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Industry Trends, News Analysis, Market Intelligence and Opportunities

Asian Satellite Market Highlight 5G, AI, IoT

by Peter Galace and Virgil Labrador

ConnecTechAsia 2019, which concluded on June 20 in Singapore, continued to live up to expectations of priming Asia for the digital future with over three exciting days of networking and discussions on the latest innovations and trends in 5G, AI, IoT, Smart Cities, and Future of Connectivity.

ConnecTechAsia 2019 was held during a frenzied week of various satellite-related events such as the Satellite Industry Forum organized by the Asian Video Industry Asscoiation (AVIA)-formerly known as CASBAA, held the day before ConnectTech Asia on June 17. ConnecTechAsia, comprising BroadcastAsia, CommunicAsia and NXTAsia drew 38,000 attendees and 1,700 exhibitors over two venues.

The event unfolded over three exciting days of networking, announcements, thought leadership keynotes and discussions, showcases on the latest innovations and trends including 5G, AI, IoT, Smart Cities, next-generation broadcasting and more.

5G emerged as the show stealer. At ConnecTechAsia Showcases and discussions around 5G throughout the event shone the spotlight on how the technology will create value and deliver benefits to businesses and societies, and how 5G will accelerate the adoption of emerging technologies as Asia's digital future beckons.

KT, formerly known as Korea Telecom, launched the world's

Continued on page 4

What's Inside

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EDITORIAL

Staying on Top of Developments

Every one needs a break. Traditionally the summer months in the Northern Hemisphere is a time to look back, reflect and recharge for the rest of the year and beyond. Our team of editors and correspondents globally will give you valuable insights on market trends and developments to guide you through the challenges ahead.

For this issue, I teamed up with of Asia-based associate editor Peter Galace in covering the ConnecTech Asia and AVIA Satellite Forum in Singapore last month. We also provide coverage on the Satellite show in Washington, D.C. last May by Elisabeth Tweedie as well as the Luxembourg Space Forum by our Europe-based correspondent Omkar Nikam. Our editors and correspondents are spread out all over the world to give you a comprehensive view of the industry. All of them are not just professional writers but have extensive work experience in the industry. So, they understand the market and challenges that it faces from your perspective.

Enjoy this issue and the coming ones where we will continue to provide you with coverage on all the key events and developments in the industry globally.

Virgil Labrador

Virgil Labrador
Editor-in-Chief

Satellite Executive BRIEFING
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EDITORIAL

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Asian Satellite Market

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first nationwide commercial 5G wireless network in South Korea in April. Following the launch, the company showcase included an AI Hotel Zone demonstrating an AI-assisted hotel room, controlled by KT's AI service platform – GiGA Genie – and a 5G-powered AI robot cafe 'beat2E', with a smart robot barista that autonomously provides 47 tailored drinks.

In addition, KT's SKYSHIP Zone demonstrated how 5G can enable drones and robots to carry out search and rescue operations, enhancing disaster relief efforts. It also featured KT's 5G journey at its 5G history zone, and allowed visitors to experience and understand history, in Augmented Reality, that showed how the company has been able to break new barriers throughout Korea's technological journey.

"In the new 5G era, KT will transform from the largest national network operator into the world's leading global intelligence platform by collaborating with innovative partners around the globe," beamed Yoon Jong-Jin, KT's senior executive vice president.

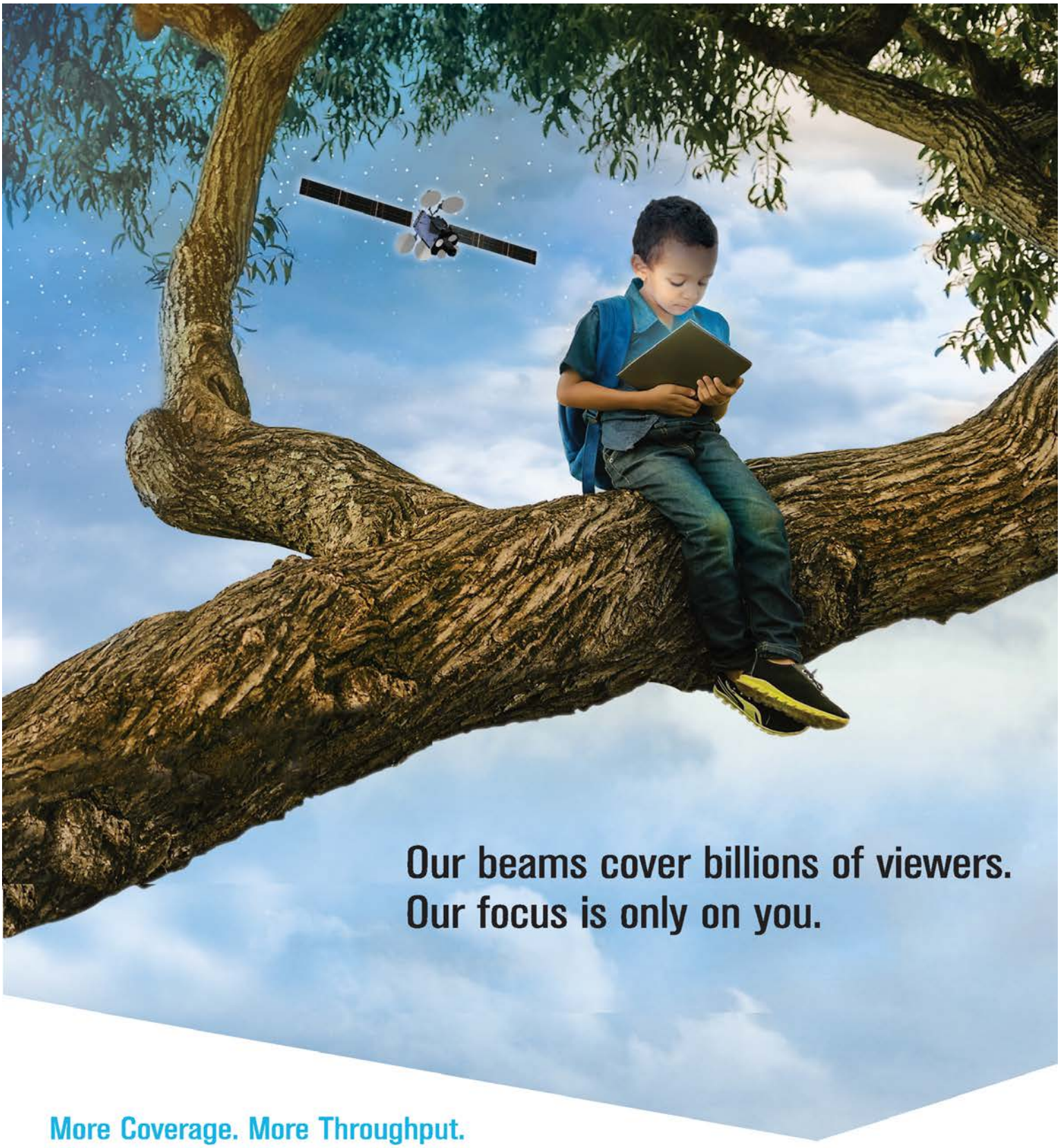
At the ConnecTechAsia Summit, Seizo Onoe, president of DOCOMO Technology and chief technology architect, delivered the 5G keynote highlighting the possibilities unlocked by 5G in a digitalized space, and why cross-industry collaboration will be key to 5G's success.

The CXO Roundtable on 5G that followed, brought together key executives from Bridge Alliance, Facebook, Huawei, VMware, among others as they discussed ongoing 5G projects, used cases and lessons learnt from 3G/4G in shaping the development of 5G globally.

