TECHNOLOGY INTELLIGENCE FOR THE SATCOM MARKET MIDDLEFAST

THE VSAT CONUNDRUM

Crucial connectivity is required to develop the mobility sphere with fast, reliable connectivity

INSURING SATELLITES

Satellite insurance is getting more expensive with increasing launch failures and bigger satellites

With ever more satellites being launched, interference is a huge threat to the industry. The only way to fight this is through proper training and machine learning





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DOMINIC DE SOUSA (1959-2015)

PRINTED BY

ALALIF PRINTING PRESS LLC



CPI Trade Publishina FZ LLC whose registered office is 207 – 209, Building 3, Dubai Studio City, Dubai, UAE.

www.cpitrademedia.com

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VFI CON

This month's issue is packed with fantastic features that I'm sure you'll enjoy reading. I had the chance to interview the Chairman and CEO of elseco, a company that underwrites risks for the space, energy and aviation sectors. He revealed to me some of the key reasons that can affect the insurance of satellites and how recent failures have been increasing insurance premiums in the market.

Furthermore, with the increasing number of launches of small sats, we really need to address the problem of interference. The problem has to have a two-pronged approach, both from the operators as well as the terminal manufacturers. It is true that interference can be caused by satellites. However, the lack of type approvals for antenna and equipment manufacturers is something that the industry as a whole is suffering from. Everyone is looking for the cheapest antenna on the market, and more often than not.

this is not the best solution. Unified type approvals are the necessity of the hour.

To add to this, we have technicians and installers that think they know how to set up the antenna, but most of the time there is a definite lack of knowledge. Issues like cross-polarisation and incorrect look angles are also causes of interference, and this is often seen with VSAT installations be they fixed or SOTM terminals. This is where training becomes a crucial component of the equation.

Harnessing the power of machine learning and Augmented Intelligence too will help reduce the number of instances.



CLAYTON VALLABHAN Editor SatellitePro ME

Arabsat-6A assembly complete

NEW SATELLITE

Lockheed Martin has completed assembly on the Arabsat-6A satellite, which was recently shipped to its Sunnyvale, California facility to begin a comprehensive series of tests to ensure it is ready for operations in orbit.

"This new satellite will strengthen our existing fleet that offers millions of people mobile and landline communications service across the region," said Khalid Balkheyour, CEO of Arabsat. "We look forward to completing and launching this state-of-the-art new satellite to offer even greater



internet, television and radio services to our customers."

Arabsat-6A is part of the two-satellite Arabsat-6G programme and the second of Lockheed Martin's modernised LM 2100 series satellites to complete assembly. The other Arabsat-6G satellite, Hellas Sat 4/ SaudiGeoSat-1, recently completed assembly and was also shipped in companion satellite Hellas Sat 4/SaudiGeoSat-1 are the most advanced commercial communications satellites we've ever built," said Lisa Callahan, Vice President and GM of Commercial Civil Space for Lockheed Martin. "The modernised LM 2100 that these satellites are built on is packed with new innovations, including solar

arrays that are 30% lighter

November 2017 for testing.

"Arabsat-6A and its

and 50% more powerful, upgraded flight software and more efficient propulsion capabilities resulting in longer manoeuvre life."

Asiasat announces new VP of Business Development

APPOINTMENT

AsiaSat has announced a new VP. Lara Kwok, who joined AsiaSat in August 2017 as Director of Business Development and Strategy, has been promoted to Vice President, Business Development and Strategy, following the retirement of Sabrina Cubbon after 25 years of significant contributions to AsiaSat.

Lara brings 13 years of experience in private equity and investment banking, and in her new role will identify new business opportunities and drive strong strategic direction for business expansion and development of the company. Prior to AsiaSat,

she was employed by the Longreach Group between 2007 and 2015 as Principal of the Greater China investment team. Before that, she held various positions in global investment banks in New York and Hong Kong. Lara has an MBA from MIT Sloan School of Management.

AsiaSat President and CEO Andrew Jordan said: "I am pleased to see Lara take the helm of our business development and strategy team. Since joining only a few months ago, she has revitalised the strategy and business development of the company, and I am eager to see the new paths and opportunities."

UAESA organises initiative on meteorites



NEW INITIATIVE

The UAE Space Agency, in cooperation with the University of Sharjah, the Sharjah Centre for Astronomy and Space Sciences (SCASS), and the Japanese Chiba Institute of Technology, organised the first ever scientific initiative on space meteorology in the UAE.

The initiative included the participation of

more than 100 students from the University of Sharjah on an exploration mission to find meteorite remains in the Maliha Desert. The students used new techniques including drones, advanced surveying technology and robots. The Agency also contributed to lectures on the National Space Programme.

MARCH 2018 satelliteprome.com UPDATE



UAESA announces MeznSat project

NEW SATELLITE

The UAE Space Agency has announced a new satellite project called MeznSat. A 3U CubeSat, MeznSat will study Earth's atmosphere and is being developed in partnership with Masdar Institute of Science and Technology, and the American University of Ras Al Khaima (AURAK).

The CubeSat project will see undergraduate students design and construct the MeznSat before using it to collect and analyse data on carbon dioxide and methane levels around the UAE. The project seeks to realise the Space Agency's strategic goals of capacity development, promoting scientific research and coordinating national space sector activities.

MeznSat will be developed by undergraduates at AURAK, who will avail of the world-class facilities available at Masdar Institute.

Gogo's 2Ku inflight services to utilise SES-15 capacity

INFLIGHT SERVICES

Gogo announced that more than 200 aircraft equipped with its 2Ku inflight connectivity technology now use the increased capacity delivered by SES-15. These came online in SES-15's first operational month and are the first to benefit from the new HTS capacity.

SES-15 entered service in January 2018 and is SES's first hybrid satellite providing Ku-band wide beams and Ku-band spot beam capacity over North America, Mexico, Central America and the Caribbean. Due to SES-15's highpowered HTS beams, all Gogo aircraft outfitted with its next-generation modem will experience an even better customer experience, with improved economics. All new 2Ku installations enter service with the upgraded modem, and all 2Ku-equipped aircraft are expected to have the new modem by

the end of this year.

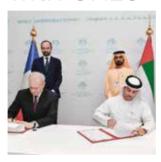
"Gogo's 2Ku technology is delivering industry leading performance today, but we designed the technology with an open architecture so it could take advantage of numerous enhancements over time," said Gogo Chief Technology Officer Anand Chari. "As we layer in more HTS capacity from satellites like SES-15, 2Ku's performance will get even stronger without having to touch the aircraft."

"Deploying HTS connectivity requires a coordinated and collaborative approach because of the spot beam design," said Elias Zaccack, Executive VP Global Sales at SES Networks. "We are proud of our strong working relationship with the entire Gogo team."

Gogo has signed capacity agreements across 11 SES satellites around the world, including agreements for HTS capacity on SES-15.



UAESA signs MoU with CNES



PARTNERSHIPS

The UAE Space Agency has signed an MoU with the French National Centre for Space Studies (CNES), defining a framework for cooperation in the fields of space science, research and technology as well as the development of a joint mission to monitor Earth's spectrum and atmosphere. The MoU was signed on the sidelines of the World Government Summit in Dubai, which took place 11-13 February.

The MoU was signed by HE Dr Eng Mohammed Nasser Al Ahbabi, Director General of the UAE Space Agency, and Jean-Yves Le Gall, President of the French National Centre for Space Studies, in the presence of HH Sheikh Mohamed Bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai, and Edouard Philippe, Prime Minister of France.

The MoU defines a framework for collaboration and the exchange of information and expertise in the fields of space science.



Arabsat hounoured by The League of Arab States

RECOGNITION

The League of Arab States Secretary General HE Mr. Ahmed Aboulgheit, has honoured The President and CEO of Arabsat, for his efforts in the field of Arab Joint Labour.

The ceremony was attended by Arab Organizations and a crowd of Arab Media Figures.

His Excellency gave the Shield of Honour to Khalid Bin Ahmed Balkheyour, President and CEO of Arabsat, in recognition of the great role he played in the field of Arab Joint Labor. The Secretary General praised the excellent performance of Arabsat in the field of satellite communications, which ranked Arabsat amongst the world class international satellite operators through its programmes and projects carried out.

UnicomAirNet chooses Eutelsat for connectivity

INFLIGHT SERVICES

UnicomAirNet (UAN) has signed a multi-year agreement with Eutelsat Asia, an affiliate of Eutelsat Communications, to address the fast-growing in-flight connectivity (IFC) market in the Asia Pacific region.

