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SATELLITE Markets & Research

Industry Trends, News Analysis, Market Intelligence and Opportunities

China's Space Industry Has Come a Long Way

by Blaine Curcio and Tianyi Lan

April 24 is China Space Day in China, a day more or less on par with Earth Day (i.e. a sort of non-holiday formal day of observation), and one which is met with a corresponding conference and exhibition, held in unconventional cities, including Harbin (2018) and Xi'an (2017).

This year's edition of the conference was similar in this regard—with the riverside city of Changsha being an interesting choice—but was markedly larger than in year's past, with several significant conferences being held concurrently in different parts of the city. With literally multiple hundred panelists in total across dozens of panels, no number of summaries could capture the full events of China Space Day 2019. With that said, my attendance across several different forums, events, and exhibitions led to a few main takeaways.

The State Still Gets Center Stage

Having attended a number of conferences in China over the past 18 months, one of the trends across conferences is the theme of the state getting center stage. This has historically involved local governments, major State-Owned Enterprises (SOEs), or other representatives of the state as the key guests at the conference, the people getting the

Continued on page 4

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EDITORIAL

The Asia-Pacific Market

As CommunicAsia in Singapore is in June, this month's issue focuses on the Asia-Pacific region. We have two excellent articles on two of the largest markets in Asia--China and Japan. Our cover story on the Chinese space market written by Blaine Curcio details China's space ambitions while the article on Japan by Naoakira Kamiya focusing on developments in 8KTV leading up to the Tokyo Olympics next year.

We also have a comprehensive article on the In-Flight Connectivity market by Bernardo Schneiderman who will be at the Connected Aircraft summit in San Diego covering the event. We will also be at CommunicAsia and we hope to see you there. Drop by our booth at Level 1 of the Marina Bay Sands, booth # N4-09.

View video interviews with key executives from Satellite 2019 at:

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China's Space Industry

from page 1

keynote speeches, and the SOEs getting the largest booths in the exhibition hall.

In Changsha, it was no different, with varying representatives of the state getting prominent roles in the festivities. This included:

• Yang Liwei. Mr. Yang was the first Chinese person to be sent into space, when he went into orbit in 2003, and remains a hugely respected and revered figure within Chinese society (similar perhaps to John Glenn or others following their space accomplishments). Mr. Yang received an award during the opening ceremony, and was broadly lauded as a representative of the national space program, and by extension, the national government.

• Hunan Governor Xu Dazhe giving a major keynote speech during the opening ceremony, highlighting the capabilities of Hunan and the variety of companies that call the province home. Xu's prominence at the conference could be said to be an indication of the local government's influence in the conference but it is also a reflection of the unique importance of Governor Xu himself—indeed, he is noteworthy in that he is a former Chief Administrator of CASC and CNSA, as well as a major player in SASTIND—the very powerful governmental administration for state-owned enterprises. Given the relative absence of space-related companies in Changsha/Hunan, one might conclude that Xu's various aerospace roles were a factor in bringing this conference there.

"...China's space industry had clearly come a long way in terms of actual development, particularly on the commercial side..."

• The exhibit floor, whereby the largest booths, by some margin, were the state-owned companies and their subsidiaries (i.e. CASC, SAST, CALT, CAST, etc.), followed by some of the private companies that may have funding or other resources from the SOEs, followed by the purely private companies.

While there was a lot more participation from the private and commercial companies—and indeed, multiple sub-conferences focusing largely/purely on commercial space—the China Space Day conference remained, like most space conferences in China, dominated by the state in many aspects.

The city of Changsha was all decked up for China Space Day 2019.

China Has Come a Long Way

This year's Space Day was markedly different from last year's, primarily due to the fact that this year saw a UNOOSA space conference held concurrently with various other China Space Day Conferences. This led to several opportunities for China, which were exploited fairly well. First, a lot more foreigners came this year. The UNOOSA conference was at least half non-Chinese, with attendees hailing from South Asia, Southeast Asia, Sub-Saharan Africa, Europe, Latin America, and North America—that is to say, everywhere. While the international attendees primarily attended the UNOOSA event, the spillover effect involved the other conferences—those hosted by CNSA, Future Aerospace, etc.—having a more international attendance as well. China's use of soft power here was impressive, insofar

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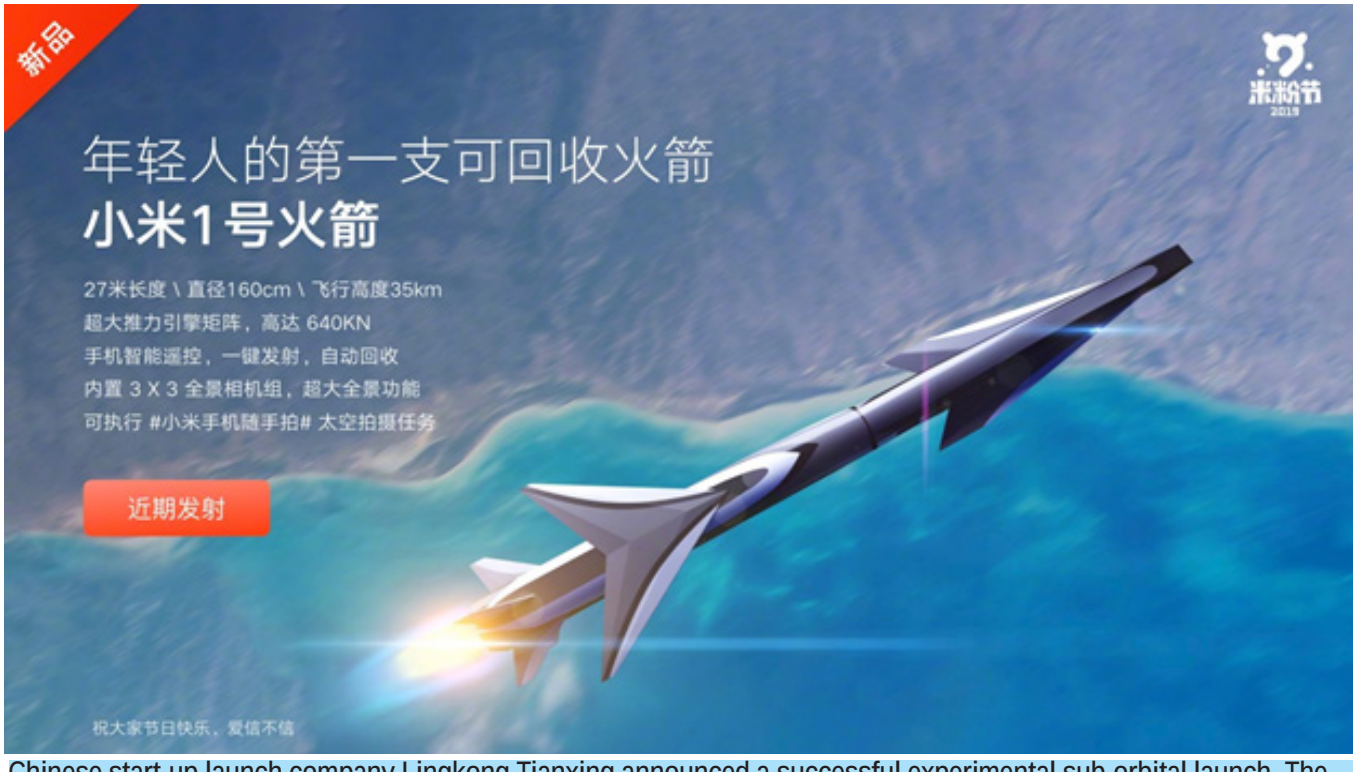
"...The conferences were an indication of China's increasing assertiveness on the global space stage, but also a sign of the increasing degree to which there is, and will be, opportunities for collaboration between China and the rest of the world..."

as the UNOOSA conference was used as a way to highlight the achievements of China's space program, in particular in its pursuit of win-win cooperation. Put another way, many of the UNOOSA speeches and panels were showcasing the various aspects of the Chinese space program in helping achieve the UN Sustainable Development Goals (SDGs), one of the main themes of the UN conference.

Separately, the marketing of the conference itself has advanced markedly over the past several years. 2019 saw a conference poster chock full of symbolism, and one that became a moderate viral hit due to the quality of its imagery. As first pointed out on Twitter by an industry observer, the 2019 poster is in particularly sharp contrast to the poster from the inaugural China Space Day in 2016.

On the whole, compared with previous conferences that I have attended in China related to space, this one felt as though the organizers had a better understanding of marketing, and a better understanding of how to position the Chinese space industry within the conference. This was partly due to the platform provided by the UN, but was also partly due to increasingly savvy behavior by China. Indeed, the inclusion of Russian astronauts, France as the guest of honor, and other countries' representatives in the opening event, China likely accumulated much goodwill in the space domain during this event.

Separate to China's progress in terms of soft power, the Chinese space industry had clear-



Chinese start-up launch company Lingkong Tianxing announced a successful experimental sub-orbital launch. The company can be considered a "second-generation" , with its founder—Wang Yudong—being a former executive at OneSpace, before founding the company in 2018.

ly come a long way in terms of actual development, particularly on the commercial side. This showed in several ways over the course of the week of the conference. On 23th April, a start-up China launch company, or Lingkong Tianxing, announced a successful experimental sub-orbital launch. The company can be considered purely a "second-generation" Chinese launch company, with its founder—Wang Yudong—being a former executive at OneSpace, before founding the company in 2018. On the same day, the deputy director of the CNSA, Wu Yanhua, Said that the CNSA would issue a special notice on the regulation of commercial launch vehicles, aiming to regulate the research, production, and experimental development activities of commercial launches. In addition, the National Space Law was now included in the legislative plan of the 13th National People's Congress Standing Committee, which will be included in commercial space activities. All the announcement showed the ambitions and the attitude of the administrations that commercial space is one part of China space activities and the administrations wants the companies to follow their rules.

Russian cosmonauts sending their regards to Chaina Space Conference participants from the International Space Station.


Pizza Hut and Spacety--an out of this world combo.

Commercial space is a new concept in China, having only started in 2014. The ultimate outcome is completely unknown, but to now, the private and state-owned sector have seen some complementary development, although the private sector has been hampered by regulatory uncertainty. Moving forward, commercial space will continue to grow in China to a point, but eventually, the companies will need to deliver results (revenues, successful launches, operational constellations, etc.)

The Youth Will Take Over the World

Perhaps the most interesting aspect of the China Space Day events was the relative youth. The United Nations event had a large number of young people, including many students, which is to some extent to be expected. The private/commercial space industry events, though, were also full of young people, with the founders of most of China's commercial space companies in their 30s. Even the SOEs and their subsidiaries are staffed primarily by fairly young people. On the whole, this is one area where China has a clear advantage, which is manifesting itself in more ways than one.

First, there are a lot of young Chinese aerospace engineers. Many of them stay in China. Second, though, there are many foreign students in China studying to be aerospace engineers (or similar). One specific example was the presence of the

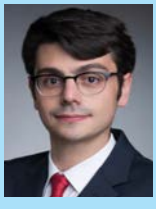
Beijing University of Aeronautics and Astronautics—Beihang University—at the conference in Changsha. Beihang is perhaps China's premier aerospace university, with around 10,000 postgraduate students. In addition to having many Chinese representatives from Beihang (primarily graduate students and professors), there were an impressive number and diversity of non-Chinese Beihang students. This includes a French friend of mine in Shenzhen, an Italian in Beijing, and a Bangladeshi whom I did not meet personally but heard ask a question during the conference. All three have, at some point, studied at Beihang University. Many of the future leaders of the space programs of the developing world will continue to go to Embry Riddle, MIT, etc., but increasingly, many are going to Beihang, Harbin Institute of Technology, or others. In a hard-to-define, but not insignificant way, this will likely lead to advantage China.

The Chinese government plays a key role in its space industry as evidenced by the numerous speakers from local state and national governments in the China Space Day conferences.

Conclusion

During a muggy, steamy week in April, the medium-sized city of Changsha became Space City, China. Executive VPs of China Great Wall rolled into town, the Wanda Vista Hotel got booked full by the United Nations, and the statue of Mao Zedong on Orange Island received more rocket scientist visitors than it had in years.

The conference was an indication of China's increasing assertiveness on the global space stage, but also a sign of the increasing degree to which there is, and will be, opportunities for collaboration between China and the outside world. Moving forward, the year between now and China Space Day 2020 will likely see the first commercial orbital launch by a Chinese company, the continued deployment of Chinese global LEO constellations, and the general development of the Chinese space industry at what we might call China Speed. On my last day in Changsha, I was walking around a local Wanda Plaza Shopping Mall—a mall so large, that it had not one, but two very spacious Starbucks. Outside of the Pizza Hut, I spotted what looked like a space capsule. Sure enough, local smallsat company Spacety—one of the few Chinese New Space companies with headquarters in Changsha—had made a deal with the local pizza hut for a promotion. In this way, one day at a time, we are seeing space in China become more relevant to the masses.



