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SATELLITE Markets & Research

Industry Trends, News Analysis, Market Intelligence and Opportunities

Vertical Markets for Satellite IoT

by Hub Urlings, Herbie Rijndorp and Marco Franken

Much has been made of the potential of the Internet of Things (IoT) market for satellite service providers. Estimates range for the size of the addressable market for satellite IoT from 10 million connected devices by NSR to 30 million by Riot Research. Whatever the actual number, there are several vertical markets that are very promising for Satellite IoT. We will cover several of these verticals in coming issues of the Satellite Briefing--starting with this issue on a little less well known sector--the meteorological market.

Recent developments in IoT connectivity and the coming of ubiquitous global low cost IoT connectivity are bound to cause a major technology disruption in the meteorological world.

New types of terrestrial networks and in particular the new small satellite (< 500 kg) based IoT systems. Especially communication satellites in the nano sat category (1-50kg), called cube sats for their 10x10x10 cm based frames, will connect millions of weather sensors all over the world. These Low Power Global Area Networks (LPGAN), will disrupt the weather data gathering segment streaming big clouds of meteo sensor data back to ever more advanced meteorological models running in the cloud. The huge increase in the number of weather

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EDITORIAL

The "Now" Normal

It has been over a month or more of stay-at-home orders worldwide that some consider as the "new normal." People mostly work from home, trade shows and conferences have gone virtual and almost all business engagement or interaction has been in the digital realm.

Not all of these changes are inherently bad, some are actually more productive working from home with less distractions, I do share the anxieties expressed by Lou Zacharilla in his column on page 25. Virtual trade shows and exhibitions are good, but they are not a good substitute for the real face-to-face interaction of the real thing. Take for instance, the NAB which was cancelled last month. This month, the NAB has gone virtual, calling it the "NAB Express" The program has the same great lineup of speakers and you can "visit" virtual exhibits. As temporary measure in view of the crisis, it's a good thing but it's not quite the same as the hyperactive and dynamic event that attracts over 100,00 attendees from al over the world to Las Vegas every year.

Rather, than resign ourselves to these as the "new normal," I think it better to look at the situation more fluidly and see is as the "now normal" as things are constantly changing. As Thomas Fröhlich, CEO of WORK MIcrowave put in the survey of executives in this issue, his company is on "permanent alert" and quick to adopt to changing conditions.

Almost half of the U.S. and parts of Europe are slowly re-opening their economies this month, there is at least a better recognition of what we all have to face with the COVID-19 pandemic and companies have taken measured responses to the current crisis and beyond. In this issue, we feature some of the satellite companies' responses page 17.

At some point, trade shows will be back, but I think it's a safe bet that it won't be quite the same as it used to be. Physical distancing will be with us for a while, until a vaccine is developed. There's also always the possibility of other epidemics in the future. So, now more than ever, it's important to keep abreast of all the changes and make the necessary adjustments and long-term plans to ensure that we all get through this safely and more or less whole.

Virgil Labrador
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Satellite Executive BRIEFING
Industry Trends, News Analysis, Market Intelligence and Opportunities

EDITORIAL

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Satellite IoT

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data points will not only increase the reliability of traditional macro forecasts for the country, but increasingly also enable improved meso forecasts (When and where will the hurricane hit the shore?) and micro forecasts (How does the weather this season affect the crops on my land?).

Where the advances in weather technology occur throughout the whole process of data gathering, data analytics and modeling, forecasting and the user interface displaying weather reports, we will limit this article to the developments in data gathering. In this article we will have a look at the impact of the new generation of satellite IoT system on the weather data gathering and how it will disrupt the meteorological world.

"Making the Weather"

To make a forecast, meteorologists collect data from a wide range sources and feed those into weather model, essentially a big software program that runs on a supercomputer. Multiple times a day, new atmospheric data — obtained from a mix of weather satellites and on the ground weather stations — is automatically fed into a model, which generates a prediction by applying equations from fluid dynamics, physics and chemistry to data like temperature, wind direction and humidity.

Historically is was the government that made the investment for weather satellites and to build out a ground network of weather stations to collected weather data. Weather forecasts were a public service to society. Forecasting the weather and climate changes and distributed via national TV. The large investments for this e.g. for weather satellites are made from public funds and operated under control of public organizations like EUMETSAT and National Oceanic Atmospheric Administration (NOAA).

"...Recent developments in IoT connectivity and the coming of ubiquitous global low cost IoT connectivity are bound to cause a major technology disruption in the meteorological world..."

Traditionally weather data comes from publicly owned weather stations on the ground (and seas) and doppler radar stations reinforced by weather balloons, sounding rockets, and more recently drones.

According to WMO, well over 10 000 manned and automatic surface weather stations, 1,000 upper-air stations, 7,000 Voluntary Observing Ships (VOS), 100 moored and 1 000 drifting buoys, hundreds of weather radars and 3,000 specially equipped commercial aircraft currently measure key parameters of the atmosphere, land and ocean surface every day.

In the UK alone in 2015 there were 330 UK weather stations, 16 weather radars and up to 300 ships and aircrafts, providing 106 million weather observations a day. To analyze these millions of observations, data flows to the European Centre for Medium-Range Weather Forecast (ECMWF) in Reading (UK), where one of the most powerful supercomputers in the world puts them into weather models and produces global numeric weather forecasts for users worldwide.

Add to this ground based data gathering infrastructure some 16 meteorological and 50 research satellites to get an idea of the size of the global network for meteorological, hydrological and other geophysical observations. Once collected, observations are quality-controlled, based on technical standards defined by the WMO Instruments and Methods of Observation Programme (IMOP), then made freely available to every country in the world through the WMO Information System (WIS).

The data coming from these sources are often publicly available for private weather companies that then employ in-house teams of meteorologists and data scientists to re-skin and repackage the data and sell it to clients whose survival and risk-management depends on precision forecasts.

Weather for Cash

Where weather services are traditionally provided by governments and public organisations for free as a form of soft-diplomacy, new commercial entrants are entering the market to both augment and extend weather data gathering and forecasting's abilities

Weather is one of the biggest business opportunities in the world and grows by the day,

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both on macro and meso level. This applies for the macro level forecasts for a country. With the growing number of smart phones, lot of weather-related start-ups started providing intuitive, engaging and easy to use apps for weather data. The daily news forecast on TV is now joined by individual local weather reports, with billions of people now checking their (local) weather every day on their phone whenever they wish or need.

Growing more rapidly however is on the meso level of forecasts, triggered by weather induced emergencies like flooding, hurricanes and thunderstorms, flash floods, tornadoes or heath waves.

Extreme weather kills more than 500 people in the US alone. The impact of weather on the world is enormous, with 1/3 of our global economy being weather sensitive with a US$ 2.1 trillion impact of on the global GDP variation. This while considering that 5 billion people have limited or no access to weather forecasts. The cost of flooding and storms in the midwest of the US alone in spring 2019 alone was an estimated US$ 3 Billion. It is estimated that each year, the global trucking industry loses upto 32.6 billion trucking hours globally to weather-related events. Weather causes 28 per cent of highway crashes, 19 per cent of fatalities and 23 per cent of delays across the globe.

This financial risk is why insurance companies, public government organisations, commercial enterprises and house owners are all looking for accurate forecasts on meso level. It is therefore no surprise that we see a growing number of weather start ups that promise by using Artificial Intelligence (AI) to revolutionize weather forecasting and deliver more actionable forecasts.

More Weather Data from the Ground

More data mean more accurate forecasting, and seismic advances in weather data gathering technology have enabled the recent emergence of so called micro forecasts. New sensor and communication technology have brought the industry's ability to collect and analyze data from every corner of the world, to a new level and the end is not in sight yet.

Apart from the "Official" WMO certified weather stations, we see that an abundance of meteorological sensors has become operational including cellular systems, weather balloons, drones and ocean-going robots.

What to think of an exotic new system called Saildrone that provides drone powered global weather forecasts using ocean going sail drones that are fitted with sea, sky and horizon cameras and sensors that take atmospheric and ocean measurements? The ambition is to launch 1000 saildrones for planetary coverage at a 6x6 degrees resolution or one saildrone per 580 km square.

Weather Underground (part of The Weather Channel since 2012) alone has 250000+ private weather stations worldwide that share their data as a basis for weather forecasts. When you look at the distribution of stations in the graphic on the next page, you see a one-on-one coverage map of terrestrial telecom networks. Under the header "Citizen science" Weather Underground is a global community of people connecting data from environmental sensors like weather stations and air quality monitors so we can provide the rich, hyper local data you need to power your passions. They use an open source model where contributors of weather data can also use the accumulated data sets for their own forecasts.

New data also come from the use of cellular based systems. Cellular IoT data can be used as one input for micro-cell weather forecasting, using the power levels of radio waves between the SIM and the cell tower to establish real-time weather conditions at an extremely local level. This information can then be combined with other data sets, such as telematics, to establish whether cars in the area have their lights on, or are using their windscreen wipers, building a more complete picture of weather conditions.

Commercial weather company Climacell claims to map the world's weather data with millions of observations others can't see. For their forecasts they see everything around them as a possible weather sensor, from wireless networks to connected cars. With so many sensors out there, they claim to have built a proprietary big data collection and analysis platform, combined with exclusive weather models. With this foundation, Climacell aims to provide minute-by-minute, street-by-street forecast, globally.