UAN was established in 2017 by China Unicom's broadband network unit and Hangmei, a Chinese Wi-Fi service and content provider for railways and buses, to provide IFC services to Chinese commercial airlines. As of 2019, it will lease the remaining capacity on the high-throughput payload of the EUTELSAT 172B satellite to enhance IFC services across an area stretching from the west coast of North America to Asia and Australia.

The agreement follows the signature of an MoU between China Unicom and Eutelsat, which took place during French President Emmanuel Macron's state visit to China in January. The MoU aims at addressing the satellite communications market in Asia Pacific, within the framework of the Belt and Road initiative.

The EUTELSAT 172B satellite was launched in June 2017 on an Ariane 5 rocket. Built by Airbus, EUTELSAT 172B is the first European all-electric satellite. Optimised for inflight connectivity, its innovative high-throughput payload of 11 spot beams enhances efficiency, enabling dynamic power allocation on high-traffic air routes in the Asia Pacific region.

UAN GM Herman Guo said: "The trans-Pacific region is the world's busiest aviation market, with the fastest growth rate. EUTELSAT 172B will provide high-quality IFC services to passengers, with the best performance and efficiency."



Designs for Hope Probe unveiled at WGS



MARS MISSION

The final designs of the Hope Probe, the Arab world's first interplanetary mission, were unveiled at the **World Government** Summit in Dubai. Details of the muchdiscussed Mars 2117 plan, which aims to create the first human settlement on Mars, and the UAE's astronaut programme, which will train Emiratis in space exploration, were also discussed.

"The Arab world has a long-standing history with space studies and astronomy, with many early pioneers in the field. This rich heritage continues to power our future through our numerous space exploration endeavours," said **HE Yousuf Hamad Al** Shaibani, Director General of the **Mohammed bin** Rashid Space Centre, at the summit.

MARCH 2018 satelliteprome.com UPDATE

NYUAD gathers experts in space sciences

PARTNERSHIPS

The Centre for Space Science at NYU Abu Dhabi (NYUAD) convened a meeting of senior members of the UAE space sector and international scientists recently on Future Directions in Heliophysics. Heliophysics is the science of how the sun's interior influences the atmosphere of the sun and its planets.

Speakers presented important scientific challenges in understanding the behaviour of the sun, which in turn limit the ability to predict its impact on our space environment. Discussions of potential space missions focused on



CubeSats, which provide an affordable and powerful means of studying the full surface of the sun and characterising its impact on us from space.

Participants also discussed the advantages of

a collaboration between the Centre for Space Science and the UAE on building space programmes.

Director of Space Missions, Science and Technology Khaled al Hashemi and Head of Space Projects Abdulla Al Marar presented the UAE Space Agency's vision for the future, including the status of the 2020 mission to Mars with UAE's Hope Probe. Director of the Space Science Department Miriam Rashid Al Shamsi described the activities of the Mohammed Bin Rashid Space Centre in Dubai.

Conference participants discussed questions on the sun, the most important influence on the Earth's weather and space environment.

Also present were guests from Khalifa University, American University of Sharjah and UAE University.

WTA ranks Du's teleport among world's top 10



RECOGNITION

The WTA has ranked du's teleport in the top ten in its most recent annual rankings, the Top Teleport Operators of 2017. Through its teleport, du serves regional and international broadcasting customers from Dubai. Since teleport operations

began in 2004, du has increased the number of uplinked TV channels, growing its current teleport facility by over 600%.

The WTA annual rankings of companies by revenue and revenue growth are compiled by surveying teleport operators worldwide.

Hiltron Communications appoints new MD

APPOINTMENTS

Antonio Monteverde, previously Sales Director at Hiltron Communications, has advanced to the role of Managing Director.

"Antonio Monteverde combines extensive technical experience of the satellite communications industry with an excellent track record in sales and business management," commented Dan **Technologies CEO Ole** Clausen. "He has also represented Hiltron very effectively at major industry events such as Angacom in Cologne and the NAB Spring Convention in Las Vegas,

as well as on Hiltron's exhibition stand at recent IBC shows in Amsterdam."

Monteverde added: "The core of Hiltron is a highly skilled engineering team which develops excellent satellite communication hardware and software whenever needed, to augment the third-party solutions it needs in its role as a satcom systems integrator. My mission now is to build on that knowledge base and product portfolio both here in our **European home markets** and around the world."

Antonio Monteverde joined Hiltron in April 2016.



Interference has always plagued the satellite industry. With ever more satellites being launched and more terminals coming to market, interference is threatening the industry. The only way to hit back is through proper training and machine learning



With so many small sats coming onboard, there is going to be a strong issue of

interference. The community needs to come together to start tackling this issue, before it becomes more difficult for operators and networks to function.

Jorge Ciccorossi, Engineer, Space Systems Coordination Division, Radiocommunications Bureau at the ITU, says: "Certainly, when we see a number of systems coming to the RFI environment, we will address more of these cases. For the time being we are exploring this scenario and planning and participating in study groups, just to see how these compatibilities are possible and if they are possible in some cases, but we also need to think about collaboration. I'm sure the industry will bring about some solutions for this, either in the field of monitoring by perhaps deploying more stations for monitoring, or even from the state.

"We need something that can give us some assistance to how these systems are being operated, because it's one thing to see it in theory and completely different on how we see it in practice, and we will certainly solve this problem, but it remains a challenge certainly."

The most important challenge is not the systems properly coordinated by the ITU, but other projects like CubeSat projects – we need to follow them. They are inspiring and disrupting space services, but at the same time transforming the whole satellite ecosystem.

"Some of them are not using the appropriate frequency bands and might have found cheap technology in the market, thus we have to try to guide them to use the appropriate frequency and also notify the ITU to inform the satellite community that they are there. This is perhaps



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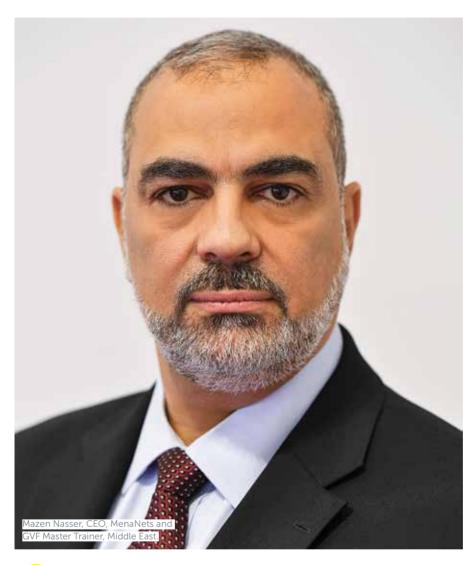
our biggest role, but they are very welcome and serve an important role in the space community," explains Ciccorossi.

In some ways, the satellite industry is a victim of its own growth. The more terminals and satellites, the higher the number of instances of interference.

Andreas Voigt, Manager, Communications Systems, Eutelsat CSC, says: "From my point of view, a very clear definition of frequency areas which LEO, GEO and MEO satellites can use has to be adhered to. The problem with CubeSats using HAM radio frequency is for sure something that is problematic, because if there are more of them, the bands will not be too wide since there is no space to be extended for communication. When we have a look at LEO satellites or whatever we are going to have, we need strong protection and frequency usage where there are geostationary satellites and where there are LEO and MEO environments.

"We also need to protect services in GEO, and services which they are going to use in LEO. You will see more and more operators with a number of satellites who are not going to use these frequencies; however, the requirements for LEO operators is that they would like to have loads of frequencies available, which can then lead to issues for other operators, not mentioning as we all know 4G and 5G environments. So we need to be prepared for C-band and other frequencies to be more shared, and incident and problem management needs to be very aware of what's going on."

GVF as an organisation was initially approached by many operators to mitigate interference – this is why the organisation started its training services.



The training is something GVF did because we saw there was a need in the market. It is a response, because we found that there is a lot of interference"

Mazen Nasser, CEO, MenaNets and GVF Master Trainer, Middle East

It got collective instances on interference and then developed the training programme. As of now there is a bouquet of more than 30 modules online that can be purchased through a subscription, but more importantly there are people like

Mazen Nasser, CEO, MenaNets and GVF Master Trainer, Middle East, who do hands-on training and give a more real experience to vendors and operators.

Nasser says: "The training is something GVF did because we saw there was a need in the



The problem with cubesats using HAM radio frequency is for sure something that is problematic, because if there are more of them, the bands will not be too wide"

Andreas Voigt, Manager, Communications Systems, Eutelsat CSC

market. It is a response, because we found that there is a lot of interference. There was a picture that came out a while ago where an installer was pointing the device to a satellite because he thought that it should be pointed to the satellite, and he

was standing in front of it with the transmission on, and there were health risks on this person and when he found out he felt very bad. So through this we know there are sometimes people who think that they don't need training, but it's very important.

