specification precludes satellite from participating in the IP streaming ecosystem. The multicast advantage of satellite is still unmatched by any other platform. Consequently, SATCOM must find its opportunities serving the most popular channels, linking hard-to-reach locations and/or concentrating in high-quality video delivery.

The business opportunities for satellite in the IP content distribution environment are wide and varied. From serving high-density locations (airports, sports venues, etc.) where bandwidth would otherwise exhaust, to expanding video streaming into areas where terrestrial coverage is poor, or creating a hybrid satellite-terrestrial service where the most popular channels are broadcasted via satellite, the industry still can find growth opportunities in the new video distribution paradigm.

While OTT over satellite offers to video platforms the cost benefits of multicasting, ubiquitous coverage and the high quality and reliability of satellite, through the adoption of the IP streaming paradigm, satellite can now capture customers that were previously out of their target audience.

In view of the future challenges ahead for traditional video, some satellite operators — including *AsiaSat* and *Thaicom* — are already launching their own IP content over satellite platforms pursuing new emerging opportunities.

### Emerging Business Cases
The possibilities are wide and varied for IP Content Distribution over satellite and the market can grow spectacularly if the right conditions are given.

According to NSR'S *Wireless Backhaul via Satellite, 12th Edition* report, IP content distribution could see more than 1.8 million sites serving various use cases deployed by 2027.

The first use case witnessing rapid adoption of the OTT over satellite paradigm is streaming hotspots in public spaces. The content is multicasted to broadcast OTT hotspots, enabling consumers in public venues such as bars, coffee shops, and restaurants to access a set of channels.

In this model, satellite can capture on-the-go audiences using their mobile devices, far from the traditional home main screens, the traditional DTH platform enlarges its addressable market expanding into a B2B2C model, public venues offer an enhanced service to their customers and end-users get the convenience of streaming without consuming their mobile data allowances.

This model can be expanded into areas where terrestrial connectivity is of poor quality or unavailable whatsoever. Interestingly, some customers in emerging markets are leapfrogging traditional TV and consuming video with IP devices.

# How Satellites Make A Better World

### Schools go online in the unconnected world...

By Robert Bell, Executive Director, Space & Satellite Professionals International

**A child born in America or Europe can expect to live in a household making the equivalent of at least US$31,000. For a child born in Mexico or Peru, the figure is less than US$6,000. In Africa south of the Sahara, the average income per person equaled only about US$760.**

The problems of inequality are complex. Of all the things that could change the fate of children in poorer nations, however, one stands out: education.

In America and Europe, nearly 90 percent of children at least finish secondary school. In Mexico, only 37 percent manage to do so. In most of Latin America and Africa, nations do not even bother to track this number, focusing instead on boosting the number of children finishing elementary or primary school.

In rich and poor nations, the better educated you are, the more you earn and the higher will be the standard of living you can give to your own children.

A technical school graduate in Singapore, for example, earns 3.7 times more than a graduate of secondary school, and someone with a university diploma out-earns that high school graduate by 5.5 times.

Improving education is a matter of money, culture and commitment. However, increasingly, it is also about technology.

America and Europe are part of the Connected World, where schools are making the Internet a core part of classroom education and homework. Mexico, Peru and much of sub-Saharan Africa are in the Unconnected World and this is where the majority of the world's citizens still live — getting internet into most schools there is a distant dream.

That dream, however, is coming true in more and more locations, thanks to the hard work of governments, not-for-profits and companies — and to satellite technology.

## Bits and Bytes from the Sky

The village of Qocha Moqo is where thousands of schools have been connected as part of government-funded progams over the past few years. This village is located in the Andes Mountains of Peru 16,000 feet above sea level. Newcom donated a year's worth of satellite Internet access to a village school and partnered with two nonprofits to install the equipment and train people to use it.

**Willka Yachay** is a Peru-based nonprofit that is dedicated to helping indigenous communities thrive in the modern world without sacrificing their cultural traditions. The other nonprofit, Kidnected World, provides online creative tools to connect young people around the planet.

According to *Hanna Rae Porst*, Willka Yachay's director, "*Internet connectivity, powered by solar energy, has been life-changing for everyone involved. Thanks to the Internet and Kidnected's creative tools, students have been able to connect with other students and indigenous tribes around the world, and share their cultural knowledge and ways of life. After school, the computers are open to all of the forty families that make up the village.*"

The impact on teachers has been equally profound. "*Our teachers come from as far away as 22 hours of travel,*" said Porst, "*and they live and teach in the remote villages for three weeks straight. There is no telephone signal in Qocha Moqo, but now for the first time, our teachers can communicate with their families while they are here.*"

## Entrepreneurs for Education

The city of Puebla in southern Mexico is world's away from the village of Qocha Moqo. Home to 1.4 million people, Puebla is the capital of a rural state with an economy that mixes the manufacturing of machinery and equipment, automobiles and furniture with the agricultural production of eggs, coffee, beer and beans.



*Willka Yachay builds schools high in the Andes. The organization collaborates with Q'ero parents and elders on construction, administration and curriculum development. Culturally sensitive teachers are employed and Wilka Yachay provides all supplies, nutritious food and national and international field trips.
Photo is courtesy of Wilka Yachay.*

However, two-third of public schools in Mexico still lack Internet access and many of Puebla's rural schools are among them. Fortunately, a Mexican nonprofit, **Entrepreneurs for Technology in Education** (UNETE), is doing something about this need.

For a Puebla school, UNETE provided computers and a WiFi network and Newcom contributed the satellite connectivity and systems that, for the first time, put 90 students and teachers online.

Over the past 16 years, UNETE has made is possible for 2.3 million students to access modern technology in Mexican schools and the two organizations hope to duplicate the Puebla model at hundreds of schools throughout rural Mexico.

There are an estimated 3 billion Internet users in the Connected World. Another 6 billion additional devices now connect to the Web, forming the leading edge of the fast-growing Internet of Things (IoT) that **Ericsson** predicts will total 26 billion by 2020. More than 4 billion people, however, still live in the Unconnected World. Thanks to satellite, the next generation living there will have greater opportunities than any generation that came before them.

*This feature was produced for SatMagazine by Space & Satellite Professionals International (SSPI).*

**www.bettersatelliteworld.com**

**willkayachay.org**

**newcominternational.com**

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*Photo Credit: Jalisco Campus Party, Flickr Creative Commons*

# SatBroadcasting™: The RSCC Experience...

## Delivering football to Latin America and beyond.

*By Andrey Kirillovich, Director of Integration Services and Turnkey Projects*

**The Russian Satellite Communications Company (RSCC) was established almost 51 years ago as a broadcasting teleport providing world's first nation-wide TV distribution network via satellite in 1967.**

Satellite applications have spread far beyond transmitting video since then — now satellites are widely used for delivering voice and data; however, broadcasting remains the bread and butter for the SATCOM industry, bringing in more than 60 percent of global revenues. Global sport events, such as the Olympic Games and FIFA World Cup, have been always an exhibition of the latest developments in live video broadcasting, IT and telecom.

RSCC, as Russia's prime satellite communications and broadcasting provider, has been heavily involved in the transmissions of both events. The 2014 Winter Olympic Games in Sochi were held in just one city, so terrestrial fiber and wireless technologies played the main role.

This year, the main global football event was held simultaneously in 11 cities spread across Russia and the events were attended by more than two million fans in support of 32 national teams. Satellite was predominantly used for live reports and interviews with players, coaches, celebrities and fans around the stadiums.

A special information / communication infrastructure was deployed, combining 11 cities into a single network serving 230 locations. Video transmission was also made available to broadcasters from 220 countries. An internal cable broadcasting network was deployed, connecting more than 5,000 TV screens at the stadiums for the audiences and commentators.

For the first time in history, all video for the media stands at the stadiums was transmitted in Full HD format. Also, the Ultra HD option for transmission was — for the first time — available for all matches. Non-linear viewing of the events was also huge — in total, 258 Tb of Internet traffic was consumed by the streaming audience.

In addition to providing backup for fiber transmissions, satellite was heavily used for the occasional-use (*OU*) services, delivering live transmissions of reports, interviews and other events surrounding the World Cup. RSCC was heavily involved in these transmissions, delivering live content from SNGs (*Satellite News Gathering*) to major Russian broadcasters via the company's Russian Ku-band beams of **Express-AM** satellites located at 40 degrees East, 53 degrees East and 140 degrees East.