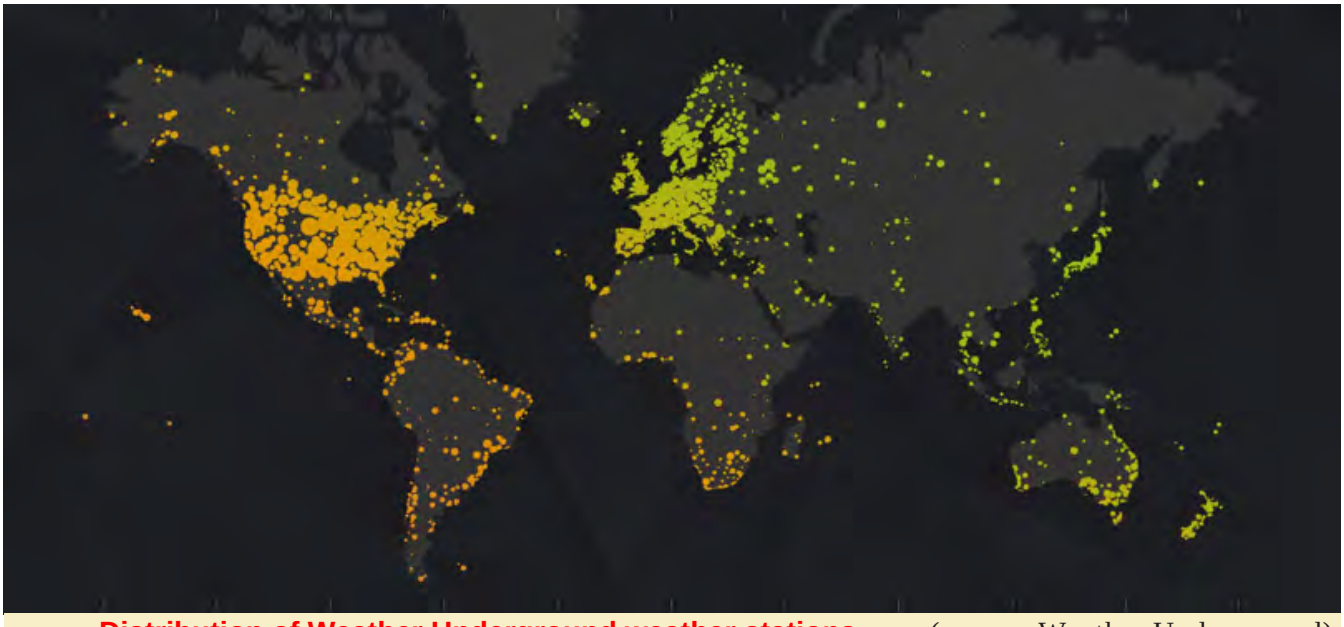
Using weather-related sensor data from smart phones, a Google

patent seeks to predict 'micro-climates' (and maybe even map your commute away from inclement weather). A patent from 2017 outlines a way for Google to use sensor data from mobile devices to determine and forecast up-to-the-minute weather conditions at "micro-locations." The invention could make it possible for Google to predict "micro-climates" at sites as specific as a certain spot in the park, or a particular street corner of a city block.

The Geostationary Operational Environmental Satellite is a good example (GOES 16 and Goes 17 satellites that have recently been launched) from the US by NOAA. Instruments aboard the GOES satellites collect data through a Visible and Infrared Spin Scan Radiometer (VISSR), a high technology device that measures the vertical structure of water vapour and temperature in the atmosphere over specific locations.

528 miles (830 to 850 km) in a North/South orbit sending regular images back to earth. This enables the onboard instruments (VISSR) to monitor and record global atmospheric conditions and cloud data by collecting numerous weather parameters that affect weather patterns.

From Europe the Copernicus constellation is a state-of-the-art weather satellite system developed in a cooperation between the EC and ESA with the objective to manage the environment and to understand and mitigate the effect of climate change and ensure civil security.



Distribution of Weather Underground weather stations. (source: Weather Underground)

More Weather Data from Space

Although an impressive number of weather satellites are in space, many satellites are 20 to 30 years old, carrying very relevant, but outdated technology. Upgrading the weather satellite fleet is an expensive and time consuming enterprise but steady progress is made. Billions of Euros are pouring into "space weather" with a global market projected to be worth between Euro 4B and 6B by 2025.

This allows the following data to be collected:

- Images of cloud and snow formation
- Wind information from cloud motion.
- Estimates of precipitation.
- Air and sea temperature.

In addition a new generation Polar Orbiting Environmental Satellites (POES) is coming into service. These satellites circle the earth at approximately 515 to

The fast-changing climate and economic developments around the world have created increasing demand for high-quality weather and climate data. At the same time, traditional weather satellites have become more expensive and have long development cycles. Is the small satellite revolution offering an answer–constellations of small satellites, cooperating to

produce the most precise, abundant and timely data on our planet?

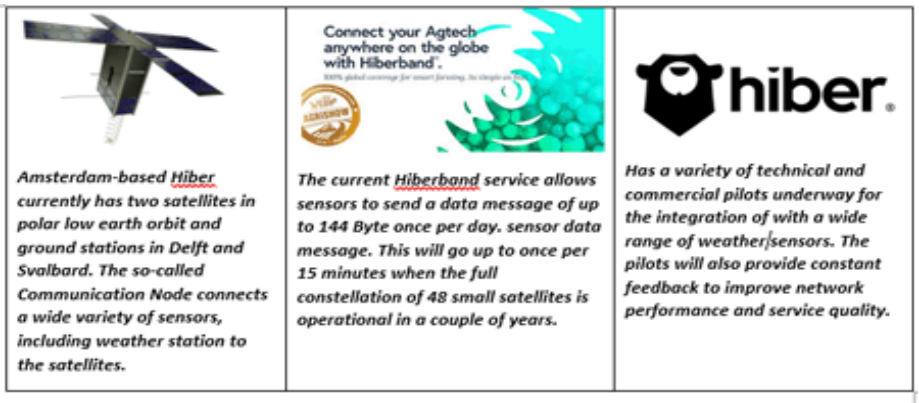
Small sat start ups such as Spire Global, GeoOptics and later also Planetiq are in varying levels of development and operations, providing a images and weather data from inexpensive small sats in Low Earth Orbit, using satellite weather observations based on innovative sensor readings such as radio occultation.

These space-to-(digital)-cloud analytics companies are now using their constellation of small satellites for entering the meteo market. Spire recently launched a Weather Forecast product, offering new weather forecasts dedicated to the maritime industry. The product will feature atmospheric and oceanographic weather attributes including, among others, sea surface temperature, ocean currents, wave height, surface wind, and air temperature, all available globally. Time will tell if they will be able to successfully compliment existing government weather assets in a sustainable way.

New satellite IoT systems will have a dramatic impact on weather data gathering as, due to the low costs of IoT connectivity and the use of low power satellite terminals, the number of weather data points around the world will grow in an accelerated pace. This will enable massive data streams from meteo sensors all around the world to come together and augment weather observations derived from weather satellites and the ground weather station network. The use of satellite also allows us to fill the geographical gaps that currently existing in the existing ground infrastructure.

The Rise of Small Satellite IoT in Low Earth Orbit

A new generation satellite IoT systems that is using cube sats in Low Earth Orbit are emerging to provide low costs and low power global connectivity to a wide range of sensors including weather stations. Their connectivity cost will match the costs for terrestrial networks like Lora or Sigfox and will be in the range of Euros per month per data point.



Amsterdam-based Hiber currently has two satellites in polar low earth orbit and ground stations in Delft and Svalbard. The so-called Communication Node connects a wide variety of sensors, including weather station to the satellites.

The current Hiberband service allows sensors to send a data message of up to 144 Byte once per day. sensor data message. This will go up to once per 15 minutes when the full constellation of 48 small satellites is operational in a couple of years.

Has a variety of technical and commercial pilots underway for the integration of with a wide range of weather sensors. The pilots will also provide constant feedback to improve network performance and service quality.

Globally, half a dozen satellite IoT players from all over the world are working to get their small sat constellations operational and enter the market. The current status in the LPGAN market is that the development of the end-to-end network is in its final phase. Among the is Amsterdam-based Hiber which has currently two satellites in low earth orbit and ground stations in Delft and Svalbard in the Netherlands.

All have launched and tested prototype satellites, ground stations have been established and ground modems and antenna equipment is available to be connected to a wide range of weather sensors. The sat-iot players are now preparing for launch, that is expected end 2020 - 2021 to bring a number of new IoT connectivity services.

The increase of data streams into advanced weather models running on cloud based supercomputing power means we can provide better and more accurate forecasts.

This not only might improve our quality of life here on Earth but it is also opening up a completely new segment of the weather market. With the increasing availability of cost-effective data and imagery derived from small satellites, new opportunities are emerging to create applications that are tailor made to the needs and desires of public organisations, companies and consumers.

The New Weather: Micro Forecasting

The number of applications derived from satellite IoT data streams looks endless and will vary between analysis of shipping traffic, optimizing energy grid management, creation of base maps for urban planners, natural hazard and disaster planning and recovery, airplane tracking, water productivity tracking, estimating surface water reserves, monitor-

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ing illegal logging and deforestation, and detecting underground water and mineral sources.

The meteorological industry today and tomorrow is fresh, young and hi-tech, especially in the new micro level forecast area:

- Farmers need to know the optimal time to plant corn before a frost.
- Airlines need to optimize their flight schedule in advance of a blizzard.
- Walmart needs to plan pre-hurricane inventory
- NGO's to prepare for humanitarian emergencies at rapid response, micro level.
- Cricket coaches now can match data about the pitch with atmospheric conditions: 'Big Data meets cricket.'
- Shipping companies need weather forecasts for their immediate impact on their ships and as a new way to illuminate risk on maritime routes, conserve fuel, and safely increase productivity.
- Energy companies need to optimize their solar panel location placement.