"We have been adding modules because we see there are gaps and needs in the market to fulfil, and we get those responses from satellite operators, network operators and end users, and when we started the programme we saw a lot of people coming to register. Through the training courses, we saw those gaps. When we offered them a choice of online training. people asked if there are any physical classes available. Online training is available in a few languages, but it's not available in Arabic, so a lot of people who prefer the Arabic language prefer us to train in-class.

"This is what we are doing more of. We would like to see that the operators and users see that nobody can do any installations without them being trained and having a certification to do an install. It's just like when you want to get your health checked, you go to a doctor, and you want to make sure that the doctor is capable of giving you a good check-up."

Another thing GVF experienced was the elimination of type approvals. It saw that a lot of people were not using type approvals. Previously, all antennas had to be type-approved. However, nowadays people just use any antenna on the market – they buy whatever is cheapest.

"I would like to see type approvals coming back to the market. When it came to VSAT, just anything was okay. This has to change," says Nasser.

Mostafa Fathi Abdalazem Alazab Elkhouly is a Research Fellow at Fraunhofer IIS. He thinks the main problem is getting type approval from various satellite operators.

"The main problem for getting type approval is that the manufacturer has to run behind MARCH 2018 satelliteprome.com COVER STORY

the different satellite operators to get approvals one after the other. This is very inefficient in terms of cost and time spent. He has to go through all the type approvals, which in a way are all similar. They need to go through all the same tests over and over, like the static test, measure the antenna pattern, dynamic tests where the antenna is put on some motion track to see the pointing performance and cross polarisation. They need to check if all this is in compliance with the regulations.

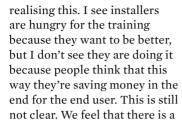
"This is the point where standardisation is very important, and GVF is working very actively in the way I see it. They try to get all the satellite operators together in a consensus where we need standardised type approval procedures. The operators know that this is very important, but the problem is everybody has their own business model and their own interests. I hope we can see standardised testing procedures in the near future. If we have both these components and we have a standardised global environment for testing SOTM terminals, soon you will find the stamp of type approval on each of the datasheets for the COTM terminals."

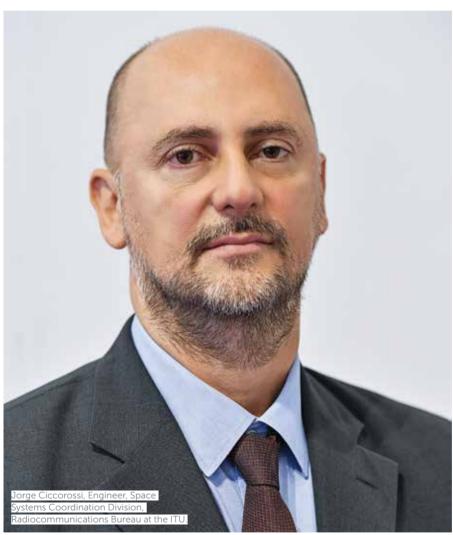
Nasser believes cost is what everyone is worried about these days, and he says at the end of the day it always costs more to do things right.

"It seems that the satellite market has slipped away and forgotten about doing things better and hurt itself with interference. GVF stepped in and is now doing a lot of type approvals for the manufacturers. This is because of the cost, and we saw by not doing that people started to use non-approved antennas and non-approved equipment. By not doing this, they thought the manufacturer

is reducing costs so they can sell more equipment, which in turn caused more problems and this costs us more in bandwidth. Eventually it is cost-effective to pay more to get a better quality installation.

"I don't see the market





We need something that can give us some assistance to how these systems are being operated, because it's one thing to see it in theory and completely different on how we see it in practice"

Jorge Ciccorossi, Engineer, Space Systems Coordination Division, ITU

sickness out there but they don't know what the medicine is."

Voigt believes there are two parts to training – the first is training people, which has been done successfully for several years.

"People need to be trained whenever we are going to have fixed reserves in the field, to avoid satellite interference and whatever kind of human error can happen. whether cross polarisation or intermodulation, etc. However, we also need training for technology. We are going from 100% humanbased technology to automated environments like phased array antennas, maritime and nautical solutions. Therefore, we also need training for the equipment. This training is done by Fraunhofer and other companies that are coming up. I believe the combination of both of these will then culminate with us reaching an environment where we can reduce incidents," he explains.

Ciccorossi agrees that standardisation is definitely an issue.

"We already have some standards for antennas for fixed service and so on, but others can also contribute to the ITU in order to have measurement techniques and standardisation for these procedures. I'm sure these will be used in the future, and to have these type approvals is something that will be useful for the satellite community. The more people are trained, the better it is."

In conclusion: as technology changes, we are also seeing new bands come to market. It started with C-band and then Ku-, followed by Ka-band. The same thing happens with training. GVF started with classroombased training in the beginning, and effectiveness did not meet requirements. Then it structured



The main problem for getting type approval is that the manufacturer has to run behind the different satellite operators to get approvals one after the other"

Mostafa Fathi Abdalazem Alazab Elkhouly, Research Fellow at Fraunhofer IIS

it to an online platform, which helped in reaching more people – today, more than 13,000 people are certified. However, GVF still finds gaps in the kind of training and solutions delivered.

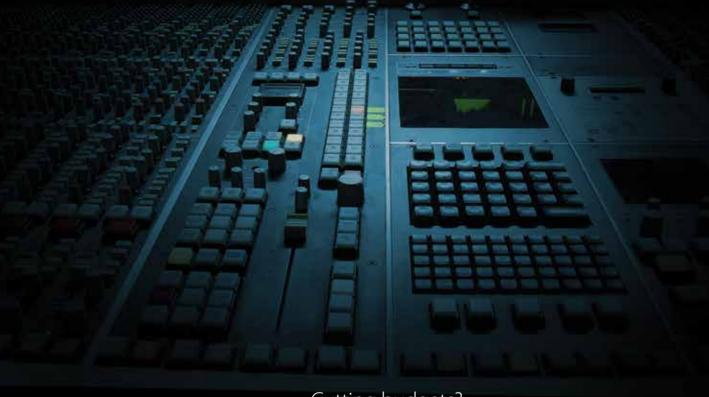
GVF has recently launched completely customisable



classroom-based training, with modules delivered by industry veterans who will create the content and customise it for the audience over a couple of days. This is how it is now bridging the gap from field installation training to Earth stations.



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MARCH 2018 satelliteprome.com VSAT



VSAT is absolutely crucial for those communities where terrestrial infrastructure is minimal, in many cases giving them access to services such as video and the internet. Often these communities are remote and lack communications infrastructure. Having a connection can have a major impact on the socioeconomic aspects of a community.

VSATs are by definition small and easily installed, making them extremely valuable for many applications and environments. Especially in rural areas where few people live, and which therefore have fewer reasons to attract telecoms providers, VSATs can be the only cost-effective way to keep communities connected.

Andrew Bond, Sales Director at ETL Systems, explains: "Not only does VSAT deliver a connection into those communities, it is a more cost-effective alternative to conventional satellite communications services. VSAT can be implemented quickly, has a relatively low up-front investment, and per minute operating costs are low. Reliability of VSAT terminals is also increasing with the advent of HTS and spot beam technology, due to the higher power density under the spot beams."

Martin Coleman, Executive Director, Satellite Interference Reduction Group, agrees and adds that VSATs are providing a lifeline and bridging the digital divide.

"For one, they can deliver coverage where no other services exist, and two, they are quick and simple to set up. They are generally easy to use and new tools being launched make them easier to operate."

John Finney, Founder of Isotropic Systems, chimes in with some figures to substantiate the degree to which VSAT is a necessity in rural areas. He says fixed broadband penetration remains below 1% in Africa, while nine million households in Europe remain unconnected. At the end of 2016, 53% of the world's population was offline. Even in the US in mid-2017, satellite providers only delivered broadband to approximately two million consumers, leaving more than 16 million households with weak connectivity.

According to him, new HTS satellites can help serve these communities with lower costs for reliable and ubiquitous broadband: "This is provided that a suitable ground terminal solution sufficiently reduces the cost of current market offerings. Isotropic Systems and its optical technology will revolutionise data transmission with a truly disruptive terminal. These will help to create faster, higher capacity backbone networks; highperformance, low-cost mobile devices; and rapid digital adoption and inclusiveness, making possible explosive growth in data volumes. Areas where VSAT was unprofitable or unimaginable will now move forward and be connected via low-cost antennas."