International customers were also using RSCC satellites as a source of live video content from World Cup venues. This time, RSCC has gained a unique experience in working closely with various broadcasters from Latin America.

Express-AM8 satellite, located at 14 degrees West, was used as a primary source for OU services from Russia during the global football event. In fact, this was not the first time RSCC satellites were used for delivering TV content to South America. In 2017, the same satellite was used for live transmissions of the football matches from FIFA Confederations Cup, which is typically a dress rehearsal for the country hosting World Cup to check its readiness status one year before the main event. At that time, satellite transmissions were organized from four cities delivering live feeds to Chile and a few other South American nations.

That was a unique experience for RSCC of close and online interaction with OU and broadcast engineers from Latin America TV companies. According to the broadcasters and SNG providers, the satellite solution offered by RSCC enabled them to avoid costly turn-around services at European teleports, ensuring the quality of transmission service with delay lower than via trans-Atlantic fiber systems. This helped Latin America broadcasters to increase the audience, as the viewers instinctively were choosing the channel where the action was happening earlier than at alternative sources.

Capitalizing on this previous experience, RSCC has expanded the company's offerings to Latin America TV companies during the World Cup in 2018. Concurrent with satellite transmissions for Russian customers via the additional RSCC satellites, the **Express-AM8** satellite was dedicated specifically for trans-Atlantic delivery of TV reports to customers in Peru, Chile, Columbia and Mexico. The unique footprint of this satellite has made it possible to transmit video feeds from the World Cup host cities directly to Latin America countries using one hop at lowest latency, without turnaround service in Europe. Football

*RSCC's EXPRESS AM-8 satellite beams coverage.*



*Artistic rendition of RSCC's EXPRESS AM-8 satellite.*

fans in Latin America were able to watch live reports from the training camps of their national teams, interviews with players and fans, and other news related to the World Cup.

The Express-AM8 satellite is one of the latest assets added in 2015 by RSCC to the firm's 12 GEO satellite orbital fleet. The satellite is located at 14 degrees West — the spacecraft's beams cover all of the continents on both sides of the Atlantic Ocean. This gives RSCC a unique opportunity to offer simultaneous event coverage for customers in Europe, Africa, Middle East, and the east coast of North America, Caribbean region as well as Latin America in C- and Ku- bands. In addition to connectivity options in delivering or backhauling data traffic in Latin America, this satellite is also an excellent tool for TV distribution and the delivery of video content from all over the globe to viewers in Latin America.

Based on the recent experience gained from live transmissions to Latin America from the World Cup in Russia, the Express-AM8 satellite has gained some serious advantages over the terrestrial routes of delivering TV signals from Europe, including lower latency and cost, less complexity and wider coverage. Now RSCC is ready to offer international and national broadcasters a new tool for delivering their video content to Latin America with playout, encoding, CAS and uplink services at RSCC teleport in Moscow or at partner teleports in Western Europe.

RSCC offers an attractive low-cost offer for payTV platforms all over Latin America for the delivery of original Russian-made TV content and programs. RSCC is a prime satellite distributor of TV channels in Russia, acting as a one-stop-shop for TV channels willing to enter the Russian market and searching for ways to access the Russian viewers on different platforms (Direct-to-Home, cable operators and terrestrial FTA). As a result, RSCC is aggregating a substantial number of original Russian-made TV content, which is quite popular with the international audience in other parts of the world (cartoons, junior programs, adventure and leisure channels and etc.). Such aggregated content can be delivered in any format to the potential viewers in Latin America and be included into the packages of local payTV platforms.

In August of 2018, RSCC accomplished a great milestone by receiving landing rights for the Express-AM8 satellite in Brazil, which is the largest market in Latin America. The Russian satellite operator received a license to operate the C- and Ku-band capacity over Brazil from that nation's local regulator, **ANATEL**. In addition to Brazil, the Express-AM8 satellite provides full coverage of almost the entire Latin American countries from the south of Mexico, the Caribbean, Andean Region, Brazil, La Plata, Southern Cone and down to Patagonia.

Non-linear TV viewing is increasing across the globe. OTT and other VoD (*Video on Demand*) services are regarded as a serious threat to satellite TV platforms. All traditional payTV operators are attempting to adapt to the new market reality by developing hybrid solutions to adjust their basic video solutions to multiscreen viewing. Moreover, television today is migrating toward a cloud solution based on the intellectual processing of metadata obtained from the viewers. Cloud-based technologies give access to global content, created in any part of the world, including user-generated content. Plus, the payment is made specifically for the content consumed, avoiding expensive package payments.

Evolving payTV operators will not depend on the volume of stored content. Moreover, hybrid cloud-based solutions allow arranging signal coding in a cloud, eliminating the need for a specific physical location. The future of video transmission business is a cloud-based TV platform providing linear and multiscreen viewing options, various formats (SD, HD, UHD) and limited location presence.

All this creates unique opportunities for traditional TV operators and new entrants to expand their subscriber base and content offering, find new sources of monetization and reduce their CAPEX/OPEX. To capture this opportunity, RSCC has deployed a broadcasting managed service platform in Russia for channels entering the Russian market, offering them distribution services to Russian TV screens irrespective of the type of watching.

Now, with the Express-AM8 satellite widely used in Latin America during World Cup 2018, recently obtained landing rights in Brazil and successfully launched broadcasting platform in Russia, RSCC is planning to replicate the company's experience gained in the course of more than 50 years of satellite broadcasting to cover a new, geographical market.

***www.rscc.ru***

*The author is Andrey Kirillovich, the Director of Integration Services and Turnkey Projects for RSCC.*

# Maritime Cyber Security

## Let's talk holistically...

By Tore Morten Olsen, President, Maritime, Marlink

**Digitalization has the potential to transform the maritime world. Data can optimize operational efficiency, maximize profits and improve safety for passengers and crew.**

However, perhaps one of digitalization's most important applications, considering early October's somewhat chilling 'final call' from scientists for immediate global action on climate change, data can also make the shipping industry greener. Cold, hard cash talks the loudest, of course, but a future where cargo movers may be selected on their environmental credentials is a persuasive argument for the maritime industry to focus on reducing emissions.

All this means SATCOM at sea is expected to experience continued growth. This does come with greater risk, of the cyber variety. For example, in May of 2017, the UK's **National Health Service** was practically crippled by an outbreak of the *WannaCry* ransomware virus. Another well-known event, at least within the maritime industry, is that one of the world's largest shipping companies was also severely affected by the related *NotPetya* malware.

While cyber security has been growing in importance to the maritime industry for more than a decade now, this was a stark warning of the damage that determined cyber criminals can cause when malware finds a way through to affect operations.

Addressing cybercrime at sea and at the onshore office requires a multi-layered approach. The nature of cybercrime means that there can be no single solution that will ensure a fleet and business is secure. The countless attack vectors, from email, phishing and social engineering to DVD, USB sticks and infected websites all require specific forms of defence.

Add into this hostile mix the diversity of the weaponry used by cyber criminals; Trojan Horses that pretend to be legitimate software, but actually carry out hidden, harmful functions; Spyware that enables advertisers or hackers to gather information without permission; Adware that displays unwanted adverts on computers, slowing them down and eating bandwidth; Ransomware which blocks the system or encrypts data, forcing its victims to pay a ransom to the cyber attackers in order to regain access; and 0-Day exploits for which no patch will exist and that are not detectable by conventional anti-viruses.

There is also a key human element to consider on ships. With the expanding VSAT deployment, internet connectivity onboard is no longer restricted to business usage, but is also provided to seafarers for welfare purposes. In segments such as merchant shipping, crew consumption represents as much as 50 percent of the overall data consumption on board.

Although most vessel operators would implement an IT policy to ensure staff usage remains reasonable, **e.g.**, by blocking illegal (*BitTorent*) or bandwidth hungry applications (video streaming), crew members can find ingenious ways to bypass these safeguards; swapping network cables or using business-usage computers for leisure purposes are just two basic examples.