We will explore the above in a follow up article.

Conclusion

The data-gathering technology for weather forecasting is undergoing rapid growth. We see a range of new media being used for ever more accurate and localized forecasts, not only in the ground sensor networks, but also in space where an increasing number of weather satellites provides more and detailed weather observations.

Small sat IoT satellites provide low cost connectivity to globally dispersed weather sensors now collecting data from locations that were previously unavailable due to high costs and availability.

To bring them into use for the meteorological sector a couple of challenges need to be matches. The first is to choose between the different new IoT connectivity services offered by the various systems, that each have their own satellite terminal equipment and service specification. The second is how to transform the incoming data into valuable information.

To meet those challenges we have founded https://SatIoTLab.eu were expertise and best practises on existing and new satellite IoT connectivity is gathered and distributed via webinars, workshops and publications aimed specifically at public and government sectors like the meteorological world.

The new flood of weather observation data this will bring will not only make the macro forecasts more accurate, it also provides "any-time" weather forecasts that are tuned to specific personal and professional requirements. We are not yet so far that you can get the weather you like, but you can rely on the forecast of the weather you get.

Hub Urlings was one of the pioneers of Satellite M2M as Product Manager Inmarsat-C at the famous KPN Station 12. Now, 25 years later he is again involved in the development of a new generation of smallsat based Sat-IoT services as ESA Innovation Manager at Hiber.global. To meet the complexity of the sat-IoT value chain he developed the SatIoT lab.eu as an education and co-creation platform for global sat-IoT applications. He can be reached at urlings@m2sat.com

Herbie Rijndorp joined the International Maritime Satellite Organisation (Inmarsat) in London during the pre-operational phase in 1981. He worked at application development and introduced Electronic Data Interchange (EDI) for Machine-to-Machine data communication over the end-to-end Inmarsat links. Later-on he worked on EU sponsored projects developing Remote Monitoring applications via the Inmarsat 64 kbps and 384 kbps High Speed Data links. Later he was one of the founders of M2sat and as such currently working on the start-up of the M2sat-IoT lab. He can be reached at rijndorp@m2sat.com

Marco Franken has worked at Philips developing early stage APIs for aero and government networks, followed by service and applications development at Inmarsat. More recently, his focus has been the efficient use of sensors, IoT and intelligent data across insurance, finance, farming and maritime.He can be reached at franken@m2sat.com

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OPINION

Business Agility Lessons Amid the COVID-19 Pandemic

by Hari Abburi

Mission critical elements of operational agility and what they mean for individual businesses, and industry at large, in the post-pandemic era.

If there's one thing the global business community has learned from the COVID-19 pandemic that continues to ebb, flow and unfold on the daily, wreaking having on bottom lines in every corner of the world in its wake, it's the outright imperative for companies to be agile "from top to bottom." In fact, agility is rapidly establishing itself as "the great equalizer," asserting its unbridled authority over which companies—from global conglomerates to mom and pops...and EVERYTHING in between—will survive another day. While business agility has always been a key driver and benchmark of notably successful operations, now more than ever it's become abundantly clear that a business's ability to rapidly (and accurately) assess a situation and then pivot quickly and with relative ease in response can be a deal breaker in the most profound sense. For many companies, lacking this agility ability, on not just one but multiple (if not all) levels of the operation, is the literal end of the road.

Though commonly correlated directly to "innovation," business agility encompasses so much more. We know that superstar, wildly successful companies undertake tremendous efforts to best ensure all facets of their business become and remain aptly nimble—to the extent foreseeable, at least. Then COVID-19 struck. This crisis has exposed unanticipated cracks, insufficiencies and vulnerabilities that have put companies and industries at-large in a tailspin—even those once ostensibly at the top of their agility game.

As we endure the pain and even appropriately shift focus to more human-centric health and socio-economic concerns, individual leaders, businesses and industries as a whole must still undertake due diligence in relatively short order to identify—and shore up—agility failures in order to emerge from this horrific happenstance stronger and more dexterous than ever.

This will, of course, be easier said than done. Learning from this crisis and implementing requisite change to become appropriately resourceful and flexible requires a seismic shift in operational paradigms, not simply tweaking crisis management plans.

Below, are a few observations on some of the hard lessons learned amid the pandemic and offers some strategies in relation. This includes what the top three key elements of operational agility: intersections, interfaces and insights.

Hard Lesson #1: Not working at the speed of the customer

Crisis amplifies flaws. The pace at which the coronavirus has not only magnified, but also accelerated the damage these flaws create, has been

eye-opening and replete with lessons to be learned. Today we see mid-sized companies scrambling to activate digital tools with customers and employees, but not realizing that interface tools are just one element of agility. Being digital is a delicate balance between design and scale that directly changes the way a business operates. Even companies that have had digital transformation projects underway for some time now have realized that they just aren't "really" digital to the extent needed. Operating at the "speed of the customer" requires a deep understanding of where your customers and their experiences lie, though without any boundaries–of industries, technologies or expertise. It is about being at the right intersections and with the right interfaces and insights. New customer buying habits and expectations are being created right now. The businesses that are analyzing these emerging trends and modeling out the long-term implications will adjust faster to industry—and the global economy's—new normal.

Hard Lesson #2: Not having a 'globalized' market mindset

We often hear that we live in an interdependent globalized economy. But situations like the COVID-19 pandemic have revealed the vulnerabilities and negative impacts of the closing of geographical borders, countries prioritizing their own needs and leaning hard on multinationals to function nationalistically in their own homelands. However, the problem and the solution are the same. No single company, or country, has all the expertise, experience or skills required to function at the speed of the customer. Hence sharing, trading and ongoing learning are the key necessities to promote a stable and healthy globalized economy. The key reason we have start-ups disrupting large traditional players, or being valued as much as those that have been in existence for multiple decades, is that access to knowledge, skills and capital is truly global.

Hard Lesson #3: Not Identifying the right platform, data and technology

I hear many arguments on how and why large players have access to technology due to their deep pockets. While that is true, many traditional business have demonstrated the value of platform thinking whereby they build an ecosystem for their customers to connect their needs despite dissimilar services. This could be your local street corner bakery or an Airbnb. The ability to imagine your business as a platform is key. Otherwise, if you haven't dealt with how your business can sustain itself if and when there is another pandemic, you are essentially risking losing it all. This time it was unexpected. Next time, businesses should be better prepared... those who aren't will suffer a greater toll.

Hard Lesson #4: Not building an augmented workforce strategy

We can expect COVID-19 to spur huge changes in Robotic Process Automation (RPA) and intelligent automation. Yes, humans doing it alone is rapidly becoming an antiquated concept, like it or not. Objectively speaking, augmented workforces are smarter–they learn fast, focus on value adding activities and are overwhelmingly customer-centric. By 2025, I believe that there will be a mix of four to five bots or virtual assistants (or RPA processes) per employee in all types of companies. Almost 30 percent of every job has some level of automation potential. If companies can redefine their strategic workforce planning to beyond just planning productivity with humans, they will multiply their customer value while actually creating more jobs in other areas of the economy.

Hard Lesson #5: Not thinking about the future in a different way

Those business leaders who believe we will return to "business as usual" are at a huge disadvantage. COVID-19 will have permanent consequences on the future of every type of company in every type of industry. While many leaders talk about future, very few do something truly effective about it. This is an unfortunate truth even of enterprises with abundant capital. This is due to a combination of factors, including a lack of imagination or not knowing where to start the journey amid a litany of future issues that loom large. In my work, I help leaders take a hard focus on ideation: a commodity that is in short supply due to a glut of pressures. For investor-driven operations, this includes the weight of meeting quarterly numbers in an ever-growing, fickle-minded, risk averse climate. The ability to think, plan and execute in a clinical fashion is the key to realizing transformation. This is not to be confused with

a rigid plan. Rather, it is about thinking through the ideas, experimenting quickly and scaling up. It is about surprising customers with possibilities that they never thought were possible.

All told, the World Economic Forum reports that the global economic slowdown is forecasted to cost the global economy at least US$ 1 trillion in 2020—and that's aside from the tragic human consequences of the COVID-19 pandemic, according to the UN's trade and development agency, UNCTAD. Such a gut-wrenching estimate should be motivation enough to take a cold, hard look at your organization's adaptability—or lack thereof—and think-tank concerted strategies for a multitude of scenarios—even those that are "highly unlikely but in the realm of possibility." The best plans will serve as "ideation insurance," accounting for worlds we don't yet live in...and, in some cases, hopefully never will.

Hari Abburi is an internationally recognized global executive and consultant to Fortune 500 firms, small to mid-size enterprises and start-ups. He has distinguished himself as a leading expert on businesses and how their leaders can become more agile and strategic, and he's become a frequent presenter at conferences throughout the U.S., Europe, Asia and India. Through his firm, The Preparation Company, Abburi helps CEOs, Chief Transformation Officers and Chief HR Officers develop strategies that make them more competitive, responsive and multi-platform-based, which allows them to more quickly scale their products and services to reach new customer segments. Hari can be reached at at: www.PreparationCompany.com.

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Satellite Companies' Responses to the COVID 19 Pandemic

This month the Satellite Executive Briefing asked executives of satellite companies from all over the world on what impact has the global COVID-19 pandemic has had on their business and what measures have they taken to respond to the crisis and how they see their companies emerging from all these. The companies represent a cross-section of the various segments of the industry including manufacturers, service providers and a satellite operator. Here are their responses:

Manuel Lobeira, CEO
ACORDE Technologies, Santander, Spain

Fortunately, so far, from the operational point of view, the only impact suffered by ACORDE is some longer transportation times for some part of the component supplies that we need. Obviously there is a personal impact due to the great global concern and the limited interactions, travels, etc., which affect meetings and some other activities of our customers.