Finney also thinks HTS is starting to disrupt the satellite industry and launch into its next generation. For geostationary (GEO), medium and low-Earth orbit (MEO, LEO) HTS satellites, the industry has invested approximately \$16 billion. These satellites will enable faster connectivity, but more importantly, they will also change the pricing model for satellite bandwidth by supplying the market with hundreds of Tbps of capacity.

Keith Murray, Product Manager, Maritime and AERO at Thuraya, says: "HTS and extremethroughput satellites [XTS] shall deliver very high data speeds,



VSAT can be implemented quickly, has a relatively low up-front investment, and per minute operating costs are low. Reliability of VSAT terminals is also increasing with the advent of HTS and spot beam technology"

Andrew Bond, Sales Director at ETL Systems

between 10 and 20 times that of a normal VSAT wide beam satellite. These tend to have smaller spot beams and presently appear to be concentrated in a few areas close to land and around the Asia Pacific area. These shall deliver very high data rates but also allow those requiring lower data to use much smaller terminals, allowing the terminals to be more compact and lower cost."

"They also promise that the cost per MB shall be lower in comparison to other satellite technologies, but that still has to be proven. A key area where

they may be of use is in the aero market – with aircraft connectivity growing and cabin connectivity being more and more popular with end customers, faster data rates are required for the aircraft. The ability to use smaller, lighter terminals has obvious attractions to the aviation industry."

He adds that LEO constellations can deliver the ability to use small terminals with low power requirements and lower latency than GEO satellites, making them particularly suited to user datagram protocol (UDP) internet sessions and mobile applications. The new constellations promise much higher data rates than previously seen from LEO satellites, but still in the range of 1-2Mbps, much lower than Ka-band networks.

Alvaro Sanchez, Sales and Marketing Director at Integrasys, says: "We are already seeing 200Mbps in HTS payloads using existing HTS ground infrastructure, which is a great deal more than achievable using other satellite technology. LEO satellites will be able to achieve much higher connectivity speeds. so coupled with HTS technology, this will increase significantly in the coming months and years. Indeed, even in the near future I strongly believe that we will see 500Mbps and 1Gbps using a 1.2m parabolic dish."

This increased capacity and faster connectivity speeds will give rise to a lot more applications than previously possible. We are already seeing a rise in connected cars and mobility applications in maritime vessels and aeroplanes.

According to Sanchez, Toyota and Honda are already working on this and looking into how satellite can help. One key aspect is the multicast capability of the satellite. This will be crucial because it means a car software upgrade

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can be received by all vehicles at the same time, having minimum bandwidth requirements for large-scale deployments. Maritime and aerospace will continue to be strong markets, but in the future, the new constellations will make it easier for polar flights and ships.

Murray feels both new types of satellite constellation will increase connectivity on vessels in the maritime, aircraft and land sectors: "For vessels, it shall bring greater access for crew welfare and applications that move towards smart ships, tracking, remote management and monitoring of equipment onboard. This is already underway with applications such as the roll-out of ECDIS and engine monitoring."

"For aero applications, a greater choice of live streaming video/TV, as well as a move to safety services driven by the FAA and EASA for the cockpit, including tracking, remote black box and electronic flight bags. On land, the greatest predicted growth area is in M2M/ IOT, with particularly the LEO networks giving the ability to use small, low power terminals in cars and remote locations such as utility infrastructures for pumping stations, meters, floodgates, etc. Also agriculture for the monitoring of crops and livestock."

Coleman thinks we will also see advances in other IoT applications, and increased demand for OTT services. VSATs are well positioned to integrate all types of new ideas and remote locations that lack infrastructure.

With new satellites appearing over Earth and a variety of terminals offered by manufacturers around the globe, there is a high risk of interference and reduced efficiency. Finney believes new VSAT terminals will support HTS high-power spot beams. These satellite beams reuse spectrum very efficiently

The eventual emergence of flat panel technology at a price VSAT vendors can afford will be a step change in VSAT design, and growth in all mobility markets is an exciting prospect."

Martin Coleman, Executive Director, IRG and lower chances of interference. The interfering party would need to be within the small area of the specific beam providing connectivity to have an impact.

Murray, however, hints that erring terminals could cause unintentional interference.

"Regulations and standards set up by the ITU and IEEE ensure that these terminals should not interfere with other appliances or have interference from other devices or ground networks. The difficulty is that, due to the worldwide coverage of these satellites, the terminals have to work in various countries that may have slightly different regulations and spectrum use. Terminal equipment manufacturers must consider this during the design process. The other aspect is that the majority of countries require some sort of type approval to be undertaken when a new satellite



terminal is imported to its country."

To combat interference, there are a number of tools available on the market. This includes tools to detect it when it happens, as well as better monitoring to predict it before it happens. As with anything, when it comes to reducing errors and increasing efficiency, one of the most effective methods is to ensure quality products throughout the satellite chain.

Bond says a major contributor to interference is poor quality. Satellite operators are increasingly realising this and investing in ensuring all equipment is manufactured to the highest quality possible, in order to reduce errors such as interference.

Coleman also thinks the problem can be eradicated through the help of tools such as Satmotion Pocket and education of the entire chain: "Human error is a significant cause of interference-causing terminals, so ensuring error-free set-up is essential. Satmotion Pocket, a downloadable app from Integrasys, has been highly effective at doing so."

"Network monitoring is essential to ensure good quality of service and therefore reduce interference. Several of IRG's members, including Integrasys, Kratos and Siemens Convergence Creators, have developed sophisticated monitoring technology. The SatGuard solution from Kratos, a real-time VSAT interference monitoring tool, accurately identifies and geolocates an interference-causing VSAT by decoding its terminal ID, the same as using carrier ID elsewhere."

Terminals are becoming flatter, lighter, simpler and smaller – but not cheaper. The industry has already invested a great deal in HTS developments, and this will likely continue in the coming months and years. Today, we



VSAT is mainly used in the early stages of a field's life. As the field comes into main production, then the rigs often have fibre or microwave links to them"

Keith Murray, Product Manager, Maritime and AERO, Thuraya

> already have terminals in every band. Although the majority are currently in Ka-band, we will see more and more in other bands. At the same time, terminals will become more and more automated, according to Sanchez.

"The industry is working towards making operation of satellite terminals much simpler, to the point where you can operate it the same way you operate a mobile phone," he believes.

Bond thinks terminals are under increasing strain to deliver more services than ever before. The increase of HTS satellites in Ku- and Ka-band, coupled with demand from the broadcast industry for OTT content in the traditional bands,

means teleports are delivering more services, in more bands, under more time pressure. There is also a lot less tolerance for any degradation of signal.

Finney agrees and says today's electronically steerable antennas cost tens of thousands of dollars, which he sees as one of the biggest inhibitors of the growth of HTS use.

"Fully integrated terminals such as those pioneered by Isotropic Systems are evolving to support the new HTS satellites and harness the large volumes of bandwidth they can supply. In addition, new terminals have become smaller and lighter, as nearly every mobile platform has limited space for another piece of equipment.

"As we talk about evolving technology, I strongly believe it is time to disrupt the current satellite terminal model. Isotropic Systems has developed a very innovative technology that strongly differs from existing satellite antennas. By introducing optical elements, Isotropic Systems has drastically reduced the complexity of the electronics and improved the capability of the antenna such that the cost, power consumption and size are dramatically reduced. Even with these changes, we increase the functionality measure in terms of gain, instantaneous bandwidth and simultaneous connections.

"Isotropic Systems is poised to enter the market with new, highly efficient terminals allowing users to choose one frequency, either Ku or Ka, but also shortly after that, they will be able to automatically access any available frequency from multiple operators," he explains.

Oil fields and Maritime applications

Oil fields are extremely difficult to connect. In many cases they need to move, and as they do so, MARCH 2018 satelliteprome.com

reconnect with the satellite. The stabilisation of oil prices helps significantly in this vertical, and connectivity demand will grow significantly in coming years. Connectivity to vessels that can monitor the rig, and in the case of exploration send data back to it, can only be carried out by satellite communications.

Murray explains: "VSAT is mainly used in the early stages of a field's life. As the field comes into main production, then the rigs often have fibre or microwave links to them. It is used on vessels supporting the operations for various tasks, including receiving engineering drawings or instructions on tasks, sending

survey results, as well as crew welfare. New applications in this sector could increase remote operations and support. Specialists would be able to support more rigs from onshore, reducing costs and increasing efficiency if their tasks are carried out remotely. For this, good, reliable communication is required, and this can be provided by satcom."

According to Coleman:
"VSATs are a perfect solution in
their various ruggedised guises.
Compact terminals make them
ideal for stabilising on moving
platforms. However, the eventual
emergence of flat panel technology
at a price VSAT vendors can afford
will be a step change in VSAT

design, and growth in all mobility markets is an exciting prospect. Adding LEO constellations into the mix will increase the use of VSAT when deployed in the polar regions, especially useful for both the maritime and aero industries."

