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SATELLITE Markets & Research

Industry Trends, News Analysis, Market Intelligence and Opportunities

Key Trends to Watch in 2021

by Virgil Labrador, Editor-in-Chief

The new year is finally here and it certainly is more promising than the very challenging year that was 2020. To say that the past year was a challenge is a huge understatement, but despite it all, there were some bright spots that bodes well for 2021 and beyond.

One of the bright lights from 2020 is literally the fast deployment of Starlink LEO satellites, here seen visible in the night sky. (image from StarWalk)

One of the shining lights of 2020 was the continued deployment of Low Earth Orbit (LEO) satellites. SpaceX's Starlink had a spectacular year having launched over 1,000 satellites in its constellation to date. Also, despite the downturn in key vertical markets like aeronautical and maritime, new vertical markets are emerging that will supplant or at least make up for lost opportunities

All in all, the consensus among satellite executives is that 2021 will be a pivotal year for recovery in the industry, with projections that 2021 will reach the level of 2019 in terms of revenues and growth forthcoming from 2022 and beyond.

There are also some key events coming in 2021 that will stimulate developments for the satellite industry. Foremost among these is the 2021 Summer Olympic games

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What's Inside

EDITORIAL

2021 Reset

There is some debate on what year a decade actually starts. Some say it's the year that starts in 0 (like 2020), others in the year 1, as in 2021. Regardless of your position in this debate, most people would rather forget 2020 and start the decade off with 2021.

As our cover story this month shows there is lots to look forward to in 2021 and beyond. The satellite industry has weathered the global COVID pandemic quite well and will likely emerge from it stronger than it was before the pandemic. Our Satellite Markets Stock Index on page 30 bears this out. This index shows that the satellite industry has actually gained 2 percent from its value in December 2020. It's still below what is was in January 2020 before the pandemic hit, but it has regained a significant amount of its value since. This actually lags behind the S&P 500 which has gained 17% of its value since before the pandemic. This goes to show that there is still a lot of work to be done for the satellite industry to fully recover, but it's on the right track.

We at Satellite Markets and Research can't wait to get back to live exhibitions and conferences in the later part of this year. Nothing says more about the industry being back than having large face-to-face gatherings again. It's going to be an interesting year and we'll cover it all for you.

Virgil Labrador

Editor-in-Chief

Satellite Executive BRIEFING
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EDITORIAL

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Trends to Watch...

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in Tokyo, Japan that was postponed from last year to this July. The Olympics is set to showcase new 8K Ultra HD technology and revive the flailing sports broadcasting market. Ultra HD technology will be a boon to the satellite industry due to it requiring higher bandwidth to transmit.

With COVID-19 vaccines starting to roll out in 2021 and reaching a substantial part of the world's population by mid-2021, the aero and maritime markets are set to recover, slowly at first and gathering momentum by year's end.

Here are the key trends to watch in 2021:

More Consolidation

In a downturn, companies that have sufficient resources are always looking for mergers and acquisition (M&A) opportunities to grow their companies and increase market share. 2020 saw major M&A activity, among them Intelsat's purchase of inflight entertainment company Gogo Inc. and Viasat's acquisition of maritime and oil and gas service provider RigNet. Intelsat, which underwent bankruptcy proceedings in 2020 is obviously betting on the recovery of the aero market. The same goes for Viasat, which has been heavily vested in the aero market and its hedging it bets by expanding its maritime and oil and gas portfolio.

Although some mergers did not materialize in 2020 such as the Comtech acquisition of Gilat which would have created a ground equipment powerhouse, expect more M&A activity in 2021 which will considerably impact the dynamics of the satellite industry.

NSR forecasts that 5G will generate US$ 21 Billion in cumulative revenues hrough 2029 for fixed satellite services, mainly from cellular backhaul. Image source: galaustralis.com

The Decade of the LEOs

Last year we projected that the decade of the 2020s will be dominated by the LEO constellations. In 2020, despite the initial falling out of some players with the bankruptcy of OneWeb and LEOSat, LEO companies led by SpaceX' Starlink and Amzon's Kuiper are on track to fully deploy their megaconstellations. Even OneWeb has remerge from bankruptcy with new investments from Bharti, the UK government and Hughes, among others.

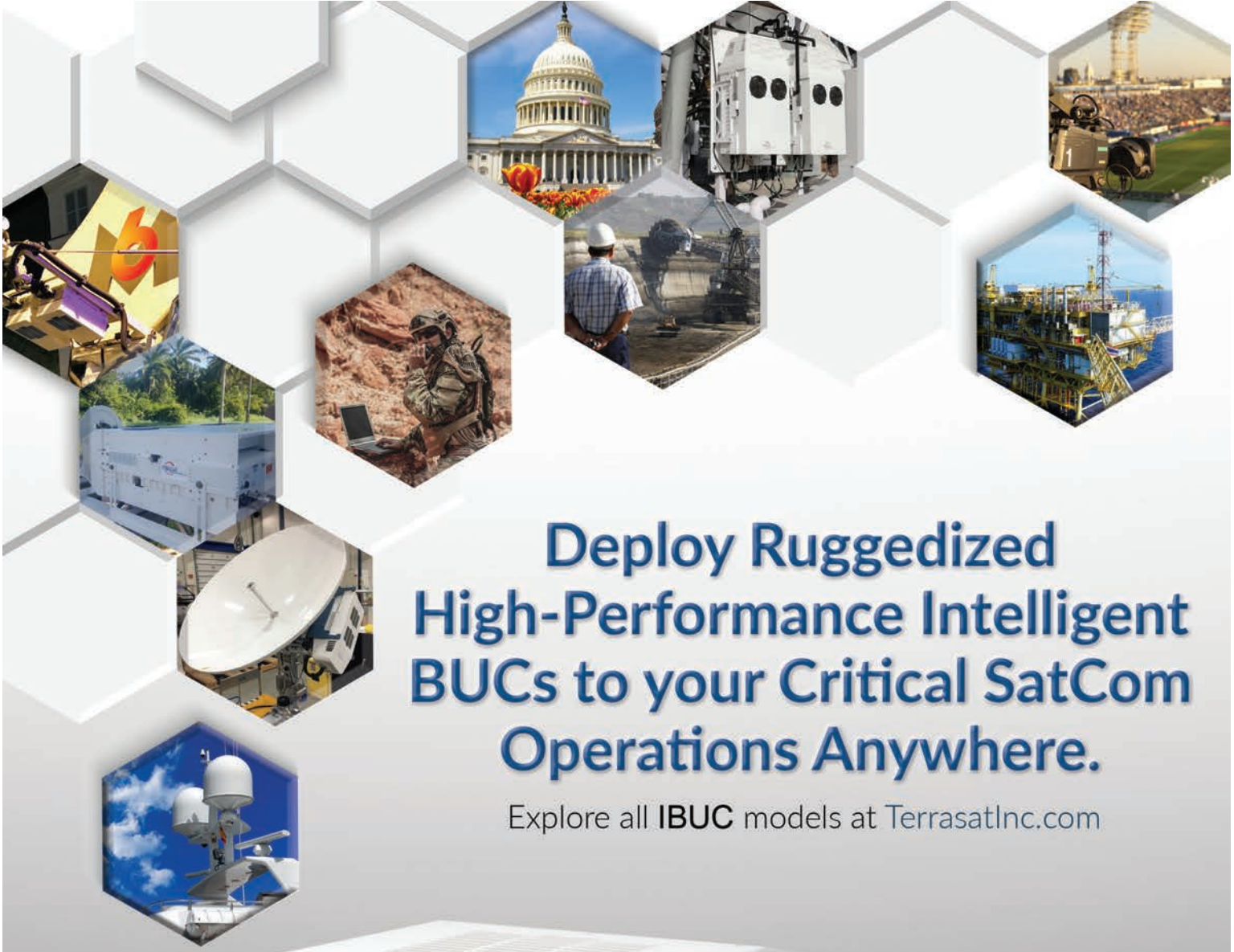
The global pandemic has actually significantly increased the wealth of two of the main backers of LEO systems, namely SpaceX' Elon Musk and Amazon's Jeff Bezos, who have been going back and forth in the top 1 and 2 positions of the world's richest persons. Given the heavy infusion of cash needed to launch LEO systems, SpaceX' Starlink and Amazon's Kuiper will likely not be struggling in terms of getting new capital. With such heavy hitters bankrolling some of the LEO systems, the emergence of LEO constellations (at least two of them) is almost assured through the end of the decade.

China has also gotten into the LEO game with new planned constellations from emerging Chinese companies (see Blaine Curcio's article on "China's Answer to Starlink" in our December 2020 issue).

One thing going for the LEO operators is the increasing demand for internet access in developing countries. Over four Billion people still do not have basic internet access and LEOs can help bridge the gap in this underserved market.

Emerging Verticals

The global COVID-19 pandemic has change society in profound ways, not the least of which is the way people work



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and relate remotely requiring large amounts of bandwidth. This has led to the acceleration of new technologies such as 5G. 5G will be many orders of magnitude better than previous wireless communications and data connectivity networks. NSR forecasts that 5G will generate US$ 21 Billion in cumulative revenue through 2029 for fixed satellite services, mainly from cellular backhaul. "But what makes the standard truly ground-breaking is that it has been designed from the ground up as a network of networks that can seamlessly integrate technologies including satellite into the 5G core. These advanced features mean that 5G has the potential to become a unified network platform, which satellite services can adopt to deliver plug-and-play convenience to fixed and mobile network operators," according to a recent report from the World Teleport Association.