Our company implemented immediately all the recommendations of the Health administrations and went even further: teleworking has been implemented for those who can, and the rest of the staff is being provided with single use personal protective equipment (PPE), redistributing the factory production facilities to guarantee the social distancing, cleaning infrastructures, contactless biometric access control. On top of that, ACORDE has contributed to the community by financially supporting the acquisition of ventilators and medical PPE for the regional health services.

All the good work done in the past permitted us to deal with this crisis in a more comfortable way, thus we will keep on doing the good things of the past (fast and flexible response to customer request, quality as the basis of every development, innovation and robustness as key factors) while introducing some new elements from the lessons learnt (i.e. some degree of teleworking to further improve the existing family reconciliation, more virtual meetings reducing trips and improving the user experience).

John Restivo, CEO
Advantech Wireless, Montreal, Canada

Despite the evolving COVID-19 pandemic and related economic conditions, Advantech Wireless Technologies Inc. and Alga Microwave Inc. continue to be fully operational around the globe.

Both companies confirm that they remain open for business despite recent announcements of temporary regional government shutdowns.

Advantech and Alga supply products to leading Canadian and American global communications companies, as well as governments and their agencies

and the militaries of many NATO countries. As such, we are regarded as an "essential business" or our products as "high priority", meaning products that are essential to critical infrastructure viability in defense, media and telecommunications industries.

In addition, our sales and engineering teams remain available to support customers as needed.

In order to supply these critical products, we have taken a number of proactive and precautionary measures to protect the health and safety of our workers, customers and communities, including work from home, bans on travel, and self-isolation when required. We have also implemented additional measures in our facilities to protect workers, drawing on the experiences gained from our operations in China, South Korea and Vietnam. As we continue to monitor and assess the global impact of COVID-19 on our business, we will regularly adapt and evolve these measures as circumstances require.

Our highest priorities are keeping our employees safe, ensuring our ability to serve you during this difficult time.

Krystal Dredge, Marketing Director
AvL Technologies, Asheville, North Carolina, USA

COVID-19 has had a significant impact on AvL Technologies. The early impact of the crisis was a dramatically smaller SATELLITE show with many cancelled meetings and the abrupt halt of the show a day early. As soon as local governments began responding to the pandemic with stay home orders and emergency medical facility expansions, AvL received many orders for antennas that were needed immediately, and the company was able to fulfill those orders. A few expected orders have been delayed, but this has enabled the company to reprioritize other important orders and move up fulfillment and ship dates. AvL's biggest challenge has been maintaining a rigorous production schedule with the manufacturing team split into shifts to enable mandatory distances in production areas.

AvL's first challenge was to determine how to remain operational during the crisis as AvL is a Defense Industrial Base supplier. Many of our office-based employees are working from home, which required our IT team to help these employees transition to working remotely. Our manufacturing employees are now working in shifts so that only half of any team is working during a shift. Our manufacturing teams are maintaining 6 foot distances, wearing masks and gloves, and continually cleaning shared equipment. The AvL procurement team also reached out to key suppliers to ensure we would be able to get needed parts through the duration of the crisis.

AvL has learned that the company can operate efficiently during a crisis, and we expecting physical distancing recommendations to continue for the foreseeable future. An additional positive impact we expect from the crisis is that we expect to have a healthier workforce moving forward – we've learned the importance of frequent hand-washing and how to not spread germs, and it will make our workspaces significantly healthier from now on. From a business impact perspective, we do expect that the crisis will have an impact on our business due to delayed orders, but we expect it to be short-term. And the many important meetings that did not take place at the SATELLITE show will be rescheduled during the coming months as AvL will be taking our new products launched at SATELLITE on the road for many live demo opportunities.

Mauricio Segovia, CEO
AXESS Networks Barcelona, Spain

The pandemic has clearly changed the way we are doing things.

Next to securing our global AXESS families, the center of our decision-making has been our clients that depend and rely on the communications services we provide them.

Most of our customer base is in verticals with limited impact from COVID-19. However, some of our clients have been hit hard by this pandemic; the oil price crash didn't help our oil and gas customers, whereas in other sectors AXESS has upgraded networks on short-notice to overcome congested networks.

All teams are currently reaching out to our clients to let them know how we can support them in their distinctive situations.

On a global scale, AXESS offered all staff members to work from home where possible. All travels have been suspended and we shifted all meetings into the virtual world.

These adjustments have been carefully made by our management team on the basis of all information available in the distinctive countries of our offices. Our main goal is to operate at 100% under low risk scenarios.

Our teleports are kept alive by our passionate key ground-station teams that have minimum exposure to our larger admin, sales and support teams.

We identified that 90% of our employees are currently working in virtual offices, without affecting our capacity to maintain the expected service levels.

We all sincerely hope that this situation will be overcome as soon as possible and that science and research will find a cure or vaccination that will save lives soon.

Personally, I believe that this crisis might change society's attitude into being more attentive, more grateful and more fragile at the same time. It might lead to enhanced business relations and to acknowledgements of support that anyone granted especially during these unprecedented times.

Besides that, AXESS has a strong customer base from various industries in widely spread geographic areas, that allows us to better withstand the impacts in some sectors.

We believe that after this crisis many companies, including ourselves, might consider keeping some of the measures for various good reasons. Thus, we expect the demand for data transmission to grow further.

Statement from the Board of Directors
Eutelsat S.A., Paris, France

Compared with many industries, our activity is highly resilient, characterized as it is by long-term contracts, a substantial backlog (4.3bn Euros as of 31 December 2019, representing 3.3 years of revenues) and the criticality of our capacity for customers. This is especially true of our core broadcast business which represents over 60% of revenues.

Overall the impact on FY 2019-20 total revenues will be limited. Nevertheless, certain verticals or sub-verticals are feeling the effects of the current crisis, particularly since mid-March. These include:

•Occasional Use (circa 1% of Group revenues, included in the Professional Video vertical) which is impacted by the postponement or cancellation of sports and other events;

•Mobile Connectivity (6% of Group revenues) which is affected by the impact on airline and maritime traffic;

•And, to a lesser extent, Fixed Broadband (6% of Group revenues) which is experiencing a slowdown in gross adds in a context of more challenging customer gathering.

Revenues at the end of February were in line with our expectations; however, these effects will be progressively felt in the Third and Fourth quarters of the current Financial Year (2019-20), and are likely to be reflected at least into the early months of FY 2020-21, together with a more generalised slowdown in the pace of new business.

Elsewhere, the crisis is affecting the operations of other players in our supply chain, notably satellite manufacturers, launchers, and gateway installers, with the following impacts:

•The launch of EUTELSAT QUANTUM, planned for the third quarter of calendar 2020, is likely to be delayed;

•The deployment of ground gateways supporting the operations of EUTELSAT KONNECT is likely to be partially delayed.

In consequence the revenue ramp-up of these two expansion satellites will be pushed out. This will have no impact on revenues of the current fiscal year, but delays will affect our expectations for FY 2020-21.

Alvaro Sanchez, CEO
Integrasys S.A., Madrid, Spain

At Intergrasys we have decided to work remotely with all the areas within the company functioning in its full capacity without interrupting any customer commitment or needs.

Currently the Spanish Government is managing part

of every communication provider within the country such as Telefonica, Orange and Vodafone as Communications is one of the basic services everybody must have in this pandemic, setting their policies and controlling the prices, as the demand is greater than ever.

Alvaro Sanchez

We implemented all the suggested measures as soon as we came back from Satellite show that took place in March 2020, therefore, up to date and to my knowledge no employee of Integrasys has been tested positive to Covid-19. Integrasys is a great company thanks to our people and we believe that the most critical task is to take care for our team in this exceptional occasion and continue to be productive for our customers success.

As most of the companies are working remotely it is clear that the automation is crucial and so far, we have seen an important uptake into our automation solutions for News Gathering and Carrier Monitoring. During these difficult times and as an exceptional gesture we have been offering to our clients automated systems free of charge to use during Covid-19 pandemic. Additionally, as our engineers are not able to travel, we are offering to all our customers with already purchased systems or solutions that are to be purchased, a free of charge remote installation services.

As this threats drives for innovation, we have accomplished another initiative to avoid difficult and slow logistics processes, as we have virtualized all our systems for our customers so now they can run in a customer computer on a VM Ware, so it is very easily loadable and expandable remotely.

Due to the importance of health and the difficult times we live today; we will see many projects in the coming years related to automated disease prevention and automation in health system with less doctors involved. This kind of automation require IT and communication companies working together, so we expect an important uptake in this kind of projects.

In the coming months we will see a social change, with more fear, and worries from outsiders, therefore we will see our local offices more and more relevant. We now serve USA from Washington DC office, and Asia from Jakarta office; however, we have been thinking for very long time to set up a new Middle East office and perhaps now is the right time.

Steve Richeson, VP-Sales and Marketing
Mission Microwave
Santa Fe Springs, Calif., USA

Mission Microwave has continued operations as a critical supplier of communications equipment to government and critical service provider customers. Along with the entire industry the company has experienced some supply chain disruptions and efficiency effects resulting from efforts to comply with Center for Disease Control (CDC) protocols and maintain a safe work environment.

Mission Microwave continues to manufacture product and is working closely with customers to understand their evolving concerns so that we can jointly work towards supporting their requirements. Our customers are seeing changes which create opportunities to work together to accommodate their evolving priorities. We have had to react to support some customers who had missions directly related to the COVID-19 response. For example our team was able to put in some long hours to make a critical delivery for a customer supporting a FEMA initiative.