Finney concurs and adds that the driving force is the quick deployment of VSAT terminals, no matter how remote the location. The HTS satellites and coverage available today and rapidly coming online will reach all major offshore routes and remote regions, supporting maritime and other offshore vessels for leisure and commercial operations.

"The crew and passengers on these platforms need to



access the internet for various data-driven applications. These include Wi-Fi, entertainment, social media, equipment tracking and monitoring, AIS systems, weather reports, onboard sales and services, video on demand and augmented reality applications for training.

"No sector will function effectively worldwide without the connectivity that satellites can provide," says Finney.

Challenges

The VSAT industry has many challenges facing it; terminal manufacturers and regulatory bodies need to come together to ensure standards are met. The aim is to provide consistent error-free service, but the plague of interference is bound to play havoc with customers constantly demanding lower costs and manufacturers flouting guidelines in order to deliver products at these costs.

Coleman says: "VSATs remain the single largest cause of satellite interference; some figures estimate that 40% of all worldwide interference is caused by VSATs. On top of this, many of IRG's members state that when VSATs are installed in an area, incidents of interference markedly increase. Unfortunately, with cost being continually driven down, the spectre of poor quality products is inevitable."

"IRG is working with the industry, raising awareness of the problems and encouraging manufacturers to excel in network design (automation and closed-loop) and produce quality products, yet continuing to develop new methods and tools to manage the complexities of a VSAT network."

Another major issue is overcapacity due to the rising number of constellations, leading



LEO satellites will be able to achieve much higher connectivity speeds, so coupled with HTS technology, this will increase significantly in the coming months and years"

Alvaro Sanchez, Sales and Marketing Director at Integrasys

to a drop in revenue for operators. Murray explains that there is a natural lag between take-up of available capacity, due to the advent of new applications and the launch and investment in satellites and associated infrastructure. This could mean greater consolidation within the industry as companies merge to reduce costs and broaden their offering. The encroachment of other technologies such as GSM, fibre and Wi-Fi is also reducing the areas that make satellite communication attractive.

The issue of signal degradation is also being addressed by the community.

"The biggest challenge right now for VSAT operators is ensuring no loss or degradation of signal, even in the harshest environments. We have a range of solutions aimed specifically at this sector, which are ruggedised to avoid any weather damage. We have also introduced a VSAT over fibre solution, which enables a fibre link from the antenna to the remote control room. It is capable of delivering connections for links up to 10km apart, without the need for extra amplification. This means that it can drastically reduce signal loss, by a factor of approximately 500 at L-band, and ultimately ensure a much higher quality feed. In addition, unlike copper cable, optical fibre is immune to EMC from lightning and other natural causes," explains Bond.

The Future

Regardless of ongoing challenges and methods of rectifying interference and other issues, our industry gurus think the future certainly holds some amazing possibilities.

With ever more services being squeezed onto VSATs, one thing that must change is the way satellites are accessed.

"We highly believe this will change significantly over the next decade, moving to much simpler, fully automated methods," says Sanchez, reiterating that connectivity to satellite must become simpler, akin to a mobile phone accessing a GSM signal.

Coleman of the Satellite Interference Reduction Group thinks that everything from satellite access to IP routing is simply going to be complex.

"To manage our future of fully connected devices will require new advances in technology not seen in our industry so far. We in IRG believe that the use of artificial intelligence and machine learning techniques within network management

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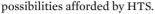
- in the shape of tools, smart routers, switching, scheduling using real-life customer demand statistics - will be the true way forward if we are to successfully manage this super network."

For Bond, the next decade looks exciting, but without challenges. He thinks there will be a great deal of change for the satellite industry, driven primarily by both GEO and LEO HTS.

"For one thing, we believe the demand for services will increase as the consumer demand for constant connection and higher throughputs increases. This will fuel the need for more bandwidth and for the efficiencies afforded by HTS. This in turn will create a

number of challenges for the VSAT sector, which will be handling even more services, but with even less tolerance for errors. This will drive requirements for existing and new products with high resilience and reliability, which will be able to handle future requirements satellite communications," he says.

Finney is of the opinion that companies like Isotropic Systems will bridge the gap between supply and demand to enable a new wave of satellite business opportunities at any orbit or frequency in consumer and enterprise broadband-centric systems. He believes their antennas will finally allow operators to maximise the enormous



Murray sees greater use of multiple connection methods in one device, with satellite just one of them.

"Smaller, more power-efficient terminals with more built inintelligence. There is also a shift from the traditional GEO orbits towards LEO constellations, with as many as 6,000 LEO satellites being launched in the next ten years. Also, one of the most expensive parts of the business, the launchers, shall see more competition from private enterprises and countries like India and China helping drive down the cost to launch." he concludes.

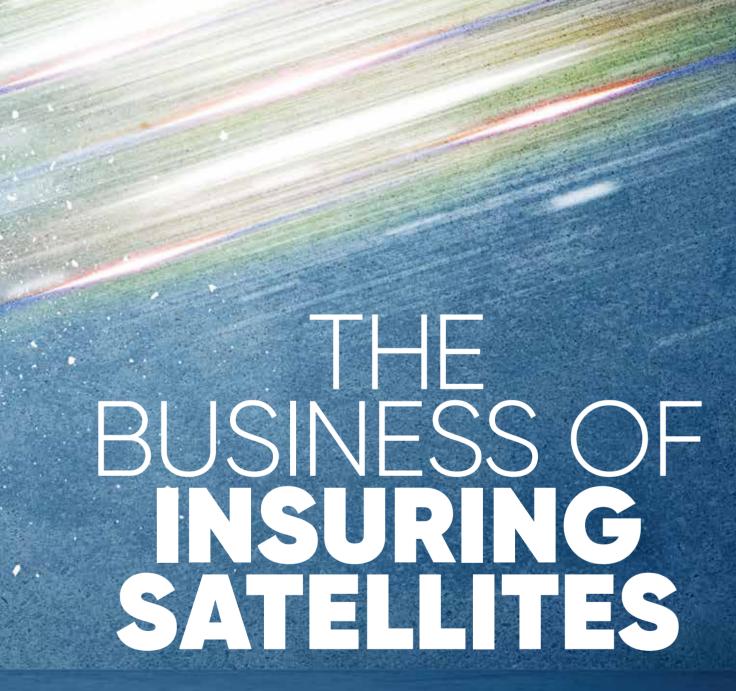
The crew and passengers on these platforms need to access the internet for various data-driven applications. These include Wi-Fi. entertainment. social media. equipment tracking and monitoring, AIS systems, weather reports, onboard sales and services"

John Finney, Founder, Isotropic Systems



INTERVIEW





Laurent Lemaire, Chairman and CEO of elseco, a space risk management and insurance underwriting specialist, speaks exclusively with *SatellitePro ME* about the space insurance segment and how it is changing with the emergence of new types of satellites and launch vehicles



How are satellites insured, and do they have to be insured at each stage?

Satellites are insured from cradle to grave. They are insured throughout their construction and up to launch by the manufacturer. At launch, risk of loss typically passes to the operator, and they then take over insuring their satellite for the launch, for the operating years in orbit and sometimes also for a deorbit. Launch insurance covers the satellite against the launch failing or leaving the satellite on the wrong orbit, whereas in-orbit insurance covers any failures on the satellite itself caused by workmanship or poor design, but also by space debris or collision.

What are the major sectors that insure satellites?

The two main types of satellite operator that correspond to the majority of premium income are telecommunication and Earth imaging companies, with smaller operators in surveillance, space science and exploration, manned spaceflight and navigation. Communication operators can provide broadcasting services for TV and radio, as well as telephone and broadband services. Earth imaging operators will provide images used for cartography, civil engineering, agriculture and others. The operators are technology companies, often with a global presence, such as Intelsat, Dish network, Echostar, YahSat, Digitalglobe, Arabsat, Spotimage, SkyPerfect and more. The recent advance of smaller satellites and launchers has also seen a growth in possible missions and applications, and many new and smaller operators are entering the sector.

How much does it cost to insure a satellite?

Launch insurance covers the satellite against the launch failing or leaving the satellite on the wrong orbit, whereas in-orbit insurance covers any failures on the satellite itself"

Laurent Lemaire, Chairman & CEO, elseco

How does this change depending on the type?