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COUNTRY UPDATE

Japanese Satellite Market

by Naoakira Kamiya

With 21 commercial satellites at the geostationary orbit, Japan is still the largest satellite operating country in the Asia Pacific Region.

Broadcasting Satellite System Corp (B-SAT) currently operates four satellites, BSAT-3a, -3b, -3c and -4a, at 110 degrees east. Unique feature of BSAT-4a satellite is that it carries 12 brand-new left-hand circularly polarized Ku-band transponders in addition to traditional 12 right-hand version.

In preparation for the 2020 Tokyo Olympic and Paralympic Games, B-SAT ordered one more satellite, BSAT-4b, from SS/Loral in March 2018 to bring additional capacity and backup BSAT-4a. The satellite is tentatively scheduled for launch aboard Ariane-5 rocket in April or May 2020.

There is no doubt that NHK is sweating blood for unprecedented live transmission of coming Olympic and Paralympic Games in 2K, 4K, 8K, and needs, among others, sufficient capacity to expand premium and full-featured in-home experience.

SKY Perfect JSAT Corp (JSAT) operates a large fleet of 17 satellites at the end of February 2019. Their active satellites are located at 85 degrees east (JCSAT-85), 110(JCSAT-110A), 124(JCSAT-4B), 128(JCSAT-3A), 132(JCSAT-5A), 136(N-STAR-C & JCSAT-8), 144(Superbird-C2 & JCSAT-16), 150(JCSAT-6), 154(JCSAT-2B), 162(Superbird-B3), and 169 (JCSAT-12). In addition JSAT has one backup satellite called JCSAT-110R located near 110 degrees east.

Furthermore JSAT and Intelsat jointly own and operate Horizons-1 satellite at 127 degrees west, Horizons-2 at 85 degrees east, and Horizons-3e at 169 degrees east. The latest addition is Horizons-3e, which was launched aboard Ariane-5 rocket on September 26 2018.

Presently JSAT plans to launch two more satellites, JCSAT-17 and JCSAT-18, in the latter half of this year. JCSAT-17 is a state-of-the-art multi-beam satellite of S-band and C-band, and is being built at Lockheed Martin Space Systems in Colorado. On the other hand JCSAT-18 is a joint satellite with Kacific Broadband Satellite and under construction at Boeing Satellite Systems in California. JCSAT-17 satellite is intended for NTT DoCoMo for their high throughput services in Japan. As to launch service, JSAT ordered from Arianespace for JCSAT-17 satellite, and from Space-X for JCSAT-18.

Preparations are underway for the Olympics in Tokyo next year, will they be ready to broacast live in 4K and 8K?

The most important and immediate task for both B-SAT and JSAT is to explode 4K and 8K Ultra HD market by utilizing brand-new left-hand circularly polarized transponders. B-SAT has 12 such transponders on BSAT-4a and JSAT also carries 12 transponders on N-SAT-110A. These transponders have been officially allocated by Ministry of Internal Affairs and Communications (MIC) for 4K and 8K ecosystem.

So far as BSAT-4a is concerned, SC Satellite (Shop Channel 4K,), QVC Satellite (4K QVC), and Tohoku-Shinsya Media Services (Cinema 4K) already started using one such transponder for 4K broadcasting. In addition NHK uses one more transponder for their Super High Vision premium entertainment service in 8K. According to NHK, their 8K broadcasting starts from 10 A.M. and continues for 12 hours and 10 minutes until 10:10 P.M. every day.

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B-SAT said WOWOW has committed to use a part of one transponder for their 4K entertainment channel from December 1 2020.

Regarding N-SAT-110A, J-Sports 4K, 4K Nihon Eiga + Jidaigeki (Japanese Movie Channel), Star 4K, and Sukachan 4K (SKY Perfect Entertainment Channel) started broadcasting from December 1 2018. J-Sports line up four 4K channels and SKY Perfect Entertainment two channels.

Another important task for all broadcasters in Japan is the transition to IP. So far QVC Satellite and JSAT seemed to have been in most advanced stage.

Advanced 4K8K broadcast in Japan started with fanfare on December 1st, 2018.

QVC Satellite, a subsidiary company of QVC Japan, is broadcasting 4K HDR shopping programs for 24 hours every day and has already adopted IP interface connecting 4K editing facilities and master control room at their renewed broadcasting center in Yokohama. According to QVC Japan, its system integration based on SMPTE ST2110 was carried out by Diversified Media Group in the US.

JSAT adopted IP transmission format called NMI (Network Media Interface) proposed by Sony for its new 4K master control room, which is already in operation from November 2018. According to JSAT, IP offers flexibility and agrees with "the expansion concept of spine and leaf" directed by the management. As was mentioned, JSAT presently offers eight 4K channels on five transponders of JCSAT-110A but aims to use all twelve transponders in near future upon approval from MIC. They also installed two new uplink antennae on the roof of Tokyo Media Center to handle additional 4K traffic.

Meanwhile NHK said that their 8K OB Vans, SHC-2 and SHC-3, were built on SDI/IP hybrid basis, and recently-built 4K OB Vans, 4K-2 and 4K-3, adopted Sony's IP live production system for delivery interface. NHK presently owns three 4K and three 8K OB Vans and is well prepared for live sports production. Furthermore NHK said that it plans to procure one more 8K OB Van in 2019.

The challenges and opportunities driving the transition to IP delivery of content are well understood by Japanese broadcasters. But 12G-SDI and IP hybrid connections are still prevailing. It is too soon to tell when and how IP transition will be worked out in entire workflows.

As to new satellite business in Japan, Quasi-Zenith Satellite System Services (QSS) is now operating four Quasi-Zenith Satellites (QZS) named "Michibiki" in Japanese. Three satellites, QZS-2, QZS-3, and QZS-4, were launched aboard H-2A rocket during 2017 and full operation including QZS-1 officially started from November 1 2018. Unique features of QSS operation are sub-meter signal called L1S and sub-centimeter signal called CLAS. In addition QSS commenced iPNT (Indoor Position, Navigation, and Timing) and expanded its service area tremendously.

Another new development has been made by Globalstar Japan, which is a joint venture of Globalstar in the US and IPmotion in Japan. They started selling and renting GSP-1700 satellite mobile phone, SPOT Gen3 global satellite GPS messenger, SPOT Trace asset tracking device. In addition they are providing Sat-Fi satellite hot spot services. In October 2018 Globalstar Japan unveiled such equipment and service at their booth of CEATEC Japan exhibition floor and attracted the attention of Japanese satellite professionals. As is known, Inmarsat, Iridium, and Thuraya are already selling and renting satellite mobile phones and providing IoT services in Japan.

It is interesting to know how Globalstar Japan will permeate into Japanese market.

Last but not least two pieces of good news have spread out in Japanese satellite community recently.

In terms of Made-in-Japan satellite, Mitsubishi Electric Corp (MELCO) delivered Es'Hail2 to Qatar Satellite Company (Es'Hailsat). MELCO proudly announced that in-orbit tests have been successfully finished and Es'Hail2 entered service at 26 degrees east on March 6 2019. The spacecraft was built by MELCO's Kamakura Works and launched aboard Falcon-9 on November 15 2018. Es'Hail2 was designed with Ka-band spot beams and Ku-band wide beams for Middle East and Africa region. It is also noteworthy that the satellite carries amateur radio transponders.

Another piece of good news, which was welcomed by Japanese satellite industry, is that SoftBank Group agreed on additional large-scale investment in OneWeb. Exact amount was not disclosed but it is our educated guess that more than half of US $12.5 billion would be invested. However there is no sign yet that the gateway for OneWeb constellation is being constructed in Japan.

Naoakira Kamiya is the Managing Director of the Satellite System Research Institute and Director of the Japan Satellite Business Association. He can be reached at: zum05241@nifty.ne.jp

EXECUTIVE ROUNDTABLE

Innovations in In-Flight Connectivity

by Bernardo Schneiderman

NSR forecasts that inflight connectivity (IFC) will be a US$ 36 Billion market over the next decade, as more airlines outfit fleets with high throughput satellite (HTS) services. However, the IFC market endured a challenging 2018 due to delays in installing equipment, indecisions by airlines, and uncertainty on business models, on top of technical and regulatory hurdles according to NSR . Overall, the market lost a bit of its shine as aeronautical connectivity grew in 2018 by US$400 million 40% less than expected. On the bright side, passenger aircraft retail revenues reached more than US$1 Billion for the first time. NSR expects 2019 revenue growth to be the same with a faster pace of inflight connectivity hardware installs to catch up on backlog.

Euroconsult forecasts that 23,000 commercial aircraft will offer connectivity to their passengers by 2027, up from 7,400 aircraft in 2017. In January 2018, around 90 airlines had either installed or committed to install IFC solutions. Offering connectivity was first seen as a differentiating factor, however as more and more airlines provide connectivity, offering in-flight Wi-Fi starts to become a must-have in order to keep a competitive positioning in the extremely challenging airline market

To shed light on the latest innovations in IFC, we asked the leading providers to participate in a virtual roundtable discussion. Participating in the roundtable are: Jags Burhm, Senior Vice President, Aero-Global Mobility, Eutelsat; Dominic Walters, Vice President, Inmarsat Aviation; Mike Hooper Director & General Manager – Aviation Line of Business, Iridium; Lisa Kuo - Director, Connectivity, Panasonic Avionics; Aditya Chatterjee -Senior Vice President, Aero Market Segment Solutions, SES; Gustavo Nader – VP of Strategy, Thales InFlyt Experience; Jon Cobin, EVP of Strategy, Gogo; and Meherwan Polad, Vice president, Global Sales and Business Development, Viasat Commercial Aviation.

Satellite Markets (SM):Give us an overview of what your company does in the satcom aviation market?

EUTELSAT-Eutelsat currently provides in-flight connectivity and live-TV services across Europe, the Middle East, Africa, Asia-Pacific and the Americas through seven satellites located between 117° West and 172°: EUTELSAT 117 West A, EUTELSAT 115 West B, EUTELSAT 3B, KA-SAT, EUTELSAT 10A, EUTELSAT 70B and EUTELSAT 172B.

INMARSAT - We're transforming the aviation industry by bringing high-speed inflight Wi-Fi to every flight path in the world. We own and operate a network of high-throughput satellites covering the globe, allowing us to direct capacity exactly where it is needed most by our customers.

We can deliver both high-speed passenger connectivity and operational connectivity to the aircraft, estimated by the London School of Economics (LSE) to be worth $30 billion and $15 billion annually to airlines by 2035 (respectively).

Many airlines are already flying with or are in the process of installing our award-winning passenger connectivity solutions, including Lufthansa, Air New Zealand, Qatar Airways, Singapore Airlines, Norwegian, Avianca, Air Asia and Citilink to name a few. More than 1,750 aircraft are currently under signed contracts for our passenger Wi-Fi services, in addition to a strong new business pipeline.

Within safety and operational services, we are helping airlines tap into the power of real time operational insight to enable digital transformation. We are already on more than 90% of the world's oceanic fleet with our Classic Aero service, the global standard for flight operations and safety satcoms. Our next-generation service, SB-S, is the first and only global aviation broadband solution for operations and safety communications, and is currently in flight with Hawaiian Airlines, Shenzhen Airlines and United Airlines.

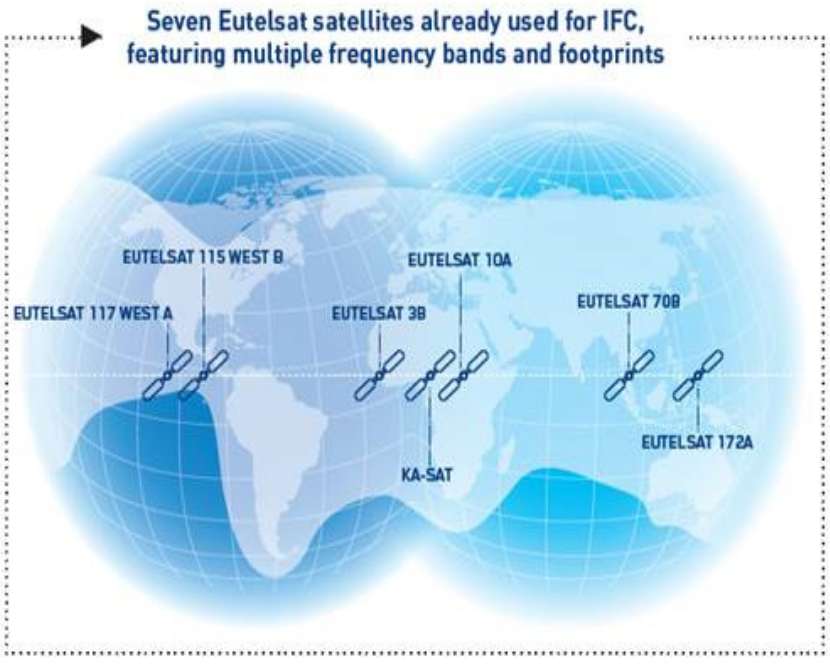
IRIDIUM - Iridium has been widely adopted across all aviation segments given our small antenna form factor and also our unique network that can support communication on fast moving aircraft, and also under the rotor

blades of aircraft. In addition, Iridium is approved for offering AMS(R)S cockpit safety voice and FANs data services for oceanic, remote and polar operations for commercial and business aircraft. In short, Iridium is the global leader in supporting 10s of thousands of aircraft globally.