Mission Microwave's customers had a great deal of positive momentum going into the COVID-19 crisis. We entered this crisis on the tail of a surprisingly successful two days at the Satellite2020 show in Washington. While the uncertainty of the next few quarters is palpable, we do expect to come through the crisis with the same or perhaps an even stronger market position as our customers continue to deliver superior satellite terminals in support of critical networks.

Alexander Müller-Gastell, CEO
ND SATCOM, Friedrichshafen, Germany

As of the end of April, our company has experienced little to no impact. Foremost, we are grateful that our entire ND SATCOM workforce has remained healthy. Naturally, certain aspects of business projects have had to be postponed as well as a few trade shows. Nonetheless, we have demonstrated our business agility to this crisis by proactively addressing opportunities where our

products are ideally suited. For example, ND SATCOM's proven product portfolio–from Communication-on-the-Move to Portable Ad-hoc LTE networks-provides the level of security and reliability required to manage crisis communication and decision-making. As well, with education driven online on a massive scale, ND SATCOM can provide distance learning solutions via satellite technology. Overall, we have been very fortunate.

In these uncertain times, we are ensuring a high level of responsiveness and workflow continuity to meet the needs of our customers. We are doing this by protecting our employees and their families as well as possible and by providing them a safe environment as per guidelines set by government and health agencies. Our staff is fully equipped to work remotely and have all the necessary tools, such as web meeting applications, to enable continuous operations. We also organized a COVID-Crisis Team at the beginning of March; they meet weekly to discuss and assess the current situation.

We are in the fortunate position of having been able to continue our business during this unprecedented global crisis, and our outlook is positive for the future. For example, our teams are currently working hard toward a highly anticipated product launch for the military sector. We will continue to prioritize the health of our employees and their safe working conditions. Through our flexible workplace adaptations in this period, we have learned we are on the right digitalization path and will invest more in new technologies in the near future to maintain seamless interactions with all our stakeholders regardless of location or circumstance.

Ralf Mayr, CEO
RF Design, Lorsch, Germany

Like most companies, the COVID-19 pandemic has affected our business. There has been disruption in our supply chain and this has resulted in longer delivery times for materials that we need and fulfillment of customer orders have been delayed. We have been working closely with our suppliers and customers to work out revised delivery schedules and also to restore the normal delivery times in a reasonable period of time. As more countries start opening up their economies, we see improvements in the supply chain and are optimistic that we will return to close to the pre-pandemic level in the next few months.

We put the health and safety of our employees first and we have instituted strict new health and safety protocols at work. As a manufacturing facility, we have increased sanitation and hygiene in all work areas. Workers have separate work areas with a minimum 3 meters distance from each other. We are happy to note that none of our workers have tested positive for the virus. For administrative, engineering design and development, and sales and technical support staff, they work remotely from home and hold meetings via videoconferencing and so far this arrangement has worked very well. With all the protocols we have put in place, we are firmly committed in meeting the requirements of our clients and are ready to take new orders for our products.

We are using this time to develop new products and come us with innovative upgrades to our current products. All of our employees are involved in this process which leads to better product knowledge and appreciation of our company's product service portfolio on the part of our employees. With everyone involved in brainstorming sessions, we get better information and ideas to improve our products and develop new ones. One key lesson we learned from this crisis is the need to purchase and stock up on essential materials to prevent further disruptions in our supply chain and delivery schedules. As a result of this, I think we will emerge better from this crisis as a company and be well prepared for any future crisis.

Vagan Shakhgildian, CEO
UHP Networks, Montreal, Canada

UHP Networks is proud to supply equipment and services on a continuous basis to the Canadian, US and international emergency services, including mobile hospitals, police forces and also to the media and telecommunications sector.

Vagan Shakhgildian

As a designated essential business, UHP Networks has maintained its operations at full capacity throughout the pandemic. Our R&D, Technical Support and Sales personnel are equipped with a full suite of tools which enables them to successfully continue their work from home. Our product design with its software-defined modular architecture allows us to manage our supply chain in an efficient and effective manner. All our factories remain fully operative and our inventory stocks are kept at an optimum level; hence our delivery lead-times remain unaffected by the pandemic.

We had to cancel all business travel and switch to doing installation and commissioning of VSAT Hubs and networks via remote access. Training services are being delivered via webinars and video conferencing. Despite the challenges, all services are being maintained at an adequately high level. The R&D activities have not been impaired. We are preparing to release Software 3.6 with many exciting new features such as, for example, 200 Msps/650 Mbps DVB-S2X modulator and Beam Switching. Details of the new release will be covered in a webinar to be held in the next two weeks.

We will use the lessons learnt to further improve our processes and systems. In particular, we will release new tools for remote installations, will enhance our cloud-based Helpdesk and will make a wider use of webinars and other similar tools for product marketing.

Thomas Fröhlich, CEO

WORK Microwave, Holzkirchen, Germany

The COVID-19 situation is a challenging time for everyone regardless of what industry you are in. I feel fortunate to have a fantastic team at WORK Microwave who have rallied together in this testing time to adapt working processes and behaviors to ensure business continuity.

I am proud to say that the entire WORK Microwave organisation has been fully operational during this period, and we have luckily been exempt from any shortfall in our supply chain due to the virus so far. Some deliveries have been delayed, but we managed each time to still receive the parts in due time. Hence, all of our solutions and customer deployments have been delivered, as scheduled and on time thanks to the additional efforts of the entire team. All personnel have remained available to our customers and partners by email or phone, during regular business hours, same as usual. When it comes to limiting the spread of COVID-19, we have strictly adhered to all government and WHO recommendations. Our production teams have been working in split shifts, to limit the risk of personal contact. The working areas have been reorganised to allow people to keep an appropriate distance to each other. Sales and engineering staff have been partly working remotely from home. These critical measures were put into place to keep our employees healthy and production running, without any interruptions.

Thanks to the improving situation in Germany, we are now starting to bring back the people previously working from home to their company work desk by implementing some additional protective measures in their offices.

Firstly, as probably many other companies, we have learnt through this crisis how to better handle such pandemic situations - which might come back one day in this interconnected global world.

Secondly, we have to face potential business impact in the mid-term. This crisis adds up to a period of uncertainty in the worldwide Satcom market.

The Geostationary business has been in a strong recession for already 1-2 years at least now, with no end in sight, while everybody was waiting for the non-GEO constellations to arrive - and those are starting to struggle now as we see from recent Chapter 11 declarations of OneWeb and LEOSat. Now with the pandemic, also some of the traditional players who were not in a very healthy state beforehand enter into a critical state like Speedcast very recently or Intelsat requiring additional money. As most of these players are our customers, we need to be concerned and forward thinking. For WORK Microwave, it means the strategy we already implemented in the last years needs to be accelerated even more, which is to develop alternative pillars of activity based on our core competences-RF engineering, production and digital signal processing.

As we start to come to more normality we will stay mindful to be able to take necessary measures if the situation in the company or in Germany will change. Due due to the current constantly changing global we are on permanent alert to be able to react quickly to keep our lead.

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Zoom This!

by Lou Zacharilla

They can call it what they want. I call it "UN-social distancing."

Let's face it, living life online sucks. It always has. It always will. I'm sorry. I just like being with people. I like schmoozing. I like talking – about anything. I even can tolerate close talkers who spit a little – although not these days!

I am totally grateful to have a secure place to stay-in-place, a job and the food security that makes living through a pandemic in New York City bearable. And I am good with my high-speed Internet and distributed-work situation, which SSPI implemented years ago.

We haven't missed a beat.

But I miss:

- Going to conferences and having a laugh listening to Mike Antonovich.
- Moderating panels and getting to ask questions on behalf of the audience that educate me more than anyone.
- Audience applause!
- Being part of that echo chamber where, after two days, everybody is passing along the same information as if infected with gossip.

- Going to booths and booth parties. (Especially those of companies from Belgium, where the beers are amazing! I sure hope ST Engineering iDirect doesn't cheap out and cut-off Newtec's beer quality.)
- Hell, I even miss the jet lag!

But it must be so. In New York many have died. Our city's lessons have been brutal and sobering. "Life is precious" is not a cliché any longer. It can end in a flash and many are saying their last goodbyes to families by Zoom, thanks to an ER nurse and her tablet. It has stopped me cold and kept me disciplined and distanced. But according to the Governor of New York we have saved at least 100,000 lives. And many are ones that have really, really counted: healthcare workers, cops, firefighters, transit workers, postal workers and the folks who deliver mail and vegetables.

So not having Belgian beer at a trade show is a small, temporary sacrifice. Not having big crowds to watch SpaceX launch astronauts into space for NASA next week is a temporary sacrifice. You can watch it online with the rest of the nation.

While merely online it is good to be in the satellite industry. I am proud that while real heroes do battle with this epidemiological nightmare, the satellite industry is, as usual, keeping things going. And as usual we do it invisibly. Take weather for example. The plummet in commercial flights (down 97% in some cases) has left us with fewer measurements for weather forecasts. Or would. Fortunately, ESA's Aeolus satellite mission is helping to fill this gap. Under normal circumstances, commercial aircraft equipped with sensors supply measurements of temperature, wind speed and wind direction in the atmosphere below 13 km. Without these measurements, the weather forecasts we take for granted everyday are much less accurate. And during planting season, that is no small seed.