The Asia Pacific Satellite Communications Council (APSCC) organized a conference on the exhibition floor of ConnecTechAsia 2019. Pictured here is the session on "How to Make Old Space and New Space Synergy" moderated by Blaine Curcio and featured panelists including Samathorn Sam Teankingkaeo, CTO, muSpace; Yasunori Yamazaki, CBO, Axelspace; Richard Lim, Sr. Sector Development Manager, Inmarsat; Imran Malik, VP, Global Fixed Data, SES Networks and Melvyn Chen, Head-Business Dev., Asia-Pacific, Intelsat.

Challenges for the Asian Satellite Industry

The AVIA Satellite Industry Forum (SIF) brought together many of the most influential leaders of the industry this year to dis-



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"...Pricing is still a challenge for the industry with overcapacity and increasing pressure on costs and this therefore increases the pressing need for innovation..."

cuss critical issues including regulatory discussions at WRC19, the raging spectrum wars among satellite operators, pricing, demand & supply, and the latest in "Newspace" activities.

The need for innovation in order to stay relevant was a main point for keynote speaker, Steve Collar, CEO of SES. In his opening address, Steve said that "customers demand high quality video everywhere, anytime and on any screen. Satellite operators can play key roles in the digital era especially in integrating satellite with the Cloud and supporting applications that will create more experience and value for the customers."

Pricing is still a challenge for the industry with overcapacity and increasing pressure on costs and this therefore increases the pressing need for innovation. Mitsutoshi Akao, Group President of Global Business Group of SKY Perfect JSAT noted that the "Asia region is a very tough market, so in order to survive, we need more cost-effective satellites and that is one of the reasons we have launched a new high-throughput satellite."

The other prominent discussion at SIF centred around spectrum wars. "Spectrum should be allocated to services that make highest and best use of it", said Steve Collar. Chen Xun, EVP of APT Satellite added that a "C-band frequency war is inevitable. The industry has to fight harder to protect it especially in Asia where C-band is most viable." In the closing C-Suite panel, Lon Levin, President & CEO of GEOshare predicted that "5G and the Internet ofThings will happen faster than we are planning for. This will be a great opportunity fo satellite operators, many of which are already seeing an increase in data transmission business. To take full advantage of the future flood of 5G needs, the satellite industry must develop ground segments that facilitate the transmission of 5G such that the choice between terrestrial and satellite becomes irrelevant."

Jim Simpson, CEO of Saturn Satellite Networks, advised that "in this era of dynamic change, the satellite industry needs to evaluate what it does best – delivering large amounts of capacity into areas without substantial terrestrial infrastructure, leveraging commercial electronics and taking advantage of economics and advancements, and focusing on market needs."

Future of Connectivity Satellite Forum

Across three summit days at ConnecTech Asia, industry experts discussed how 5G will revolutionize connectivity, the issues that hinder deployment, debunk myths and promises, commercialization opportunities, and the ways consumers and businesses are set to evolve in a hyperconnected future.

Analyzing the satellite communications industry, Christopher Baugh, president of Norther Sky Research, said the four biggest satellite operators (SES, Intelsat, Eutelsat and Telesat) reported a combined 1.3% negative growth from 2013–2018 while the five biggest satellite service providers posted a 14.5% positive revenue growth. However, in 2018, the biggest 4 satellite operators posted an average of 74.8% EBITDA growth. Baugh observed a changing satcom dynamics of managing demand, supply, and pricing to reach an equilibrium. NSR also observed that Enterprise Data, Broadband Access, Commercial Mobility and Government/Military are driving the supply of satellite capacity in space, which is estimated to generate $14 billion in new revenues. NSR estimates global satellite capacity at 3.3Tbps today, from 360Gbps in 2005, to 19.1 Tbps in 2024, to 48Tbps in 2028. NSR is also observing considerable price reductions by 29% of video pricing and 52% of HTS pricing from 2017–2020.

Baugh said that in 2013, there were 148 emerging space companies with cumulative investment of US$2 billion. By 2018, new space companies numbered 362 with cumulative investment of US$14.6 billion. He said large constellations are entering the industry with OneWeb and SpaceX

alone enjoying a US$4.4 billion funding, although the profitability of LEO constellations remains a big question mark with non-GEO HTS revenues versus expenses hitting a revenue gap of US$6 billion from 2018-2019. Baugh concluded that there are three certainties emerging in the satellite industry as follows: supply will rise with LEOS launch, prices will fall, and demand remains uncertain because there is no clear legitimate target market.

Sunil Gupta of the Hewlett Packard Enterprise said the path to unlocking the full potential of high bandwidth, dynamic scalability and advanced security. But these would require big challenges such as — evolving standards and technology, resource pooling, distributed networks, multi-vendor stacks and infrastructure manageability. Thus, the new for software defined structure is essential.

Ali Ebadi of Measat shared some of the strategies and outcome from the World Radiocommunication Conferences (WRC) 2019, organized by the International Telecoms Union. He said two significant trends are driving fuel massive connectivity devices. Thus, he said, there is a need for choices of different bands or range of spectrum to be made available to address every region needs. ConnecTechAsia, comprising BroadcastAsia, CommunicAsia and NXTAsia, wrapped up last Thursday drawing 38,000 attendees and 1,700 exhibitors over two venues.

Based on projections, Ebadi explained, by 2020, video traffic will account for around 75% of mobile data traffic and M2M/IoT connections will be more than half of the global connect-

ConnecTechAsia, comprising BroadcastAsia, CommunicAsia and NXTAsia, featured 38,000 attendees and 1,700 exhibitors over two venues--the Marina Bay Sand Expo center and Suntec.

5G remains strewn with many challenges. He said, 5G requires accelerating the transformation of current technology infrastructure that would require — ultra-low latency, high availability, the wireless industry to develop 5G as follows: 1) Increase in demand for wireless broadband services needing faster, higher capacity network and 2) Internet of Things (IoT/M2M) that ed devices and connections by 2022. This means that there will be 14.6 billion M2M/IoT connections by 2022 and that 5G devices and connections will be

over 3% of global mobile devices and connections by 2022. Out of 12.3 billion mobile devices, this 3% or 422 million of those will be 5G capable and globally, the average 5G connection will generate 21GB of traffic per month by 2022 (per device per month).

Ebadi said satellites can help to fill the gaps in ground-based networks to enable ubiquitous 5G coverage such as: 1) Trunking – satellites can link central 5G stations to small cell stations in rural communities; 2) Backhaul – satellites can also "backhaul" connections directly to local cell stations for extremely remote locations like islands; 3) Provide communication for airplanes, trains, boats and other vehicles in places beyond the reach of terrestrial networks.

He said that while latency is the major disadvantage of satellites over 5G, not all applications are latency sensitive. Thus satellites can play a role in application that is not latency sensitive like agriculture, video streaming where it can be cached and etc. He added that typical latency for GEO is around 500-700ms, MEO less than 200ms and LEO is targeted 50ms or less. Combination of these constellation can cover a lot of applications, even some latency sensitive applications, Ebadi added.

Conclusion

"This year's show has seen much more vibrance in the many networking opportunities and activities throughout the event. This includes CXO Forums, workshops, tech tours, engaging conference sessions, shared knowledge at the several stages on the showfloor and new partnerships forged among attendees who also had the opportunity to witness ground-breaking technologies that are changing Asia's future landscape. We achieved this through the new and strong support of our many knowledge partners, in particular Informa's Ovum, Light Reading, Tractica alongside Accenture, Deloitte, McKinsey and KPMG," said Ivan Ferrari, event director for ConnecTechAsia, from organiser Informa Market.

"... satellites can help to fill the gaps in ground-based networks to enable ubiquitous 5G coverage ..."

Commenting on and new exciting plans for the future of the event, Ferrari adds, "Going forward, by strengthening our partnership with key stakeholders such as the Infocomm Media Development Authority (IMDA), ConnecTechAsia2020 is set on its course to be the landmark infocomm, media and technology event in Asia. It will encompass top brands and speakers from across the globe, the latest content and technology showcases, and lively activities and networking events, aimed at delivering an ever increasing value to attendees.