PANASONIC-Panasonic Avionics Corporation is a supplier of inflight entertainment and connectivity (IFEC) services and solutions. We design, engineer, manufacture, and install customized IFEC solutions including NEXT Online, our global, high-speed satellite connectivity network made available through partnerships and collaborations with satellite operators designed to optimize payloads for aero connectivity.

SES - SES is the world's leading satellite operator and provider of multi-band, Ku and Ka capacity and network services supporting markets ranging from media and entertainment to inflight connectivity with more than 70 satellites in GEO and MEO (50+ GEO and 20 MEO) orbits combined with strategic ground infrastructure across the globe. SES is building the leading global multi-band, multi-orbit satellite network, delivering smart, seamless worldwide coverage to enable a new era of inflight connectivity. We have designed our global network to meet the ever-changing demands of inflight connectivity and entertainment with a future-proof intelligent connectivity that can dynamically and intelligently enable the bandwidth that passenger needs to enjoy the app they are using aboard the plane or to support the connected aircraft of the future.

THALES - Thales is a worldwide leader in aerospace, satellite networks, connected skies and cybersecurity. The company is also known for its market leadership in air traffic management, training and simulation, inflight entertainment technologies and nose-to-tail aircraft



connectivity. Thales is a full-service integrated connectivity provider offering a wide range of technical solutions for seamless global coverage and a best in class onboard experience. Working with industry leading partners, we use satellite technology to ensure that a Wi-Fi connection can follow a passenger from the terminal, through take-off, at cruising altitude and landing. We're also working on the operations side by helping airlines look at all the data coming from their aircraft. Harnessing that data can help airlines improve efficiency, get information on passenger behavior to increase brand loyalty and accelerate revenue generation.

VIASAT - Viasat is a global communications provider and a world leader in satellite broadband communications, networking and related technologies. As an innovator in broadband technologies and services, the Company offers an end-to-end platform of high-capacity Ka-band satellites, ground infrastructure and user terminals, enabling Viasat to provide cost-effective, high-speed, high-quality broadband solutions to enterprises, consumers, airlines and government users around the globe, whether on the ground, in the air or at sea.

Specific to aviation, the Company's vertical integration strategy, proprietary technology platform and high-volume of Ka-band capacity—more owned Ka-band capacity than any other IFC provider helps differentiate Viasat from the IFC pack, as the Company delivers the fastest satellite connectivity in the air several times faster than traditional IFC services and enables full streaming capabilities at-scale. Our belief is have a lot of capacity at the right cost to enable airlines to offer better services.

We also go beyond passenger experience, and offer complete operational connectivity from cockpit to cabin to ground to give airlines real-time data and analytics of their fleet, travelers, and crew which generate additional revenue opportunities and operational efficiencies.

GOGO- Gogo is the inflight internet company. We bring the highest performance to airlines and passengers alike across every device, every flight, everywhere—all powered by our global inflight network. Gogo

partners with leading airlines across the globe who rely on our industry-leading 2Ku high-speed satellite Wi-Fi solution flying to over 80 countries.

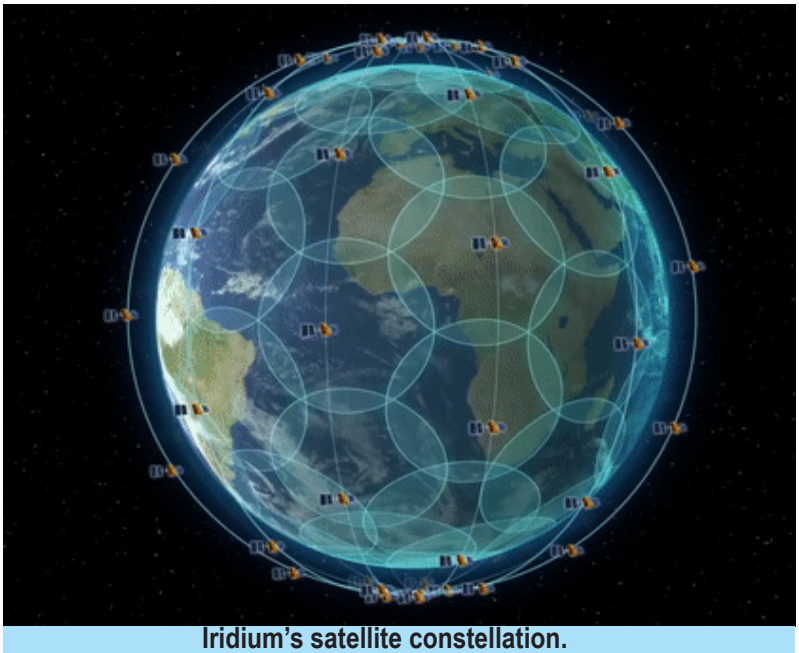
SM - Please describe what solutions you now provide and in the future for In-Flight Connectivity for passengers and for aircraft operations?

EUTELSAT - Our global in-flight connectivity offer relies on different solutions depending on the market. Across the globe, we leverage the multiple frequency bands and diverse footprints our fleet offers to respond to growing the demand.

In Europe, leveraging the high transmission speeds and bandwidth of Eutelsat's KA-SAT high throughput satellite, our inflight service allows aeronautical service providers to offer airlines and their passengers top-quality Internet access, video streaming and GSM services via tablets, smartphones and laptops.

With the launch of EUTELSAT 172B in 2017, we have significantly strengthened our offer across the Asia-Pacific region, one of the fastest-growing markets for this vertical. Through its innovative High Throughput Ku-band payload, this satellite can provide inflight broadband with multiple user spots optimized to serve busy Asian and trans-Pacific flight paths. The strengths of this satellite have led to its selection by Panasonic Avionics Corporation and UnicomAirNet. Direct feedback from the airlines that are operating on EUTELSAT 172B has been very positive as they have experienced an increase in the user experience.

INMARSAT -Our aviation connectivity solutions and infrastructure have been designed specifically for this purpose. The Global Xpress network powers GX Aviation, our global passenger Wi-Fi solution offering the most extensive coverage of flight routes around the world, and JetConneX, our high-speed solution for business aviation users. We also founded the European Aviation Network, Europe's fastest inflight connectivity service designed to meet the unique challenges of the region's busy airspace.



Iridium's satellite constellation.

The adoption of Inmarsat's passenger Wi-Fi services has been fast-paced; in April this year, we announced that 1,000 aircraft have been installed with our next-generation inflight broadband solutions.

We also offer real-time operational connectivity to airlines with SB-S. Combining cutting-edge satellite technology with secure IP connectivity, SB-S is the world's first and only global broadband solution for aircraft operational and safety communications, driving digital transformation in the airline industry. Inmarsat is the only aviation satcom provider authorized to provide aviation safety and operational services globally, including in China and India.

Iridium - Today, Iridium offers narrowband services but our next generation of Iridium Certus broadband services will enable a more diverse product offering. Iridium does not see this as a commercial aircraft service offering but it is very viable for a small number of passengers on a business jet. Our primary focus is on the cockpit/flight deck of aircraft, with ability for cabin service for business jets and aircraft with smaller numbers of passengers.

Panasonic Avionics - Panasonic has developed a suite of services around NEXT - our inflight entertainment and connectivity platform, including Theatre, Marketplace and Wellness solutions.

As part of NEXT Online, Panasonic offers a range of connectivity services for airlines and their passengers including fast internet, live television, and inflight mobile use, along with ZeroTouch™ which enables airlines to remotely deliver content to and from the aircraft via satellite, cellular or Wi-Fi connectivity.

All of Panasonic's connectivity services are managed from its Customer Performance Center (CPC) which proactively monitors and manages each aircraft equipped with NEXT Online to provide airlines with peace-of-mind and confidence in their investment.

SES - SES Networks works closely

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with all leading inflight connectivity (IFC) service providers, including Gogo, Global Eagle, Panasonic Avionics, and Thales, to help develop and deliver tailored and intelligent connectivity services that airlines need to meet their passengers' evolving and escalating demand for connectivity in the skies.

SES's global aero network is enabled by conventional and the most up-to-date, state of the art high throughput (HTS) GEO satellites that are providing inflight connectivity to nearly half of the connected commercial aircraft flying today.

As part of our innovation roadmap, SES will bring the game-changing combination of MEO and GEO capacity to the aero market. SES Networks has already transformed connectivity at sea with its growing O3b Medium Earth Orbit (MEO) constellation – which features 20 Ka-band satellites in orbit today-- and aero is next up.

SES is developing a next-gen MEO system called O3b mPOWER, which will open the door to a whole new level of inflight connectivity services for airlines and their passengers and crew. Increasingly sophisticated IFC solutions will rely on the faster connectivity speeds and lower latencies that O3b mPOWER is set to deliver – giving airline passengers the same broadband experience in the sky that they've become accustomed to on the ground.

Airlines will increasingly look to various levels of satellite capacity – delivered over a mix of conventional and HTS satellites in GEO and MEO – to not only deliver connected passenger services such as email, gaming, social media, web browsing and streaming, but to drive operational efficiencies across their enterprise. Pilots, for example, are utilizing connectivity in the cockpit to track real-time weather conditions along their flight path to reduce flight delays and avoid turbulence, which in turn saves money and improves passenger satisfaction. Airlines are utilizing connectivity and fill further utilize this connectivity to monitor fuel consumption, engine wear, even food and beverage inventories to cut waste in real time. SES and our IFC service provider partners are working with airlines to help them fully capitalize on our intelligent connectivity across their operations.

THALES - Thales is providing the next generation aviation connectivity solution over the Americas. FlytLIVE includes full internet services with the capability to stream to the entire cabin with high speeds, increased capacity, and unmatched redundancy. This solution ensures a consistent experience to crew and passengers at peak times and in high traffic routes while optimizing bandwidth.

FlytLIVE today offers a full end-to-end solution where passengers receive full internet connectivity with the capability to stream video content interact through social media and play games. In 2021, FlytLIVE will operate with the SES-17 satellite manufactured by Thales Alenia Space. Its spot beams will provide full coverage for the Americas region including South America, Caribbean Islands and North America. The solution will be equipped with close to 200 spot beams of mixed sizes for flexible allocation of capacity over high-traffic airline routes, digital transparent processors that adapt where aircrafts fly, and field of view beams overlaying the spot beams to enable multicast and the most efficient delivery of content and IPTV channels.

Leveraging broadband services over the Iridium NEXT constellation of 66 operational satellites and 9 spare satellites that cover 100% of the globe, FlytLINK by Thales provides dedicated satellite-based communications capabilities primarily aimed at connecting aircraft cockpit and crew operations. This includes real-time weather, flight tracking, secure flight safety data and voice, electronic flight bag pairing, enhanced operations through crew scheduling, in-air reporting, service logging, aircraft monitoring and more.

GOGO-Gogo Inflight Systems incorporate a high-capacity, fully redundant and scalable network dedicated to aviation. It uses proprietary technology to access our open ecosystem of Ku-band satellite network for global flights, which means the best performance for aviation for now and in the future. Gogo has more than 1300 aircraft flying on its global satellite network, both with our Gogo Ku and Gogo 2Ku products.

Gogo Ku is our first-generation broadband satellite solution, which is currently used by Delta and Japan Airlines. Gogo 2Ku is the leading high-speed satellite Wi-Fi solution providing a ground-like experience

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for passengers. It's now flying on more than 1,000 aircraft globally with more than 18 airlines committed to the service. The innovative Gogo 2Ku antenna and proprietary modem deliver significantly higher bandwidth to aircraft, minimize service disruptions associated with beam switches, and drive faster satellite handoffs. 2Ku relies on two low profile, high efficiency, mechanically steered phased-array satellite antennas manufactured by ThinKom. The antenna is only 4.5" in height and 6.5" in height including radome. This results in lower drag compared to other SATCOM solutions. The radome is 17" off the top of the aircraft.

Today, the technology is delivering industry leading performance including the ability to stream video. 2Ku can deliver 100+ Mbps to an aircraft today. Today, 2Ku is delivering more than 15 Mbps to each passenger device at 98 percent system availability.

We've designed our system-level platform to support both passenger and operational applications. That involves an architecture that can support separate in cabin networks, that is designed to feed a variety of aircraft and ground data sources securely and contemplates the ability to host and change software in compliance with strict aviation standards.