Certainly in a time when doctor's visits and elective procedures are on hold – and yet people fall sick – telemedicine is making rural life potentially more appealing for those of us who may have enough toilet paper, but want to get outside and walk with-

out swerving around others now and then. And the role of satellites for contact tracing, as testing ramps up, may soon become obvious. As will its role in a global healthcare community that, like the Crisis Connectivity Charter in our industry, will mobilize assets during the next epidemic. https://www.sspi.org/cpages/crisis-connectivity-charter

And satellites carry an enormous burden as they continue to support farmers who continue to introduce "smart agri" techniques around the world, which yield more crops, manage logistics and serve as an increasingly critical provider of data.

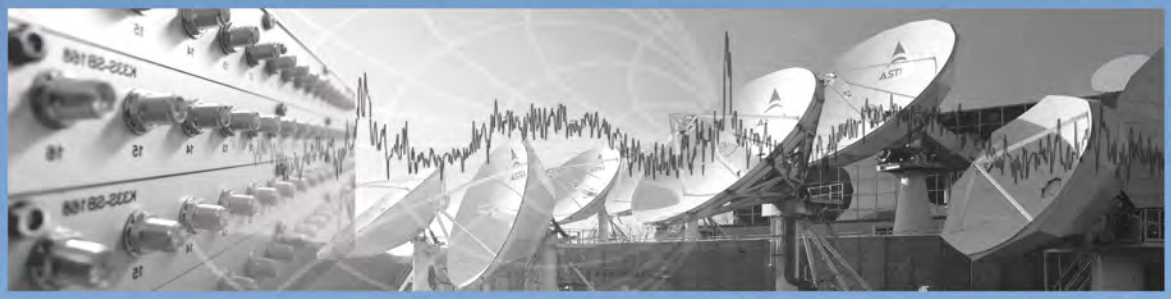
Satellite 2020 was the last event I attended in the flesh.

What lies ahead? Who knows? If we are smart and follow the science, maybe I will be in Utah in August for Small Satellite Conference. I'll be the guy wearing the mask with the #NewYorkTough logo.

Stay well.

PS: On May 14th I will moderate a panel on behalf of the SSPI India chapter on how our industry is supporting our key industries during the COVID-19 crisis. Please visit: https://www.sspi.org/cpages/chapter-affiliate-india or send an email to: tbond-williams@sspi.org for details.

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



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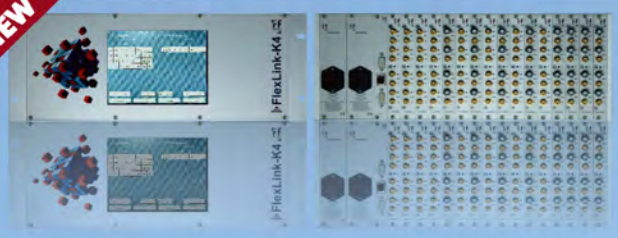

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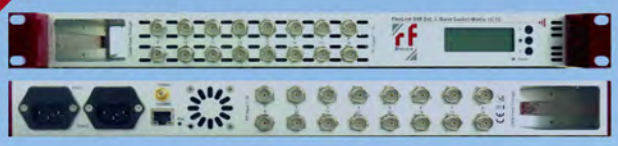

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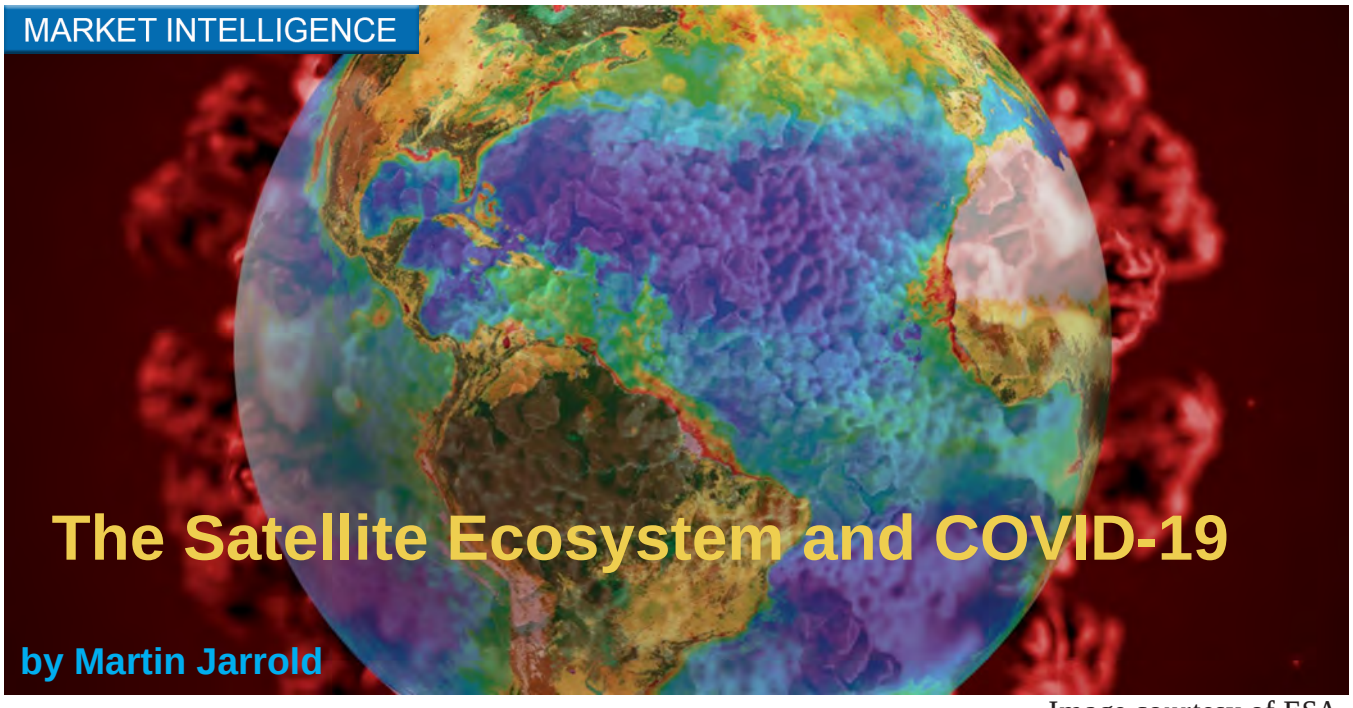

The Satellite Ecosystem and COVID-19

by Martin Jarrold

Image courtesy of ESA

In starting to draft this column it was impossible not to be affected by the news that the official global figure for Covid-19 fatalities was approaching 250,000. The zoonotic – interspecies – jump to humans and subsequent pandemic spread of the novel coronavirus (SARS-CoV-2) has badly impacted many of the world's most advanced and richest countries, but the epidemiology tells us that the worst of the impact, on the less-developed world, is still to come.

As infection takes hold in lower-income countries, affecting communities with weak health systems, affected by conflict, comprising displaced peoples, or which are permanent high-density slums, then it will, as never before, be seen just how vital to the integrity of modern human society the uniquely ubiquitous capabilities of satellite – for communications, Earth observation/remote sensing (EO), navigation, and meteorology – really are.

The pandemic has highlighted the varied types of contribution and response that the satellite industry brings to crisis circumstances. Taking a very broad view, these responses are emerging from the context of satellite generally being more resilient than many other industries to economic downturn consequent on crisis. Demand for its services from many user market segments is holding up, in other segments it is elevated. However, some key user market segment demand suggests that parts of the industry are likely to fare badly.

Inevitably in the current circumstance, commercial and consumer demand for broadband connectivity remains strong, and will get stronger. "Lockdown" restrictions have led to demand for telecom services to increase, underpinning telecommunications' significance in enabling mass migration to home working, enabling people to stay in touch with friends and family, and to access streamed entertainment. Early reports across the telecom market overall indicate traffic increases ranging between 30 per cent and 70 percent for mobile broadband. Figures are even higher for fixed voice and broadband, ranging between 50 per cent and 100 percent.

While communications generally, Internet and entertainment access needs remain vital to a pandemic world, and demand for government services remain high, the established satellite operator part of the value chain, with certain important company exceptions, is cushioned from the most severe aspects of "lockdown"-related economic reversal. Occasional Use services are impacted by cancellation of sports and other large-scale events, but it is satellite operators with significant mobility business – most obviously those serving the maritime industry and commercial passenger airlines – that are among the most exposed. Space segment capacity

demand will inevitably reflect reduced demand from the service providers which supply passenger cruise lines and reflect the forecast the 2020 reduction of 30 per cent in air passenger traffic.

A GVF survey of announcements by organizations across the satellite industry value chain reveals a focus on four common and importantly reassuring themes: employee safety and security, strategic business stability, customer service continuity, and supply chain maintenance. Specific details of these announcements will feature on the GVF website at www.gvf.org

Satellite technology is never more vital than now: The World Health Organization's Covid-19 'Second Preparedness & Response Plan' calls 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. While government and other official authorities are prime actors in such plans, so, among other key industrial sectors, is telecommunications – the satellite segment specifically.

Consider where satellite has an already demonstrated pedigree in capacity building for preparation and response. GVF, as the only globally-based representative body for the industry, is – along with a number of its member companies – signatory to the UN Crisis Connectivity Charter and is the only private sector representative entity in the World Food Program administered Emergency Telecommunications Cluster.

Resource poor countries lacking strong information and healthcare systems are more vulnerable to pandemic.

Deeply rooted and long-standing satellite industry support for development and deployment of capacity building resources in the form of GVF Training is another illustration. This is currently reinforced with provision for home-working personnel to undertake training certification. GVF Training resources remain operationally available 24/7 and whilst isolated or on furlough industry personnel can enhance their current productivity and prepare to resume on-site work when the pandemic resolves. GVF Training has introduced deferred course fee payment for a period of 90-days. With reference to continuing to serve the training needs of developing world-based industry personnel, the GVF's Andrew Werth Developing Country 50 per cent discount remains available for eligible applicants.