Insurers charge a premium rate which is applied to the sum insured. The sum insured is normally a function of the replacement cost of the satellite, i.e. the cost to procure a new satellite and to launch it. Some operators will also insure the revenue they would lose during the approximate three-year period it would take to rebuild and relaunch the satellite. The sum insured therefore varies substantially from satellite to satellite, depending on the satellite cost itself, as well as the launcher cost and whether any revenues are insured. Finally, the premium rate varies depending on the insurer's view of the satellite type, the specific satellite application and the launcher used. Launch insurance can therefore cost \$5 million to \$20 million, with annual in-orbit policies costing \$500,000-\$1.5 million. The global space market premium income for 2017 is estimated in the region of \$650 million.

Are these costs rising with launch failures?

Costs mentioned above are influenced not just by launch failures but also by satellite failures. Failures within the space

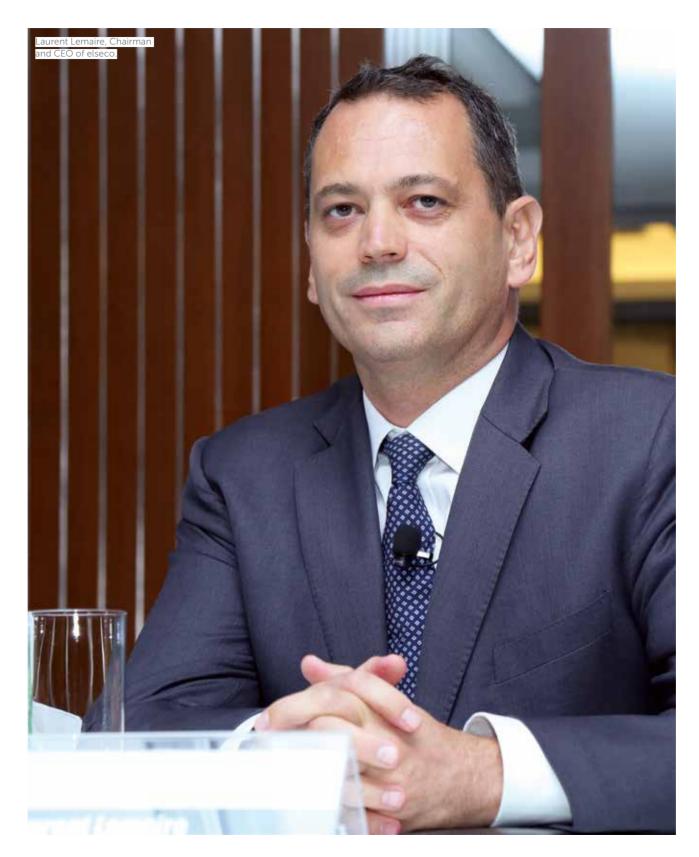
market in general can influence all insurance costs depending on their impact on market results; failure of a specified technology will increase the cost of insuring a similar technology thereafter. This increase in cost will mainly be influenced by the extent of the failure, the ability to identify the root cause of such failure and implement measures to avoid its occurrence in the future, the transparency of the manufacturer and/or insurance buyer with the insurance community on such failure, as well as the level of recurrence of failures on a similar technology.

Does the launcher also require to be insured, and up to what point?

The launch vehicle is generally seen as disposable and is therefore not insured. However, one current launcher and several upcoming projects use various degrees of reusability, e.g. a reusable first stage has a commercial and therefore insurable value to the launch operator. Insurance is available to cover this risk not iust during the launch itself, but also during the return to the launch pad. Furthermore, during the launch a failure could cause damage to third-party property; obtaining insurance against this is generally a prerequisite for the launch operator to obtain a licence to launch.

Does the cost of insurance go down as the satellite's remaining life time reduces?

As long as there are no significant events on the satellite, most insurers would see the satellite to be the same level of risk throughout its design lifetime once it has successfully passed its in-orbit testing. Sometimes satellites suffer failures of on-board equipment which may use up



available margins or redundancies
– in this case, insurers may seek
to increase the premium rate or
to reduce the cover. Sometimes,
satellites are operated beyond
their nominal lifetime; this
also normally requires a higher
premium rate to be applied.

Are there any challenges? How are they being overcome?

The challenge to the insurers is to rate the risks correctly to ensure that over time, the premium they receive covers the losses they pay. Since there are relatively few insured satellites and losses and every satellite tends to be unique, it is difficult to use traditional statistical techniques. Technical experts working with the insurers will therefore carefully review the design of every satellite and its launcher before they will agree to insure it.

Another challenge arises when a satellite suffers losses in orbit. Most of these are innocuous, The challenge to the insurers is to rate the risks correctly to ensure that over time, the premium they receive covers the losses they pay"

Laurent Lemaire, Chairman & CEO, elseco

but some may be a precursor to further losses or may leave the satellite with reduced margins or workaround capabilities in terms of future losses. The insurers need to assess how this should impact the cover, the rate, or whether they want to continue to insure the satellite at all.

How is the industry evolving?

The traditional space insurance market has experienced gradual rate reductions for over a decade, with pressure on the rating environment justified by a general reduction in losses. In parallel, a minor revolution in the space industry is taking place, caused by miniaturisation and increased capabilities of electronics. Socalled mini-, nano- and cube satellites are enabling more functionality to be built into ever shrinking satellites, which can then be launched on smaller launchers. Combining this with the ability to launch many, maybe thousands, of these satellites into constellations opens up possibilities for more missions and applications using space infrastructure. As a result, the industry is reinventing itself, forcing insurers to go outside their comfort zones.

For the last four years, space insurers have been able to manage successive challenges and have supported growing space ventures. We would expect to be able to continue to enable innovation by providing effective risk mitigation products going forward.





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Caught up with Alex Holvoet, SVP Programme Management at LeoSat, to get an idea of how a low-Earth orbit satellite constellation can help telecom companies develop their infrastructure to meet the demands of exploding data traffic, boost newly needed capabilities and develop asset portfolios and business models



It is said that Big Data is the new oil. What infrastructure do telco's need

to be able to compete?

Our world is increasingly datadriven, cloud-based and transnational, creating an ever growing demand to move large quantities of data quickly and securely around the globe. In 2015, global networks for the first time carried more than 1 zetabyte of traffic globally, and traffic is forecast to grow exponentially. We are entering the zetabyte era with big data increasingly driving the need for new infrastructure.

With these developments in mind, there is a clear focus in the telecoms sector on providing the appropriate networks needed to offer always-on connectivity and smart data analysis and management. Up to now, when mobile (telecom) operators were looking for service expansion, a satellite solution was used to complement urban terrestrial networks in semi-rural and rural locations. This allowed them to expand to previously unconnected areas. For some operators, even full out-of-country capacity is based on a satellite service.

As such, growth for mobile operators in coverage areas and services led to increasing bandwidth demand. However, this developed to a point where traditional satellites could not provide the solutions to improve a business case. Alternatives were found in microwave solutions or, in urban areas, fibre was used as a backhaul. While this certainly addressed the issue of capacity, it also introduced new obstacles, including long lead times to install, particularly an issue with customer implementations and high up-front costs.

Now, with the new developments in satellite constellations, there is



The benefits of high speed, low latency and rapid deployment are now available via satellite from LEO, providing a resilient and future-proof network to deliver connectivity and services"

Alex Holvoet, SVP Programme Management, LeoSat

a better alternative for (mobile) telecom operators in search of growth. The benefits of high speed, low latency and rapid deployment are now available via satellite from low-earth orbit (LEO), providing a resilient and future-proof network to deliver connectivity and services.

What does LEO offer in comparison to traditional satellites (GEO, MEO)?

As much as services from traditional GEO and MEO satellites have been improved, satellite systems are still often perceived in the telecoms world as a last choice for network connectivity when

terrestrial infrastructure is not available. Now a new generation of constellations are being designed for even lower orbits, such as LEO (1,200-1,500km). The lower orbit allows high throughput and latencies of below 30ms.

In addition, the newest innovation is adding intersatellite connections. They allow latencies even lower than fibre on long distances (> 6,000km). Using this architecture, which is fundamentally different from satellite's traditional 'bent-pipe' architecture, there is no need to downlink to gateways to terminate traffic. And when beyond the inter-satellite links the space is also equipped with routing and switching capabilities, then a direct point-to-point spatial MPLS network can be deployed in a very short timeframe. With these capabilities, native IP is supported in a MPLS configuration.

With these new developments, LEO constellations can provide opportunities for telecom operators which will give them access to previously unavailable levels of network performance, combined with worldwide reach.

What does a LEO system comprise, and how does it work?

LeoSat's new 'touchless' architecture is in fact an optical backbone in space. With light travelling 1.5 times faster through space than through fibre, LeoSat can provide low latency and therefore better performance than fibre over long distances. The system comprises 78 satellites that will orbit the Earth at approximately 1,400km. These satellites will be connected to each other using optical data links (laser beams) that can each carry 10Gb of data. Each satellite will have four links connecting it to the satellites in front, behind, to the left and to the right. This provides

COMMS



a fully meshed data network that covers the entire globe.