GOGO-Gogo provides a suite of connected aircraft services such as eEnablement, which is pilot and crew connectivity, data management (aircraft data access and wireless quick access recorder) and operational solutions that include automated turbulence reporting and flight optimization.

SM: Currently IFC solutions are using either Ku or Ka-Band. What proportion among the two bands are you using and do you have any plans to move between the two bands or implement hybrid solutions?

EUTELSAT - Eutelsat currently uses both Ku and Ka-band capacity across several markets and we've found that airlines focus is on providing an affordable service rather on a debate on Ku vs Ka-band. Our fleet is compatible with both bands and we plan on continuing to work with both for the time being as this meets the markets requirements and provides us with maximum flexibility to address mobility markets.

INMARSAT -We're continuing to invest in Ka-band to deliver a truly global passenger connectivity solution with GX Aviation. The global network uses three core satellites that provide global coverage, and a fourth operational satellite that adds further capacity where needed. We are continuing to expand the network with flexible high-capacity Ka-band satellites that will dynamically add and move capacity wherever needed.

To meet future demand, we have a fully-funded development roadmap that includes new satellite launches in 2019, 2020 and 2021. Later this year, we will launch GX-5 to provide additional capacity over Middle East, Europe and the Indian sub-continent, and in the consequent years we will launch two extra I-6 satellites. These developments bring unprecedented flexibility, scalability and cost efficiency to the network, assuring customers their requirements will continue to be met in the next decade and beyond.

EAN is comprised of an S-band satellite complemented by more than 300 ground stations. This network design was conceived from scratch, specifically for the needs of European aviation. We offer the most consistent service in Europe due to this fully integrated system, working in unison across land and sea.

Iridium - Iridium does not offer Ku or Ka band for services but we have partnered with many such companies to offer a combined solution for Iridium as the cockpit solution and the Ku or Ka as the cabin solution. The services however are separate and do not cross over.

Panasonic Avionics - Panasonic currently provides connectivity solutions over both the Ku and Ka bands. To us, it's not about the frequency spectrum – it's all about the network that provides the best user experience. We seek to implement economically viable options that will enhance the connected experience for our airline customers and their passengers in flight.

SES- SES continues to build a global multi-orbit, multi-band network of conventional and high throughput satellites and ground infrastructure designed to deliver on current and future inflight connectivity demands. We currently have both Ku-band and Ka-band capacity in GEO, and with our MEO Ka-band we are on the verge of furthering the transformation of connected air travel, much as we have already aboard cruise ships at sea.

By providing global coverage in both Ku-band and Ka-band across two orbits, SES is enabling IFC service providers and ultimately the airlines now to create new IFC offerings that help differentiate them in a fiercely competitive marketplace. Having powerful connectivity in multiple bands and orbits also helps airlines to future proof their IFC strategies and deployments. And as we work with technology partners, antenna producers for example, we can develop hybrid solutions that enable airlines to leverage both Ka-band and Ku-band capacity, allowing them to use the best connection to meet their requirements at any given time.

THALES - Thales has used Ka-band satellite technology from the beginning of our connectivity program. Ka High-throughput satellites (HTS)

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will remain the dominant technology with increasing awareness of new global Ka HTS solutions, which have the ability to provide unprecedented amounts of capacity in high traffic zones. The performance and capacity of Ka HTS solutions specifically designed for mobility enable global, seamless satellite-based connectivity, making it the best choice for the broader commercial aviation market.

VIASAT - Viasat is a Ka-band IFC provider, and to date, almost all of our airline install base use our Ka-band system. However, we also have dual Ku-/Ka-band shipset, and where necessary, we will leverage Ku-band satellites as gap-fillers. This idea is not new to Viasat—the Company has years of expertise in delivering dual-band antenna systems to the global market. The Company's first-generation Ku-/Ka-band shipset served airframes ranging from commercial narrow-body planes to larger senior leader government aircraft.

Then in April 2019, Viasat introduced its second-generation Ku-/Ka-band shipset, inclusive of an advanced hybrid antenna and complementary radome. This dual-band system, aimed at the commercial wide-body aircraft market, will keep passengers and crew connected across commercial Ku- and Ka-band Geosynchronous and Non-Geosynchronous satellite networks, virtually anywhere they fly around the globe.

The shipset sets into motion an accelerated migration path for commercial airlines to operate on Viasat's global High Capacity Ka-band network including our Viasat-3 constellation. It immediately enables worldwide roaming connectivity for new or retrofit aircraft – serving a large and growing portion of their routes on the fastest Ka-band networks, and the balance on global widebeam or spotbeam Ku satellites. Airlines can steadily migrate a greater proportion of their routes to the faster, more economical Ka-band service enabled by a growing array of partner satellites as well as the global ViaSat-3 constellation planned for launch in 2021 and 2022.

GOGO - Gogo's global satellite network offers both global coverage and scalable capacity in the Ku band. This allows airlines to benefit from abundant capacity from many satellite operators and satellites on a global basis. As more aircraft come online, Gogo can easily lease extra capacity. We leverage the open ecosystem of the leading satellite providers in the world, with the largest including Intelsat and SES.

Viasat's hybrid Ku/Ka Band antenna

Our strategy is and has always been "customer-focused and technology-agnostic." Our satellite network is GEO and Ku in commercial aviation because to date that's been the only source of supply that meets our needs in terms of performance, economics, scalability, redundancy and certainty of supply. Passenger and airline expectations for satellite Wi-Fi means continual growth for capacity needs – not just every several years or some day in the future, but right now and on an ongoing basis. It means handling the global and local requirements of aviation including managing the 20% of the earth's geography that sees 80% of the traffic and, serving hub cities like Atlanta, London or Tokyo, with outstrip the capacity of any one beam or satellite at their peaks. We've been clear that we deployed 2Ku in the Ku-band for these reasons – not any attachment to a certain frequency or orbit. We've said we would consider adding Ka-band based services if-and-when it met our needs for serving customers, but we were early entrants via partnership in Ka and saw its issues and we don't yet see those being overcome. Nor is there any need to diversify today because Ku has the coverage, capacity, ability to layer, redundancy and economics we need.

SM - What are your plans for the next few years using satellite communications for the Aviation market considering the wave of new satellite constellations both GEO High Throughput Satellites (HTS) and the new wave of LEO and MEO constellations?

EUTELSAT - We believe that GEO will remain the best fit for in-flight connectivity for both technical and financial reasons. We expect the availability of Very High Throughput Satellite (VHTS)capacity to be more impactful on the industry than the one from the launch of constellations. The scale of VHTS and the associated lower Capex/Gbps will

further drive service adoption. With regards to this evolution, Eutelsat will benefit from the launch of the KONNECT VHTS satellite due to enter into service in 2022.

INMARSAT -There is still a lot of talk and investment in low and medium earth orbit satellite constellations such as OneWeb, Telesat and StarLink (SpaceX). But there continue to be business challenges with LEO, particularly with the spread of capacity over low density regions, which can lead to inefficiencies and low yield.

There's a clear funding gap in the LEO strategy, so although we're staying close to the market and continuing to investigate opportunities, our strategy focuses on self-owned and operated geosynchronous satellites (GEO). We believe that GEO satellites are the most efficient way to deliver capacity to our customers, offering the best service with the best economics.

IRIDIUM-Not much for Iridium here as we are not going to be an IFC main supplier as these other systems are planning. As mentioned before, our focus is on the cockpit. If anything, these new entrants have the potential to be new partners of ours.

Panasonic Avionics - We are already utilizing HTS across our worldwide network, and will shortly augment this with our XTS system (Extreme Throughput Satellite - an enhanced version of HTS). We are also actively talking to NGSO operators to see where and when the collaboration can take place. Our technology is agnostic, which makes Panasonic the best value solution provider for the connected in-flight experience.

SES - SES Networks is keenly focused on a new age of inflight connectivity, with an IFC roadmap set to bring unrivaled multi-band, multi-orbit satellite capacity to aviation.

Today, our GEO HTS satellites – SES-12, SES-14, and SES-15 – are providing powerful capacity across air travel routes around the world, already taking inflight connectivity to a new level.

2021 promises to be a pivotal year in the aero market, as SES launches SES-17 – an advanced Ka-band HTS satellite – into GEO orbit to serve as the foundation of Thales' FlytLIVE IFC service over North, Central and South America as well as the Caribbean and Atlantic Ocean Region. 2021 will also see the launch of SES' next generation O3b MEO constellation called O3b mPOWER. With the GEO and MEO pieces firmly in place, SES plans to introduce to the aero market in 2022 the leading global multi-band, multi-orbit network of smart, seamless worldwide coverage capable of meeting each passenger's connectivity requirements virtually anywhere in flight.

THALES - With continuous innovation of our products and solutions, Thales is at the forefront of new technology development and is focused on the new wave of satellite constellations. We are working closely with our partners to develop and test next-generation solutions that are capable of multi-orbit operations to ensure we maintain relevancy and leadership in the market.

VIASAT - Viasat's proprietary Ka-band satellites are at the core of our technology platform. The ViaSat-1 satellite, the Company's first-generation high-capacity Ka-band spot-beam satellite, was placed into service in January 2012. On June 1, 2017, the Company's second-generation, ViaSat-2 satellite, was successfully launched into orbit. In addition, Viasat owns and operates two additional satellites over North America: WildBlue-1 and Anik F2, and the Company jointly owns KA-SAT over Europe through its joint venture agreement. The Company also has leasing agreements with Ku-band satellite operators to 'fill in the coverage gaps' until Viasat's third-generation, global, 3+ Terabit per second (Tbps) constellation, ViaSat-3, is in orbit.

With respect to the ViaSat-3 constellation, the Company currently has two ViaSat-3 class satellites under construction—the first satellite is for the Americas, the second is for the Europe, Middle East and African (EMEA) market, and Viasat recently announced it has begun design on a third ViaSat-3 class satellite to serve the Asia Pacific market. With all three ViaSat-3 class satellites on orbit, the Company will have global coverage and more capacity in space than any other IFC provider.

GOGO-As a company, we were early adopters of LEO in the L-band and it's been an important part of our business aviation services for many years. Gogo has satellite partnerships in place that include high-throughput satellite capacity and future low earth orbit (LEO) satellite capacity when it comes online. We're very supportive of the efforts to add broadband LEO and hope it will be an augmentation to our network moving forward. There's still quite a ways to go but we have the only LEO-ready antenna on the market today.

Bernardo Schneiderman is the Principal of Telematics Business Consultants. He can be reached at: info@tbc-telematics.com

PRODUCTS & SERVICES MARKETPLACE

A guide to key products and services to be showcased at CommunicAsia 2019, June 18-20, Marina Bay Sands Expo Center ,Singapore

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www.advantechwireless.com

At **Advantech Wireless Technologies**, we design, manufacture and deploy networking for broadband connectivity, broadcast solutions, video contribution and distribution and mobile backhaul, using satellite and terrestrial wireless technologies. Our revolutionary technologies include world-leading GaN technology based high power amplifiers, SSPAs, block-up converters (SSPBs), frequency converters, deployable antennas and terrestrial microwave radios.

AvL Technologies
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Twenty five years in the satellite communications industry, **AvL Technologies'** presence in the global market over the years, speaks volumes of the company.

AvL's first antenna – serial number 001 – is a 1.8m SNG antenna still in operation today, and it operates from its third uplink truck at PacSat.

At CommunicAsia this year, our booth will have on display:

• A 1.2m motorized Fly&Drive antenna that can be mounted on to a pick-up truck, SUV or box truck. The antenna has a 3-piece segmented reflector that fits into a small case making it easy to ship or transported as a vehicle mount.

AvL Model 1258KFD Mobile Broadband Transportable Antenna

• Our 2.0m ultra-light and easy-to-point manual operation axi-symmetric antenna.

This antenna has a 12-piece carbon fiber reflector and RF package that consists of a 55W Ku-band BUC, which is located behind the hub. The antenna is easy to assemble and can be on-network in <25 minutes.

• The 75cm FIT, one of the aperture sizes of the Family of Integrated Terminals.

The FITs are designed to accommodate current and future modem, RF and satellite frequency options.

• Model 1224i, 1.2m fully-integrated auto-deploy network terminal that comes with a 6-piece carbon fiber reflector, removable boom, and band-configurable weatherproof electronics enclosure.

C-COM Satellite Systems Inc.
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Visit C-COM's booth to see a demo of the latest motorized iNetVu® MP-100-MOT ManPack antenna system. These highly portable antenna systems can be easily configured to provide quick access to satellite communications in Ku, Ka or X-band – anytime, anywhere. The robust yet lightweight ManPacks come in 3 sizes, 60 cm (6-piece carbon reflector) 80 cm (5-piece) and 100 cm (7-piece). They can be assembled in 10 minutes or less, and are available in manual formats.