Consider how satellite has historically brought emergency telecommunications to meet the vital needs of first responder organizations, as well as ensuring maintenance of business continuity connectivity where other communications technologies have fallen over as a direct result of disaster, or where sheer bandwidth demand – arising from circumstances like pandemic-imposed social distancing/working from home – outpaces terrestrial capacity supply, or indeed where such technologies have been very limited or uneven in geographical deployment in the first place.

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.

Additionally, from the satellite operator community, is commitment to the 'Covid-19 Global Humanitarian Response Plan'. Joint efforts by members of the Inter-Agency Standing Committee (IASC) – aggregating the Covid-19 strategies of WFP, WHO, IOM, UNDP, UNFPA, UN-Habitat, UNHCR, UNICEF, and various NGOs, complement-

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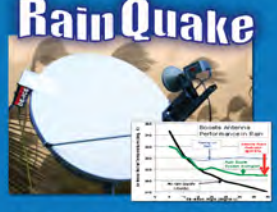

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ing plans developed by the International Red Cross and Red Crescent Movement – bring coordinated humanitarian response to 51 of the world's poorest countries.

Consider the role of satellite communications in facilitating movements in the global supply chain of raw materials, manufacturing components, and finished products, whether on the high seas or other parts of the freight transportation logistics chain. An extremely important sub-set of this consideration is the welfare needs of crews – surely an example grouping of key workers – of the world's maritime infrastructure. Plying the world's oceans and connecting raw materials, component and finished goods suppliers with their industrial and consumer markets, ships crews are now, more than ever, remote from home and family, sometimes for longer periods than ever as crew change-overs are restricted by travel "lockdowns".

Consider the contribution of satellite to networks that enable the dissemination of knowledge and its application around the globe, particularly, given the nature of the present crisis, in the fields of telemedicine, and extending to the promotion of enhanced hygiene practices and virus transmission prevention guidance. At other times, of course, the contribution of satellite extends more widely to cover the broader scope of e-Learning/ distance education – helping towards the achievement of the UN Sustainable Development Goals, and contributing to enabling the development of what has been

"...The pandemic has highlighted the varied types of contribution and response that the satellite industry brings to crisis circumstances..."

defined in a UN Development Program (UNDP) and Environment Program (UNEP) paper as a global digital ecosystem. This is not only about communications satellites, but also navigation, remote sensing, and meteorological orbiting spacecraft.

From data to actionable intelligence: Epidemiology & social distancing dynamics: EO missions can be used to explore the effects of Covid-19. Health-related observation data dynamics are noted below, but, of course, there are the economic effects of "lockdown". Europe's Copernicus Sentinel-5P satellite mission is already providing key information on economic changes taking place resulting from limitations on work-related activity. Additionally, the European Space Agency (ESA) has issued a call for proposals to see how EO satellite data can be used to map changes around transport networks, commercial ports, and heavy industry. ESA is also launching a special call for remote sensing experts and machine learning scientists to submit ideas on how satellite data could mitigate the situation for industry, commerce, transport, and agriculture.

The European Global Navigation Satellite Systems (GNSS) Agency (GSA) is compiling a repository of apps that use GNSS as a knowledge bank of solutions being used to fight Covid-19. Aiming at providing a toolbox to help authorities, emergency services, citizens and app developers to understand what resources are currently available – and what needs remain unmet – the GSA is calling for already working apps to map the spread of coronavirus, to monitor incidences of Covid-19, alert users about possible risky contacts, and helping them to manage queues in supermarkets, pharmacies, and public spaces, and facilitating logistics for goods.

Recognizing that the satellite view can help epidemiologists understand the context of a coronavirus outbreak in a way other tools cannot, it also has the potential to help scientists predict when and where infectious disease outbreaks may occur, based on observing flows of people from one place to another, identifying possible ecological factors that may have led to pandemic through mechanisms enabling new zoonotic viruses, and possibly related to where human populations are encroaching on animal habitats. Environmental factors that play into outbreaks of diseases like Ebola have been seen, studied, and predicted, using data gathered from orbit. Additionally, AI is helping outbreak prediction by quickly analyzing the wealth of data beamed from orbit.

"Tools for the job...": A world in pandemic undoubtedly needs more than ever before a wide range of satellite-based technology, but it also needs a platform agnostic approach to securing essential connectivity for

society and for economy.

Governments can best assist their populations in meeting their connected needs in a pandemic and post-Covid-19 world by facilitating market access to the most applicable and cost-effective solutions, via a wire, wireless, or a satellite connection. Imposition of requirements for extremely low latency – in the context of a crisis where the demands of video gamers are secondary, and the "business as usual" requirements of stock market financial institutions are far from the most fundamental of economic priorities – is impractical. The modest latency provided by satellite communications is perfectly acceptable and fully functional for the applications that are the priorities. Moreover, any decisions on questions of necessary financial subsidy to communications in a crisis should not be made based on distinctions amounting to tiny fractions of a second.

For satellite to play its necessary and vital part the industry must be guaranteed the spectrum which is needed to meet the increased needs of citizens of a now very different world. Such spectrum allocation requires little or no outlay of capital in the form of government subsidies or tax benefits to the satellite operators – certainly not on the scale of assistance now being sought from many governments by the wireline and wireless industries.

Note: This column is an edited extract of a longer article written for publication through various GVF platforms and other media channels.

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In Search of the World's Missing Girls

Millions of girls are missing. They are missing from school. They are missing from jobs. They are missing from the leadership of their communities and nations.

They are missing because they live in places where just "being a girl" is hard. Twelve million of them every year become child brides and teenage mothers. One hundred thirty million of them are not in school – worldwide, girls are almost twice as likely as boys to miss out on education. Of the more than 600 million unemployed young people in the world, most are female.

Plan International

Founded in 1937, Plan International is one of the world's largest nonprofits fighting for children's rights and equality between women and men. It works with communities to tackle the fundamental reasons why girls and women go missing.

Education, training and technology are its tools. In the Philippines, it helps local farmers – most of them women – create new markets for their products. In Nicaragua, it trains girls in business – and also in how to protect themselves from violence so they can succeed as street vendors. In Bangladesh, it created a mobile app that lets traditional matchmakers learn the true age of brides and grooms. It stopped nearly 4,000 child marriages in its first six months.

And everywhere, it trains women in leadership, management and technology, so they can become teachers to others. Training has reached more than 6,000 women in 150 countries, and they are changing the world, one community at a time.

Reaching the Missing

Plan International's mission takes it to places where basic communications can be a big challenge. That is why, for more than a decade, it has worked with a company called ITC Global to connect 24 offices and teaching sites across western and central Africa. High-quality connections let Plan International coordinate work across more than a dozen nations while keeping its operations lean and efficient.

ITC Global equips those sites with its Office in a Box: a small, powerful satellite terminal that provides Wi-Fi, internet access and telephone service. Satellite can be complicated, but ITC Global makes it simple – with local installation and maintenance from five regional offices and quality monitoring around the clock.

Click here to view a video on how satellite technology help locate missing girls :
www.youtube.com/embed/AezFD-zBbBs

If women everywhere had the same job opportunities as men, say the experts, it would give the world a $28 trillion dollar economic boost. Today, Plan International is making a serious downpayment on that promise. Its goal? To transform the lives of 100 million girls for the better in just five years.

ITC Global helps make that goal a reality – with a satellite network that lets the dedicated people of Plan International bring millions of girls and women into the light.

Produced for Satellite Executive Briefing by Space & Satellite Professionals International. See more stories and videos of satellite making a better world at: www.bettersatelliteworld.com

Maxar Closes MDA Divestiture

Westminister, Colo., April 8, 2020 Maxar Technologies announced it has closed the sale of MDA, previously a wholly owned subsidiary of the company, to a consortium of investors led by Northern Private Capital for CAD$1 billion. Net proceeds, including customary adjustments, and after application of currency hedges related to the transaction is expected to be approximately US$729 million.

"The closing of the MDA transaction concludes the near-term reshaping of our balance sheet and business portfolio," said Dan Jablonsky, Maxar CEO. "Going forward, our growth strategy remains focused on providing leading capabilities in Earth Intelligence and Space Infrastructure, including geospatial data, data analytics and spacecraft and robotics that are well aligned with the strategic priorities of our government and commercial customers."

"The closing of this transaction — when combined with the recently completed sale of real estate in Palo Alto — reduces Maxar's overall net debt by roughly US$ 1 billion and significantly improves the company's leverage ratio," said Biggs Porter, Maxar CFO. "Importantly, we believe these actions provide Maxar increased flexibility, range and focus to drive revenue, profit and cash flow growth over the next several years. We also have good liquidity with only US$ 15 million drawn on our US$ 500 million credit facility as of March 31, 2020."

After deducting fees, expenses and any reserves for contingencies, the proceeds will be used to reduce indebtedness as proscribed in the company's credit arrangements.

Rocket Lab Closes Sinclair Interplanetary Acquisition

Rocket Lab has closed the transaction to acquire Sinclair Interplanetary, a leading provider of high-quality, flight-proven satellite hardware. Rocket Lab initially announced the execution of the agreement to acquire Sinclair Interplanetary on March 16, 2020 pending customary closing conditions and satisfying The Investment Canada Act review process. Terms of the approved deal were not disclosed.

The acquisition strengthens the satellite division of Rocket Lab, which produces the Photon spacecraft lineSinclair Interplanetary products will become key features of Rocket Lab's Photon satellite platforms designed for low Earth orbit, lunar, and interplanetary small satellite missions.