Virgil Labrador is the Editor-in-Chief of Los Angeles, California-based Satellite Markets and Research which publishes a web portal on the satellite industry www.satellitemarkets. com, the monthly Satellite Executive Briefing magazine and occasional industry reports called MarketBriefs. Virgil is one of the few trade journalists who has a proven track record working in the commercial satellite industry. He worked as a senior executive for a teleport in Singapore, the Asia Broadcast Center, then-owned by the US broadcasting company CBS. He has co-authored two books on the history of satellite communications and satellite technology. He holds a Master's in Communications Management from the University of Southern California (USC). He can be reached at virgil@satellitemarkets.com

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Luxembourg Space Forum: Consolidating Global Space Cluster

by Omkar Nikam

The dynamics of the global space community are honing the focus towards developing more international cooperation, with these opening opportunities to transform various industrial sectors. Countries like Luxembourg are becoming the focal points of the global space entrepreneurs by encouraging huge amounts of investments in the space sector, punching far above their weight in this emerging industry.

Tis was highlighted by the Luxembourg Space Forum, held on 21st and 22nd May 2019, which gave a broad overview of emerging space applications, international cooperation and the role of Europe and China in the space industry. Carine Claeys, Head of the Space Task Force, Ji Wu, Chinese Academy of Sciences, and Marc Serres, CEO of Luxembourg Space Agency (LSA) were some of the highlighted speakers at the forum. With the engagement of space industry experts in various sessions, attendees received key insights into the current and future trends of the space industry.

The Luxembourg Space Forum gave a broad overview of emerging space applications, international cooperation and the role of Europe and China in the space industry.

Public-Private Partnerships in Military Satellite Communications: A European Perspective

Partnership and commercial approach are now triggering the utilization of defense satcom in Europe. GovSat is a leading public-private joint venture between SES and Luxembourg government that provides satcom resources for the European Defense Forces. Currently, GovSat's major customers are NATO (North Atlantic Treaty Organization) forces in Afghanistan and the Belgian Navy off the coast of Africa. The launch of GOVSAT-1 satellite in 2018 is an indication that Europe has strong goals to be independent in the Defense satellite communications (satcom) resources. Various delegates from SES, GovSat, and ESA

provided some insights into the challenges faced by the satellite industry in the defense domain, among them the development of strong end-to-end encryption for defense customers.

Terrestrial connectivity possesses a greater challenge to provide secure communications. The terrestrial communication is reliable when deployed in one specific location; whereas is a more effective source of communication for multiple locations especially in military operations. But satellite connectivity is flexible and reliable for using Quantum Key Distribution (QKD) for military communications. In April 2019, European Commission and European Space Agency initiated the development of pan-European quantum communication infrastructure. ESA's role in this agreement is to develop satellite quantum communication systems called SAGA (Security And cryptoGrAphic mission). And the development of quantum communication is one of the critical aspects of the European Commission's Digital Europe Programme. This gives a crystal-clear picture of the increasing public-private partnerships in Europe. Meanwhile, on 20 May 2019, NATO's Communication and Information Agency planned to release a budget of EUR 318 million in business opportunities for satellite communications and cybersecurity.

Looking at past one decade of military satcom, where the government itself was the producer, manufacturer, and consumer, there was limited scope for innovation. But now, Europe is taking military satcom to a whole new level by showcasing a trend of encouraging public-private partnerships in some of the critical areas of space applications for Defense. Indicators of the success or failure of this strategy could be, among other things, the extent to which programs such as GovSat are seen as being appealing to non-European governments.

China: Breaking the Myth

'Massive – Rapid – Progressive' is what defines the advancement of Chinese Space Industry.

China has ensured its growth in space applications on a national level through top-down programs, largely executed by state-owned enterprises (SOEs). And now it is expanding internationally with a massive investment in space infrastructure. The fireside chat session with delegates from the Chinese Academy of Sciences and Shanghai Jiao Tong University provided an in-depth view of how and what is fueling China's growth in the space sector. The Chinese government's keen interest in the development of space applications for civil, commercial, and defense purposes is the key to the country's rapid progress in the space sector. In China, commercial space companies are under the umbrella of social financing. The social financing can be described as the circulation of domestic money within the national borders. It includes direct and indirect financing via banking system, stocks and bonds on the capital market. The social financial strategy is the main tool in China for ensuring the growth of private space companies. This also brings in a new set of space applications which are more inclined towards creating social impact in the society.

"...China has ensured its growth in space applications on a national level through top-down programs, largely executed by state-owned enterprises (SOEs). And now it is expanding internationally with a massive investment in space infrastructure..."

China's presence in Africa and its support for launching satellites for many of the African nations is a critical strategy to expand its Belt and Road Initiative (BRI). On the other hand, from a global perspective, China is helping the underdeveloped and developing nations with its space resources for the development of their national economy. In January 2019, China announced its plans to fund USD 72 million for EgyptSat-2, an earth observation satellite program by Egypt. And in May 2019, China also agreed to finance USD 6 million for Ethiopia's first earth observation satellite ETRSS-1; of which the estimated cost is USD 8 million. Both Ethiopia and Egypt are advancing in space sector with the Chinese grants worth millions. All these global fi-

nancing efforts by China are building a foundation for the growth of countries that are lagging behind in their space program development. Though there are some dubious speculations about Chinese investment in foreign countries, China is currently one of the nations that are trying to reconcile the global space cluster.

Emerging Space Applications: Innovation or Indistinguishable?

According to Seraphim Capital, in 2018, venture capitalists invested USD 3.25 billion in the various space companies. The NewSpace industry is surely changing the ways of utilizing space data and implementing it for terrestrial purposes. But few questions remain unanswered, is the New Space bringing innovation? Or is it just reworking on the foundation laid by the traditional space companies?

Using earth observation data by implementing AI, machine learning, and data analytics are helping the government and private institutions to reduce the efforts in urban planning, climate change monitoring. But from a satcom standpoint, Internet of Things (IoT) is the only application that seems to yield fruitful results in the future for energy, agriculture, and food sector. While other New Space applications of satcom like providing internet from space are making the market too crowded with little or no space for innovation. The entry of Amazon in the satellite segment might fade out the companies that are providing ground segment services in the coming years. The company recently partnered with Lockheed Martin to provide ground station services for startups from almost every major part of the globe. Similarly, OneWeb, SpaceX and Blue Origin are in the race to provide global internet connectivity via Low Earth Orbit (LEO) satellites. With respect to this competitive ecosystem, these companies slightly ignoring the need of strong ground segment capabilities. As the LEO satellites need fast uplink and downlink transmissions, this ground segment ignorance might be an issue for many of the LEO satellite operators.

The New Space industry players must critically think in which specific industrial segment they can provide the most amount of space applications. It will not only help the New Space market to grow but also to evolve efficiently and sustain for a longer period.

Conclusion

The Luxembourg Space Forum brought together global space industry experts to discuss and engage with the space community. During the forum, Marc Serres, CEO of LSA announced the launch of LSA's Data Center. The aim of this Data Center is to support businesses in Luxembourg by utilizing data from European Copernicus Earth Observation programme. Luxembourg's growing status as a space hub of Europe is a unique takeaway for many emerging space nations.

On the other hand, China remains one of the key players in the global space sector. Due to the country's increasing presence in Pakistan, Ethiopia, Angola, Egypt, etc. China is set to achieve milestone in the space industry by displaying one of the largest international cooperation in the world. While the geopolitical wave is hitting the space industry from every corner, it is also leading to the loss of space assets for many nations. For example, due to the Brexit, UK is taking some of the losses on its shoulders such as the removal of Galileo Satellite Security Monitoring Centre (GSMC) from its territory; which is now relocated to Spain. Therefore, it is the need of the hour that every nation should carefully balance their national and international interests to ensure growth and sustainability of space resources.