While deployment of sophisticated tools such as Anti-Virus and firewalls, as well as ensuring regular software updates and back-ups on board, can help defend against cyber-attack. Marlink has found that a surprisingly large number of business-usage computers or crew devices on vessels do become infected.

How to improve the situation? How does the industry defend against such a prevalent issue, one that can have a hugely damaging safety and financial consequences?

### Holistically speaking

Marlink's approach, as one of the largest global maritime SATCOM providers, is to think holistically.

The company's cyber security solutions have protected customers from thousands of cyber-attacks/ However, with the growing sophistication of today's cyber criminals, a more joined up approach will help to secure the maritime industry for the battle ahead.

Leading this charge is the development of Marlink's new **Cyber Guard** offering, an integrated portfolio of disparate technology solutions that, when used as part of a an all-encompassing approach, can significantly reduce cyber risk. The Cyber Guard portfolio enables Marlink customers to protect, detect and resolve any cyber-threat through the product's holistic combination of network resilience



*Cyber Detection Security Operation Center.*
*Image is courtesy of Marlink.*

and redundancy, dedicated maritime cyber-security technology that include Anti-Virus and firewalls and maritime **Security Operation Center** (SOC) experts.

Cyber Guard introduces a new maritime cyber security framework that brings together a diverse set of powerful tools to defend against cyber-attacks or resolve any successful intrusions. Cyber Guard uses proven maritime cyber security technologies, and to answer the ever-changing threat patterns, the product is in constant development.

The latest solution for Cyber Guard is a unique new service called **Cyber Detection**, which monitors all outbound and inbound network traffic around the clock and enables customers to view threats affecting their vessels through an intuitive, web-based dashboard.

Requiring no additional installation of equipment onboard vessels, nor upfront investment (CAPEX) for the ship owners, the Cyber Detection service identifies more than 50 different threat categories (including malicious applications, intrusion attempts, confirmed intrusions, abusive usage and social engineering), whatever type of SATCOM technology used to connect the ship, VSAT or MSS.

As part of the Cyber Detection solution, Marlink has established a new SOC and introduced a dynamic and intuitive **Cyber Dashboard**, which provides customers with real-time actionable alerts and counter-measures while delivering easy to digest insight on the cyber risk level throughout their fleet.

A combination of machine and human intelligence is integral to Marlink's Cyber Detection service and offers a significant improvement over existing maritime cyber-security systems. While using proven rule-based algorithms to detect malware or unauthorized activity on a network, Marlink's SOC experts investigate in parallel any anomalies and pro-actively hunt for Advanced Persistent Threats (APT) designed to stay '*under the radar.*' Augmented by the SOC team's deep knowledge of how cyber criminals target maritime industry operations, continuous service tuning and data analytics, the dynamic nature of the Cyber Detection service enables it to become more intelligent over time, improving its ability to detect advanced cyber criminality on a maritime customer's network.

While stopping in bound threats before they even reach a computer offers an extra layer of defence, Cyber Detection's network monitoring is also capable of identifying already Malware-compromised computers on board a vessel by investigating data traffic anomalies from, *i.e.*, covertly transferring files from a hard disk or receiving in bound commands from cybercriminals. It will also guard against a newly emerging threat for the maritime industry, the targeted cyber-attack. In a targeted cyber-attack, attackers select a company for a specific objective such as disruption, financial gain or even smuggling, and spend several weeks or months to find weaknesses in the cyber security systems.

After infiltration, such tailored malware is designed to stay undetected while performing its mission, concealing its tracks and following a very specific strategy. This is a highly sophisticated intrusion that can only be detected through services like Cyber Detection, which provides *Deep Packet Inspection* (DPI) and 24/7 cyber expert monitoring.

With the operational, financial and environmental benefits of digitalization driving the expanding VSAT deployment in maritime making networks secure is now an industry-wide issue and no longer the sole domain of SATCOM providers and IT departments in shipping companies.

Whether an indiscriminate or targeted attack, the negative impact on maritime operations as a whole can be severe. However, a holistic approach combining technology and cyber security experts, as well as focused and on-going development of new defenses like Cyber Detection, can provide a much more secure platform with less interruptions for the maritime industry to leverage the power of digital transformation.

**www.marlink.com**

*Marlink's Sealink C-Band Antenna*

# Uplink: World Teleport Association

## Inside the Tier 4 teleport — Part One

*By Robert Bell, Executive Director*

**We go through life protected by rules and procedures that are mostly invisible to us.**

*Your airplane flight is safe because of a mass of rules and procedures governing every aspect of the journey.*

*Your food is safe because producers must be certified that they meet certain standards.*

*The same kind of certifications protect the (legal) drugs you take for health reasons.*

The digital world we all inhabit is, likewise, protected by the certification of data centers as meeting standards for robust operation. The business of broadcast is standards-based and much of its technology is certified for quality.

However, such was not the case until 2014 when a set of standards and certification were established for a key part of the broadcast value chain: the teleport. The teleport facility and the sets of technologies that connect ground-based content to contribution and distribution networks in the sky finally became a reality.

## One Out of Five

In that year, the World Teleport Association began certifying the facilities and operating procedures of teleports.

Certification provided the first objective and transparent way for teleport operators to validate the quality of their operations and for customers to select vendors that offered the right price-performance level for their needs.

Teleport certification is based on an in-depth questionnaire created by a Standards Committee of teleport and satellite executives. The examination covers business continuity, transmission systems, network operations, safety and security.

Questions explore how the teleport manages capacity, maintains service levels, ensures security and oversees changes. Full Certification includes a site inspection by a WTA auditor, who also issues a report suggesting ways to improve operations. The end result is certification at one of four quality levels, from Tier 1 at the bottom to Tier 4 at the top.

What does it take to become a Tier 4 teleport? This process is not meant to be easy — and it isn't. Only one out of every five teleports certified by WTA achieves the coveted Tier 4 level.

Tier 4 teleports are designed and maintained with remarkable attention to all the factors that ensure high availability and resilience in the face of problems.

## More Than Satellite

Certification for teleports is especially important at a time when they have become so much more than uplink sites.

Teleports that serve the media and entertainment business are data centers and content hubs. They ingest content, format it, schedule it and play it out. They protect it. They feed content to the sky as well as to distribution networks that drive the OTT business.

Teleports have become experts at overcoming the technical and operational problems that can stand in the way of OTT monetization. Their value to media and entertainment grows by the year, and certification provides their customers with the assurance that they can give high-value content the treatment it deserves.

What does that assurance look like? More in our next installment. Visit **www.worldteleport.org/certification** for details.

*Author Robert Bell is the Executive Director of the World Teleport Association.*

### New WTA Member Update

**ATEME**, *France: a global leader in HEVC, H264, MPEG2 video compression solutions for broadcast, cable, DTH, IPTV and OTT.*
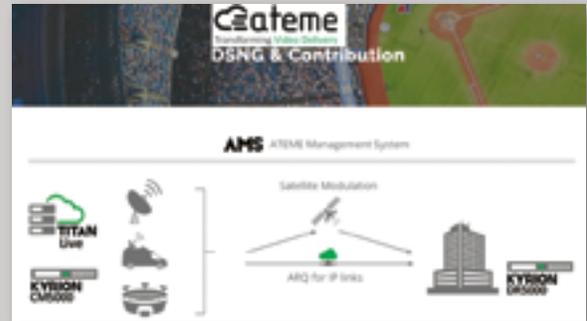


**Dalkom Somalia**, *Somalia: a leading Somalia based telecom provider established in 2003.*

**Azyan Telecom**, Oman: first licensed VSAT service provider with expertise in VSAT connectivity, network consultancy and support in the Sultanate of Oman with its Earth station in Muscat.



**PEKASAT**, Czech Republic: specialized in satellite networks. The company has long-lasting experience in the satellite communication and the company collaborates with major satellite network operators around the world in the coordination process of satellite networks.



**AzerCosmos**, Azerbaijan: The first and only satellite operator in South Caucasus, providing communication services and highly reliable satellite platforms.



**Campo Rico Group**, Puerto Rico: Dedicated to creating private networks using broadband technologies.



**du**, UAE: Provides carrier services, a data hub, internet exchange facilities and satellite services for broadcasters.