With inter-satellite connectivity via laser links, LeoSat not only provides better latency performance, it also guarantees a much better level of security by avoiding ground stations. Low latency is important for two main reasons. Firstly, it enables the higher throughput; and secondly, it allows native mode IP, which reduces processing power and the use of standard

modems/routers, saving both equipment and operational costs.

What are the new opportunities in the telecoms sector?

For telecom operators and companies with the need to upgrade and extend existing networks, LeoSat's constellation can provide instant digital infrastructure from anywhere to everywhere which is fast, secure and reliable, opening up a wide range of new opportunities.

The focus on growth for (mobile) telecom operators has initially been targeted at growing the size of the coverage areas and thus the size of the addressable market. Additionally, new services have been introduced to increase usage and revenue per subscriber. Also, incremental services have been developed in order to become a full ICT provider in the footprint. Now, one of the key drivers for maintaining the customer base and ARPU is customer experience

and expanding where possible, along with the introduction of new generations of telecom standards (4G, LTE, 5G).

Areas where LEO connectivty can enable growth include:

• Backhaul to remote locations

Satellite services have been used to support revenue development in remote areas until lower-cost alternatives such as microwave solutions for rural or semi-rural areas or fibre for urban locations became available, thus leaving satellite links only to be used for connecting very long distances or very remote areas (e.g. islands in the Pacific). With the development of HTS satellite solutions, these more remote areas will now also be able to enjoy mobile services beyond 2G. The continuously growing demand, typical for the mobile industry with its growing penetration rates of smartphones, will require mobile operators to further expand their capacity.

• Backhaul to mobile base stations

A typical network has base stations on fixed locations. Specific (large) customer requirements could be served through a local infrastructure that is (semi-) mobile (e.g. open mining sites which are moving during the course of operations). Very often the large-scale operations employ a workers community that is large enough to make a viable business case for mobile operators. While the base stations can be easily moved along, the required backhaul capacity typically can not. Using a satellite link, mobile operators can now consider moving their backhaul capacity along with the base stations as part of changing the location of the operation

• Event ready Backhaul and seasonal hotspots

In support of specific events or busy seasons when a surge in capacity

is expected, mobile operators have used cell on wheels (COWs) to cover for this. For concerts, sports events, etc, the customer expects the same quality of service as he normally receives, arguably even more, given that more online interaction with social media is to be expected during such events. These high expectations can be met using a satellite link that can backhaul large amounts of traffic. On top of that, these satellite services can be deployed rapidly, totally fitting the nature of these events. As with the COWs, the capacity can be mobilised to support existing hotspot locations in times where no events are on the calendar.

Service Hubs

Service hubs is another area where a satellite solution with low latency and high throughput could be considered. Mobile operators that operate in different markets have most likely centralised specific services – for example, provisioning certain services or price plans and real-time charging. Using the very low latency offered by LeoSat, the location of the service centre can be completely flexible. Centralising for rapid deployment is one aspect. Redundancy and fast recovery when something goes wrong in one specific location is another. This can be achieved by having two service centres operating as fully redundant operations.

For operations that currently have multiple hubs, there is an opportunity to create additional redundancy for existing services and/or create a platform for rapid deployment into new markets of new services in a test market. These flexible opportunities to create service centres wherever is best for the operator to support its business are first steps towards software-defined networking.

• Business customers /

enterprise backhaul

Telecom operators who offer ICT services to larger business customers have also used mobile networks to provide data access services in specific verticals. To grow the service revenue from this developing business segment, more high throughput services cannot be provided via existing 3G/4G networks, as this leads to service degradation, mostly felt by consumers at the business locations. Operators are finding alternatives in local point to (multi-) point wireless solutions.

• Edge caching support in semi-rural areas

Caching is key to optimise both trunking and backhaul capacity. Growing into LTE and later towards 5G in dense areas, caching even closer to the customer will be required to meet the quality of service expected by the customer. This will bring new bandwidth challenges and as such opportunities for LEO satellites to create specific hotspots with flexible, high-quality backhaul characteristics.

What does the future hold?

Looking at the different solutions currently deployed by mobile operators and the expected developments in the telecoms industry via LTE to 5G, a low-Earth orbit satellite solution will become a must for those situations where high throughput, low latency, operatorgrade security and mobility is expected, especially in combination with rapid deployment.

LeoSat is expanding the traditional satellite market for telecoms by filling the space between satellite and fibre, and in doing so is providing the mobile operator with a sustainable growth path towards a future with high bandwidth demand and flexible 4G and 5G technologies.





The Shift from Passenger Wi-Fi to the Connected Aircraft

To say that passenger expectations for in-flight connectivity have increased would be an understatement. No longer content with cheap, wired headphones, today's passengers consider inflight connectivity a must-have, and it increasingly guides their decision on what airline to fly.

According to the 2016 SITA Airline IT Trends Survey, 97 percent of passengers now carry Internet-capable devices while traveling. And, as many as one in four of these tech-savvy customers choose to fly with one airline over another simply based on Wi-Fi availability.

Yet, uptake has been slow for paid service and there are several contributing factors. Data rates in the sky don't match rates on the ground. Many passengers believe that Internet service is a basic right and should also be offered for free – just like in hotels and cafes.

This situation has airlines looking for ways to secure business value from their networks – rethinking the financial formula for in-flight connectivity.

Today, airlines are also moving beyond an exclusive focus on the customer entertainment, connecting the entire aircraft to enable digital applications and connect to operations on the ground.

"Fully connected" now means cockpits with electronic flight bags to improve aircraft operations. It means increasing communication between the crew, cockpit, and ground maintenance teams to allow for better predictive aircraft management and repairs.

It means equipping cabin crews with the latest mobile technology to improve customer care, increase

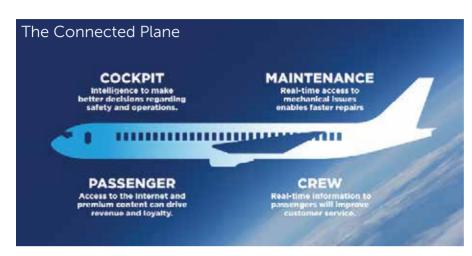
on-board credit card transactions. and offer real-time authentication to help reduce fraud, all of which lead to increased revenue. And of course, it means high-speed connectivity and premium content to satisfy passenger demands. The new vision of the "connected aircraft" presents an even greater network challenge for airlines. It equates to managing a global wireless network in the sky that serves a much broader suite of applications and endusers, all of which are vying for contested bandwidth. Now is the time for airlines to begin implementing new innovation.

Creating the Business Case for In-Flight Connectivity

When evaluating the proper communications solution, airlines need to consider their long-term plans for a broad range of applications across their fleet and service territory. Passenger Connectivity The growth of smart phones and tablet devices are creating an environment where many passengers want to use their own technology to stay connected for either work or social reasons. This includes streaming video, voice connectivity and online activities, such as email and social media.

Crew Solutions With connectivity onboard, airline crew can take customer service to new heights. They can enhance the experience by knowing the travel history and details of particular passengers or let passengers select meal preferences electronically. They can better check on the status of connecting flights or checked baggage before landing and provide hotel bookings if passengers experience travel delays.

Flight Operations Cockpit
Services Electronic Flight Bag
(EFB) systems provide pilots with
a suite of applications designed
to provide greater insight into the
performance of their flight. When
connected, EFB systems can better
provide real-time information,
including dynamic charts, weather
updates and navigation tools that
provide better insight and improve
situational awareness for the pilot.



pilot to share operational details about the plane with aircraft support personnel and technicians on the ground. Data tracking enable airlines to make decisions in real time to improve aircraft operations and reduce operating costs.

Maintenance Applications With in-flight connectivity, sensors on aircraft can monitor aircraft health through engine management, or critical system functionality, along with measuring other parameters like speed, altitude and fuel consumption. These systems can alert ground crew of maintenance issues prior to landing. This will help ensure that maintenance can be addressed as soon as the plane reaches the

Leverage High-Speed Capacity

The most critical challenge today is the need for higher throughput connectivity to the plane. The emerging solution is High Throughput Satellites (HTS) which delivers increased data rates to passengers and lowers the airlines cost per bit.

NSR predicts that HTS and Kuband VSAT networks will overtake Air-to-Ground (ATG) systems as the dominant mode of in-flight connectivity. ATG will decrease from a 73 percent market share in 2014 to 35 percent in 2024. HTS will rise from 3 percent to 33 percent market share in the same period. By 2025, NSR estimates 18,000 aircraft will be powered by HTS, adding up to \$2.8 billion in potential revenue.