Omkar Nikam is a correspondent of the Satellite Executive Briefing magazine based in Strasbourg, France. He also works as a Market Analyst with Orbital Gateway Consulting (OGC) Before joining OGC, he completed his Master in Space Studies from the International Space University and had over three years of experience in the Indian media and marketing industry. .He can be reached at: omkar.nikam@community.isunet.edu

OPINION

Optimum Performance is the *Only* Performance

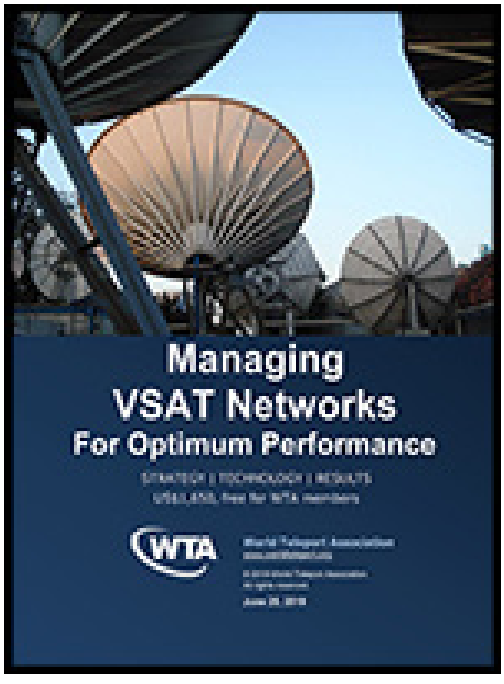
by Robert Bell

For a technology launched in the 1980s, VSATs have shown a remarkable ability to adapt and thrive. In fact, they are on a growth curve that, according to NSR, will create cumulative market revenue of $159 billion over the next decade. Maritime is forecast to lead the pack with a 16% CAGR to 75,000 VSAT-enabled vessels by 2028.

Growth is good. But it is rarely painless and nearly always comes with challenges for those trying to serve the growing market. Not least of which is trying to manage that growth while maintaining or even improving the bottom line.

That's why WTA will soon publish a new report, Managing VSAT Networks for Optimum Performance. After speaking with teleport operators, satellite operators and technology providers, we are unpacking the challenges and how service providers and technologists are meeting them.

The challenges are many. High (maybe unreasonable) customer expectations for quality of service, which demand higher levels of redundancy throughout the network. Customer demands for more for less money, which increases pressure on margins. More upstream traffic, driven by the explosion of video. And most of all, rising complexity as hundreds of terminals and applications become thousands.



Future-Proofing Your Networks

The experts we interviewed are intent on future-proofing networks to adapt to all these challenges – and do it profitably. They start with precision mapping of networks and terminals, merging that information with external maps, weather and the location of such interference sources as mobile antennas. Speaking of interference, there are great new technologies from companies like Kratos that reduce the long and tedious job of geolocation to a few mouse clicks.

Service providers are also having to accept the responsibility for end-to-end quality of service. It's a big challenge to guarantee service across multiple networks, only some of which you control. But smart operators are finding ways to do it, from investing more in redundancy to new approaches for live monitoring.

Dealing with the Data Flood

The downside of all this hard and excellent work is the flood of data it produces. One contributor

said that he is generating between five and six million data points from a single RF system covering up to 90 sites. Artificial intelligence offers the only possibility of making sense of it all, and there is a lot of progress in that area, as detailed in our recent report, Automating the Teleport.

In today's competitive market, optimum performance is the only performance that customers will accept. Look for our publication announcement of Managing VSAT Networks for Optimum Performance next week. We thank Kratos for the financial support that made the report possible. Like all WTA reports, it is free for employees of member companies and available on a paid basis to all others.

Robert Bell is Executive Director of the World Teleport Association, which represents the world's most innovative teleport operators, carriers and technology providers in 46 nations. He can be reached at rbell@worldteleport.org Managing VSAT Networks for Optimum Performance it is free for employees of member companies and available on a paid basis to all others at the WTA website at: www.worldteleport.org

SHOW REPORT

Satellite 2019

by Elisabeth Tweedie

It's hardly surprising that two topics dominated Satellite 2019 in Washington this year, were: the low earth orbit (LEO) constellations, and 5G. Topics that are constantly in the news, and are in fact related. Although many of the applications do not require it, low latency is one of the specifications of the 5G standard; therefore many operators feel that the LEO constellations are necessary for the satellite industry to be fully integrated into 5G.

As we all know there are a myriad of potential LEO systems. However only a few of these are attracting media attention: OneWeb, Telesat, LeoSat, and SpaceX. In the last week these have been joined by another big name: Amazon. In fact, there has been no announcement from Amazon itself, but its filings with the ITU have been noticed. The system, known as Project Kuiper, is described as a network of 3,236 satellites, operating in three orbital levels: 367 miles, 379 miles and 391 miles. These would provide coverage of the globe from 56 degrees north to 56 degrees south, effectively covering everywhere south of Moscow and North of Cape Horn, in other words most of the populated world.

In a session entitled "Constellations: Do the business models close?" Tom Wayne, CFO OneWeb, made light of the Amazon announcement, and of the other potential operators. "Of course, there will be competition, but we will be there first." He also stated that OneWeb would be profitable after a couple of years in operation. This confidence in first mover advantage was also reiterated by Alex Streckel, the new CEO of OneWeb: "We will have first mover advantage……our second generation of satellites will start to go up, when others will be at the first generation."

Interestingly, OneWeb, which like O3b, started with a primary target market of the unserved, in this case schools in developing nations; recently announced a change of focus; maritime is now its primary target market. Given that there are no inter-satellite links in the constellation, this may prove challenging. Alex Clavel, Managing Director of SoftBank, OneWeb's major investor, pointed out that "ROI is first and foremost, and then you will have the bandwidth for Schools." He emphasized the importance of doing good, "the human value of what we are doing is very important to us as an investor."

Both OneWEb and Telesat emphasized the need for a diversified approach to to user terminals. OneWeb stating that it had a range of terminals now in place, both flat panel and dual parabolic.

Amazon, of course is no stranger to space, it has an agreement with Lockheed Martin to Integrate its ground network and with Verge, Lockheed Martin's ground network for LEO systems. These of course include not only the "big" names that we're

all familiar with, but also the numerous cubesats already operational. According to Joseph Portale, Senior Program Manager, Lockheed Martin Space Systems, Verge will be operational over the contiguous United States by 2020, with further expansion around the globe planned. The initial network will deploy traditional parabolic antennas, but the possibility of moving to electronically steered antennas in the future is being considered. Lockheed Martin is developing its own electronically steered antenna, but according to Portale: "We haven't yet got the cost metrics right." Verge will be available to users of the LEO systems on a "pay per minute" basis. Companies using Verge, can have their satellite data directly downloaded to Verge and pushed to the AWS cloud, with the intention of providing faster access to the data, regardless of where the user is located. In addition AWS are building their own ground stations which will be integrated into the Verge Network. The current target is to build 12 by the end of the year. These will be located in the different amazon regions of which there are 16. By integrating the two networks, users will be able to request data from the satellites through their AWS account and have it downloaded to the nearest Verge ground station. In the opening session "What's the next big idea?" Shayn Hawthorne, Senior Manager and AWS Ground Station Program Lead, Amazon Web Services, security is a big issue. He emphasized the need for the same level of security for the whole value chain, that exists for a computer network. Given the number of data breaches that we continue to hear about on an almost daily basis, one has to question whether this is adequate security for a satellite network. Lisa Callahan, VP & GM Commercial and Civil Space, Lockheed Martin, echoed the need for security, looking to a future where it satellites would be so flexible that it would be possible to upload an app to change the mission after the satellite is in orbit.

5G Over Satellite

As already mentioned, many in the industry are counting on 5G to bring new business to the satellite industry – and the LEOs in particular; and an equal number are skeptical as to whether 5G over satellite is even feasible.