Innovative Technologies

Pandemics have a way of spurring innovation. Isaac Newton developed some of his great theories during his isolation from a pandemic. This pandemic has also given rise to innovative products and services that are being introduced in the market.

Among those to watch out include Microsoft's satellite-to-cloud service Azure Orbital which is competing head on against Amazon Web Services in the cloud via satellite market.

Another company to watch is Northrop Grumman's SpaceLogistics which last year made history by successfully servicing two commercial satellites in-orbit with is Mission Extension Vehicle-1. Watch out for more of these types of innovative services emerging in the years to come.

"...The global COVID-19 pandemic has change society in profound ways, not the least of which is the way people work and relate remotely requiring large amounts of bandwdith..."

The Space Sector is Poised for Growth

Space is going through a renaissance of sorts with renewed public interest the likes of which has not been seen since the 1960s.

Last November 15th, Crew Dragon Capsule launched by SpaceX' Falcon 9 rocket docked at the International Space Station delivering four astronauts. It was the first time the US successfully shuttled humans in space since the end of the Space Shuttle program nearly ten yeras ago. This significant achievement was heralded by many as a game changer in human spaceflight.

After many fits and starts, Virgin Galactic is targeting 2021 for its much awaited launch of tourists to space with its SpaceShipTwo vehicle. Virgin Galactic has over 8,000 people sign up for its sub-orbital flights costing US$ 250,000 each.

Space activities in China and India also continued unabated even during the pandemic. Last month, China launched a mission to the moon that planted a Chinese flag in the moon's surface-the only other national flag apart from the US currently in the moon. Meanwhile, India is planning to launch this year uncrewed flight tests of its Gaganyaan human spaceflight program to be followed by crewed launches in 2022-23.

The emergence of the US Space Force has also elicited similar ambitions for other countries. All this activity and renewed interest in space will benefit the satellite industry by residual effects in investments and innovation.

Things are looking up for the satellite industry in 2021.

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

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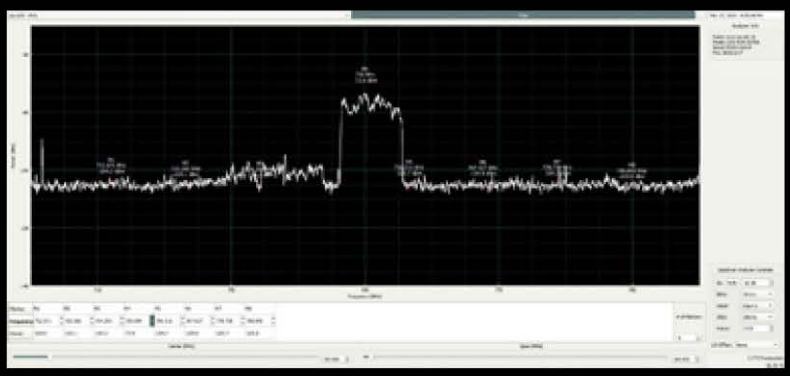

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FEATURE

Space Debris: A Worsening Problem

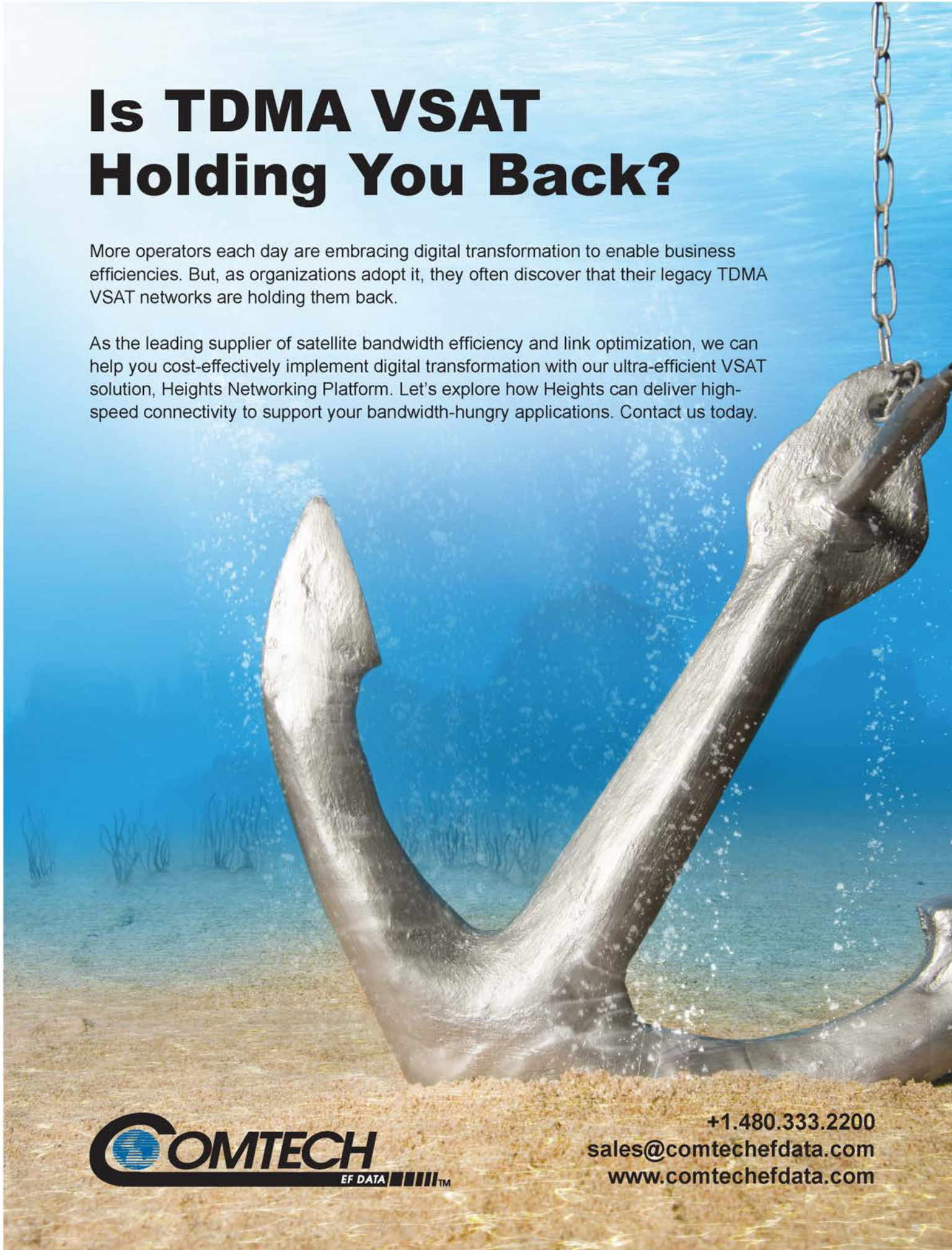
by Omkar Nikam

Image: MIT News

Ever since satellites have been launched in outer space, both opportunities and risks have increased in the various earth orbits. For more than 50 years, more than 5000 rockets have been launched carrying multiple space objects, mainly satellites into the orbit. Today most of these objects are either turned backed to earth or continue to revolve in earth orbits, ultimately increasing the risks for existing and future space infrastructure in low earth- (LEO), medium earth- (MEO), and geosynchronous earth (GEO) orbits. According to the latest update on the space environment by the European Space Agency (ESA), more than 9100 tonnes of space debris are in several earth orbits. While the space agencies like ESA have initiated an action plan for space debris mitigation, the international cooperation is important to help keep our collective space environment safe and clean for future use of the outer space.