Also on display, the iNetVu® Ka-98G Drive-Away Antenna is a 98 cm auto-acquire satellite antenna system which can be mounted on the roof of a vehicle for Broadband Internet Access over any configured satellite. The system works seamlessly with the iNetVu® 7710 Controller providing fast satellite acquisition within minutes, anytime anywhere. Avanti Approved & Thor7 Type Approved; Field Upgradeable to Ku-band and are ideally suited for government, military, emergency response, disaster management, public safety and broadcast.

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Data continues to be the premier supplier of bandwidth-efficient satellite modems, VSAT networking solutions and RF products to MNOs globally in diverse and challenging environments. With infrastructure equipment supporting >60 Gbps of mobile backhaul over GEO, HTS and MEO, we have the experience and product diversity to facilitate value-added and efficient deployments. We closely monitor market trends and have designed our solutions to deliver true benefits to MNOs – the performance needed to reduce required satellite bandwidth, drive down the total cost of ownership, improve quality of experience and deliver the industry's highest KPIs.

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Comtech Xicom Technology provides a broad product line of KPAs, TWTAs, SSPAs and BUCs for worldwide satellite uplink covering C-, X-, Ku-, DBS-, Ka-, Q-band, Tri- and Multiband with power levels from 8 to 3,550 watts and available in rack-mount and antenna-mount ODU packages.

Comtech Xicom has led in the design and production of millimeter wave TWTAs. Xicom has been shipping high power Ka-band amplifiers since 1997. We have shipped more than 2000 Ka-band amplifiers to military and commercial customers around the globe. We can offer CW amplifiers for TT&C as well as peak amplifiers for multi-channel communications. We offer both outdoor mounted and indoor products to meet our customers' needs.

Comtech Xicom is the world leader in Q-band HPAs. We have 50, 120, 140 and 200W products. As well as a dual-band Ka/Q band amplifier. We have full mil qualification. V-Band is an emerging frequency of interest due to the vast available bandwidth and the availability of V-band hardware. Comtech Xicom offers a 250W V-Band amplifier for gateway service.

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Es'hailSat, the Qatar Satellite Company, is a communications satellite operator headquartered in Doha, Qatar. Es'hailSat was established in 2010 with the goal of managing and developing Qatar's presence in space. The company provides independent, high-quality, advanced satellite services to broadcasters, businesses and governments in the MENA region and beyond.

With the aim to be a truly global satellite operator and services provider, Es'hailSat started the operation of its first satellite Es'hail-1 at 25.5° East in 2013 supporting key broadcasters in the region, beIN SPORTS and Al Jazeera Media Network. Es'hail-2, the company's second satellite was launched on November 15, 2018 and entered in commercial service early 2019 at the 26° East orbital position.

Gazprom Space Systems
Booth Level 1 #U2-01
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Gazprom Space Systems (GSS) is a Russian satellite operator providing high quality Yamal capacity all over the world. Yamal satellite fleet consists of four satellites, namely Yamal-202 (49°E), Yamal-300K (183°E), Yamal-401 (90°E) and Yamal-402 (55°E). Due to high performance and wide coverage areas, Yamal satellite capacity is in high demand over Asia-Pacific, Middle East, Europe, Russia and CIS. It is perfect for Backhaul, Trunking, Broadband, mobility and SNG services.

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Integrasys is a privately owned company specialized on engineering and manufacturing Satellite Spectrum Monitoring systems and VSAT tools in the telecommunication and broadcasting markets. Integrasys was founded in 1990 by a group of Hewlett-Packard engineers experts on Automated RF & Microwaves Test Systems and Software. Since then Integrasys has evolved towards today's company, offering a wide range of signal monitoring products for different telecom services.

At Integrasys our mission is to provide the industry the best quality and fastest technology available in carrier mon-itoring systems, with the customer service and care that our customer's deserve. We want to add value to our customers in quality of service, technology, speed and cost efficiency, by innovating; therefore satellite industry recogniz-es Integrasys as the leader for innovation in satellite signal carrier monitoring systems and VSAT tools.

Mission Microwave Technologies
Booth Level 1 # R3-09
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Mission Microwave Technologies is developing revolution-

ary Solid State Power Amplifier BUCs to support ground-based, airborne, and space-based applications. Utilizing the latest in semiconductor technology, we have optimized the size, weight, and power (SWaP) for these critical applications while delivering the best possible reliability. Mission Microwave currently offers advanced GaN BUC products at X-Band, Ku-Band, and Ka-Band from 12W to 400W, and sets the "new standard" for performance and reliability.

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At Satellite 2019, **ND SatCom** will be highlighting its SKYWAN **5G product which features:**

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- Smallest hub on the market
- Supports all kinds of topologies

The SKYWAN **5G** satellite router is a reliable, flexible and versatile satellite communication platform for customer centric networks. It is a bi-directional MF-TDMA plus DVB-S2X system that supports voice, video and data applications in the most bandwidth efficient manner combined with unrivalled real-time performance.

SKYWAN 5G unlocks new business opportunities for service providers e.g.in enterprise networks. Total cost of ownership is significantly reduced thanks to the fact that only one type of device is needed for all roles in the network. Each SKYWAN **5G** has the full functionality on board and specific features are unlocked by a license key. One small hardware for all network roles simplifies logistics and unprecedented scalability enables the growth of your network in a very cost efficient manner. This saves costs in terms of logistics, certifications, network configuration and maintenance. Measuring in at only 1 RU the SKYWAN **5G** is the smallest hub device on the market.

SKYWAN **5G** enables star, mesh, multi-star and hybrid topologies. Each unit can act either as a hub or master station, therefore adding agility in terms of its network role. Geographical redundancy of the master station is already built-in and a DVB-S2X outbound can be added easily at every station. Network virtualization allows seamless integration into all IT infrastructures.

The device is so flexible: the customer can change the topology anytime, or cascade units to increase traffic volume per site according to business growth.

Newtec
Booth Level 1 # P2-01
www.newtec.eu

Newtec is specialized in designing, developing and manufacturing satcom equipment and technologies that can be applied in a wide range of single and multiservice applications from broadcast (all-IP networks), consumer and enterprise VSAT, government and defense, cellular backhaul and trunking and mobility, offshore and maritime markets.

Discover Newtec's latest industry-leading broadcast equipment, including the M6100 and the MCX7000; Find out more about the benefits of All-IP broadcasting and how it can transform your business; Experience a demonstration of DVB-S2X Channel Bonding UHD Contribution: 4K sports/events coverage made possible over fragmented space segment.

RF Design
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RF-Design specializes in developing, manufacturing, and marketing high-quality RF equipment, RF distribution and RF-over-Fiber solutions for the international Satellite-, Broadcating- and Broadband communications market. Our product portfolio includes a wide-range of Switch Matrix systems, RF-over-Fiber solutions, Splitters/Combiners, Switches/Redundancy Switches, Line Amplifiers, RF/DVB Signal Quality Analyzers and LNB-supply/conrol systems...perfectly suited for applications in Teleports, Satellite Earth Stations as well as for Broadcast- and Broadband RF distribution infrastructures. We also have strong capabilities to design and to manufacture cus-

tom-made products and solutions for your individual needs. All our products are developed, manufactured, tested, and approved in our own facilities in Lorsch, Germany and characterized by high quality, reliability and superior RF performance.

At CommunicAsia, we will be demonstrating our new RF Quad over Fiber system ***"QLink"*** with our new single, quad or 1:1 redundant ***"HQSeries"*** amplifier units and our *"FlexLInk"* Switch Matrix Solutions.

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Booth Level 1 # V1-07
www.rscc.ru

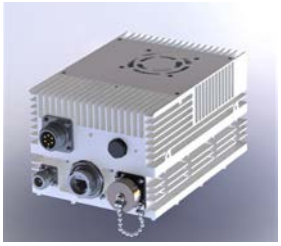
Russian Satellite Communication Company (RSCC) is the Russian GEO satellite operator with global coverage. RSCC provides a full range of communications and broadcasting services via its own terrestrial telecom facilities and satellite constellation; e.g. video distribution and contribution, DTH, DSNG, broadband Internet access, IP trunking and cellular backhaul, maritime mobility, SCADA, enterprise networks connectivity and other. The company operates various regional satellite TV distribution networks and corporate VSAT networks for fixed and mobile customers.

Spacebridge
Booth Level 1 # H2-01
www.spacebridge.com

SpaceBridge Inc. is an established supplier and global market leader in broadband satellite communications technology. The company develops and provides satellite network equipment and services, VSAT HUBs, Terminals for Point-to-Point, Point-to-Multi-Point, and Mesh typologies, as well as SCPC broadcast modems for GEO & NGSO satellite constellations and Cloud-Based managed services.

Terrasat Communications
Booth Level 1 # Q2-11
www.terrasatinc.com

Terrasat Communications presents the latest state-of-the-art IBUC for Fly-Aways & COTMs; the IBUC3. The latest in Terrasat tech is now ultra-lightweight, super compact, available up to 40W & comes with a 3-year warranty. All IBUCs allow the operator to customize configurations & manage alarms & sensors for real-time network management and control. IBUC reliability is baked into the IBUC3 design and verified through intensive individual unit testing.



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Terrasat Communications designs and manufactures innovative RF solutions for Satellite Communications systems. Our ground-breaking IBUC – the Intelligent Block Upconverter – brings advanced features and performance to C-band, X-band, Ku-band, & Ka-band satellite earth terminals and VSAT's. Our products offer exceptional value at a reasonable cost, thereby allowing our customers to stay ahead of their competitors. Through conservative engineering, Terrasat products have gained a reputation for enduring over the long term in extreme operating conditions.

UHP Enterprises
Booth Level 1 # R1-01
www.uhp.net

UHP Networks is a leading global manufacturer of advanced VSAT networks and systems. Headquartered in Montreal, Canada, the company has over 370 networks and over 40,000 remote terminals installed in 50 countries. Among its customers are Fortune 500 corporations, major broadcast networks, top-tier US Mobile Network Operators and government agencies. UHP has the industry's first software-defined VSAT router, offering unparalleled processing capability (packets per second, Mbps, TCP sessions) per W of consumed power and superior bandwidth efficiency owing to the industry's most sophisticated TDMA protocol and DVB-S2X signalling. The company won the 2018 VSAT Stellar Award for Best Ground Segment Technology.

Work Microwave
Booth # V2-07
www.work-microwave.com

At CommunicAsia 2019, **WORK Microwave** will be showcasing the industry's first V-Band frequency converters as a qualified product. The converters are available in various dimensions of outdoor housings and cover the full ITU uplink bandwidth range from 47.20 to 51.40 GHz, providing full 4 GHz of bandwidth. As global consumption of bandwidth-intensive data and broadcast services increases, higher throughput satellites will be a requirement in the future. By offering V-Band-ready equipment WORK Microwave is helping the satellite industry tackle this important challenge.

Old School

by Lou Zacharilla

At Satellite 2019 there was a payload full of exotic, interesting sessions, many flavored for the month and the buzz of the "New Space" era. While our commercial space and satellite industries are undergoing a burst not unlike the roar caused by Mount Vesuvius when it blows, the long hours on the show floor, the stream of panels and the happy chatter at networking events yields an inevitable echo chamber. By the last day we bounce around each other, happily, collegially and more often than not in a state of overload.

But bouncing we are these days!

Everything seems to be touched by satellites. Even the high seas. There was a session on "the IoT of Oceans," and an homage to the carelessness of disruption called, "Move Fast without Breaking Things." This sounded more appropriate to our industry, which in the end really doesn't break so much as breaks through.

We submit to the lure of knowing all for the sake of finishing a Powerpoint presentation. And that's fine. I heard a lot of this hot air at our amazing SSPI Hall of Fame Induction Celebration, fueled by the entry of OneWeb's Greg Wyler into the Satellite Industry's Hall of Fame. OneWeb, which hasn't made a dime but has generated millions in funding and billions in buzz and good will (read: PR), found its founder inducted where he will be enshrined with others whose paths were of a different era, but whose visions were as noble and whose balance sheets walked the walk - as OneWeb's no doubt certainly will (and must) do.

We also inducted the leader of a satellite fleet that was once the laughingstock of the financial community but returned to genuine glory, disproving F. Scott Fitzgerald's claim that there are no "second acts in American life."

Wrong.

Maybe Fitzgerald, a genuinely great writer but not a satellite guy, was thinking about the upper 10% of Long Island swells who flopped around him, rather than those of us bouncing along the trajectory of a reborn industry. We had gathered inside the Newseum to honor achievement and it was all around us.