These capabilities also enable a gate, for quick turnaround. Ensuring Quality of Service ENABLE MULTI-TIERED CLASSES OF SERVICE PLAN 1 ONE OARD SERVICES ONE OARD SERVICES

Improve Service Levels

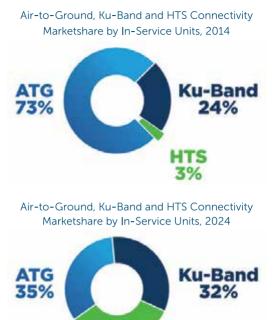
Speed, by itself, is only part of the equation. Combining HTS with mobility applications presents a major challenge when it comes to managing complex Service Level Agreements (SLAs). The increased capacity available through HTS can mean very little unless you can increase the quality of the end-user experience.

It is becoming increasingly difficult to manage bandwidth across a contended network that spans multiple beams, aircraft and MARCH 2018 satelliteprome.com WHITEPAPER

end users. At any given moment, there are thousands of aircraft operating around the globe, with each one needing to connect to various bandwidth levels over the course of their journey. Even with faster modem speeds, bottlenecks can occur if network traffic is not prioritised correctly.

Those operating aero VSAT networks need to expand their thinking from what data rate is being delivered on an individual airplane to how do they source, integrate and manage a global pool of bandwidth. They need a global bandwidth and network management system that allows them to pool satellite capacity across numerous spot beams and create group service plans that can automatically allocate resources as they are needed.

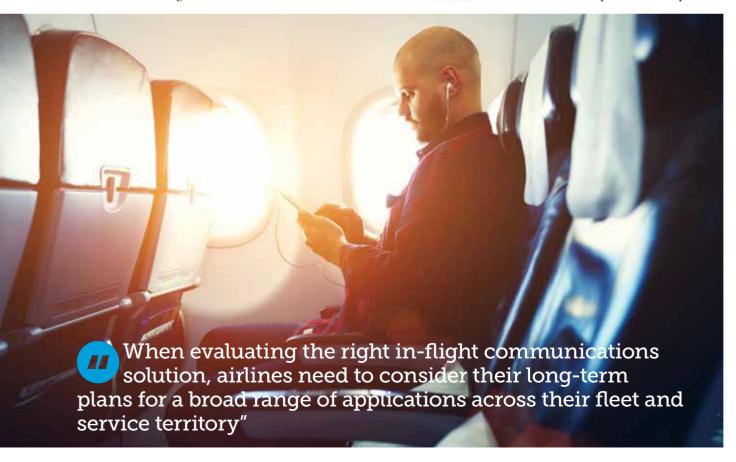
Airlines can manage the use of



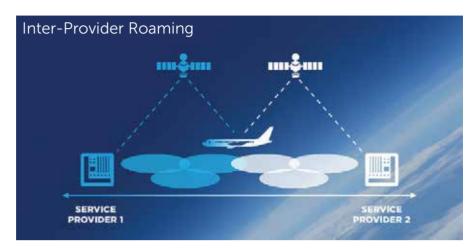
bandwidth across an airline's entire fleet to prioritise service levels based on multiple criteria, including bandwidth profiles for individual aircraft or even specific onboard applications. Without such a measure in place, an airline operator or service provider may need to over-allocate dedicated bandwidth to each application to ensure an acceptable quality of service.

High-Speed Beam Switching

Another key requirement to providing the optimal customer experience is automatic beam selection and fastbeam switching. To ensure seamless connectivity, an aircraft must now be able to automatically switch between satellite beams as it moves from one geographic footprint to the next with no manual intervention across multiple satellite footprints



Source: NSR



in a high-speed environment. Internet sessions should not be interrupted as the plane moves through several beams on a flight.

Adopt Multi-Provider Roaming

Regional service providers catering to airlines will need to adopt roaming to expand service reach outside of their core networks. Mobile operators have mature architectures that enable a customer to roam from a home network to a guest network while maintaining home service plans.

The satellite industry is developing similar capabilities whereby a satellite service provider may partner with other service providers to enable their mobility terminal to roam between autonomous networks.

Service providers adopting these business and technical models will maximise capital and operational resources. The roaming technology itself can evolve into multiple forms – roaming from a service provider's regional coverage to another, or roaming from a GEO constellation into a LEO/MEO constellation.

Bringing Smarter Technology Onboard

A major area of improvement for in-flight connectivity encompasses onboard satellite equipment. From antennas, to onboard computers to remotes, technology is now more powerful and efficient, resulting in improved bandwidth utilisation and reduced weight penalties.

New innovations also allow for significant reduction, of traditional upgrade-related downtime, such as installation and maintenance.

Flat-Panel Antennas

Advancement in aeronautical flat-panel antennas can increase network speeds and reduced airline operation costs. The result is antennas that are smaller, thinner and more aerodynamic, combined with greater bandwidth capacity. These antenna's electronic steering capabilities also represent a significant advancement over traditional mechanical methods to

ensure constant satellite connection.

Powerful Software-Defined Modems

Swapping out onboard equipment is a considerable logistical and regulatory challenge. It can take several years for a regulatory body to approve new hardware to be installed inside an airplane, even longer if it requires installation of new antennas or anything mounted to the frame structure of the airplane.

Today, airlines can adopt a remote solution that's engineered with a high degree of flexibility to adapt to changing requirements while only paying for the capabilities that they really need at any given time. Through software-defined and reprogrammable remote architectures, this next-generation of remotes can be continually upgraded over-the-air to increase network capabilities and throughput levels, while dramatically extending the deployment life in the air.

This software-defined architecture also allows to incorporate support for other waveforms in the future whether for working more efficiently on different GEO HTS satellites or different orbits such as MEO and LEO altogether.

Source: iDirect http://www.idirect.net





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THE TELEPORT OPPORTUNITY

Alvaro Sanchez, Sales and Marketing Director, Integrasys, speaks exclusively to *SatellitePro ME* about the evolution of teleports and the opportunities it brings

In January 2018, the World Teleport Association published its Teleport Opportunity Report. It is clear that the satellite industry is being disrupted right now, perhaps more than it has ever been. For teleport operators, the new models of connectivity, coupled with the media and data revolutions, are presenting significant challenges but also a number of opportunities, and we strongly believe that teleports will be more relevant than ever before.

Evolution of Teleports

Teleport operators have innovated over the years, but this has been a slow and steady evolution matching market trends. Now they are suddenly facing fast-paced change driven by a number of external developments and pressures.

First, they are faced with new models of connectivity, including high-throughput satellite (HTS) and the new and upcoming MEO and LEO constellations, which bring a whole new set of challenges.

For example, in the HTS environment if a single remote is wrong, a beam can be degraded or down for a significant amount of time. This has a knockon effect for customers expecting continual service, and a huge economic impact for both the service provider and satellite operator. However, HTS also brings many advantages, enabling cost-efficient reach into otherwise unconnected areas. Unsurprisingly, the



industry has already invested a great deal into HTS developments. It is clear from the report that HTS will continue in the coming months and years.

We will also see a great deal of innovation, with LEO and MEO constellations launching. Of course, a much faster orbit means challenges ensuring continual connection, minimum downtime and a huge range of smart applications. The sheer number of satellites in orbit will present its own hurdles for operators. At the same time, these will provide massively increased connectivity speeds, matching an affordable pricing structure thanks to flat panel antennas. HTS has already greatly increased connectivity speed; with LEO, this is set to increase further still and reduce latency even more than MEO.

A World of Opportunity

Despite the challenges, these new technologies are opening up a world of opportunity for teleport operators and the satellite industry in general. It is clear from the WTA survey that teleport operators expect growth over the coming years, mainly fuelled by a growing consumer appetite for OTT video, the IoT and cloud services.

These same applications are causing uncertainty for teleport operators. Consumers don't have the patience for downtime or failed connections; they expect the content they want instantly. Take IoT, for example. As we move into connected cars, consumers will simply expect that connection to always work, on the move, and simply won't tolerate any lack of connection or maintenance. Satellite is perfectly poised to overcome those challenges and provide a connection in this environment. The connected car is just one example which will have to be solved using satellite technology. Other IoT applications will benefit from the huge capacity satellite offers.

As with all opportunities, teleport operators are facing growing competition from other providers and new entrants to the market. This adds even more pressure to respond to market demand for instant and continuous connections. This means the need to invest in the right technology and embrace innovation.

The Future is Bright

Despite challenges, teleport operators are clearly responding and adapting to a new world of satellite. Over the coming months, I expect to see them embracing these advances, finding new ways to automate and improve efficiency, and ultimately growing.



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