Understanding the Complex Landscape

Currently, ESA is one of the agencies taking actionable steps towards reducing the space debris in the earth orbits. Similarly, we can observe that the emergence of the private space debris mitigation companies from the European region; ultimately signaling that Europe might be the future flagbearer of sustainable technologies in space. But to bring together several other agencies and companies to make such an investment in the removal of space debris, there should be an international dialogue presenting opportunities, growth, and sustainable future. Dr. Moriba Jah, an associate professor of Aerospace Engineering and Engineering Mechanics at the University of Texas at Austin, mentioned in one of the recent webinars that "We need to develop a space domain digital twin to understand this complex system as it will help us gain more knowledge about the decision-making criteria." As per the Dr. Jah's statement, it is very important for the government and private entities to fully understand the nature of space debirs and how it will be affecting our future in utilizing earth orbits.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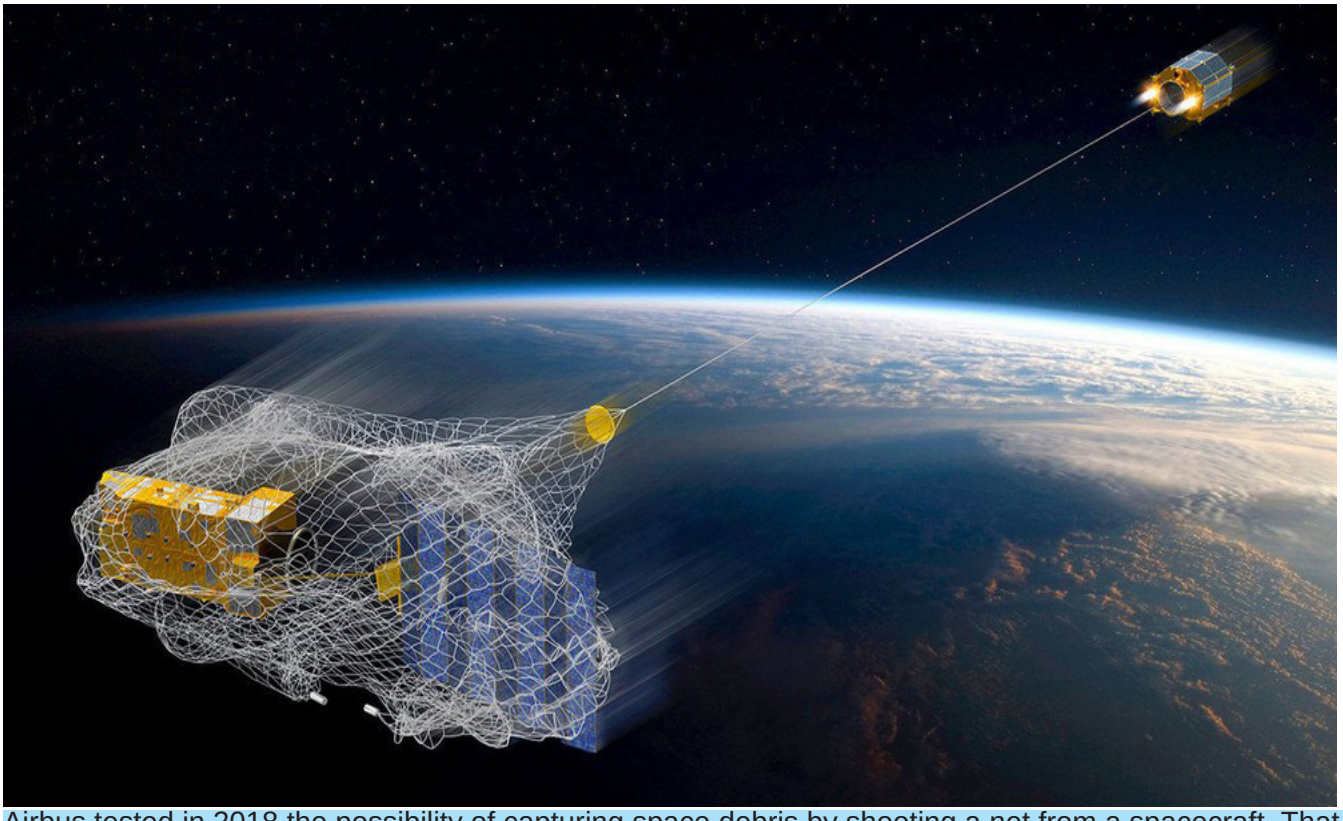

Airbus tested in 2018 the possibility of capturing space debris by shooting a net from a spacecraft. That test successfully enveloped a small "cubesat" which had been pushed seven metres away from the net-throwing craft—though this net was not tethered to the mother ship, which would therefore have been unable to deorbit its target. Tethers, indeed, are hard to manage in the weightlessness of orbit, which is why Airbus chose not to use one in this preliminary net-tossing experiment. (image courtesy of Airbus).

Opportunities & Risks

Taking a note of fast track innovation in the space engineering segments, companies like ClearSpace, a Switzerland based startup, are brining some of the best-known approaches for the removal of space debris. On the other hand, OrbitFab, a California based in-orbit space product and services startup, will be setting a mark for reducing the launch of new satellites by refueling/replacing parts of the existing systems in-orbit. There is definitely a growth and simultaneously an opportunity to innovate in the space debris mitigation vertical. But currently as there is no real-time deployment of fully functioning space debris removal spacecraft, the future remains uncertain.

According to ESA, "34000 objects greater than 10 cm, 900000 objects from greater than 1 cm to 10 cm, and 128 million objects from greater than 1 mm to 1 cm" are currently in orbit and are a potential threat to both the International Space Station (ISS) and the satellites in LEO, MEO, and GEO. Currently the most threat of space debris is for the objects in LEO. Several satellite operators like Starlink by SpaceX, Telesat, Kuiper by Amazon, etc. are now targeting LEO for operating a constellation of thousands of satellites. This has eventually increased the risk of space debris for existing human infrastructures in space like ISS. According to the Kessler Syndrome, a term proposed by NASA scientist Donald J. Kessler in 1978, provides a theoretical scenario that "The density of objects in LEO due to space pollution is high enough that collisions between objects could cause a cascade in which each collision generates space debris that increases the likelihood of further collisions." Therefore, deploying a

hardware system to remove the space debris, especially in LEO is risky as per the Kessler Syndrome.

Space Situational Awareness and International Cooperation

As far as the sustainable measures are concerned, we as the human race to have join hands together to keep our earth orbits safe and secure for the future generations. ESA's Space Situational Awareness (SSA) is a programme which considers Space Weather, Near-earth Objects (NEO), and Space Surveliance and Tracking (SST), has gained momentum in the recent years, mainly due the rising issues related to space debris. Though a first step, ESA has made an investment of approximately USD 102 million (given as a contract to a Swiss startup, ClearSpace). With these strategic steps, ESA is currently marching towards a sustainable future in space by not only mitigating the space debris, but also accommodating and encouraging private players in this arena.

Similarly, the other government space agencies need to take a step to realize what are the possible growth and opportunity indicators for stepping into the zone of space debris mitigation. In the past we have seen several satellite collisions between different countries, which has eventually led to the increase in the space pollution. Therefore, encouraging and joining hands together to make space as a safe and secure place is the need of the time for this generation. On the other hand, companies OKAPI: Orbits, a startup based in Braunschweig, Germany, has already initiated an AI-driven SSA platform to help the satellite operators better understand the space debris situation around their respective in-orbit space systems. The similar innovate private players should be encouraged by the governments to accelerate the space debris mitigation plans. And this will eventually help the global space agencies and institutions/organizations to map the landscape of the sustainable earth orbits.

Conclusion

The space pollution is a long-term problem, and we can connect this situation to our waste management system on earth. Since the start of the industrial revolution, human beings have polluted earth to the extend that we have almost accelerated the natural temperature of the planet leading to global warming and climate change. Similarly, space debris is a problem, which needs a quick action but also an in-depth understanding from several perspectives to implement the actionable measures.

"...Space debris is a problem which needs a quick action but also an in-depth understanding from several perspectives to implement actionable measures..."

It is by far clear from the European perspective that strong initiatives from the government will help drive innovation as well as create a roadmap for sustainable space technologies. With the rise of New Space technologies around the world, along with the consideration of SSA, might help the countries to reduce, optimize, and revamp the existing infrastructure in space, as oppose to launching new systems. For the moment, reusability of existing space systems, is a real-time solution. Though the debris removal process is slowly gaining a momentum, the actual deployment of debris removal system might take some time with respect to risk assessments and success rate.

Omkar Nikam is a correspondent of the Satellite Executive Briefing magazine based in Strasbourg, France.

He completed his Master in Space Studies from the International Space University and had over three years of experience in the Indian media and marketing industry. Apart from the academic and professional engagement in space activities, Omkar actively volunteers for the Space Generation Advisory Council (SGAC). He can be reached at: omkar@satellitemarkets.com

FEATURE

The Satellite Data Market in a Post-COVID World

by Mayank Halmare

Satellite data is the process of collecting information about earth through man-made satellites traveling around the earth's orbit. The most common use ofsatellite data is earth observation. Satellites deliver information about the earth's surface and weather changes. Satellite data services play an important role in scientific understanding of environmental processes such as carbon capture, albedo change, among others. This information is crucial to manage and safeguard environmental resources.

Moreover, satellite data services are used for various applications such as agriculture, maritime, defense & security, automotive & transportation, among others. Satellite data is useful for characterizing and monitoring terrestrial and surface features such as forest, desserts, and urban cities.

According to Allied Market Research, the global satellite data services market was valued at US$ 5.52 billion, growing at a CAGR of around 19.1% during the forecast period (2020-2027).

Satellite Data Services Industry Dynamics

The demand for satellite data services is increasing significantly, owing to increasing interest from the private sector toward the space industry. Private sector companies are changing government-developed technologies into affordable and lucrative technologies for commercial end-use. For instance, in June 2020, SpaceX launched 58 Starlink satellites and 3 small Earth-observation satellites. These 3 satellites and 12 other satellites are expected to provide views of earth's surface that are consistently covered in sunlight. Moreover, in June 2020, Hong Kong Aerospace Technology Group (HKATG) signed a strategic partnership agreement with China Great Wall Industry Corporation (CGWIC). The cooperation includes joint development of the Golden Bauhinia constellation system design, R&D, satellite design, testing, launch, and in-orbit delivery. Such increasing participation of private players in satellite launches and increase in the number of satellites in the earth's orbit enable satellite data and imagery service providers to provide their solutions for commercial purposes. For instance, in 2018, more than 90 satellites were launched for commercial purposes by the U.S., Italy, China, Japan, and the UK. These satellites are mostly used for mapping, monitoring, and collecting of terrestrial data, which can be used by end-users as per their requirements. However, COVID-19 has impacted the investments coming from private companies.