**DEV Systemtechnik**, Germany: Ka-band ready RF solutions meet all your RF signal management needs.



**Liquid Telecom**, Mauritius: The leading independent data, voice and IP provider in eastern, central and southern Africa.



**RBC Signals**, USA: Provides ground station communication and data services to satellite operators worldwide.

# Downlink: DEV Systemtechnik
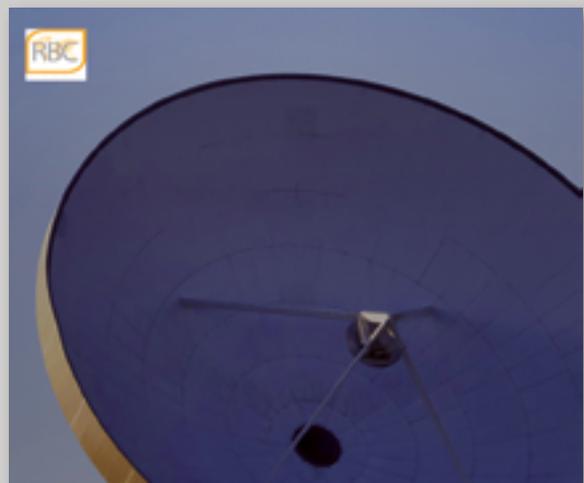
## Ka-band diversity

**State-of-the art satellite communication systems at the highest data rates are operated on the Ka-band. As transmission quality on Ka-band frequencies is heavily dependent on weather conditions, suitable system configurations need to be carefully planned and selected.**

Ka-band Site Diversity configurations relying on DWDM RF-over-Fiber transmission systems and redundancy switching units represent best-suited solutions and ensure maximum system reliability and system availability.

Satellite communication systems represent a flexible and fast implementation platform for delivering versatile services including voice, data, or video signals. As satellite communication systems do not rely on existing communication infrastructures, like electrical or optical cable networks, basically all regions of the world can be reached independent of their remoteness or their specific geographical location.

For that reason, Ka-Band satellites are gaining a high level of interest to face the increasing demand for higher data transmission rates. In addition to the provisioning of additional frequencies, satellite communication systems operating in the Ka-band offer several other benefits.

First, the available frequency range in the Ka-band is about four times larger than for satellite communication in conventional C-and Ku-band.

Second, Ka Band transmission is typically employed with the usage of multiple spot beams, so-called 'frequency reuse' operation, that allows the transmission of different signals at the same frequency simultaneously to several geographic areas.

Third, the high transmission frequencies of Ka-band allow highly focused spot beams and smaller antennas, leading to economically efficient solutions at high data rates. Consequently, sate-of-the-art High Throughput Satellites' (HTS) are operated in the Ka-band and provide data capacities exceeding 100 GBit/s per single satellite.

However, in addition to the undisputed advantages satellite communication system operated in the Ka-Band offer, they do face some challenges that need to be addressed appropriately through the installation of professional equipment and well thought out system configurations.
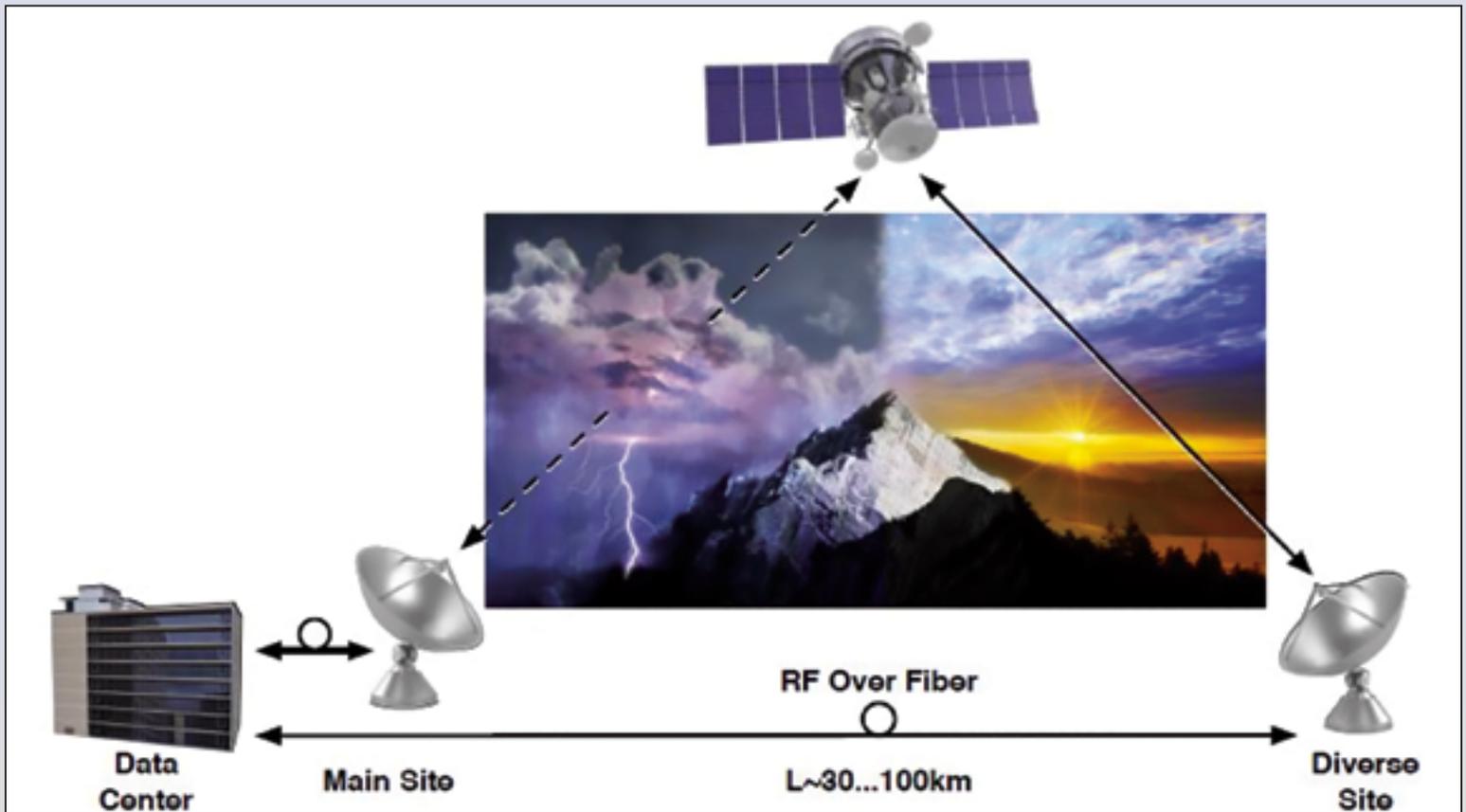


*Figure1: Schematic drawing of Ka-Band Site Diversity Ka-Band Schematic Drawing Ka-Band Transmission*

Today, satellite communication systems are deployed with point-to-point and multi-point topologies around the globe for broadcasting, data, and multimedia services and cellular backhaul.

Traditional satellite communication is based on C- and Ku-band transmission frequencies. Today, orbital positions are highly congested and additional bandwidth can essentially only be provided by using additional frequency bands.

Ka-band transmission is severely degraded by adverse weather conditions. In particular, additional atmospheric losses due to rainfall exceed 30 dB for Ka-Band satellite transmission systems.