"...many in the industry are counting on 5G to bring new business to the satellite industry – and the LEOs in particular; and an equal number are skeptical as to whether 5G over satellite is even feasible..."

In as session entitled "Factoring 5G into the Future of Satellite Service Providers", Thomas Van den Driessche, CEO, Newtec stated that 5G over satellite was definitely possible, explaining that for the last two weeks Newtec had been conducting tests with Vodafone, using Telesat's demonstration LEO satellite, to trial running a 5G core over satellite. As part of the test, 8K streaming was demonstrated showing only 18-34 millisecond latency. This is better than the existing terrestrial systems and was achieved without optimizing the ground segment.

In the same session Georg Mayer, SA TSG Chairman, 3rd Generation Partnership Project (3GPP), talked about the need to integrate satellite into the 5G ecosystem. Mayer asked the satellite industry to get more involved with the 3GPP and to clearly indicate what was needed to fully integrate satellite into the 5G network. The European Satellite Operators Association (ESOA) joined the 3GPP 18 months ago, but Mayer stated that there was plenty of room for other players in the industry to get involved.

Following on from the recent revelation about Project Kuiper, Jeff Bezos, founder of Amazon and of Blue Origin, called a press conference scheduled to start four hours after Satellite 2019 ended. Speculation was rife that he was going to reveal more about the satellite project and its (presumably) launch company. However, he had something else to announce. Earlier in the conference Mike Pence had stated that the US would send a man to the moon by 2024. Bezos obviously took that as a personal challenge, and chose to use the press conference to announce Blue Moon, a lunar lander. Elon Musk, founder of SpaceX, has made no secret of the fact that he wants to build colonies on Mars.

Bezos took a somewhat different approach, talking about trillions living in space in colonies which will be built by future generations.

Women in the Industry

It wasn't very long ago, that ladies were a relative rarity on the stage at the satellite show. Now, although we remain a minority, seeing a lady on the stage is a common occurrence. This year, in a session entitled "Our Collective Role In Empowering Women and Cultivating Diversity in Aerospace", there were no less than eight, very successful ladies on the stage. Almost all of them are pioneers, and had to push themselves forward in order to gain a toehold in the industry. Rebecca Cowen-Hirsch, Senior VP of Government and Policy Strategy, Inmarsat Government Services, described how she resorted to leaving her first name off her resume, when she first started looking for engineering jobs. Debra Facktor, VP and General Manager Ball Aerospace said that speaking the common language of maths and science helped breakdown gender barriers. Nevertheless, in spite of the increasing numbers of women in senior management positions, the challenges are not yet over. Charity Weedon, President and Co-founder, Liquinox Consulting, pointed out that women still make 87 cents for every $1 a man male engineering.

But not all the ladies in the industry are engineers, and even if they are, when they are working in a startup, they also need to speak the language of finance. Kay Koplovitz, founder of Madison Garden Sports Network, has started a foundation to help women secure funding and "speak investor speak." 82% of the startups the foundation has helped are still in business. Depending on which source you use, typical startup success rates in the USA, vary from 25 to 50%, so either way, 82% is a very impressive figure!

Given that only 21% of women, earn engineering degrees, Celeste Ford, Founder and Chair, Stellar Solutions suggested that tackling the issue, of getting more women into aerospace, we should start at the beginning and start encouraging girls in high school. As for getting ahead once someone is in the industry simple solutions were suggested, such as not being afraid to ask for help, something that equally applies to men, although the prospect of that happening was greeted with humor during the session. Probably the most encouraging pointer to the future was the fact that the session was well attended and well over half of the attendees were men.

View a video interviews with Key industry executives at Satellite 2019:

www.satellitemarkets.com/satellite-2019

Elisabeth Tweedie has over 20 years experience at the cutting edge of new commmunications entertainment technologies. She is the founder and President of Definitive Direction (www.definitivedirection.com), a consultancy that focuses on researching and evaluating the long-term potential for new ventures, initiating their development, and identifying and developing appropriate alliances. During her 10 years at Hughes Electronics, she worked on every acquisition and new business that the company considered during her time there. She can be reached at etweedie@definitivedirection.com

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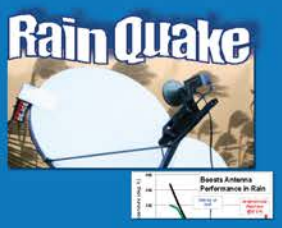

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Industry Leadership Through Innovation

by Martin Jarrold

GVF is driven by innovation on behalf of the satellite communications industry; innovation for its member organizations in particular. GVF's partner organization, SatProf, is the leader in satellite industry training. The Informa Telecoms & Tech Academy is the leading training partner to the TMT industry. Together we have developed and announced the launch of the Satellite Industry MicroMBA, and, what's more, it's available at a 20 per cent discount for GVF Members.

GVF Training courses and certifications are the established global standard for satellite communications skills, covering operation, installation and maintenance of VSAT, marine, and mobile/SNG satellite terminals, in addition to general and specialized satcom theory. Students learn, practice, and are evaluated on their knowledge and skills with online, self-paced, interactive, simulator driven training modules developed by SatProf, Inc.

The Telecoms & Tech Academy, as the leading training partner to the TMT industry, has trained more than 30,000 professionals and 500 businesses globally. The Academy was born out of the telecoms industry to elevate understanding of the challenges the sector is facing through a training portfolio which continues to evolve to address new and emerging skills gaps the telecoms & tech sector is facing.

The Satellite Industry MicroMBA is tailored for mid-to-senior managers wanting to improve their quantitative business case evaluation skills and further their understanding of the complete satellite industry business model. By evaluating topics from industry best practices to the changing digital landscape this course will help delegates identify opportunities and provide understanding on how to overcome key challenges. Following the format of the successful Telecoms MiniMBA, this two-day program provides a practical guide to best practice and a roadmap for success. The course is based on industry excellence and it will help attendees to find the right balance between technology, strategy, organization and culture and to commit to a strategic plan that meets strategic and commercial objectives.

Complete with practical exercises and real-life scenarios, the Satellite Industry MicroMBA will provide delegates with a critical understanding on the key competency areas required for success within the satellite industry

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and enable them to make more informed and commercially viable strategic decisions. Business simulation is the vehicle through which the course maximizes competency development, ensuring that ideas on strategic implementation can be tested and appraised.

The benefits of attending the program include:

- An understanding of the relationship between technical viability of a satellite network and its profitability to evaluate and build competitive businesses.
- Enhanced development of clarity and unity throughout the organization – allowing better alignment of KPIs, performance and focus with overall strategy.
- Enhanced development of new business models and identification of areas for future competitive advantage.
- Enhanced development of the knowledge to impact strategic debate and contribute actively to technology, financial, manage-

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ment and marketing decisions.

- The capability to discuss with confidence the emerging dynamics of the satellite market and wider technology ecosystem.
- Development of the skills needed to be a driver for industry best-practice.

The Approach

The Satellite Industry MicroMBA is a highly interactive two-day program, giving participants the opportunity to directly apply the lessons learned to their own organizations by combining:

- Online preparatory learning
- Teaching
- Team exercises
- Business simulation with special software tools
- Group discussion
- Workshops
- Practical application of the theory to the business

Organizational alignment, accountability, and a results orientation are stressed in each session. All interventions are hands-on working sessions designed to create not theory, but practical, business building plans and skills that will have an immediate and positive effect on participants' businesses with a tangible return on investment.

The Program Modules

The GVF Training module GVF 500: Introduction to Satellite Communications is to be completed online prior to attendees undertaking the Satellite Industry MicroMBA. GVF 500 covers: The history of satellite communications; Satellite applications; Wireless concepts; Orbits and launches; Spacecraft technology; Satellite links; Network technologies; Ground equipment for GEO/GSO satcom; Satellite Industry Structure; Horizontal markets; Regulatory issues; and, Comparing satellite with alternatives technologies.