Stringent government regulations are a major challenge for the growth of the satellite data services market. Legal issues pertaining to the restrictions on data collection, location privacy, intellectual property rights, use & storage of geospatial information & data, among others limit the scope of the satellite data services market. Players and vendors in satellite launch and remote sensing satellites require regulatory approval from agencies such as Federal Communication Commission (FCC), National Oceanic and Atmospheric Administration (NOAA), and Federal Aviation Administration (FAA). Therefore, it is critical for vendors of satellite imagery analytics solutions to consider such legal matters during the execution of various customer projects. Moreover, governments of various countries across the globe have formulated and implemented regulations to limit the use of satellite imagery to ensure national security. Formulation and implementation of such regulations are expected to highly restrain the growth of the satellite data services market. The integration of 4D GIS software with satellite data presents new pathways in the industry, which are expected to provide opportunities for the growth of the global market.

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Trends in Satellite Data Services

Artificial intelligence is disrupting the earth observatory sector. AI plays a crucial role in the satellite data service market and effectively leverages key companies to allow systems to derive insight and make decision from raw data sets with minimal human involvement. The machine learning algorithm is a powerful tool for analyzing the satellite imagery of any resolution providing accurate insights.

Moreover, better space communication infrastructure is helpful in faster file downloads from satellite databases. Key companies are providing infrastructures as a service by aggregating ground stations enabling the communication for satellite operators. Better onboard cameras and sensors are transforming the earth observatory industry with more refined satellite imagery by improving the spatial resolution and measurement accuracy. Increasing use of hyperspectral and multispectral imaging technologies for collecting data from earth provides gathering of rich and sophisticated information by collecting the full spectrum of light reflected from the earth's surface. Furthermore, these technologies combine visible and near infrared imaging to extract information.

Adoption of full motion videos, cloud computing for image storage & analysis, and real-time acquisition and processing integrated data systems (RAPIDS) is increasing significantly in the satellite data services market.

COVID-19 Impact on Satellite Data Services

The COVID-19 pandemic has swept the world, with many industries trying to stay afloat. The government and business involved with space are reacting differently to the new situation.

During the COVID-19 crisis, the demand for crisis monitoring, evidence-based cases, and business intelligence increased significantly. In addition, the players in the satellite data services ecosystem actively contributed to the response efforts by providing storage and processing capabilities for modeling & other research needs and studying the impact of COVID-19. Moreover, companies are also providing earth observation imagery for industry intelligence and monitoring of remotely located infrastructure.

Moreover, as countries began going into lockdown earlier this year, satellite images and data were used to access data without having to break social distancing restrictions. For instance, in South Africa, satellite images were used as a tool to identify potential relocation sites for people

living in high-density urban slums who were considered particularly at risk for contracting the coronavirus.

Moreover, the satellite data services and earth observatory sector has witnessed increase in demand for Big Data Analytics (BDA) services from public entities, logistics companies, large retail companies, and business intelligence for determining the COVID-19 situation across countries. The earth observation satellite fleet operating companies Maxar and Planet have witnessed increase in demand for the data they collect to help track global and regional trends in human and natural activity.

In addition, the increasing demand to showcase imagery and outputs of imagery-based applications related to the impact of COVID-19 on the global economy from the news media industry has created a positive impact on the satellite data services market. However, the demand for satellite data services from other sectors, such as financial services and energy, has negatively impacted as the price of oil and stock market collapsed in Q1 - Q2 2020. From supply point, the manufacturing of satellite components got significantly disrupted. In addition, lockdown imposed by various governments also affected the supply chain, owing to which some launch providers delayed their satellite launches.

Post COVID-19 Scenario of Satellite Data Services

The current impact of the COVID-19 outbreak in the satellite manufacturing industry is limited to delays in delivery due to activity slow-downs for some of the manufacturers. According to Allied Market Reports Analysis, satellite launches are expected to witness a drop in 2020 and 2021, owing to delay in the production and supply of launch vehicle components due to the COVID-19 outbreak. Delays in satellite manufacturing activities and satellite launches are anticipated to impact the supply of imagery and analysis services. However, the number is expected to increase by 2022 and beyond, owing to growing demand as well as the need to clear backlogs. Attributed to the COVID-19 pandemic, small & medium-sized companies in the satellite data industry may face liquidity challenges in the short term and may struggle to survive without support from their investors. According to a survey by the Korea Association for Space Technology Promotion, 66% of space companies surveyed in March anticipated negative impacts throughout 2020 while 42% of companies are expecting to recover business in the first half of 2021. Moreover, according to the United State Department of Commerce's study on the space industrial base, in the U.S., around 90% of space firms with R&D as a primary business line were small businesses. These SMEs are mostly sole source providers of critical equipment, parts, and services. The negative impact of the pandemic on the business of these SMEs may create major challenges in the near future.

With the pandemic, the demand for earth observation and satellite data for pandemic response has increased. However, the COVID-19 outbreak has forced governments across the globe to focus on medical services. The countries are reducing their space budgets to help pay for the pandemic response and recovery measures. Attributed to this fact, large-scale programs offering funds and support to earth observation downstream organizations for research in Europe and the U.S. are expected to have their budget negatively impacted for a short term.

For more information visit at https://www.alliedmarketresearch.com/satellite-data-services-market-A06428

Mayank Halmare is a seasoned market research and consulting professional. He has experience of working on various successful consultation projects with well-known brands in Aerospace and Defense industry such as Sierra Nevada Corporation, Airbus, Planet Labs Inc., and others. His expertise has helped clients across the globe to formulate successful business strategies which contributes significantly in growth of the company. He holds a bachelor's degree in Mechanical engineering and Master's degree in MBA from one of the topmost educational institute. He can be reached at: mayank.halmare@alliedanalytics.com

ND SatCom Launches SKYWAN 5G Release 2.0

ND SATCOM unveiled a new dimension in satellite communications with the SKYWAN 5G Release 2.0, redefining customers' possibilities by powering the next level of immersive VSAT experiences. SKYWAN 5G is the world's only VSAT technology allowing multi-channel TDMA networks with True-Mesh ACM for hubless secure communication.

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"The game changing SKYWAN 5G Release 2.0 is here," said Michael Weixler, Head of Product Management. "True-Mesh ACM with intelligence integrated into the SKYWAN nodes automatically gives the customer maximum performance for any topology and network design. Combined with the new Point-2-Point waveform on the same platform, customers decide when to re-configure their networks based on actual connectivity needs," Weixler continued. "Flexibility and security throughout represent a whole new level for VSATs and a quantum leap for SKYWAN 5G."

ND SATCOM is the only trusted solution provider in Europe for demanding market sectors such as aviation and the military, where the concept of reliability has far-reaching impact. SKYWAN 5G Release 2.0 underscores ND SATCOM's continuing commitment to its valued customers.

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The company's core product SKYWAN enables secure, reliable and fast communications for thousands of users daily. With the SKYWAN network solution, ND SATCOM connects the IT world with satellite communication and offers fully integrated and optimised solutions for the worldwide availability of online applications.

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PRODUCT SPOTLIGHT

RF-Design Introduces PwrMxG series, a New Flexible and Innovative RF Power Monitoring Solution

RF-Design is leveraging 2020 in innovation and development to fulfill the sophisticated market and customer needs also for RF monitoring solutions by announcing the release of its latest solution for monitoring applications, the PwrMxG series. The PwrMxG is a broadband dual channel power meter designed to measure and monitor RF carriers' power targeted to Satellite-, Broadcast- & Cable communications industry such as Satellite operators, Teleports, Earth stations, VSAT hubs and Broadcasters.

The PwrMxG power meter comes as a compact handheld unit with dimensions of only 125 x 105mm providing flexibility and low power consumption of 5W at 12V. The unit can directly be used as a standalone handheld or as as a plug in module in a 1RU/19" rack mount chassis that can hold up to 4 hot-swappable power meter modules. Thus the PwrMxG is capable for monitoring 2 to 8 RF signals simultaneously at a frequency range of 50MHz – 4GHz (PwrM3G) and/or 50MHz – 8GHzMHz (PwrM8G). RF-Design´s new power meter is special with its vast dynamic range of up to 95dB with high RF power accuracy of ±1dBm, level offset for cables and directional couplers compensation along with threshold warning and alarming both for upper and lower limits shown at the front panel display, WebGUI or as SNMP traps.=

What makes the PwrMxG also unique is the calibration feature which enables the user to calibrate the power meter according to the user's desired signal allowing a very accurate power monitoring at that frequency in addition to the minimum and maximum RF power monitoring and recording. Another distinctive feature the PwrMxG has, is a user-friendly chart on the WebGUI which displays different power values over a predefined time period (history recording).

Additionally to that the PwrMxG can be monitored and configured either locally through a front panel OLED display/keypads or remotely via an Ethernet-Interface through WebGUI or SNMP. Learn more at www.rf-design-online.de.

Will 5G Finally Marry Satellite and Cellular?

by Robert Bell

Cellular backhaul via satellite is a big sector for the satellite industry. It is also a vanishingly small percentage of total backhaul. In 2020, the arrival of 5G has offered a similar paradox: hundreds of megahertz of C-band capacity have gone to feed the bandwidth appetite of 5G, yet 5G is the first cellular standard that is incorporating satellite as a native backhaul option. Our industry could be forgiven for feeling some whiplash.