FSF for sure wasn't thinking about Matt Desch, an Ohio guy who leads Iridium and the industry in carefully placed, self-deprecating humility. There is one thing that this buckeye guy proved that never

Bill Walton accepting a Lifetime Achievement Award from the World Teleport Association (WTA) at the annual WTA luncheon at Satellite 2019 in Washington, D.C.

gets old: blocking and tackling still is the way to pay dirt. The grin on Mr. D's face grew when he the following day he also grabbed the industry's Executive of the Year award. He remained delightfully sardonic about it all because like a Zen master he knows how things can change in this industry. His is a refreshing approach.

While it was right to honor Greg Wyler for a legacy of achievement and a big dream that he sold to someone who will be either regarded as a visionary or a sucker, it was also right to honor Matt for putting into service a business model that works. There is a fine line between a vision and a fantasy. It often depends on the blocking and the tackling.

Finally, there was Henry Goldberg. His narrative was unknown to many. Yet this Washington mandarin lawyer with the exciting mind has played a larger role in shaping the modern satellite industry than his famous son, one Daniel Goldberg of Telesat. The father played a significant role in the implementation of the "open skies" satellite policy that spawned new satellite-delivered television networks, including HBO, C-SPAN and CNN. As they say, it doesn't get much bigger or more important than that.

While the industry welcomed these three new entrants, another person worthy of honors got one earlier that day in that relaxed, refreshing and light-hearted luncheon which is World Teleport Association's annual Teleport Awards for Excellence. This year's event (the 24th annual) turned into an emotional program because the person who received the honor had no idea it was coming to him.

Legendary inventor William Bartlett Walton did not get into business to make the world better. He did it for the same reason that F. Scott Fitzgerald wrote great books: because he was driven to do it. He also needed to survive and feed a family. Today they call that "old school."

Bill has been attending the old school for 40 years. What people did not know until he started inventing systems to make antennas warm and cuddly on cold winter nights was that he had done a lot of other things beforehand. But in the satellite industry he not only found his niche, he has dominated it. While "Google me" may be the new campaign slogan for most of the Democratic candidate running in the USA presidential race, or what sales people of other de-icing companies have to tell their prospective customers, Walton Enterprises has simply no peer.

At Satellite 2019 he introduced a new portable radome product to protect terminals from rain, snow, ice, wind and sand. (Someone noted that he could not protect them from my bad jokes. Ha ha ha.)

He has kept his company on top as the leader in satellite earth station weather protection by driving innovation. He doesn't look the part but he is hip. While the world and the world of satellites have become a mishmash of GEO, MEO, LEO and the antenna regimes on the ground have been running fast to adapt, the man from Oregon, who loves to fish, has kept it Zen-like simple. Like the three guys who made the Hall of Fame later that evening, he grew his business alongside the satellite industry. It is hard to imagine the C-band industry's ground segment or a teleport industry without his de-icing concepts.

I think what each of these four people share is nothing. But what they agreed on, ultimately, is that the satellite industry is poised for an amazing decade ahead. They became giants because rather than listen to the buzz, they remembered what they'd learned in the "old school." And unlike USC, you cannot buy your way into it. It is merit based.

Lou Zacharilla is the Director of Innovation and Development of the Space and Satellite Professionals International (SSPI). He can be reached at: LZacharilla@sspi.org

View a video interview with WTA Awards ceremony at:

www.satellitemarkets.com/walton-2019

TECH BRIEF

Link Budget for Dummies

by Alvaro Sanchez

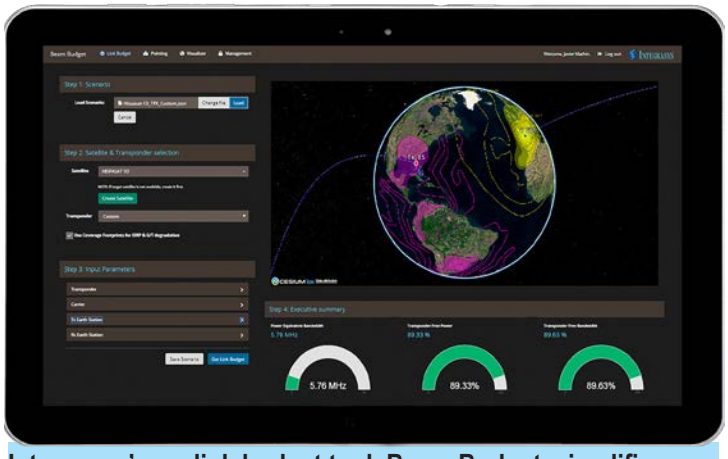
Managing new business challenges should encompass the entire satellite workflow and make it far easier to set up satellite antennas, reduce operator fails/ issues and ensure entire networks are continuously and automatically monitored. Integrasys has already worked and continues to do so, with a few satellite operators to drastically reduce running costs through better tools for installation and monitoring. Yet, there is one area that remains very tricky complicated and that is the process of buying and selling satellite capacity. Especially when you are not a experience satellite expert.

The management of the capacity using link budget calculations shows gains and losses on any given satellite link. However, few outsides of this exacting process know exactly how to assume this task, this requires expertise in this matter because even professionals who are specialized on Link Budgets, take a lot of time to perform single calculations.

This also means time is required and the correct resources must be applied to the process... and as all know, time is in short supply for most operators. With delayed link budget calculations, there is less business to materialize.

Incorrect computations result in an unsuitable satellite selection and that leads to signal degradation. Correct calculations, on the other hand, and completing a link budget quickly and effectively, equalizes to a satellite operator maximizing revenue and providing the correct capacity to the customer every time, with a greater customer experience.

Integrasys owns a simple accurate link budget tool, released earlier this year, Beam Budget. This product aims to democratize link budget calculations, making it possible for anyone to perform and understand these important calculations. There are a number of factors that make link budgets complex and those elements have been positively addressed with this tool.



Integrasys' new link budget tool, Beam Budget, simplifies making link budget calculations in a user-friendly interface.

One of the biggest issues with a link budget calculation is the volume of parameters that need to be input in order to obtain an accurate calculation.

In most cases, this work requires at least 50 parameters that include: Uplink power amplifier gain and noise factors; Transmit and receive antenna gain; Slant angles and corresponding atmospheric loss over distance; Climactic attenuation factors; Satellite transponder noise levels and power gains; Receive antenna and amplifier gains and noise factors; Cable losses; Adjacent satellite interference levels; and Intermodulation interferences.

This work generally needs to be done separately, for both the uplink and downlink frequencies. With Beam Budget, the company wanted to introduce a tool that could provide highly accurate results with fewer inputs. This tool can provide more than 75 results from just 25 inputs. Moreover, Integrasys has developed a new full-duplex function in which Beam Budget performs calculations from the HUB to the VSAT and the VSAT to the HUB, and a latest option to a regional network link budget.

Accuracy, accurate and simplicity

In spite of multiple parameters, traditional link budget work is not always as accurate as it should, and must, be. The goal for Integrasys was to ensure that all possible frequency bands and types of satellites were covered in a single tool, rather than having to further complicate matters using multiple tools, and it does with great results.

Beam Budget is available for every frequency band and also enables users to upload different types of satellite data. Every modulation is also supported. The result is the most accurate link budget calculation product possible in just one fee.

For a commercial visit to any client, link budget is really important for buying and selling satellite capac-

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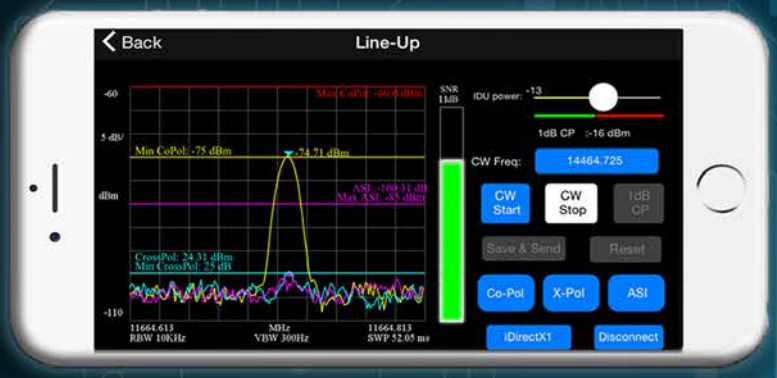

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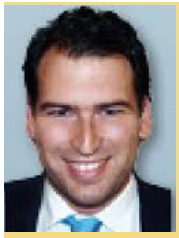
ity — these calculations enable satellite operators to confidently establish new satellite networks to ensure the best performance possible for a client company. Established networks use link budgets to calculate and demonstrate suitabilities for prospective customers. Satellite users need these tools to ensure the service they have selected is the correct choice.

In the case that link budgets cannot be performed or completed quickly enough, such could result in a costly, lost opportunity and revenue. Equally, if a customer does come on board without an accurate calculation, they may quickly take their business elsewhere if the end result does not match what they require.

Fast and accurate link budget calculations are a must — by making this tool accessible to anyone within an organization, as well as making it easy for stakeholders to understand the completed results, satellite operators can greatly improve their efficiency and have full confidence in Link Budget's results — and that, ultimately, is going to help them to realize more business.

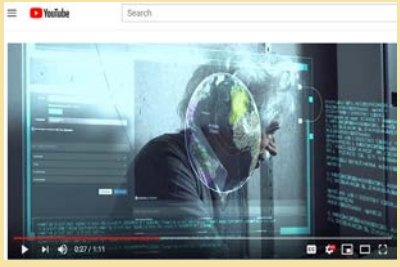
For more information, please visit http://www.integrasys-space.com/



Alvaro Sanchez is the CEO of Integrasys, which specialises in providing satellite spectrum monitoring systems for the satellite, telecommunication, and broadcast markets VSAT Tools for VSAT deployment and maintenance. He can be reached at alvaro.sanchez@integrasys-sa.com

View a video on the basics of Link Budgets at:

.https://www.youtube.com/watch?v=KnD42wIf6ko



5G Satellite Integration

by Martin Jarrold

Following-on from the Aberdeen, Scotland, Oilfield Connectivity 2019 event back in May, the GVF-EMP Partnership will be presenting its next event – Cellular Backhaul 2019: Satellite and the 5G Journey (www.uk-emp.co.uk/current-events-zone/cellular-backhaul-2019/) – as an embedded feature of the biggest 5G-dedicated event in the world, taking place on 13 June at London's Docklands ExCeL Center.

Attendees at Cellular Backhaul 2019 will be able to leverage a just recently established and innovative post-event facility on the new GVF website at www.gvf.org, a facility which was introduced immediately following the Aberdeen program and which complements the Partnership's long-standing practice of making available PDF versions of panelists introductory remarks-supporting slide decks. This slide deck availability – after the event with public domain and free-of-charge access for all interested parties, not just attendees – continues on the EMP website, but now, in addition, GVF's newly branded and designed website (which was launched during SATELLITE 2019 in Washington DC) provides a Post-Event Summary page where event delegates – and those not able to attend in person – can read an encapsulation of event proceedings, outcomes, and conclusions. The Aberdeen Summary can be viewed here https://gvf.org/news/category/post-event-summary/. Additionally, GVF members can sign-in to the website and use this functionality as a platform to ask questions, engage with event attendees and continue the dialog, post-event.

The Cellular Backhaul 2019 program in London – the second to be embedded within the KNect365 '5G World' and 'IoT World Europe' events, part of 'Tech XLR8', and in association with 'Smart Transportation & Mobility' – will be dedicated to exploring the current interaction between the satellite and wireless industries, the current and future growth of data traffic from mobile devices and how that will impact both cellular and satellite networks as they increasingly converge and integrate.

At no earlier point in the genesis of mobile communications is the success of the next generation of networking technologies so dependent upon the take-up of network services by industry vertical markets. This is clearly reflected in the qualitative nature of 5G, a quantum leap beyond the person-to-person communications focus of earlier generations of mobile and towards a device-to-device ecosphere of the Internet of Things, or as it is often characterized, the "Internet of Everything Everywhere".

GVF
Satellite. Solutions. The World.

With a series of roundtable-style formats across four themed panel-based sessions, Cellular Backhaul 2019 – which is supported by principal sponsor XipLink and by Comtech EF Data, Hughes, Newtec, iDirect, SES Networks and Gilat Satellite Networks – offers '5G World' attendees a series of thought-leadership explorations of the problems, risks and opportunities that exponential data traffic growth offers to both satellite and wireless industries and to the businesses that will rely on future integrated communications networks.

A very full program will feature panelists from ALCAN Systems; Astranis Space Technologies; CGI; Comtech EF Data; Eutelsat; Gilat Satellite Networks; Hughes; Inster; Integrasys; Intelsat; Isotropic Systems; Kratos; Newtec; SES; SES Networks; Spacebridge; TeleSat; VT iDirect; and, XipLink.

Panel #1, Unlocking Opportunities via Satellite… Beyond the Back-

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haul Opportunity & Paradigm Shifting Integration with "the Network", will feature a dialog between Michael DiPaolo, Vice President Cellular Backhaul Business Development, Comtech EF Data; Marco Mirante, Regional Sales Director, Hughes; Semir Hassanaly, Market Director Mobile Backhaul & Trunking, Newtec; John Finney, Founder & CEO, Isotropic Systems; and, Philippe Llau, Head of Data Business Unit MENA & APAC, Eutelsat.