Founded in 2001 by Doug Sinclair, Toronto-based Sinclair Interplanetary develops reliable, best-in-class spacecraft hardware, including reaction wheels and star trackers that support rapid-schedule small satellite programs. More than 90 satellites incorporating Sinclair hardware have been launched to orbit, including Rocket Lab-launched satellites from AstroDigital, ALE, and BlackSky. The Sinclair team has been entrusted with developing hardware for world-first missions including BRITE, the world's smallest space telescope, and The Planetary Society's LightSail 2, the first satellite in Earth orbit to be propelled solely by sunlight. Satellite communications company, Kepler Communications, has also selected Sinclair reaction wheels for its constellation of 140 Internet of Things satellites currently in development.

Sinclair Interplanetary will continue to be led by Doug Sinclair and the company will maintain its team and facilities in Toronto, Canada. In addition to being incorporated into Rocket Lab's Photon satellite line, Sinclair Interplanetary hardware will remain available to satellite operators building their own spacecraft.

EXEC MOVES

Arqiva Appoints New CEO

Winchester, UK, April 20, 2020--Arqiva Group Ltd. announced that Paul Donovan has been appointed Chief Executive Officer (CEO) with immediate effect. Donovan succeeds Simon Beresford-Wylie who has been CEO since August 2015

Paul Donovan

Donovan has over twenty years' experience in senior executive roles across the technology, media and telecommunications sectors. He is currently non-executive Director on Arqiva's Board and has previously been CEO of Odeon and UCI Cinemas Group and, before that, CEO of eir, Ireland's leading telecommunications business. He was also a member of the Group's Executive Committee at Vodafone where he led the Group's emerging markets businesses

During Donovan's predecessor Beresford-Wylie's tenure as CEO he has simplified the business and successfully driven year on year improvement in both revenue (four year CAGR of 3.9% to £999.5m last financial year) and EBITDA (CAGR of 5.9% to £526.4m in 2019).

Donovan's appointment is with immediate effect. He will work with Beresford-Wylie over the coming months to ensure a smooth and orderly transition. Beresford-Wylie will formally leave Arqiva on June 30, 2020.

Anokiwave Appoints Bill Nevius as VP and GM-Aerospace& Defense

San Diego, Calif., April 9, 2020: Anokiwave, Inc., announced the appointment of William "Bill" Nevius as Vice President and General Manager of its Aerospace and Defense Portfolio. In this role, Mr. Nevius will lead the company's strategic defense accounts and build upon the long history of successful partnerships in the community to expand its reach into the market with enabling technology for SATCOM, RADAR, EW, COMMS, and Space applications.

Nevius joined Anokiwave in March of 2020 and brings 30 years of experience in the Advanced Defense Systems Industry. Prior to joining Anokiwave, Mr. Nevius held positions within Ball Aerospace as Director C3I, Director Business Development, Advanced Systems Manager, and Program Manager. Bill's background as a Naval Aviator and defense industry executive brings a deep insight and personal experience of the needs and workings of Aerospace and Defense markets.

Bill Nevius

"Bill is a recognized leader in the aerospace and defense industry and is already exposing Anokiwave to new opportunities and customers," states Carl Frank, Anokiwave COO. "I am confident that Bill's engineering education, military operations, procurement experience, and successful industry leadership will serve Anokiwave well in his new role of refining and expanding our push into Aerospace and Defense markets."

Nevius holds a bachelor's degree in Mechanical Engineering (US Air Force Academy) and master's degree in Aeronautical Engineering (US Naval Postgraduate School). He graduated from the US Naval Test Pilot School and Navy Fighter Weapons School (TOPGUN). Bill holds an international patent on a sensor technology for biotechnology applications.

Key Executive Appointments at Astroscale

Denver, Colo., April 21, 2020– Astroscale U.S. Inc., the U.S. unit of Astroscale Holdings Inc., announced that Dave Fischer and David Hebert will join the Astroscale U.S. management team. Fischer joins the company as Vice President of Business Development and Advanced Systems, and Hebert joins as Director of Communications with appointments effective as of March 2020.

Astroscale is developing a service to remove space debris and secure long-term orbital sustainability.

Fischer joins Astroscale with over 30 years of experience in business and technology management. Most recently, he was Director of Business Development for RUAG Space USA. Prior to that, Fischer held several management roles in business development and strategic development with Ball Aerospace. Throughout his career, he has focused on developing trusted relationships and innovative business partnerships.

Hebert comes to Astroscale from The Aerospace Corporation where he most recently served as Senior Communications Strategist for policy, and civil and commercial systems. His nearly 20 years of experience includes strategic communications, public engagement and content development. Hebert brings experience in managing congressional and government communications; he also held management roles at The MITRE Corporation and the U.S. Geological Survey.

Since its establishment in April 2019, Astroscale U.S. has made key additions to its management team including Dr. Clare Martin, Senior Vice President of Programs and Operations and Charity Weeden, Vice President of Global Space Policy.

Aero IFC Facing Slump due to COVID-19, But Long-Term Fundamentals Remain Solid

Cambridge, Mass. , April 27, 2020 - NSR's Aeronautical Satcom Markets, 8th Edition report projects a viable long-term In-flight Connectivity (IFC) market, despite significant near-term challenges due to COVID-19. Coming off a challenging 2018 and 2019, 2020 has already seriously disrupted the IFC market, with air traffic down by at least 80% in most regions.

However, longer-term opportunities remain – once air travel resumes, planes will still require ever more connectivity, yielding a market opportunity more than 2x larger than 2019, with US$ 5 Billion in annual retail revenues by 2029. The next 24 months will be a challenge, no doubt – but IFC plans are largely delayed, not cancelled.

Planes grounded due to COVID-19.

"COVID-19 has resulted in an unprecedented, sudden drop of capacity and service demand from grounded aircraft. With the pandemic impact likely to persist for at least 18-24 months, service providers are now forced to (re)visit their fixed leased capacity contracts/costs," states report author and NSR Analyst, Vivek Suresh Prasad. "Right now, is an incredibly challenging time for all satellite mobility markets – and Aeronautical IFC has the most significant near-term headwinds," adds Brad Grady, NSR Principal Analyst, Mobility. "Yet, NSR is largely optimistic on the longer-term uptake of Aero IFC services – passengers require connectivity now more than ever."

Overall, Business Jets continue to be a bright spot, and longer-term Commercial Aviation markets will be the revenue driver – in total generating US$37 Billion in cumulative retail revenues over the next ten years. The migration from FSS to GEO-HTS will continue, and adoption of "Free Wi-Fi" is a significant driver for long-term capacity demand. MSS/L-band will continue to fuel operational connectivity, while General Aviation is on a growth-path for greater adoption rates.

Bottom Line, while today is quite challenging, and long-term fundamentals continue to point towards more IFC adoption – weathering short/mid-term uncertainty will be the key challenge for the Aeronautical Satcom sector.

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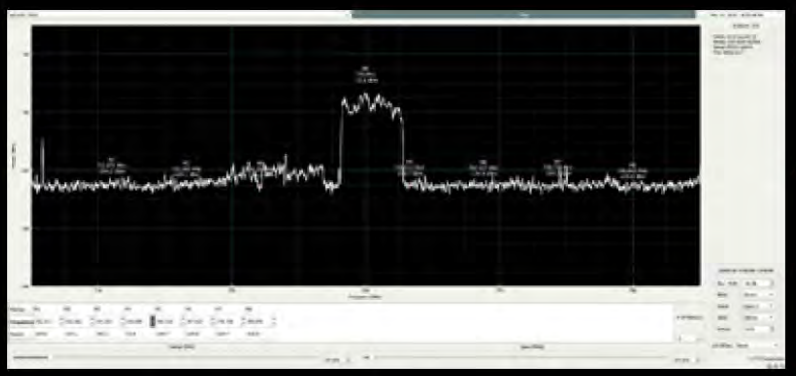

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The Satellite Markets 20 Index™

Company Name	Symbol	Price May 5	52-wk Range	
Satellite Operators				
Thaicom Public Company Limited	THCOM.BK	3.90	2.14	6.45
Eutelsat Communications S.A.	ETL.PA	10.00	8.00	18.67
APT Satellite Holdings Limited	1045.HK	2.41	2.35	3.94
Echostar	SATS	29.97	25.23	45.15
SES S.A.	SES.F	5.88	4.88	18.03
Satellite Manufacturers				
The Boeing Company	BA	131.46	89.00	391.00
Maxar Technologies	MAXR	10.86	5.73	21.45
Lockheed Martin Corporation	LMT	380.16	266.11	442.53
OHB SE	OHB.DE	34.1	25.65	48.65
Honeywell International Inc.	HON	135.2	101.08	184.06
Equipment Manufacturers				
C-Com Satellite Systems Inc.	CMLV	1.90	1.44	2.18
Comtech Telecommunications Corp.	CMTL	17.94	11.48	38.00
KVH Industries Inc.	KVHI	8.26	6.36	11.64
ViaSat Inc.	VSAT	39.38	25.10	97.31
Gilat Satellite Networks Ltd.	GILT	8.47	4.70	10.76
Service Providers				
DISH Network Corporation	DISH	23.60	17.09	44.66
Globalstar Inc.	GSAT	0.30	0.23	0.69
Orbcomm Inc.	ORBC	2.48	1.24	8.44
Sirius XM Holdings Inc.	SIRI	5.75	4.11	7.40
RigNet Inc.	RNET	1.19	0.77	11.34

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 May 5, 2020	Percentage Change Last Month
Satellite Markets 20 Index™	2,185.43	11%
S & P 500	2,842.74	13%

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