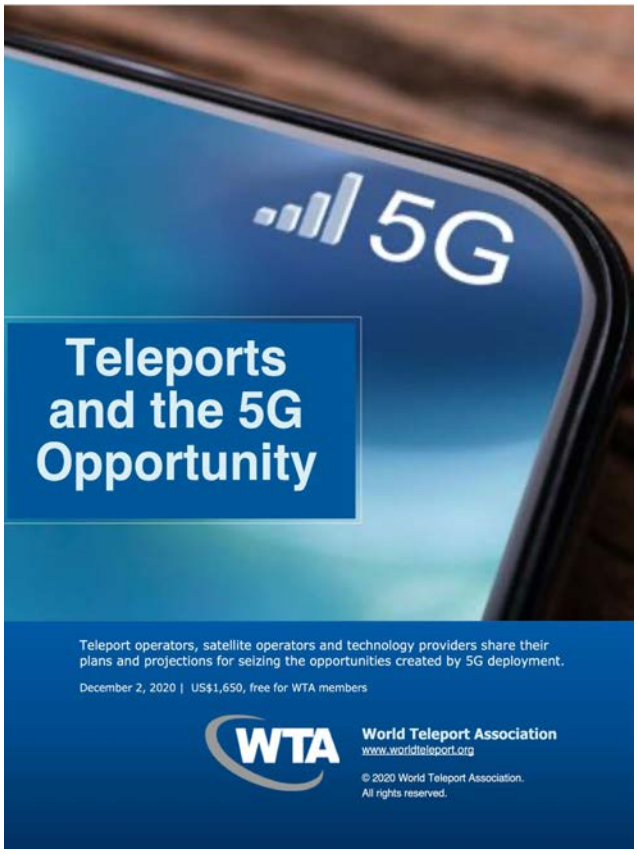
In December, the World Teleport Association published a report, Teleports and the 5G Opportunity, that makes sense of all this for satellite service providers. Here are some of the key findings for managers who need to make vital decisions about their cellular backhaul strategy.

5G is Already the Fastest-Growing Generation of Wireless Tech in History

China, South Korea and Japan are the biggest drivers of growth, and adoption is being aided by the ability of mobile network operators (MNOs) to repurpose existing 4G/LTE spectrum, base stations, core and transport networks for 5G, thanks to the Evolved Packet Core standard introduced for 4G/LTE. Compared with 4G/LTE subscribers, 5G mobile subscribers consume twice the volume of data, and much greater data growth is expected from non-consumer markets.

The 5G Rollout Coincides with an Historic Drop in Backhaul Pricing

Satellite has long represented the only effective solution to extending mobile networks into low-density or geographically challenged markets. But it was always a last resort because of the high cost of capacity and ground equipment. The dramatic success of high-throughput satellite (HTS) architecture has completely changed the financial equation. Massive increases in effective bandwidth have driven capacity prices down¬ward. For MNOs, con-



nectivity costs have passed through US$ 3 per Gbyte on its way to US$ 2, the sweet spot for backhaul. Meanwhile, higher Ku and Ka-band frequencies allow for smaller antennas, while advances in ground segment technology have shrunk size, cost and power consumption. It is a good time for satellite to become a much cheaper backhaul option, because average revenue per user (ARPU) has been falling for MNOs.

5G Will Become the Unified Network Platform, Changing Satellite in the Process

NSR forecasts that 5G will generate $21 billion in 2019-29 cumulative revenue for fixed satellite services, mostly from backhaul. But what makes the standard truly ground-breaking is that it has been designed from the ground up as a network of

networks that can seamlessly integrate technologies including satellite into the 5G core. These advanced features mean that 5G has the potential to become a unified network platform, which satellite services can adopt to deliver plug-and-play convenience to fixed and mobile network operators. That alone will significantly increase satellite's appeal as a backhaul platform. But there will be another bonus: satellite service providers will be able to take advantage of 5G's incorporation of the latest developments in software-defined networks, cloud services and virtualization, saving them from having to re-invent the wheel to optimize their own operations.

There Will Be Major Opportunities in Enterprise-Grade Services

A final benefit expected from the 5G rollout is the fact that MNOs plan to concentrate on enterprise-grade services for corporate networks, oil and gas and maritime, where they can most quickly monetize their investment. Lower satellite prices overall, and the unique capability of satellite to dynamically allocated a shared pool of bandwidth, may create a completely different business case in select rural areas where there is likely to be strong demand for 5G capabilities: oil and gas basins, wind farms and solar stations, military installations and remote industrial plants, mining regions and large farms.

The good news is that these markets align perfectly with the verticals already serviced by teleport and satellite operators. The evolution of 5G will also create "islands" of connectivity in places otherwise lacking good terrestrial broadband: large resorts in developing economies, national and state parks, and tourist towns in wilderness areas.

Meanwhile, the 5G rollout to consumers will follow the pattern of previous generations: first in dense urban areas where customers are plentiful, then in suburbs and finally in exurbs and truly rural areas where MNOs will turn to satellite. 5G backhaul for consumers may take many years to become a meaningful opportunity in most of the world.

IoT? Not So Much

Since the beginning of commercialization of 5G, one of the use cases most frequently cited is for Internet of Things services. But our report is skeptical about the opportunity. Most IoT devices transmit tiny bursts of data at intervals. As one technology executive put it, "There are millions of IoT terminals out there now, many of which are still using 2G, which is well suited to this market segment. In the future, there may be applications that require low latency, but right now the vast majority of IOT applications do not." IoT is about statistics and observing, he noted. Things like smart meter reading or connecting vending machines need a cheap chipset and wide coverage that 2G or L-band satellite provide.

"...Satellite has long represented the only effective solution to extending mobile networks into low-density or geographically challenged markets..."

WTA interviewed executives from teleport, satellite and tech companies to produce the report, and many were skeptical about the size of the opportunities and the costs operators would have to take on to access them. But on the other side of the equation is revenue. Most of the operators interviewed are already working with MNOs in some way, from one managing a satellite network backhauling from 12,000 cell sites in developing nations to a company already delivering content to edge servers at cell sites for Netflix. They see 5G as a step-change that requires careful navigation but will be well worth the journey.

Teleports and the 5G Opportunity is available for free to members and for sale to non-members at *https://www.worldteleport.org/store/viewproduct.aspx?id=17555841*.

Robert Bell is Executive Director of the World Teleport Association, which which conducts research into the teleport and satellite industry and offers a Teleport Certification program to service providers. He can be reached at: rbell@worldteleport.org

CASE STUDY

Bridging the Digital Divide in Africa with Satmotion and Alusat

MSTelcom, a telecommunications company based in Angola is bridging the digital divide in rural Africa by providing connectivity to rural Angola. MSTelcom has successfully deployed a large network across Angola supported by ST Engineering iDirect's Evolution platform.

The deployment was surprisingly quick thanks to the Integrasys VSAT Auto-Commissioning tool, Satmotion Pocket, which enhances the delivery, commissioning, and maintenance of VSAT services, while also minimizing Operating Expenses (OPEX), time to market and interferences. The combination between the iDirect Evolution platform and Satmotion Pocket made the deployment not only an easier and more accurate process but also a high-quality result.

MSTelcom is a company that is fully committed with the African market needs in the long-term; therefore, they also use Alusat, the VSAT Network Maintenance System, developed by Integrasys. This technology solution perfectly meets MSTelcom requirements, as they need to be efficient managing their remote sites and their SLAs. Alusat enables the possibility of maintaining VSAT remotely without visiting the installations and assuring an accurate performance over the time.

The smart satellite network tool provider Integrasys works side by side with leading companies within the telecommunications and satellite industry, such as ST Engineering iDirect and MSTelcom, which are two benchmark companies in their respective businesses.

MSTelcom and iDirect Team at Teleport

Agostinho Kimpa Mungongo Kusseiala, Satellite Deputy Team Leader from MSTelcom said: ''It was a pleasure working with Integrasys on having this great solution in our network. We think that from now our goals will be achievable as expected and in record time. Among other achievements we expect to: Continue to meet our SLAs; Reduce remote activation time; Conduct faster performance site measurements; Reduce international calls (to satellite space segment providers) for support and Reduce OPEX significantly (due to less remotes site visits). For us, working with Integrasys is expected to be a partnership rather than a client-supplier relationship. Working together proved to be a great experience.''

Hannes Hattingh, Sales Director Africa, from ST Engineering iDirect said: "The iDirect Evolution platform is designed to work with third party systems that support and enable faster, accurate and cost-effective deployment of remotes. Satmotion Pocket is optimized for use on Evolution and streamlines the commissioning process, enabling installers to autonomously line-up antennas and eliminating the need for hub-side coordination and back-channel communications. Post installation, the Alusat system enables MSTelcom to centrally monitor all their VSATs to ensure optimal performance."

Alvaro Sánchez, CEO of Integrasys said: ''For us, working in Africa with MSTelcom is a great honor, supporting their effort of bridging the digital divide. We are glad to partner with ST Engineering iDirect in this business and many more.''

For more information on Integrasys and its products go to: www.integrasys-space.com

Today's Greater Imperative: The Power of Satellite's Ubiquity

by Martin Jarrold

From the beginning, with Arthur C. Clarke's 1945 Wireless World article proposing that just three "geostationary" satellites would cover the entire surface of the Earth from their (relative to a point on the surface below) stationary positions, the idea of using satellites for communications was conceived to achieve global wireless connectivity.