The Mobile Ecosystem… Satellite Use Cases in 5G Deployed Infrastructures, the theme of Panel #2, will be explored by Tim Peyla, Senior Director Business Development, XipLink; Simon Gatty Saunt, Vice President Sales EMEA Fixed-Data, SES Networks; Savyon Wasser, Director Vertical Market Solutions, VT iDirect; Moti Goldshtein, Head of Products, Gilat Satellite Networks; and, Ali Younis, Head of Business Development & Product Marketing, Astranis Space Technologies.

Evolution of Ground Equipment… Infrastructure & Device-to-Device Systems comprises the theme for the next panel, #3, which will be analyzed by Vivek Jhamb, Senior Advisor, TeleSat; Assaf Cohen, General Manager-Global Vice President Sales & Marketing, Spacebridge; Deepukrishnan Pillai, Senior Analyst-Strategy & Market Intelligence, SES; Sebastien Couvet, EMEA Sales Manager, Integrasys; and, Mark Lambert, Vice President Business Development, Kratos.

The final panel of the day, #4, will feature Esat Sibay, Co-Founder & CFO, ALCAN Systems; Jaime Reed, Director Consulting Services, CGI; Javier Santos, Business Development Engineer, Inster; and, Gerry Collins, Director Product Management, Intelsat discussing Architectures and Technologies… Meshing Mobile Wireless & Broadband Satellite.

Facilitating and managing the four panels will be a moderating team with Anver Anderson, Managing Director, Anver Limited; Betty Bonnardel, CEO, AB5 Consulting; Lluc Palerm-Serra, Senior Analyst, NSR; and, me.

"...One consideration for the satellite industry during the period of the 4G/LTE evolutionary journey is to understand how it can beneficially leverage the opportunities inherent in the transitionary period of continued expansion of such networks, before 5G actually 'arrives'..."

With the first 60 Space X StarLink mega-constellation satellites having been launched a matter of days before these words are being written, we are now witnessing the tangible emergence of the satellite industry's next stage of evolutionary development. The birth of the various "mega-LEOs" – due to be launched over the next few years – will see the orbiting of more data coverage capability than on all the satellite communication payloads ever launched to GEO combined. This LEO evolution significantly adds to satellite's pre-existing pedigree of close synergy with mobile wireless, a pedigree as old as some of the earliest 2G network backhaul solution deployments across, for example, Africa.

Now, the most significant challenge in the mobile services market is achieving scalable and flexible backhaul – backhaul which is critical to ensure speed and capacity as it relates to the transport of data (and, of course, voice) from distributed network sites to the network core – particularly as markets move to 4G/LTE networks which are forecast to need to support 1,000 times more data traffic by 2020. Terrestrial backhaul optimization technologies cannot solve all challenges, and as a result there is a need for cost-effective mobile backhaul over satellite to relieve congestion.

At this point it is worth noting that whilst the future development of the global digital economy is indeed underpinned by the success of 5G deployment, some analyses of the roll-out of future cellular networks have it that 5G networks will NOT be the norm for some time and that 4G and LTE will continue along a gradual evolutionary path towards 5G. By 2025, the majority of the world's networks will have only just got to functioning LTE level but will still not yet be 5G.

One consideration for the satellite industry during the period of the 4G/LTE evolutionary journey is to understand how it can beneficially leverage the opportunities inherent in the transitionary period of continued expansion of such networks, before 5G actually "arrives". Along this evolutionary path satellite will evolve from an "interfacing" technology and service, with a secondary role in the "network", to an "integrated" technology and service, fully part of an evolving and complex "network of networks".

For further information and details regarding registration for these conferences, please visit https://gvf.org/event/cellular-backhaul-2019/ and follow the links. Alternatively, please contact Paul Stahl at EMP (Century 21 Communications) – paul.stahl@uk-emp.co.uk – or Martin Jarrold at GVF – martin.jarrold@gvf.org.

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

EXEC MOVES

KVH Appoints Ken Loke as VP-Asia-Pacific

Middletown, RI, May 22, 2019-KVH Industries has announced that Ken Loke has been named Vice President – Asia Pacific, to direct all initiatives for KVH in this important region.

Ken Loke

Loke has extensive experience in satellite and managed services with top companies active in the telecommunications and maritime industries. KVH provides connectivity solutions for the maritime market, including global mini-VSAT Broadband services used by thousands of vessels worldwide.

Prior to joining KVH, Loke held the positions of chief commercial officer and chief executive officer for Eutelsat – Asia Pacific, and senior vice president for General Electric Satellite for North Asia, Southeast Asia, and the Oceania region. A Singaporean citizen, Loke speaks English, Mandarin, Bahasa, and Cantonese.

Loke has a master's degree in business administration from the National University of Singapore and a bachelor's degree in mechanical and production engineering.

Homsy Named EVP of Thales' Telecommunications Business

Cannes, France, May 21, 2019-Pascal Homsy has been appointed executive vice president of Thales Alenia Space's Telecommunications Business Line, effective May 13, 2019. He succeeds Bertrand Maureau, who takes on new responsibilities within the Thales Group.

Homsy graduated from Telecom ParisTech in 1991 and began his career in sales at TRT-Philips.

Pascal Homsy

From 1994 to 1998, he served as area sales manager, Asia-Pacific, at Lucent Technologies. He subsequently moved up the ranks within the Alcatel-Lucent Group, where he held positions as consultant, customer strategies; Asia sales director; vice president, Local Multipoint Distribution Systems Business Unit; vice president, Voice and Services Business Unit, Fixed Switching Systems; vice president Sales, France Telecom/Orange global account; and CEO of Alcatel-Lucent France for more than three years. He was also vice president Sales, West and South Europe, in charge of France and the FT/Orange account; and president of the Strategic Industries Segment.

In April 2015, he was appointed president of the Europe and MEA Regional Business Centre, Software and Services, for Nokia/Alcatel-Lucent.

From 2017 until this latest appointment, Homsy served as global head of Sales, Big Data and Security Division for ATOS (Bull SAS).

Drawing on over 40 years of experience and a unique combination of skills, expertise and cultures, Thales Alenia Space delivers cost-effective solutions for telecommunications, navigation, Earth observation, environmental management, exploration, science and orbital infrastructures.

Senior Executives Join SSPI Board

May 15, 2019, New York City, NY — Space & Satellite Professionals International (SSPI) today announced the results of 2019 elections to its Board of Directors. The SSPI membership has elected six new Directors and re-elected four Directors to serve three-year terms beginning May 8.

Newly elected and re-elected Directors include: Ariane Cornell, New Glenn Commercial Sales Director – Americas, Blue Origin; Jonathan Crawford, President & CEO, The SPACE-CONNECTION; Jonathan Hofeller, Vice President of Commercial Sales, SpaceX; Jason Juranek; Aaron Lewis, Vice President, Arianespace; Arnulf Kjeldsen, CEO, Kongsberg Satellite Services; Barry Matsumori, CEO, BridgeSat; Nicole Robinson, Senior Vice President, SES; Dr. Walter Scott, CTO, Maxar; and Billie Sims, Vice President, Hunter Communications

The Board also appointed Mike Safyan, Planet's Senior Director for Launch and Global Ground Station Networks, and Sharyn Nerenberg, Director of Corporate Communications at Hughes Network Systems to complete the terms of directors resigning from the Board in their favor.

"SSPI's Board of Directors represents a unique blending of new space and veteran space companies," said executive director Robert Bell. "The established and emerging companies of commercial space have so much to learn from each other, and so much to contribute to the success of the entire sector in making a better world while achieving unprecedented commercial success."

Continuing in service on SSPI's Board of Directors are: David Myers, President, Communications Sector, Peraton (Chair); Thomas Van Den Driessche, CEO, Newtec (President); Michael Antonovich, CEO, Eutelsat Americas; Tony Gingiss, CEO, OneWeb Satellites; Christopher Johnson, President, Boeing Commercial Satellite Services; Keith Johnson, COO, Speedcast; David Kagan, CEO, Globalstar; Ric Vandermeulen, Vice President and General Manager, Government Satcom, ViaSat; and Elizabeth Evans of Reed Smith LLP serves as General Council.

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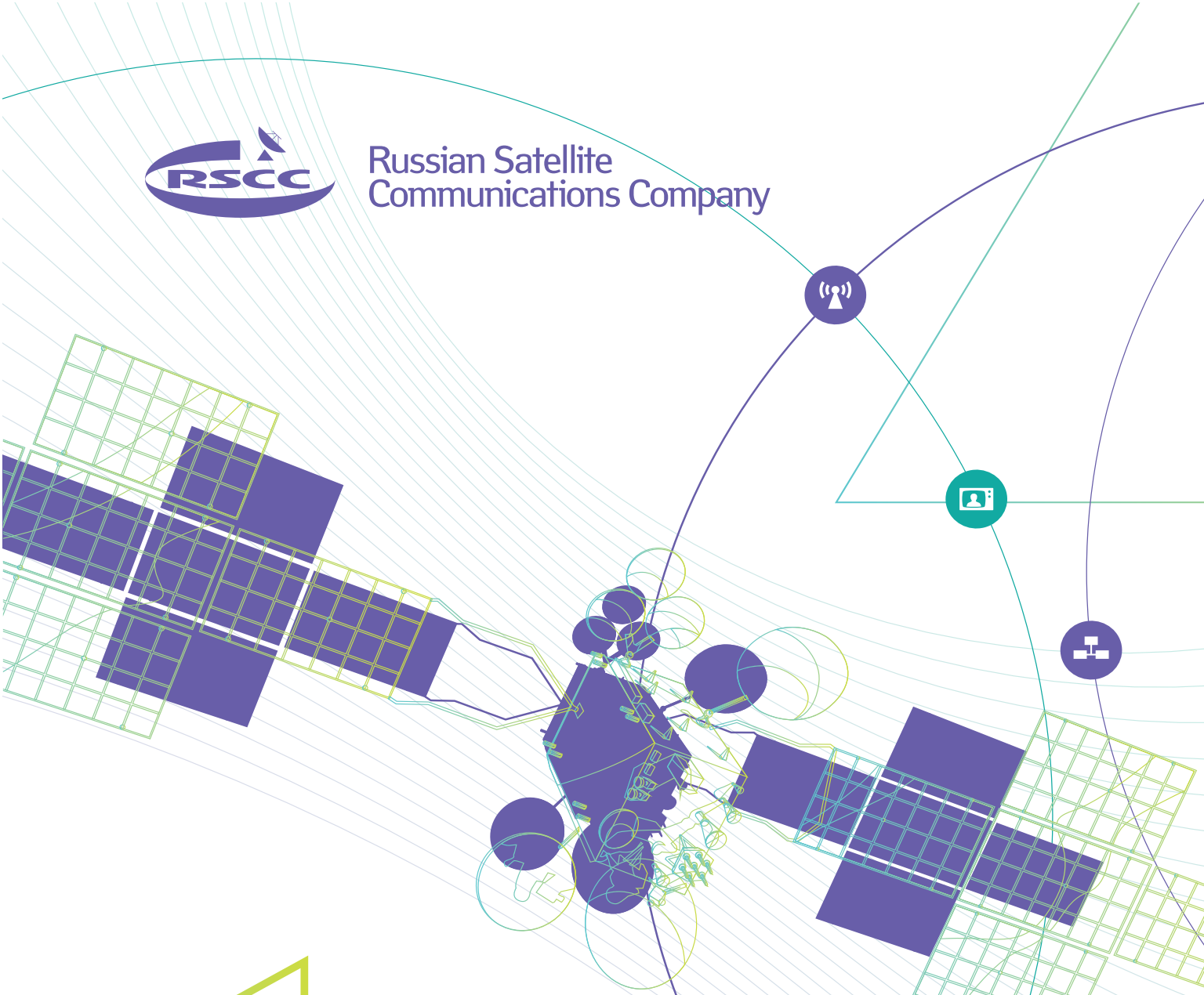

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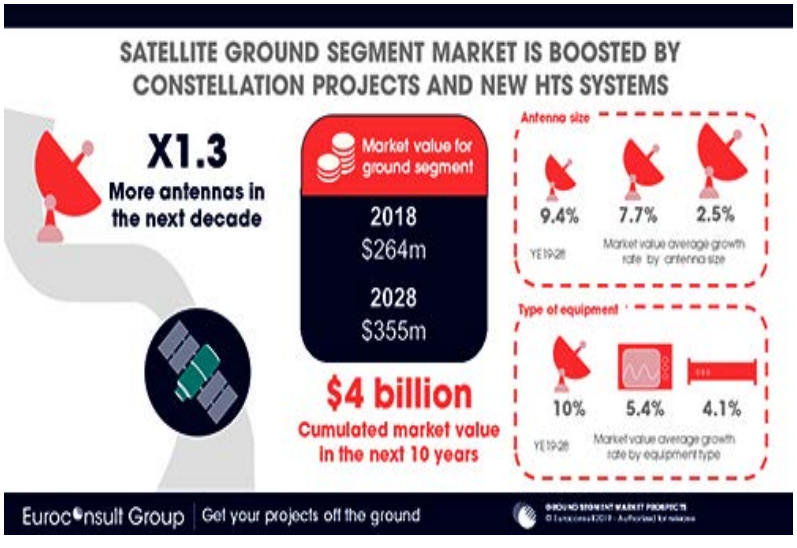
Commercial Ground Segment Aggregate Market

to Reach US$ 4 Bil. by 2028

Washington D.C., May 27, 2019 — The commercial satellite ground segment market, including satcom applications, EO applications and user terminals for user applications, is going through significant expansion in terms of both capabilities and demand and will grow from US$ 264 million in 2018 to nearly US$ 360 million in 2028.