With such high atmospheric losses conventional fade margin approaches as adaptive-waveform techniques or adaptive-power control techniques are not sufficient for compensation. For reliable and highly available systems only Site Diversity configurations provide adequate solutions.
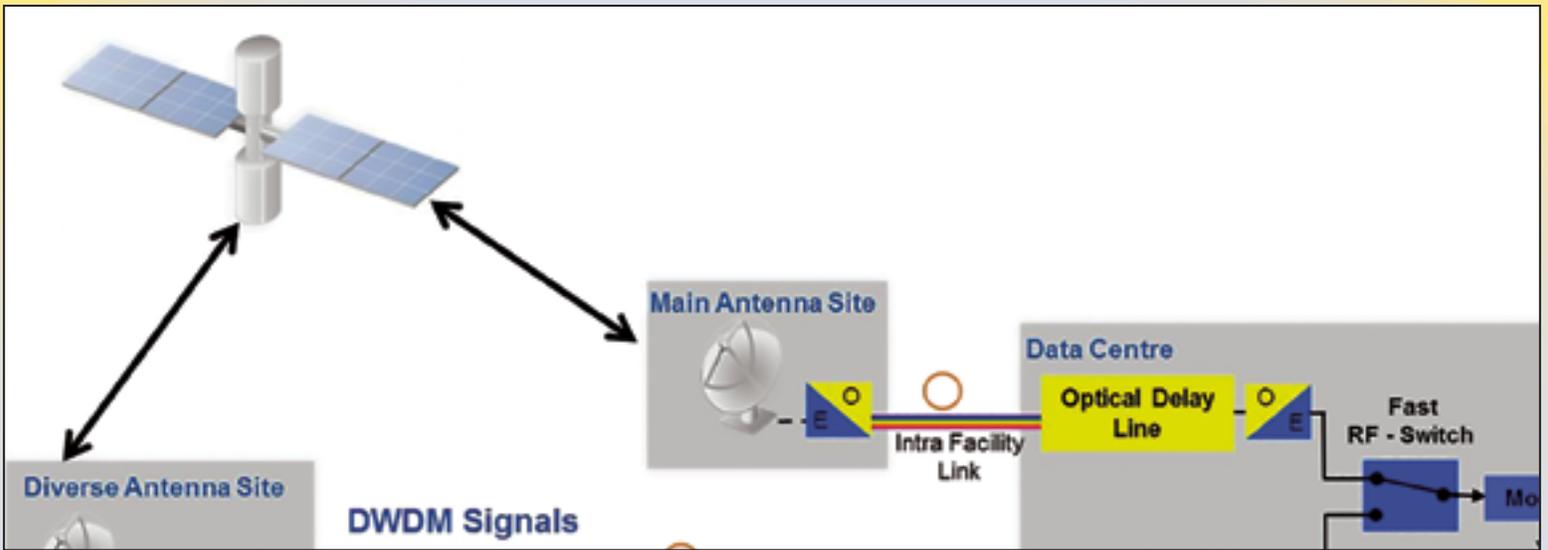
Figure 2. This is a detailed schematic view of a Ka-Band site diversity configuration.

Figure 1 on the previous page reveals the schematic view of a Ka-band site diversity configuration. The communication system is established by two antenna sites, a Main Antenna Site and a Diverse Antenna Site.

In case of adverse weather conditions, the data traffic is switched over to the Diverse Antenna Site. Typically, distance for separation of Main Antenna Site and Diverse Antenna Site is in the range 30 to 100 km. and the RF L-band signals are transmitted via optical fibers.

A bidirectional optical link is used to transfer the signals between the Data Center and the Main or Backup Antenna Site, respectively. To relay the L-band signals between the Main Antenna Site and the Diverse Antenna Site, a fast RF switching unit is used to carry out switchover operations.

As Ka-band transmission systems are mainly operated with Time Division Multiplexed (TDM) signals, the time delay between Main Antenna Site and Diverse Antenna Site needs to be compensated.

To equalize this issue, an optical Delay Line with in steps of 10 ns. adjustable time delay is used in the optical link to the Main Antenna Site. To bridge the quite long optical distance between Data Center and the Diverse Antenna Site, an optical Dense Wavelength Division Multiplexing (DWDM) transmission system is employed.

This DWDM system enables the transmission of up to 49 RF signals over one optical fiber, thereby facilitating the transfer of highest data rates.

To further increase the reliability and the availability of the system, equipment redundancy can be applied in addition. Figure 3 displays the schematic view of a bidirectional optical link between the Data Center and the Diverse Antenna Site in 1+1 redundancy configuration.

For the 1+1 redundancy example, the RF signal is converted and transmitted by one main and one redundant transmitter module and received and converted by one main and one redundant receiver module.

In the case of a malfunction or loss of a main transmitter or main receiver module, the redundancy switch at the receiver side switches over to the backup equipment ensuring a signal transmission with highest possible quality and uptime.

*dev-systemtechnik.com*
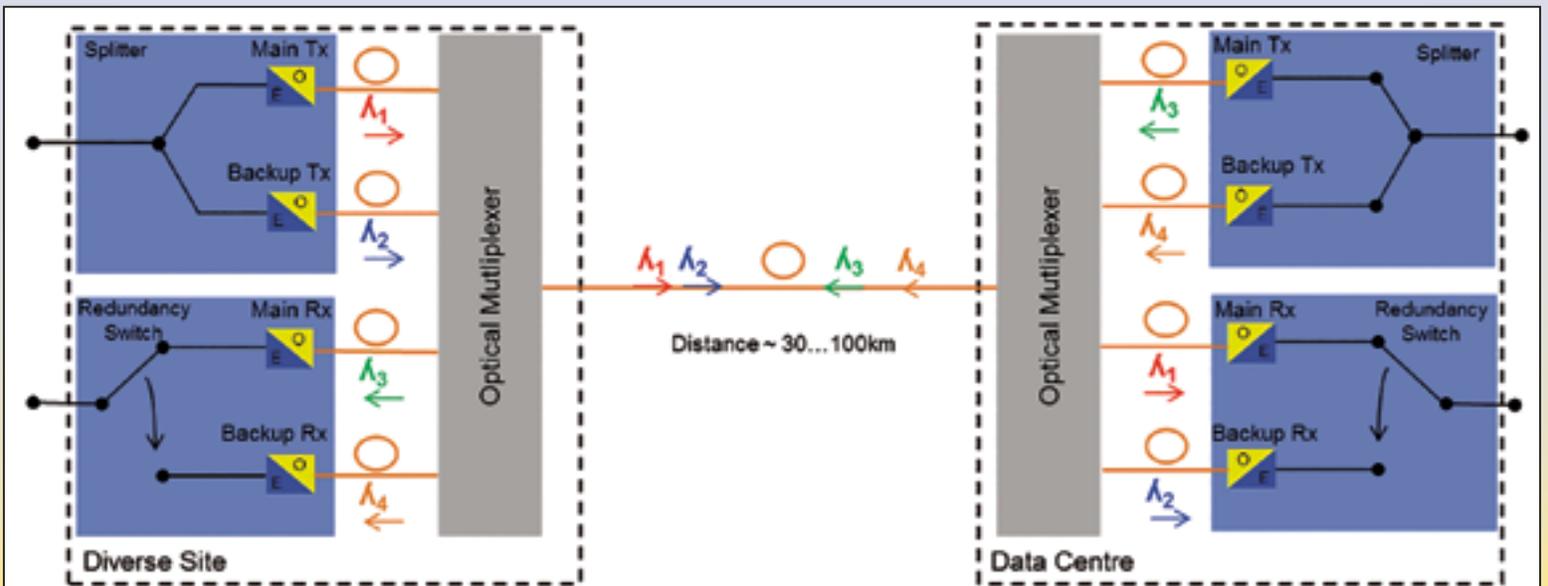


Figure 3. Detailed view of bi-directional Ka-Band Site Diversity configuration, including equipment redundancy.

# The Great Migration

### Why L-band users are moving to VSAT

*By Malcolm McMaster, President, Globecomm Maritime*

**Globecomm spends as much time as possible talking to shipowners about their communications needs. These are always rewarding conversations as the company hears about what they actually do with bandwidth, which gives Globecomm insight into what systems and solutions might suit them best.**

Over the last decade, that would almost always mean L-band satellite systems; however, this is changing. These days, the conversation might start at "L" but, more often than not, it ends at "V."

VSAT has changed, as well. From expensive, complex to buy, install and operate, and sometimes quite constrained in actual throughput, VSAT is fast becoming the new L-band as far as many shipping customers are concerned — simple, affordable and flexible.

VSAT can solve many connectivity issues with a single stroke: higher bandwidth, better speed and greater availability, to name just three. VSAT is a highly effective way of increasing capacity and enabling the data to flow, though it does need more attention to bandwidth management and an understanding of how to obtain the best out of applications and processes that drive more connected operations.

Here are five reasons why the owners we speak to are increasingly interested in the Globecomm global Ku-Band VSAT service.