Since the advent of commercial satellite communications, the industry has striven to bring increasing capacity and capability to bear on achieving this global coverage. From broadcast, through to the first receive/transmit (Rx/Tx) networking, and then the internet; from GEOs, then from MEOs, and now from the emerging mega-LEOs, the objective has been to leverage the fact that satellite does indeed deliver communications everywhere – satellite is ubiquitous.

In the affairs of humankind throughout the satellite communications era this ubiquity has been of recurrent importance, but possibly not of as much importance as in the present circumstances, where a solution to pandemic disease is truly a solution only if it is ubiquitous. If this is a little abstruse, as engaging in ideas leadership can sometimes be, do bear with me and read on.

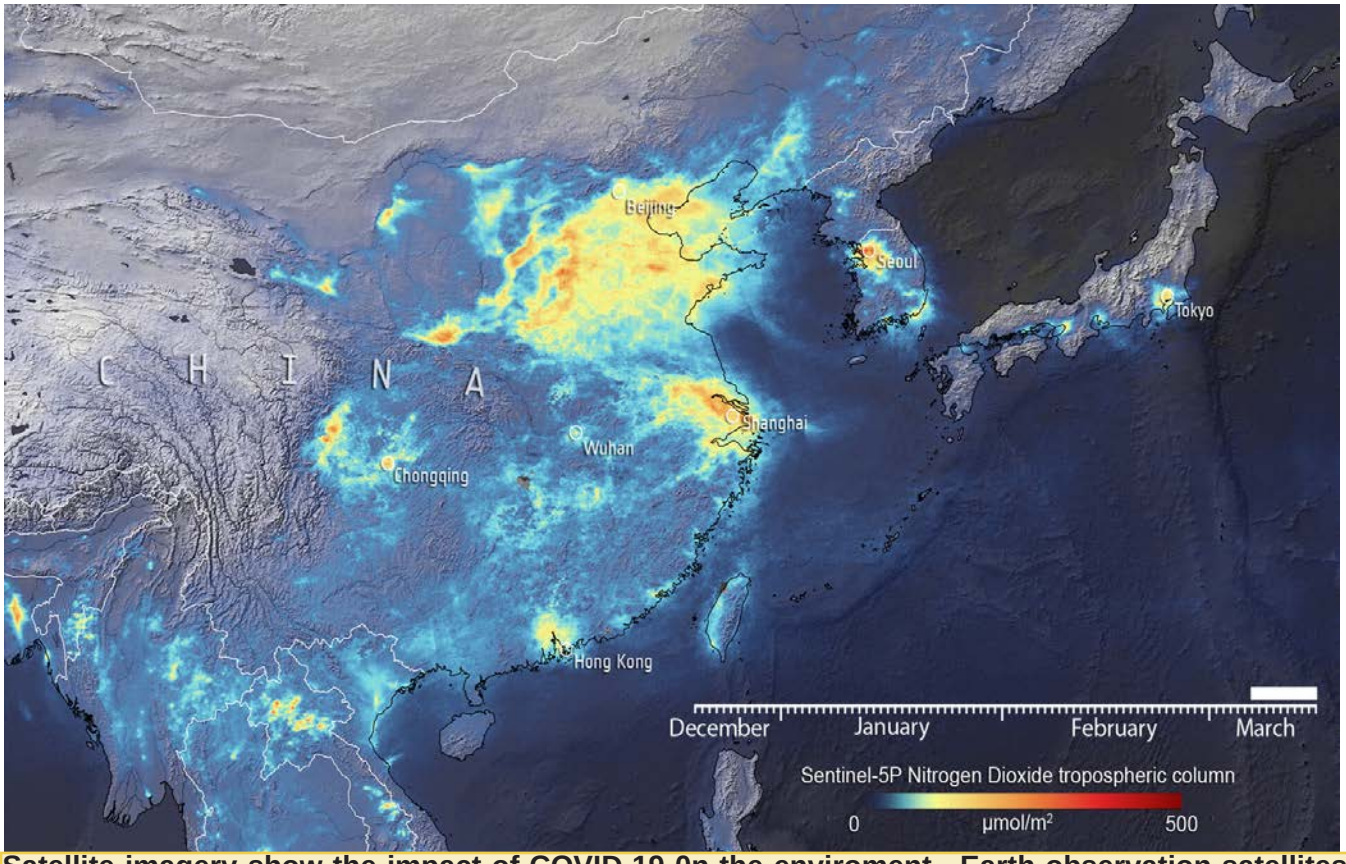
At time of writing (mid-December 2020) a year-long global public health crisis continues; yet, just recently, the development of various varieties of a vaccine gives us reasonable cause to look optimistically towards a near-term post-Covid-19 future. However, the governments and public health agencies of the world's economically advanced nations have been less than exemplary in managing prevention of the spread, impact, and response to the pandemic, and this despite the advantage of massive financial resources and highly developed infrastructures. Unsurprisingly, many developing nations, with poorer finances and weaker infrastructures, have fared much worse, as they typically do in the face of any one of a number of recurrent disaster situations.

The United Nations online UN News on 16 December 2020 published details of a press briefing by the President of the UN Economic and Social Council (ECOSOC), Mr Munir Akram, who said that equitable distribution of Covid-19 vaccines will represent an "acid test" for the international community, highlighting the importance of global cooperation in beating back the disease, and stressing that vaccines must be viewed as "a global public good" accessible to everyone, everywhere.

GVF
Satellite. Solutions. The World.

The resources and capabilities of the satellite industry have always been positioned "front and center" in creating and providing solutions in humanitarian assistance and disaster response (HADR), as was evidenced earlier this year during the GVF-Satellite Evolution 2020 Webinar Series. As noted in my previous column in this publication, 'The Evolving Role of Satellites in Disaster Response' was a webinar theme explored by representatives of Eutelsat, Inmarsat, Thuraya, and Knight Sky, and moderated by GVF's HADR Lead. Close to 8,000 individuals from at least 134 countries have watched this webinar series. So, the discussion of this topic can still be experienced through this GVF's YouTube channel at https://gvf.org/webinars/.

The pandemic has taken the nature of the satellite HADR agenda beyond the usual list – drought, earthquakes, famine, floods, hurricanes, tsunamis, etc



Satellite imagery show the impact of COVID-19 0n the enviroment. Earth observation satellites have a key role to play in a post-pandemic world. (image courtesy of European Space Agency).

– of natural disaster situations. Whereas the scope of satellite's HADR agenda has always encompassed within humanitarian programs a range of development issues related to agricultural and industrial economic development, education, health, infrastructure, etc., now to a far greater extent it encompasses the issue of global public health; an issue which has both acute/tactical (disaster) and chronic/strategic (development) aspects.

From early in the pandemic the World Health Organization's (WHO) Covid-19 preparedness and response plans called upon the international community to help with, amongst other things, countries building their capacities to prepare and respond, providing risk communication, coordination of the global supply chain, and acceleration in knowledge sharing and virtual inter-personal contact. Whilst government and other official authorities are prime actors in such preparedness plans, so, amongst other key industries, is telecommunications – and the satellite sector specifically features centrally in the provision of these capacities to prepare and respond.

During the first wave of Covid-19, GVF undertook a detailed review of satellite industry pandemic response initiatives, as covered in my earlier column in this publication in May 2020 – http://satellitemarkets.com/news-analysis/satellite-ecosystem-and-covid-19 – and also referenced in our webinar series in The Satellite Industry's Response to the COVID-19 Pandemic (https://gvf.org/webinars/). Examples of the satellite industry's response to the pandemic include:

- keeping crisis economies functioning by maintaining efficient movement of raw materials, manufacturing components, and finished products, as sea-borne container cargo or transiting other stages in freight transportation logistics.

- dissemination of knowl-

edge and its application in telemedicine, and the promotion of enhanced hygiene practices and virus transmission prevention guidance.

• bringing emergency telecommunications to meet vital first responder needs where other communications technologies falter because bandwidth demand outpaces terrestrial capacity supply, or where such technologies are limited, absent, or damaged by disaster.

• capacity-building for preparation and response, as illustrated in GVF's being – along with some of its member companies – signatory to the United Nations Crisis Connectivity Charter and the private sector's representative entity in the World Food Program administered Emergency Telecommunications Cluster.

WHO Director-General Tedros Adhanom Ghebreyesus has recently announced a global program to strengthen developing nations' primary healthcare, to better equip such countries to prevent and respond to emergencies such as outbreaks of new and deadly disease. Additionally, on 12 December 2020, UN Secretary General, António Guterres, said the Covid-19 pandemic has revealed just how important it is for all countries to have strong health systems that provide the entire population with quality services when and where they need them, noting "This year's pandemic has shown us that no one is safe until everyone is safe." Or as I would put it, the solution (i.e., the vaccines) is really only a solution when it is, just like satellite, ubiquitous.

"…This preparedness to deal with such further instances of public health crisis – as acute, discrete, and separate events – will facilitate preparedness for other – chronic, systemic, and existential – threats to human societies, such as that posed by climate shift. Here too, satellite – not only communications, but Earth observation and other mass data gathering applications through technologies like IoT – plays a key role…"

Coronavirus has illustrated what happens when the effort to address an emergency overstretches healthcare infrastructure and demonstrates the importance of preventing the spread of disease by providing healthcare education and information close to home, in the community. Resource poor countries lacking strong information and healthcare systems are more vulnerable to pandemic. E-Health platforms are indispensable in connecting hospital professionals to medical applications such as e-training, patients' e-medical records, virtual consultations, and video conferencing, immediately increasing the resilience of health service delivery systems. Lack of health infrastructure integrity, and the absence of readily available public health information, disproportionately impacts marginalized and vulnerable populations.