The face-to-face aspect of the Satellite Industry MicroMBA program is co-located with the VSAT Global & Next Generation Satellite Applications conference, 16-17 September 2019, but will take place in the classroom training facilities at the InformaTech headquarters at the Blue Fin Building, 110 Southwark Street, London. At the start of the two-day session the online course will be reviewed and there will be opportunity for joint discussion and questions before the MicroMBA program.

Face-to-Face Training

Composition of the classroom training is as follows:

(1) Business Environment & Industry Outlook

Program objectives; Introduction of the business simulation; Comprehensive overview of the technology and business of satellite communications; Key elements of the satellite industry business environment; The view of shareholders, operators, vendors, service providers, and the

customer; The changing and increasingly complex interrelationships between the different players.

(2) Strategic focus on Technology

History, launchers, orbits, frequencies, networks, equipment, bandwidth, applications and industry structure; Challenges and opportunities facing the industry over the next few years; Future trends, growth markets and the technology strategies that are likely to be employed; Updates and research drawn from GVF and Ovum's vast market intelligence resources.

(3) Global Regulation & Financial Trends

Regulatory issues, frequency bands & regions; Slot allocation & coordination 'Open Skies'; Earth station licenses; Regulated performance specifications; Type approvals & homologation; Satellite operator verification & type approvals; Band sharing with fixed & mobile communications; Radiation safety regulations; Network licenses & local regulations; License fees, financial models & industry trends.

(4) Change Management & Digital Leadership

Fundamental concepts about digital leadership; The relationship between digital leadership, innovation & change management; The core competencies of effective digital leadership & how organization personnel measure up; Developing digital culture across the organization, & aligning separate departments with cross function teams to break the silo effect; How to create the conditions for innovation & digital transformation; Examples of leading successful organizational transformation & what we can learn.

The Satellite Industry MicroMBA is a highly interactive two-day program, giving participants the opportunity to directly apply the lessons learned to their own organizations

(5) Marketing & Customer Experience

Marketing principles; Marketing channels; Positioning, Segmentation & Branding; Promotion; Distribution; Wholesale; Sources of competitive advantage; Building market based sustainable competitive advantage; Customer Proposition – Building life-time customer value; Satellite links.

A Case Study

Modern satellite communications technologies enable a wide range of services and business plan choices, but at the core, every successful satcom business must reconcile service revenues against CAPEX and OPEX. To lay the groundwork for students to successfully participate in complex markets and diverse industry segments, students will start by developing a simplified but consistent business/technical business case for a hypothetical satellite Internet service provider company. Students will learn the fundamental building blocks of a satellite ISP business, including gateway stations, operations centers, connectivity, remote terminals, and space segment, and how to size them for functionality and capacity. They will then use that knowledge, together with an interactive simulator app designed specifically for the MicroMBA course, to analyze the required CAPEX and OPEX, estimate revenues, ROI, and profitability. Working in teams, students will optimize the elements of their business, draft a business plan, and present it in a "shark tank" format to the participant group.

For more information please contact me at martin.jarrold@gvf.org or Ralph Brooker, President, SatProf, Inc at ralph@satprof.com

Martin Jarrold is Vice-President of International Program Development of GVF. He can be reached at:: martin.jarrold@gvf.org.

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EXEC MOVES

Netgem Appoints New CEO and CFO

Paris, France, July 1, 2019 — Mathias Hautefort has been appointed to-day chief executive officer of Netgem, replacing Joseph Haddad, who remains chairman. This new organisation reflects the strategic priority on services related to Very High Speed Broadband Fiber.

Mathias Hautefort remains chairman of Vitis (Videofutur), a business unit of Netgem focused on these services in France.

Alain Floch is appointed chief financial officer, replacing Charles-Henri Dutray, who leaves the Group for personal reasons. Alain Floch remains financial director of Vitis (Videofutur).

Mathias Hautefort

Netgem is a pioneer of the connected home, with the invention of the Box in 1996, and the co-creation of the independent operator of services for the very high-speed and Fiber in France, under the brand VideoFutur.

Eutelsat Makes Changes to its Executive Committee

Paris, France, June 28, 2019 — Eutelsat Communications (Euronext Paris: ETL) has announced several changes to its Executive Committee, as part of a generational renewal of its management body. These changes will be effective as of 1 July this year.

Philippe Oliva, aged 46, currently executive vice-president, sales and products, succeeds Michel Azibert as chief commercial officer. In this role, he will be responsible for defining and supervising the commercial policy, as well as generating revenue for the group.

Philippe Oliva

Jean-Hubert Lenotte, aged 51, currently director of strategy and strategic Marketing, will also be taking charge of the deployment department and will be responsible for Eutelsat's satellite fleet, frequency management and resource planning. This newly revamped department will now be known as the strategy and resources department.

Michel Azibert will remain deputy chief executive officer and, in this role, will participate in all matters of importance to the Group.

Previously director of deployment, Jacques Dutronc will become director of development, coordinating group-wide business development projects.

Michel Azibert, Jacques Dutronc, Jean-Hubert Lenotte and Philippe Oliva will report to Rodolphe Belmer, group chief executive officer, alongside the other members of the executive committee: Yohann Leroy, Julie Burguburu, Antoine Mingalon and Sandrine Téran.

Tolley Joins Intelsat as EVP and CFO

McLean, Va., June 5, 2019--Intelsat, S.A. (NYSE: I) announced the appointment of David M. Tolley as Executive Vice President and Chief Financial Officer, effective June 3, 2019. Tolley will report to Intelsat's Chief Executive Officer, Stephen Spengler, and oversee Intelsat's global finance organization. He will serve on Intelsat's Management Committee and be based in the company's U.S. administrative headquarters in McLean, Virginia.

Tolley brings over 20 years of financial experience to Intelsat. He most recently served as the Chief Financial Officer of OneWeb where he led the global finance organization and served on the company's Executive Committee. Prior to OneWeb, Tolley served as a Senior Managing Director in the Private Equity Group at Blackstone where he led satellite services strategy and investing and served on the Private Equity Investment Committee. During that period, he was Chairman of the Board of Directors of NewSkies Satellites N.V. and led the public-to-private acquisition, re-IPO and ultimate divestiture of NewSkies to SES S.A. Prior to Blackstone, he was a Vice President at Morgan Stanley in the Investment Banking Division.

David Tolley

Tolley earned his bachelor's degree in economics and history from the University of Michigan and his MBA from Columbia Business School. He currently serves on the board of directors of ExteNet Systems and the Smithsonian National Air and Space Museum.

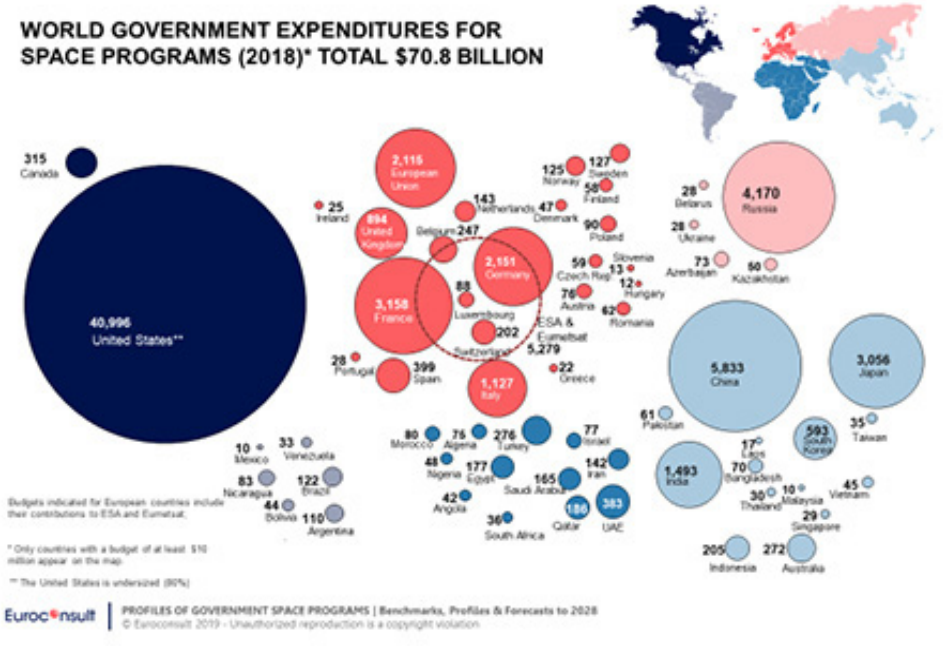
MARKET TRENDS

Euroconsult Predicts 10-Year Growth Cycle for Gov't Space Programs, to Grow to US$ 84.6-B by 2025

Paris, France, July 25, 2019 — According to Euroconsult's newly released research, Government Space Programs: Benchmarks, Profiles & Forecasts to 2028, global government space budgets are in the early stages of a ten year growth cycle with total world expenditures reaching US$ 70.9 billion in 2018, and forecasted to grow to US$ 84.6 billion by 2025.