### 1) Because shipping is changing

Vessel operators are constantly looking for ways to optimize efficiency, reduce costs and improve profitability, a combination of requirements that requires embracing new technologies while also managing investment risk.

The opportunity afforded by better ship-shore connectivity is the most direct pathway to achieving these improvements, and operators are adopting the tools; data collection and analysis, fleet management and video monitoring.

At the higher level, enhanced connectivity is able to help owners do what they must do above all else: retain their customers.

In a digital business environment, that means providing increasing visibility on vessels, cargoes, arrivals and departures, even carbon and other emissions. Once exotic notions, provision of such information is now the price of doing business for serious operators.

### 2) Prices are lower than ever

To realize the opportunities of smart shipping means overcoming historical resistance to an increased focus — and, therefore, spending — on communications. In fact, the majority of maritime communications users these

days recognize that the cost of maritime communications has fallen consistently for a decade and that spending on better connectivity can drive value into their operations.

To do this takes a commitment to understanding business requirements; which services fit what profile and how those services can be managed in order to control costs, all the while unlocking the potential of new applications and greater bandwidth.

Costs still need to be managed — there are plenty of examples of owners installing VSAT technology and quickly finding their systems overloaded and their 'unlimited' or 'all you can eat' plans infused with a variety of caveats. A clear view of usage needs can avoid this issue.

*Globecomm Helikon Radome.*

### 3) Applications are improving

Perhaps the most important factor in embracing new technology in shipping is to properly understand how enhanced communications can support smarter operations. In most cases, this means greater collection of data, whether for regulatory compliance or for performance monitoring.

Traditionally, the data needs of many shipping companies have been small — at least in comparison to other industries. For some, basic processes will continue; however, the availability of lower cost bandwidth is driving new applications, such as video and realtime voyage monitoring, that will all increase the data load.

Applications in the front of bridge space — notably, navigation charts — are driving the need for bandwidth, while at the back of the bridge, demand is exploding. Here, the use of fleet and voyage management systems, next generation weather routing and secondary management services are all further increasing demand.

In an ever-more connected shipping industry, VSAT also presents the opportunity to leverage asset tracking and remote diagnostics using the Internet of Things (IoT), without the constraints familiar to L-band.

Where once users of L-band systems would have to decide between business and crew communications, VSAT has the ability to provide that capacity on-demand, responding to short term spikes while always keeping the vessel in touch.

### 4) Ships will always need crew

The demand of crew connectivity remains strong and will continue to grow, even as automation increases in the shipping industry. At a recent shipping industry event, the CEO of a leading tanker company noted that the first question prospective recruits ask its crewing agent is not about the company safety record, but whether there is broadband access onboard ship.

True, there are changes taking place here, as well — greater automation and the use of sensors suggest that crew numbers will progressively fall over the decades to come. As this change happens, most owners agree they would prefer to minimize crew numbers rather than make the leap into the unknown of autonomous ships.

Even a smaller crew can drive significant bandwidth demand, certainly more than L-band systems can support and enough to take a large share of a ship's monthly allowance. Social media, video messaging, web browsing and similar applications are all ways in which crew will access the internet if they have the opportunity.

### 5) Security is an issue

Cyber security is certainly possible using L-band, but it is likely that any upgrade to networks, software and hardware necessary to shut the door on scams, malware and malicious hacks will probably also require an upgrade of more than just the email software.

As the old saying goes, if you think safety is expensive, try having an accident. It's critical that operators protect themselves from the risks of cyber-attack and have in place the resilience they need to operate securely.

Globecomm uses its Nimbus Pro smartbox to create private networks over all of the circuits, something few other connectivity providers can claim. Using private IP and tunneling over controlled networks provides a double layer of security. Using a private satellite network protects the ship's terminal from unauthorized transmissions, and blocking mechanisms provide further protection.

Shore to ship connections are always encrypted using the latest standards and end-to-end connectivity is via a private IP space with no exposure to the public internet. Nimbus also ensures the separation of crew and business networks so a malware infection cannot spread from one to the other.

## The End of L-Band?

Perhaps not quite yet — there will continue to be a need for L-band at least as long as GMDSS services use it for mandated safety services, and most, if not all VSAT installations, at the present time continue to use L-band as back-up.

The preceding information should not be taken to indicate that Globecomm Maritime is about to stop providing L-band solutions. L-band remains a core offering alongside VSAT as well as hybrid 'near-shore,' LTE-based options.

Think of it this way — the effect of technology is sometimes a function not of its impact when released, but when it has become part of the working fabric for a company. Overall acceptance of a technology will occur once the kinks have been worked out, the price has settled down and the infrastructure is in place to support the applications and offered services.

Few, if any, would trade their smartphone for the cellphone that provided them with only expensive phone calls and texts, cool though that may have seemed at the time. VSAT is that smartphone and there is no turning back — VSAT's time is now.

www.globecomm.com/industries/maritime/

*Malcolm McMaster is President, Globecomm Maritime.*

# Executive Spotlight: Peter Gulla

*Senior Vice President, North America Marketing, Hughes Network Systems*
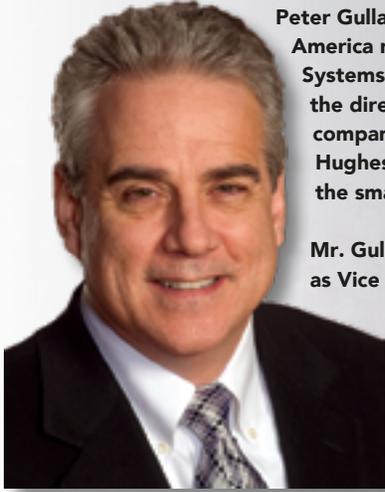
**Peter Gulla is Senior Vice President of North America marketing at Hughes Network Systems. In this capacity, he oversees the direct-to-consumer marketing of the company's flagship satellite Internet service, HughesNet, and the marketing activities of the small/medium business (SMB) group.**

**Mr. Gulla began his career at Hughes in 2001 as Vice President of Consumer Sales and Marketing. Prior to joining Hughes, Mr. Gulla held marketing positions at Road Runner and Time Warner Cable. Mr. Gulla holds a B.S. in Psychology from Florida State University, Tallahassee, Florida.**

**Hughes' efforts in supporting the advancement of education are the focus of this interview.**

*What are some ways Hughes helps to advance education?*

### Peter Gulla (PG)

Digital learning is transforming education. Yet across the world, approximately four billion people still lack connectivity. In the U.S. alone, 18 million households are believed to be unserved or underserved by wireline broadband solutions. Satellite helps close the digital divide.

In the U.S., Hughes provides high-speed broadband access to schools, libraries and rural health care providers under a federal program known as **E-Rate** to provide institutions in economically disadvantaged communities with affordable Internet access. Globally, Hughes technology connects thousands of schools across Brazil, Mexico, Russia, India and other regions for online education.

In India, Hughes developed an innovative satellite-based training solution known as the **Hughes Interactive Onsite Learning** platform. The program addresses the need for medical training in underserved areas and opens the door for expansion of basic healthcare — such as pre- and post-natal education — to many rural areas of the country. This solution currently supports 25,000 medical students in 50 rural communities across India.

*Why does Hughes invest in promoting STEM education, and what are some of the ways the company promotes access to STEM?*

### PG

Hughes employs a diverse range of STEM professionals and collaborates with countless others through our various partnerships worldwide. We know that staying competitive in a global economy depends on developing future STEM professionals. Research shows that, while occupations related to STEM are projected to grow quickly, there is a potential shortage of labor to fill those positions on the horizon.

Hughes encourages young people of all ages to embrace STEM with the aim of fostering the next generation of talent. HughesNet, America's No. 1 choice for satellite Internet, supports STEM initiatives with 4-H, the country's largest youth development organization. Since 2014, we have worked together with 4-H to increase youth exposure to STEM education and, this year, introduced STEM Lab, a free online resource offering exciting, hands-on learning activities for kids.

Encouraging kids to engage the world of STEM requires fun, challenging and rewarding activities. By partnering with 4-H to launch STEM Lab, we're hoping to excite the next generation of technology leaders, regardless of where they live.