During the ECOSOC virtual press briefing noted above, plans were outlined for an examination of issues critical to post-pandemic recovery and achieving sustainable development through structural change and investment in sustainable infrastructure.

Rapid development of Covid-19 vaccines has shown how scientific innovation can work to a common goal. It can also be applied in efforts to achieve a sustainable future for all people, however, developing countries can be limited in accessing breakthrough technologies due to inadequate ICT infrastructure.

Satellite already delivers on helping to achieve the SDGs but currently, according to Munir Akram at ECOSOC, the consequence of pandemic is that "Eighty per cent of the populations of developing countries today under lockdowns, they are in the dark. They are left behind. They have no ability to communicate, to conduct commerce, to conduct business, to be able to lead a normal life because they are isolated, virtually and physically."

Mr. Akram further called for action to "digitalize" developing economies through improving internet connectivity and access. Satellite's critical facilitating role in enabling the development of what has been defined in a UN Development Program (UNDP) and Environment Program

(UNEP) paper as a global digital ecosystem has also been explored in Global Transitions: Digital Economy, Digital Infrastructure, Connected Communities, Digital Planet (https://gvf.org/webinars/), another in the GVF webinar series.

The marginalized and vulnerable, noted above, are the very populations to which Doreen Bogdan-Martin, Director, Telecommunication Development Bureau at the ITU, referred in a recent social media posting reflecting on the winding down of 2020 and resolutions for the New Year for renewed efforts to bridge the "digital divide". Ms Bogdan-Martin wrote, "The #COVID crisis has made the case for #connectivity." Adding, "… dramatically accelerating progress on every one of the Sustainable Development Goals (#SDGs) means making considerable headway to extend digital connectivity to the 3.7 billion still totally cut off from the online world." The GVF webinar Serving Underserved Communities (https://gvf.org/webinars/) has examined this topic.

Despite the tremendous achievements in scientific research, development, and manufacture at Pfizer/Biontech, Oxford/AstraZeneca, Moderna, and other pharmaceutical organizations, the mere existence of one or more vaccines is, obviously, not enough. Reflecting on all the above, we must consider the role of satellite in, amongst other areas:

Satellite technology can enable Telemedicine applications.

- Universal distribution of the vaccines and the tracking of transportation assets
- Communications for the augmented administration and functioning of vaccine delivery infrastructure and systems
- Information and training provision for ancillary and auxiliary medical staff
- Coordination between various domestic and international, government and NGO, clinical agencies
- And for the dissemination of accurate and truthful science-based information to counter fake and false information about the vaccines as solution to the pandemic disease

All this satellite can, and must, do.

If/when future zoonotic viruses – of which SARSCov2 is just the latest example – come to constitute a repeat threat to global public health, we must and will be even better prepared to leverage the capabilities of satellite. This preparedness to deal with such further instances of public health crisis – as acute, discrete, and separate events – will facilitate preparedness for other – chronic, systemic, and existential – threats to human societies, such as that posed by climate shift. Here too, satellite – not only communications, but Earth observation and other mass data gathering applications through technologies like IoT – plays a key role, building bodies and systems of knowledge, convertible into decision-making management "dashboards" to support development and execution of Actionable Intelligence.

Martin Jarrold is Vice-President of International Program Development of GVF. He can be reached at:

martin.jarold@gvf.org

Viasat Enters Definitive Agreement to Acquire RigNet

Carlsbad, Calif., December 21, 2020–Viasat Inc. (NASDAQ: VSAT), a global communications company, announced it entered into a definitive agreement to acquire RigNet, Inc. (NASDAQ: RNET), a leading provider of ultra-secure, intelligent networking solutions and specialized applications, in an all-stock transaction that values RigNet at an enterprise value of approximately US$ 222 million based on Viasat's share price as of the date of the agreement and RigNet's net debt at September 30, 2020.

The acquisition will help to further accelerate Viasat's strategy to provide high-quality, ubiquitous, affordable broadband connectivity and communications to the hardest-to-reach locations around the globe according to the company. RigNet provides global end-to-end, secure managed communications service and installation capabilities, along with digital transformation solutions, which will enable Viasat to quickly expand into new adjacent industries, including: energy, shipping, maritime, mining and additional enterprises.

Rick Baldridge, Viasat's president and CEO commented, "With the acquisition of RigNet, we are accelerating the diversification of our connectivity portfolio and establishing a global foundation for expansion of our remote enterprise service offerings. RigNet's successful track record, global footprint, deep customer relationships and emerging technology expertise in areas like machine learning and artificial intelligence (AI) make this transaction an ideal fit as we launch our integrated global broadband platform. The transaction is accretive to cashflow, and is expected to improve our leverage position as well as offer multiple opportunities for expansion and performance upside beyond RigNet's robust energy services business," he added.

"There is a powerful alignment between RigNet and Viasat given our shared mission to provide fast, reliable coverage, anywhere customers require it," said Steven Pickett, president and CEO, RigNet. Acquiring RigNet will give Viasat direct access to over 650 customers and expand and diversify Viasat's commercial connectivity portfolio, providing Viasat an opportunity to more quickly enter adjacent industries. It will give Viasat access to complementary core technology and services, including RigNet's digital transformation toolset, which includes its end-to-end managed communications and connectivity service capabilities, like SD-WAN; the Cyphre™ cybersecurity product-line; its large-scale applications and IIoT offering; and the Intelie Live™ real-time machine learning and AI analytics platform. Viasat expects to leverage and combine RigNet's digital transformation solutions, global enterprise experience, support infrastructure and back office systems to expand into new global services.

Viasat intends to incorporate RigNet into its Global Enterprise and Mobility business unit, led by President Jimmy Dodd, which will provide further complementary capabilities and support synergies to Viasat's existing mobility businesses. The RigNet team operates from its headquarters in Houston, Texas; management is expected to stay on to provide leadership, in-depth industry knowledge and customer relationship support.

Under the terms of the agreement, RigNet stockholders will receive 0.1845 shares of Viasat common stock for each share of RigNet common stock, which represents a 17.9% premium based on the 20-day volume-weighted average prices of Viasat and RigNet. The transaction represents an enterprise value for RigNet of approximately US$ 222 million, consisting of approximately $130 million in RigNet equity value, based on the closing price of Viasat common stock as of the date of the agreement and the assumption of approximately $92 million in RigNet debt, net of cash, at September 30, 2020. The transaction is expected to close by mid-calendar year 2021, subject to the satisfaction of regulatory approvals and other customary closing conditions.

Viasat has also entered into a support agreement with certain stockholders of RigNet, under which such stockholders have agreed to vote all of their RigNet shares in favor of the transaction at the special meeting of RigNet stockholders to be held in connection with the transaction, subject to certain terms and conditions. The RigNet shares subject to the agreement represent approximately 25% of the current outstanding voting power of the RigNet common stock.

LionTree Advisors LLC and Latham & Watkins LLP acted as Viasat's financial and legal advisors, respectively. RigNet's financial and legal advisors in the transaction are Lazard Middle Market LLC and Baker Botts LLP, respectively.

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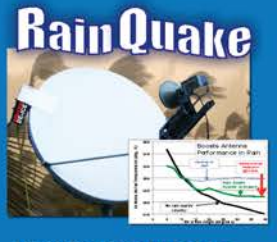

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Revgo Global Hires Daviid Liddle as CCO

Reston, Va.,, January 13, 2021–RevGo is pleased to announce the appointment of David Liddle as its Chief Commercial Officer (CCO) to manage the company's growth in the exploding satellite markets. Liddle's background and experience are well suited to navigate the company's new RF solutions required from the numerous satellite platforms planned for GEO, LEO, and MEO with greater linearity, expanded frequencies and bandwidths, higher efficiencies, smaller size and weight, and lower costs compared to traditional satcom systems.

David Liddle

Liddle, a 30-year veteran of the satellite industry, has lead sales and marketing teams for companies such as Ultisat, Comtech EF Data, Verestar and Comsat. Most recently he has been the managing partner of a leading international consulting firm to the satellite and data center industries, as well as he is the founder of The Deondo Company, a leading supplier of modular, mobile meeting spaces for the events industry.

"We feel fortunate to have David join our team and help us continue growing the company.We believe David will be an essential team member to enhance our name recognition and deliver products to new customers who require our smaller, lighter more powerful RF packages with higher data throughput," said Dr. Mike Engle, President of RevGo Global. "

RevGo Global was founded in 2003 in Reston, Virginia, USA, by experienced satcom executives. RevGo Global has shipped over 1,000,000 transceivers and is the highest volume producer of RF modules in the C-. X-, DBS-, Ku-, and Ka-frequencies in combination with its sister company, WaveLab Global. The team's expertise is "high volume" RF design and production resulting in industry leading linearity for maximum data throughput with extreme reliability. For more information go to: www.RevGoGlobal.com

Virgin Orbit Appoints Jim Simpson as CSO

Long Beach, Calif., December 7, 2020--Virgin Orbit announced today that Jim Simpson has joined its executive team as the company's Chief Strategy Officer (CSO). With the company rapidly approaching its second launch demonstration and nearing the start of commercial service, Jim's addition will help the team keep a laser focus on meeting its commercial and government customers' needs in the dynamic, global market for responsive launch.