According to Euroconsult's latest report, Ground Segment Market Prospects: Part 1, Forecasts to 2028, the aggregated market value in the next decade is expected to achieve US$ 4 billion. The initial Euroconsult report covers only large gateways, while the second part of the report dedicated to user terminals will be published in several months.



2018 has entailed a point of inflextion in the ground segment industry with the preparation of the OneWeb ground network, the launch of additional HTS systems and the need of further ground stations to provide connectivity with EO constellations. After some years of market consolidation in the teleport industry for satcom applications, the number of ground sites is expected to grow from 2019 driven by new installations in emerging regions. In the EO ground segment, the number of ground stations is steadily growing to serve the increasing demand on EO data and value-added services, the report concluded.

"In the last five years, numerous companies have announced new satcom and EO satellite solutions, largelly based on costellation projects but also on large HTS systems, aiming to capture new customers," said Santiago Perez, Senior Consultant at Euroconsult and editor of the report. "Their feasibility and sustainability are usually focused on the space segment, whereas their business cases need to evaluate them as end-to-end systems, including the ground segment that will be required. Their ground segment CAPEX and OPEX is not negligible and will have an impact on the market adoption of these solutions. Finding a sweet spot between space segment performance, ground segment features, along with service provided and price, will be key for the success of new EO and satcom satellite systems."

Each satellite mission, being in constellation or not, might have different communication needs (e.g. modcods, frequency bands, etc.) and so, the rationale for the use of ground segment can vary. The amount of data to download, the regional distribution of end-users, connectivity with ground networks, meteorological constraints, etc,, might also impact the definition and use of the ground segment.

The space sector is pushing for substantially more productive satellite infrastructure and ground segment at a lower cost. This trend is expected to intensify over the next decade, coupled with an increasing push for standardization in satellite manufacturing and ground segment equipment. New technological developments (notably going to SaaS) seek a more productive infrastructure with the aim of making lower cost end-to-end services.

Ground Segment Market Prospects: Part 1, Forecasts to 2028 is the essential tool for business planning and investment decisions in the ground segment industry, covering the different application chains in the ground segment including both satcom and EO applications. Part 2 of the report, to be published later in 2019, is dedicated to user terminals.

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ASIA VIDEO INDUSTRY ASSOCIATION

Steve Collar discusses his 2019-2020 playbook for growth and what is at stake for the satellite industry

This past week, AVIA had the pleasure to sit down with Steve Collar, President & CEO of SES.

Steve was appointed CEO of SES in April 2018. He had previously been the CEO of SES Networks as well as O3b Networks, and guided the company through the deployment of its constellation of innovative satellites. In this interview, we learn more about his new role, plans for the firm and personal perspective of the current trends for the satellite industry.

1) Steve, it has been a year since your appointment as President & CEO of SES. What are you most excited about in your job, and what are the greatest challenges?

It's a hugely exciting time in our industry with more change, disruption and innovation going on than at any time I can remember. Despite being an established operator with more than 30 years of leadership in the industry, we are at the forefront of some of that innovation and that is tremendously exciting. The greatest challenge — not just for SES but for the industry – is to change the perception of what satellite can do, to broaden the market and do a better job at communicating the increasingly valuable role that satellite can play in a cloud-scale world.

2) With the rise of online streaming activities, will this affect SES's roles and prioritisations for your video businesses?

It is absolutely the case that changing viewer habits impacts our thinking and that of our customers. That said, over the last year we have seen an increase in our reach to over 355 million households, with more than 1 billion people worldwide relying on SES for their content. The value that we bring to the video eco-system is immense. By adding the ability to format and deliver our customers' programming in a seamless way across multiple platforms including terrestrial, we are extending and enhancing our relevance and impact to our video customers.

3) You've announced that your plan is to order software-defined satellites and that's facing some challenges. How are they being solved?

I am not sure I would call them challenges. In O3b mPOWER we have already ordered and are building what I believe to be the most capable, flexible and reconfigurable satellite system that has been devised to date. For our GEO satellites we are looking to shorten the time from order to launch, reduce unit cost, and improve the ability for single satellites to fulfil multiple missions, among other things. We are close on all of these things. But there is also the important aspect of how we transform our satellite infrastructure into a true network and, for this, we are building an intelligent ground network that can dynamically and seamlessly direct traffic across our network. This will be the mark of true differentiation.

To view the full interview, visit www.aviasif.com

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The Satellite Markets 20 Index™

Company Name	Symbol	Price June 6, 2019	52-wk Range	
Satellite Operators				
Asia Satellite Telecommunications Holdings Li	1135.HK	7.39	4.62	7.43
Eutelsat Communications S.A.	ETL.PA	16.00	14.80	23.11
APT Satellite Holdings Limited	1045.HK	2.79	2.47	3.80
Inmarsat Plc	ISAT.L	541.60	355.00	646.00
SES S.A.	SES.F	13.70	13.24	20.81
Satellite Manufacturers				
The Boeing Company	BA	350.64	292.47	446.01
Maxar Technologies	MAXR	5.97	3.83	55.28
Lockheed Martin Corporation	LMT	352.52	241.18	354.34
OHB SE	OHB.DE	32.15	27.55	38.20
Honeywell International Inc.	HON	170.26	123.48	174.34
Equipment Manufacturers				
C-Com Satellite Systems Inc.	CMI.V	1.90	0.98	1.96
Comtech Telecommunications Corp.	CMTL	26.54	20.95	36.94
Harris Corporation	HRS	197.69	123.24	198.44
ViaSat Inc.	VSAT	90.88	55.93	97.31
Gilat Satellite Networks Ltd.	GILT	8.30	7.94	10.74
Service Providers				
DISH Network Corporation	DISH	36.18	23.22	37.47
Globalstar Inc.	GSAT	0.53	0.29	0.73
Orbcomm Inc.	ORBC	6.66	6.19	11.25
Sirius XM Holdings Inc.	SIRI	5.31	5.23	7.70
Speedcast International	SDA.AX	3.64	2.73	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 June 6, 2019
Satellite Markets 20 Index™	2,645.76
S & P 500	2,843.49

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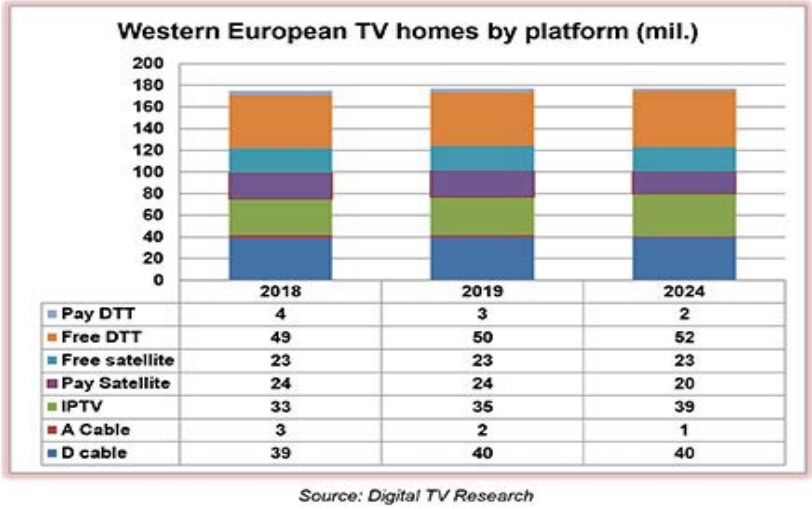

	2018	2019	2024
Pay DTT	4	3	2
Free DTT	49	50	52
Free satellite	23	23	23
Pay Satellite	24	24	20
IPTV	33	35	39
A Cable	3	2	1
D cable	39	40	40

Source: Digital TV Research

Reflecting the rising importance of the telcos, IPTV is gaining subscribers in Western Europe at the expense of the other pay TV platforms. IPTV overtook satellite TV in 2015 and will be approaching cable by 2024. IPTV will add 5.5 million subscribers between 2018 and 2024 according to Digital TV Research.

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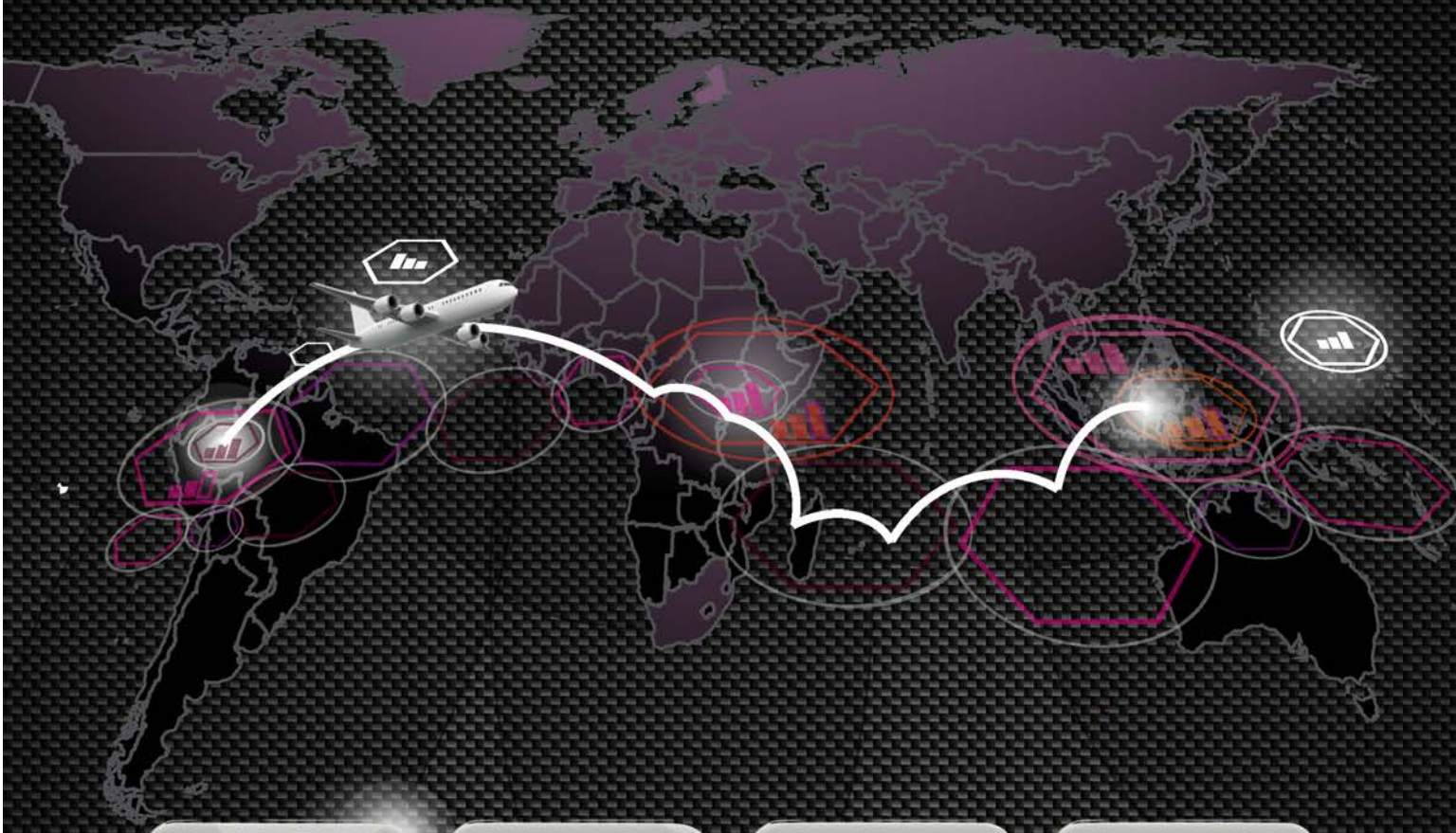

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