*In addition to encouraging the next generation of aspiring technology professionals, how does Hughes attract and develop technology talent?*

**PG**

Hughes proudly provides a collaborative environment where emerging professionals work alongside some of our most experienced innovators. Our robust internship and graduate programs place developing talent side-by-side with industry leaders in their areas of interest for hands-on projects with real-world applications.

This past summer, across our various engineering departments, interns worked on projects reflecting the wide range of Hughes solutions: from the OneWeb Low Earth Orbit (LEO) constellation project, for which Hughes is designing and manufacturing the ground network systems to the industry-leading HughesON™ *Software Defined Wide Area Network* (SD-WAN) solution for enterprises and our JUPITER-based cellular backhaul systems for mobile operators.

One intern analyzed a cybersecurity standards roadmap to help ensure systems and services continue to maintain the highest levels of current and future security standards. Another team created a video streaming quality lab complete with analytical software for system optimization.

Working on real projects in production is a cornerstone of the Hughes intern program, giving these young professionals hands-on opportunities to delve into engineering problems that have practical implications.

To support continuing education of our employees, Hughes offers mentorship programs, tuition reimbursement, skills development programs, career counseling and paid memberships to outside professional associations and organizations. This gives our employees the ability to grow within the company and develop additional or stronger skill sets to further their careers.

*How is Hughes helping to increase understanding of important issues facing the industry and connecting with key constituencies?*

**PG**

The satellite industry constantly evolves, and Hughes stands at the forefront as an advocate — educating consumers, policy makers and partners on the many benefits of satellite technology and supporting policy initiatives that help power a connected future.

Our advocacy includes membership in the **Satellite Industry Association** and the **Global VSAT Forum** as well as participation in the **Third Generation Partnership Project** (3GPP) to create 5G standards for satellite.

Another timely issue on which Hughes has taken a stand is the **FCC**'s decision to allocate additional funds to broadband deployment in Puerto Rico and the U.S. Virgin Islands. Hughes advocates an objective, technology-neutral approach to include satellite technology to ensure reliable, resilient connectivity for residents when they need it most.

*Why do you think it is important to advocate for satellite technology?*

**PG**

Satellite Internet is often not recognized for the important role it plays in delivering connectivity. Often, those in urban centers or more developed areas don't understand that there are limits to how far terrestrial technology can reach. The fact is that, in many cases, satellite is the best solution.

Our services connect customers in suburban, exurban and rural United States, Brazil and Colombia and, soon, will bring people in Chile, Ecuador and Peru online. To make Internet accessible and affordable, Hughes enables cellular backhaul and community WiFi solutions across the Americas, Europe, Russia/CIS, Middle East/Africa and Asia/Pacific regions. Hughes JUPITER™ Aero System technology is in use for in-flight connectivity on board more than 1,000 aircraft around the world. And satellite is often the first means of establishing critical communications during natural disaster. It's an extraordinary technology that is helping to bridge the digital divide and power a connected future. That's why Hughes consistently promotes and educates on the value of satellite connectivity.

***www.hughes.com***
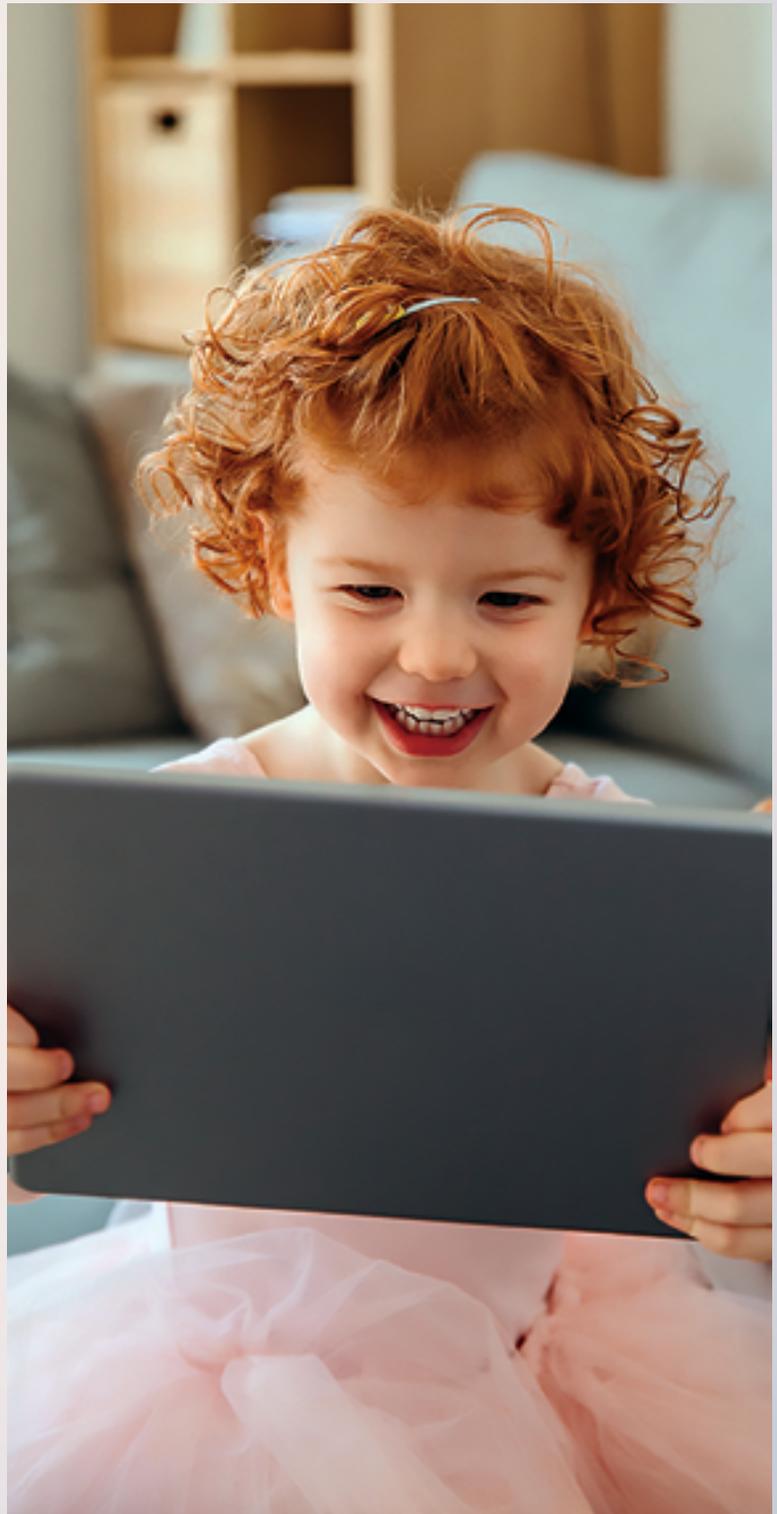
# An Omnetics Focus

## Getting connected...

By Erica Mutch, Marketing Coordinator, and Bob Stanton, Director of Technology

**As technology evolves, bigger isn't always better. Almost every technological product is becoming smaller and faster, including many products that use connectors.**



The small but mighty Nano-D is quickly surpassing its predecessor, the Micro-D, in popularity, due to its small size and rugged design. Omnetics has seen product growth for the Nano-D in the following markets:

### Small Satellites

Because launching satellites into space can cost tens of thousands of dollars per pound, size and weight are the main objectives when designing connectors inside a satellite. Smallsats have grown in popularity along with the growth of Nano-D connectors.

In a standard satellite, standardized printed circuit boards are stacked and electrically interconnected. Nano-D connectors are chosen for these connections because of their versatile format and size.

Retention screws are used to maintain signal integrity and long term mating in space, and Nano-D connectors use low outgassing materials that meet NASA specifications. Custom cable harnesses and flex circuits can be used to route signals between circuit boards.

### Phased Array Radars

Radars are used to detect enemy missiles, objects in the atmosphere, and anything else of note happening in the sky. These instruments send out a pulse of radio waves, and determine the location of the object by watching what radio waves are reflected back.

Traditional radars use a single beam of waves and measure the return waves by turning the main beam. Phased array radars, however, use an array of hundreds or thousands of beams to measure which waves are reflected back to Earth. This allows the user to be able to keep a constant eye on their target, rather than waiting for the main beam to turn.