Jim's celebrated career in space gives him experience in both the launch and the satellite industries, working with governments, start-ups, and everything in between. He recently wrapped up his tenure as the CEO of Saturn Satellite Networks, where he led the evolution of the geostationary Earth Orbit (GEO) field by changing the economics for both emerging developing nations and established organizations in the sector. He has also served as CEO of ABS (formerly Asia Broadcast Satellite), and served as the head of strategy for Aerojet Rocketdyne and Boeing Network and Space Systems.

Jim Simpson

Jim is already closely engaged with Virgin Orbit's team and its customer community, having served as a member of Virgin Orbit's board of directors since May 2019.

"I'm incredibly impressed by the new capability that Virgin Orbit is bringing online. In my career, I've had a chance to work with a number of incredible rockets, but there is nothing else that can do what LauncherOne can do in terms of being so mobile and flexible, and bringing so much value to customers," said Jim Simpson.

Asiasat Appoints Tammy Nan as VP-Finance

Hong Kong, December 17, 2020–Asia Satellite Telecommunications Company Limited (AsiaSat), Aannounced the expansion of the company's management team with the appointment of Tammy Nam as Vice President, Finance. Reporting to AsiaSat's Chief Financial Officer, Sue Yeung, Tammy will manage the finance team and oversee all financial planning and analysis, accounting, business operations and reporting activities. N

Space Economy Valued at US$ 385 Mil. in 2020

Paris, France, January 5, 2021– In its latest research product "The Space Economy Report 2020", Euroconsult estimates that the consolidated space economy, including both government space investments, as well as commercial space, totaled US$ 385 billion in 2020, a record amount. Commercial revenues of US$ 315 billion in 2020 were down 2% from 2019's US$ 319 billion evaluation, due partially to the Covid-19 pandemic affecting certain commercial markets - in particular satellite communication sub-segments focused on high mobility such as, aero, maritime, offshore oil and gas, though other factors, such as video-related revenues continuing their pre-Covid downward trend contributed to the decrease.

Added to these commercial revenues are the US$ 70 billion invested by government space budgets in 2020 (excluding government expenditures on commercial services, counted as commercial revenues), a 10% increase over 2019 government spending. There was no visible impact in 2020 on government space investments as budgets were voted before the pandemic, though the sustainability of these high government space investments post-Covid remains to be seen.

"With our latest Space Economy Report we took stock of our entire body of 2020 data and indicators across our multiple research products to provide our clients with a snapshot of the key trends, facts and figures of the current status of the space economy in these challenging times," said Simon Seminari, Editor-in-Chief of the Space Economy Report and Principal Advisor of Euroconsult.

The Space Economy Report 2020 covers the entire space value chain, with key facts and figures and concise analysis of upstream satellite manufacturing and launch services, as well as downstream satellite operations and satellite services. For the first time ever, the Space Economy Report also includes global government space budgets to provide a full and comprehensive view of the entire space economy. In addition, the report is available on Euroconsult's Digital Platform to facilitate rapid access and clear data visualizations, allowing clients to get a detailed and comprehensive understanding of the space economy in 2020 including main trends, strategic analysis, and growth drivers.

The report provides an overview of global space trends across the entire space value chain, with a special section on 2020 in Review. The report also includes dedicated chapters on: Satellite Manufacturing and Launch Services; Ground Segment; Satellite Communications; Earth Observation; Satellite Navigation.

The latest 2020 edition of Euroconsult's Space Economy research brings together a selection of key trends and indicators on the global space market, including government space budgets and commercial space revenues and offering a comprehensive look at the entire global space economy. The report provides a snapshot of commercial satellite value chain revenues in 2020 as well as global government space expenditures to provide a full view of the entire space economy in 2020.

The 2020 Space Economy Report is available now and can be ordered from the Euroconsult shop. A sneak-peak free extract of the research is also available at: euroconsult-ec/space-eco-2020

The Satellite Markets 20 Index™

Company Name	Symbol	Price Jan. 14, 2021	52-wk Range		Price Change Last Month	Price Change One Year
Satellite Operators						
Thaicom Public Company Limited	THCOM.BK	9.15	2.14	10.60	61%	130%
Eutelsat Communications S.A.	ETL.PA	9.40	7.98	14.82	-1%	-35%
APT Satellite Holdings Limited	1045.HK	2.11	1.70	3.94	16%	-28%
Echostar	SATS	24.58	19.75	43.71	4%	-43%
SES S.A.	SES.F	7.60	4.88	13.10	-4%	-39%
Satellite Manufacturers						
The Boeing Company	BA	213.24	89.00	349.95	-10%	-32%
Maxar Technologies	MAXR	49.80	7.18	51.25	76%	140%
Lockheed Martin Corporation	LMT	353.81	266.11	442.53	-2%	-17%
OHB SE	OHB.DE	44.25	25.65	46.70	13%	4%
Honeywell International Inc.	HON	207.76	101.08	216.70	0%	15%
Equipment Manufacturers						
C-Com Satellite Systems Inc.	CMLV	2.70	1.52	3.39	5%	50%
Comtech Telecommunications Corp.	CMTL	22.33	11.48	37.34	20%	-38%
KVH Industries Inc.	KVHI	12.11	6.36	12.49	18%	11%
ViaSat Inc.	VSAT	36.41	25.10	74.05	4%	-49%
Gilat Satellite Networks Ltd.	GILT	7.32	4.70	10.76	18%	-9%
Service Providers						
DISH Network Corporation	DISH	32.56	17.09	42.62	-12%	-11%
Globalstar Inc.	GSAT	0.89	0.23	1.17	178%	85%
Orbcomm Inc.	ORBC	8.47	1.24	8.48	36%	109%
Sirius XM Holdings Inc.	SIRI	5.85	4.11	7.40	-9%	-18%
RigNet Inc.	RNET	6.68	0.77	6.68	26%	11%

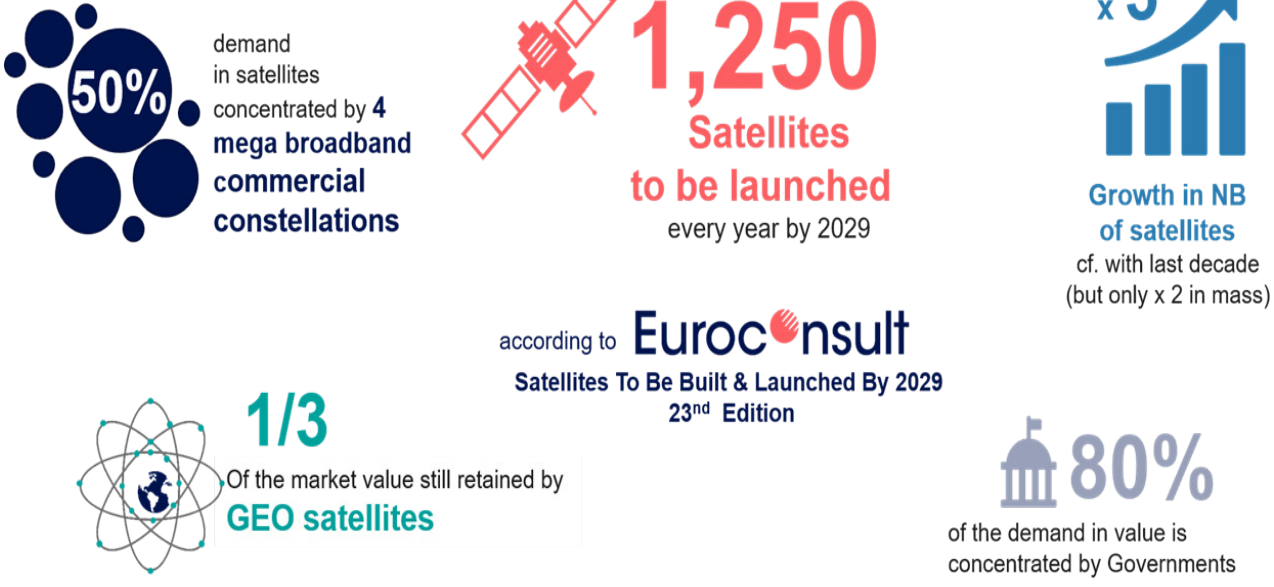
The Satellite Markets 20 Index™ is a composite of 20 publicly-traded satellite companies worldwide with five companies representing each major market segment of the industry: satellite operators; satellite manufacturers; equipment manufacturers; and service providers. The base data for the Satellite 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 January 15, 2021	1-Month Percentage Change December 15,2020	1-Year Percentage Change Jan. 2, 2020
Satellite Markets 20 Index™	2,487.45	2%	-13%
S & P 500	3,815.65	3%	17%

ADVERTISERS' INDEX

VITAL STATS

2020-2029 TRENDS FOR THE SATELLITE INDUSTRY



In its latest analysis of satellite manufacturing and launch services, "Satellites to be Built and Launched by 2029", Euroconsult anticipates almost a quintupling in satellite demand in the next decade with an average of 1,250 satellites to be launched on a yearly basis. In comparison to the 260 yearly satellites launched in the previous decade, this skyrocketing number cements the structural changes occurring in the market and the industry, not only in the number of satellites but also in terms of satellite missions and operators, both governmental and commercial.

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