The report, which is trusted by hundreds of organizations around the world, provides important detail on how much investment is expected by region with profiles of space programs in 86 countries. It includes analysis of seven different application areas for each country including Earth observation, satellite navigation, space science and exploration, space security, communications, launch vehicles and manned spaceflight.

"To support strategic planning initiatives, governments, companies and investors look to Euroconsult research for unbiased analysis of the markets that interest their stakeholders," said Steve Bochinger, COO of Euroconsult. "Our Government Space Programs research provides key evidence of the large and growing opportunities for leading and emerging space countries around the world with both concise summaries and in-depth focus, commented Simon Seminari, senior consultant and editor in chief of this research."



According to the research, the U.S. government continues to be the world's largest investor in space programs, with China, Russia, France and Japan following in that order. The U.S. budget for space in 2018 totaled $40.9 billion, 58 percent of the world market, down from 75 percent of the world market in the early 2000s. China solidified its second-place ranking, with an estimated $5.83 billion budget, as it looks to commercialize and internationalize its space sector. Russia's budget has decreased from its highs in 2013 and France tops European national spending and has overtaken Japan with the fourth largest government space budget in 2018.

Among other interesting findings, the research shows that growth drivers are reversing from the recent past, with defense budgets now expected to outpace civil budget expansion. The report shows that civil budgets worldwide will grow moderately at an average of 1.6 percent per year throughout the 2020s, driven largely by leading powers investing in science, exploration and manned flight. However, short-term budget growth will be fueled by defense programs in the U.S., Asia and the Middle East with an average of 4.2 percent annual increases until the mid-2020s.

Two records were broken in 2018, with more government satellites launched than ever before and more governments launching satellites. Going forward, the report estimates an average of 150 government satellites will be launched each year for the next decade.

Russian Satellite Communications Company

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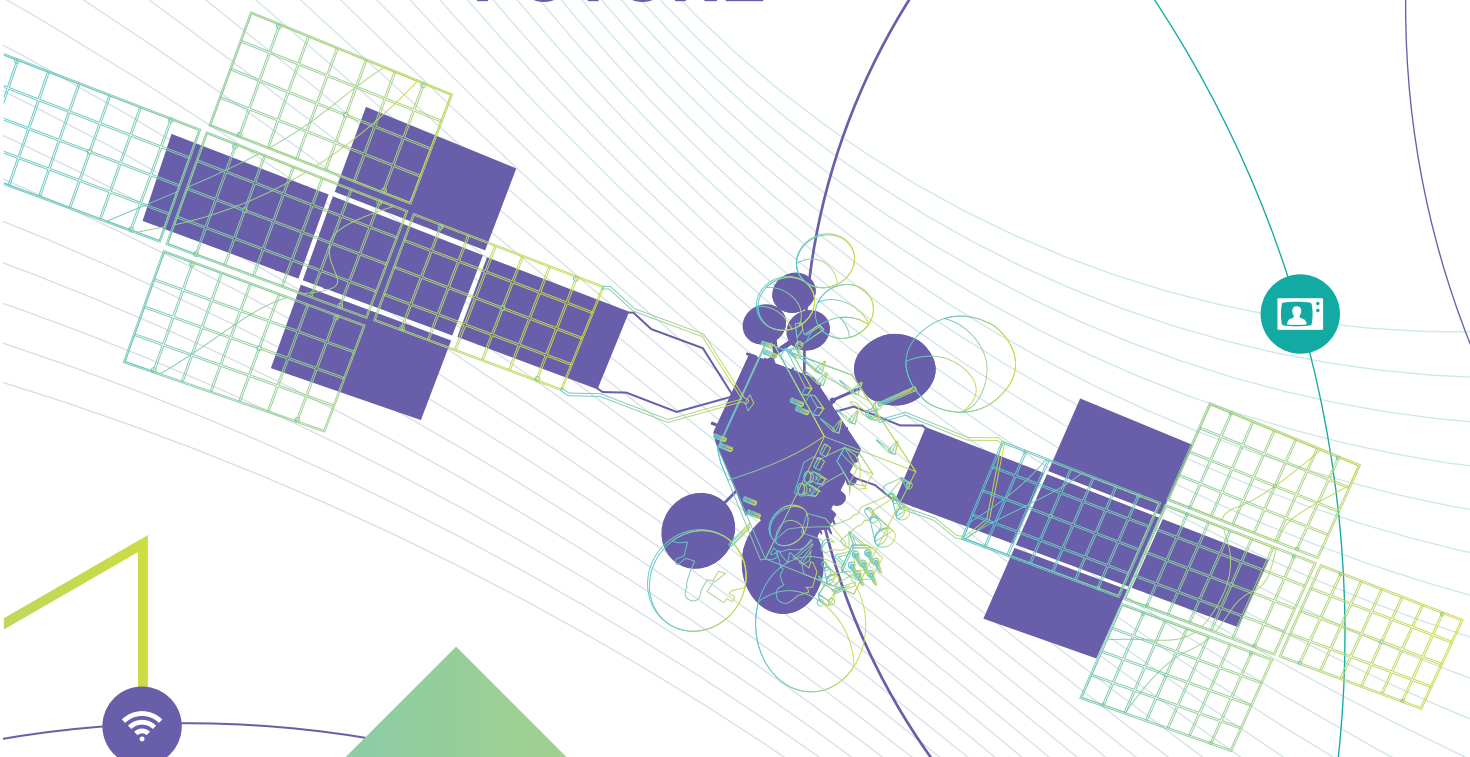

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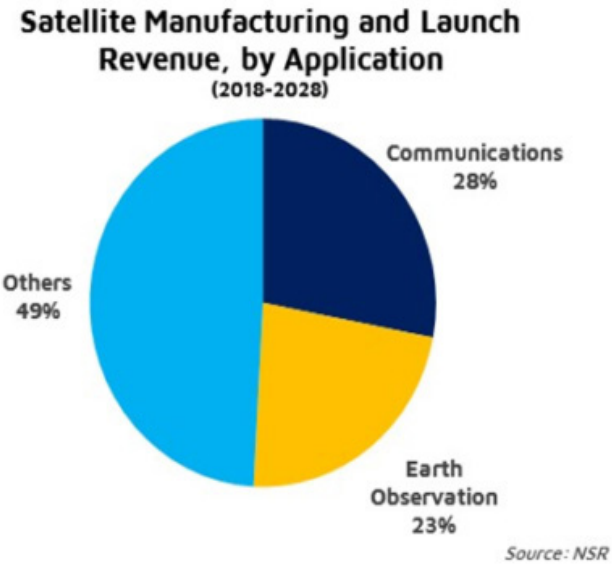
Satellite Manufacturing & Launch Services Market to Generate US$ 225 Billion in Next Decade

Cambridge, Mass., July 17, 2019 — NSR's Satellite Manufacturing and Launch Services, 9th Edition (SMLS9) report, published today forecasts a US$ 225 Billion market opportunity over the next decade, driven by Situational Awareness and Earth Observation markets.