These hundreds or thousands of signals need to be connected, which requires many pin connections from the edge of the radar transmit card to the focal beam circuit. Nano-D connectors with high pin counts are often used on the edge of the circuit boards within a phased array radar due to their small size and high durability.

### LIDAR Systems

*Similarly to phased array radars, LIDAR (Light Detection and Ranging) systems also use high pin count Nano-D connectors to transmit data. LIDAR systems are used on UAV's, helicopters, and airplanes to survey the ground using lasers.*



Omnetics connects the wires to the pins and sockets using high pressure crimping technology, eliminating the potential problems of soldered leads coming into the back of the connector. Externally, the metal shells are constructed of aluminum alloy and nickel plated. Internally, the insulators are molded from liquid crystal polymer, allowing the connector to perform within a wide temperature range: -50 degrees centigrade to +200 degrees centigrade.

As instruments become smaller and their capabilities become greater, speed must increase as well. As signals are changing from analog to digital, circuit speeds are ramping above 2Gb/s and beyond 10Gb/s, and photon signal management is enhancing performance and protecting devices from cyber intrusion.

When specified, cable signal speed capability and formats are designed to match the miniature Nano-d connectors. Designs available include IEEE 1394 fire-wire cable and expands to USB 3.1 formats and CAT-6a wiring. Higher speed data serial links can also be supported with smaller size cable and rugged Nano-connectors. Formats from USB 3.1, PCI Express 2.0/3.0, HDMI and others reaching up to 10 Gigabit Ethernet circuits are included.

***Full specifications can be found at this direct infolink...***

***www.omnetics.com***

*The system sends pulses of light to determine the direction and distance from the ground below, giving the user a clear picture of the terrain. LIDAR is used to produce precise information about both natural and man-made environments, which is helpful in a wide variety of applications.*

*To accomplish this, LIDAR instruments need circuit boards containing high-density connectors and small, flexible cabling. The Nano-D connector is optimized for this harsh environment.*

With a .025 inch pitch (0.635mm), Nano-D connectors are only ¼ the volume of a Micro-D connector, and have 80 percent less mass. Nano-D connectors are specified to MIL-DTL-32139.

*Co-author Bob Stanton is the Director of Technology at Omnetics Connector Corporation.*



*Co-author Erica Mutch completed a Bachelor of Science in Business focused in Marketing and Graphic Design at the University of Minnesota - Carlson School of Management. She then began her career in the connector and electronic manufacturing industries with Omnetics Connector Corporation. Her work includes editing and writing articles about connector news and trends, establishing editorial and advertising direction, and managing marketing campaigns.*

# Executive Spotlight:
# Alf Stian Mauritz

## *Managing Director, IEC Telecom Norway*

**Alf Stian Mauritz has been the Managing Director of Tradee Telecom (now IEC Telecom Norway) since 2005, when he created the company. IEC Telecom Group undertook a strategic investment by acquiring the Norway-based company in 2012.**

**Alf has a deep understanding of the Northern European countries needs for reliable telecommunications and has a lengthy experience in providing solutions to the maritime industry and governmental organizations. He holds a degree in International Business from The Norwegian Business School, Nanyang University in Singapore and USM in Malaysia. He is fluent in English and Norwegian.**

*Mr. Mauritz, would you please name top three development tendencies within the Scandinavian countries over the recent years.*

### Alf S. Mauritz (AM)

Over recent years, the company — as well as the Scandinavian market and the entire world — has witnessed a clear trend of increasing need and demand for data by customers.

In spite of the '*technology revolution,*' this is not a new demand... many owners and managers have only recently adopted the applications that can drive improved productivity and generate more transparent and accountable operations.

Traditional L-band — and even KU-band — are being replaced by newer technology such as Ka-band from **Inmarsat** (*FX*) or **Telenor** satellite (*Thor 7*) that allow for smaller antennas, lower priced equipment and, last but not least, attractive airtime rates. Today the maritime customer demands more than just a data link; they want numerous applications that support video streaming, GSM over satellite and other crew welfare solutions.

Affordable and flexible communication solutions are the keywords for the latest Scandinavian satellite connectivity market product development. The growing demand for data in the maritime sector, coupled with other requirements such as crew retention, remote offices, remote monitoring and maintenance, has pushed providers to work on far more comprehensive satellite solutions.

More and more the ship owners understand that they need a full cycle maritime platform to support all crew welfare and vessel management needs, complete with optimized voice, broadband data and onboard management systems.

Central to these needs are increased shore side monitoring and control. Ship owners are embracing concepts they have never worked with previously, such as higher bandwidth communications and fleet control centers from which they can provide 24/7 support to ships and crews. Such systems have been available for several years but are starting to provide deeper user experiences that build toward smarter operations. All these trends have a positive impact on satellite market development as well as providing even small fisheries with high-quality data and voice connectivity.

*What differences of the Scandinavian market satellite connectivity requirements have you noticed? Are there any challenges compared to the experience of other offices of the IEC Telecom Group in other regions?*

### AM

Of course, there are some peculiarities within different regions and markets that our group addresses, especially within the fishing industry. The company has noted a substantial change in how communication solutions are being used.

A combination of solid growth as well as smaller and lower priced equipment for fishermen has probably lead to the company installing VSAT onboard a15 meter vessel. Earlier, such technology was reserved only for the big vessels sailing far abroad.

This has opened up a new markets for IEC Telecom with a greater number of vessels. In the northern parts where the firm operates, there are other challenges the company must face that are not a concern of colleagues from central Europe. IEC Telecom is on the boundaries of coverage boundaries for several satellite systems.

A combination of Ka- and Ku-band as well as Iridium services must be delivered and harsh weather conditions require us to be in focus when solutions are designed to ensure they meet the market needs of customers as well be able to withstand various environmental conditions.

*Do your company satellite solutions and value-added services meet those requirements? Could you please give an example of particular market segments it worked for?*

### AM

The solutions provided by IEC Telecom are designed to meet the requirements of merchant shipping, fishing, government, Navy, Coast Guard and the leisure at-sea users.

Today, we are delivering communication solutions to the merchant, supply, fishing, and other vessel, and they all have seamless links between GSM/Ka- and L-band. In return, the customers receives a stable and reliable connection wherever they are sailing.

Satellite connectivity makes their business more efficient while ships and crew work more safety and the operational processes — including data transmissions — are far faster.

The company's clients can effectively communicate with officials and HQ and share live data. This has helped many of IEC Telecom customers, such as the fisheries, to increase efficiency, safety and punctuality when delivering their cargo — timing is essential to their ongoing success.

*Could you please tell more about IEC Telecom's plans for Danish market regarding the latest cooperation with ScanMarine?*

### AM

The European maritime market is one of IEC Telecom's highest priorities and we are certain that our offerings will meet the requirements of local shipping companies, regardless of a company's size, budget and communication goals.

IEC Telecom has grown significantly within the Scandinavian market over the last several years and the company's expansion includes Denmark. In 2012, IEC Telecom acquired **Tradee Telecom** in Norway and the company has experienced solid growth since the merger.

In 2014, a new office was opened in Stockholm, Sweden, due to IEC Telecom's role as a significant player in the Scandinavian market, on land and in the maritime market segments.

In 2018, the company announced a strategic partnership with **ScanMarine**. For us, this was a great opportunity to provide our customers all along the Danish coast with a variety of satellite telecom solutions such as L-band to VSAT and many other services.

The new company **IEC Telecom Denmark** will be established within the year to serve the Danish market and the areas around that country. The cooperation between the IEC business units in the Scandinavian countries (Norway, Sweden and Denmark) have clear synergies and our partners and our customers will all benefit.

IEC Telecom offers a full range of products and airtime from all of the major satellite operators. Plus, we apply our in-house solutions to customers' challenges and that makes the real difference for customers and partners.

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*IEC Telecom is an international satellite solution provider that delivers the products and services in different regions and market segments from Middle East to Europe, from small fisheries to big shipbuilding companies. Recently the IEC Telecom team announced the partnership with ScanMarine, the distributor of communication and safety equipment at Scandinavian market. Alf Stian Mauritz, managing director at IEC Telecom Norway provided comments regarding this cooperation, company's plans and overall tendencies of the Scandinavian market of satellite connectivity.*