Despite the hype created by smallsat LEO constellations, the traditional market is expected to remain the dominant source of revenue globally for building and launching satellites. While it is not likely to return to heady levels of yesterday, new opportunities are emerging that the industry can grasp if it adapts to a nimbler state of affairs.

"As the industry looks for a new normal, innovative trends are emerging," commented Shagun Sachdeva, NSR senior analyst and report co-author. "With opportunity ranging from high capacity satellites to generic, flexible and small GEO satellites, demand remains varied and specific to operators and markets. While no one size fits all, hybrid architectures with fleets of different sized assets and orbits will be a key feature of the next ten years."

With declining capacity prices seen over the past years, business case viability remains a challenge for satellite operators in this uncertain environment. And this means orders are no longer the correct market indicator. Even if the industry might see an increase in manufacturing demand, the market size will experience an overall decline as efficiency-to-cost ratio per satellite increases.



Similarly, the satellite launch market is also going through a period of transition and will experience more competition and diversity in launch options. "New launch actors are poised to enter the market, and traditional launch service providers are retiring and replacing their veteran vehicles on a global scale," noted Leena Pivovarova, NSR Analyst and report co-author. "All launch service providers are looking to address the global demand in various ways to remain flexible, innovative and stand out among their competitors." With SpaceX's high launch rates, reusability and low prices, the market is reworking internal processes to cut costs and remain competitive. This is also good news for customers, as launch prices are expected to continue declining.

Satellite manufacturing and launch revenue will decrease across the board on a unit basis, as manufacturers achieve greater efficiencies, operators opt for smaller satellites, and launch service providers compete on costs. While this will help to sustain operators' bottom line, players in both manufacturing and launch markets will struggle to keep financials healthy, resulting in consolidation, M&As and potential exits. It will be especially challenging for newer entrants, who lack the capital and resources that the established players have.

NSR is a leading global market research and consulting firm focused on the satellite and space sectors. NSR's global team, unparalleled coverage and anticipation of trends with a higher degree of confidence and precision than the competition is the cornerstone of all NSR offerings. First to market coverage and a transparent, dependable approach sets NSR apart as the key provider of critical insight to the satellite and space industries.

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The Satellite Markets 20 Index™

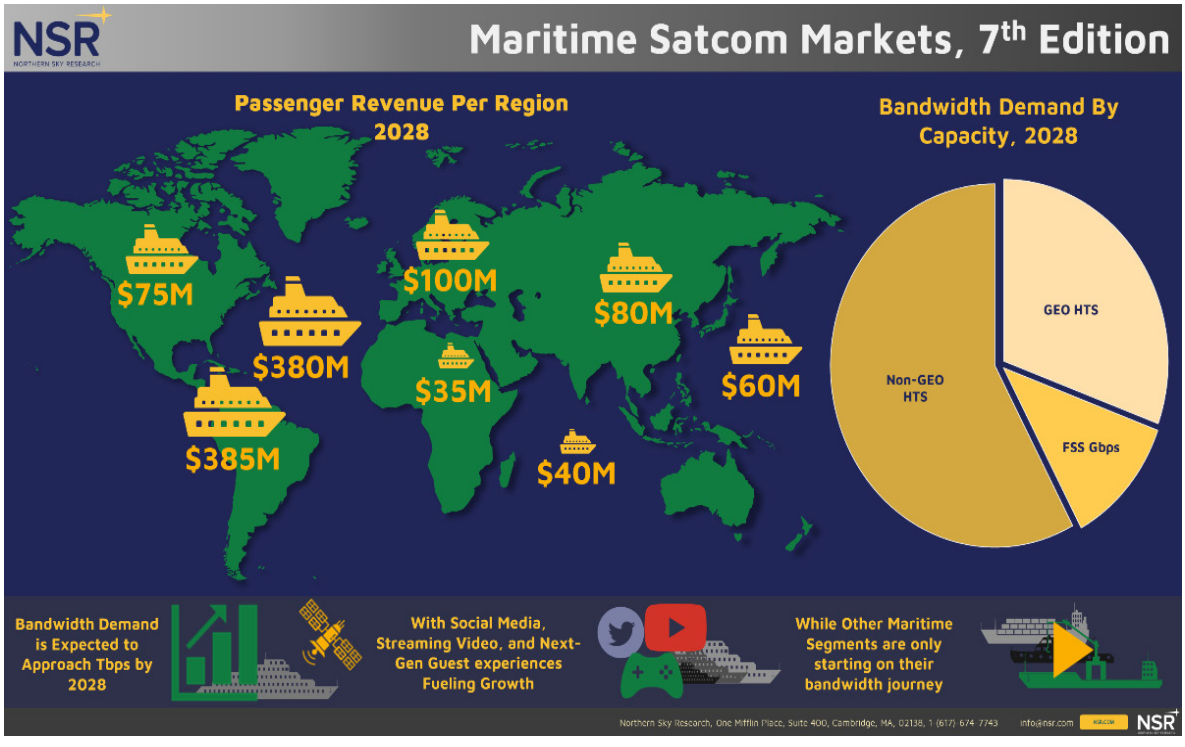
Company Name	Symbol	Price July 6, 2019	52-wk Range	
Satellite Operators				
Asia Satellite Telecommunications Holdings Li	1135.HK	9.36	4.62	9.55
Eutelsat Communications S.A.	ETL.PA	17.13	14.80	23.11
APT Satellite Holdings Limited	1045.HK	3.07	2.47	3.80
Inmarsat Plc	ISAT.L	559.40	355.00	583.80
SES S.A.	SES.F	13.79	12.52	20.81
Satellite Manufacturers				
The Boeing Company	BA	353.09	292.47	446.01
Maxar Technologies	MAXR	9.12	3.83	53.58
Lockheed Martin Corporation	LMT	369.73	241.18	370.83
OHB SE	OHB.DE	33.15	28.40	38.20
Honeywell International Inc.	HON	175.52	123.48	178.47
Equipment Manufacturers				
C-Com Satellite Systems Inc.	CMI.V	1.88	0.99	1.96
Comtech Telecommunications Corp.	CMTL	27.72	20.95	36.94
Harris Corporation	HRS	189.13	123.24	200.77
ViaSat Inc.	VSAT	82.68	55.93	97.31
Gilat Satellite Networks Ltd.	GILT	8.33	7.94	10.74
Service Providers				
DISH Network Corporation	DISH	40.73	23.22	41.39
Globalstar Inc.	GSAT	0.46	0.29	0.73
Orbcomm Inc.	ORBC	7.94	6.19	11.25
Sirius XM Holdings Inc.	SIRI	5.96	5.23	7.29
Speedcast International	SDA.AX	2.03	1.67	6.83

The Satellite Markets 20 Index™ is a composite of 20 publicly-traded satellite companies worldwide with five companies representing each major market segment of the industry: satellite operators; satellite manufacturers; equipment manufacturers; and service providers. The base data for the Satellite Markets Index is January 2, 2008 - the first day of operation for Satellite Markets and Research. The Index equals 1,000. The Satellite Markets Index™ provides an investment benchmark to gauge the overall health of the satellite industry.

INDEX	Index Value July 6, 2019
Satellite Markets 20 Index™	2,645.76
S & P 500	2,979.63

ADVERTISERS' INDEX

VITAL STATS



Service Providers				
DISH Network Corporation	DISH	40.73	23.22	41.39
Globalstar Inc.	GSAT	0.46	0.29	0.73
Orbcomm Inc.	ORBC	7.94	6.19	11.25
Sirius XM Holdings Inc.	SIRI	5.96	5.23	7.29
Speedcast International	SDA.AX	2.03	1.67	6.83

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