

# Satellite Executive BRIEFING

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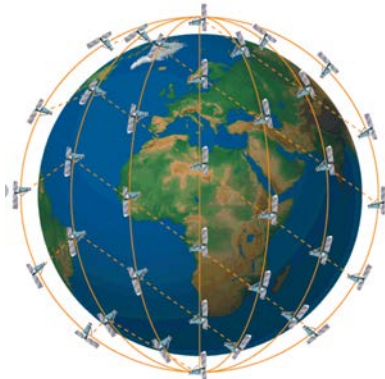


Industry Trends, News Analysis, Market Intelligence and Opportunities

## The Satellite Industry in Transition

by Elisabeth Tweedie

As we are all aware the satellite industry is in a state of flux, maybe a state of transition. The low earth orbit (LEO) constellations have been grabbing headlines for several years now, and many of us, have pointed to the lessons of the 1990s and predicted that few, if any of them would last long enough to become viable businesses. And that still may be the case.



However, right now, things are looking promising for at least two or three of the many current contenders. After being bailed out by the British government and Bharti, OneWeb reemerged from bankruptcy and has gone on to attract additional investors and launch more satellites; it now has 322 of the initial constellation of 648 in-orbit, and is intending to start service north of

50 degrees later this year. Starlink, from SpaceX is further ahead and now has 1,700 satellites launched, and is already in beta service with over 100,000 customers. According to Bret Johnson, CFO of SpaceX, Starlink also has a backlog of over 500,000 customers, waiting for the ground terminals. However, the full constellation is intended to be around 42,000 satellites, although it is believed that full global service could be provided with around 10,000, meaning that either way, in terms of reaching the full constellation, it's further behind. After a C\$1.44 Billion injection from the Canadian government, Telesat has now secured most of the funding needed for its Lightspeed constellation, and plans to start initial launches for its constellation of 300 LEO satellites next year.

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## A Transition Year



As our cover story aptly put it, this year is a transition year for the satellite industry. I'm sure everyone is looking forward to 2022 and to the end of the global pandemic. The signs are actually looking very good at this point. Always a good indicator is how the trade shows are doing. I've personally been to three live shows already in the last two months--all in the US and the attendance, while not quite the same as before the pandemic, are a good start. More importantly is the pent-up enthusiasm and energy at the shows for being able to reconnect again live and in person.

This month, I will be attending my first overseas event--the CABSAT show in Dubai, UAE. I look forward to meeting you all there at our booth at the show. I will also be speaking on the "Key Trends to Watch in the Satellite Industry" at the SATEXPO Conference at CABSAT. This month's CABSAT coincides with the opening of the EXPO 2020 world exhibition in Dubai on October 1st which will feature over 191 country pavilions and many special events that will last through March next year. CABSAT beginning on October 26th will be preceded the week before by GITEX--a major telecom show. Dubai is really going all out to ensure a safe environment and is welcoming visitors to trade shows and of course their showcase EXPO.

See you in Dubai. Safe travels.

*Virgil Labrador*

Editor-in-Chief



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## Satellite Industry...

from page 1

The change in the industry, however goes deeper than different orbital locations. The players are changing. For many years now, the industry has been dominated by a few large well-known names: SES, Intelsat, Eutelsat, Telesat, on the operator side, Arianespace, Lockheed and ULA on the launch side, whilst ground systems were dominated by iDirect, Comtech, Newtec and Gilat. There was also, never any shortage of grey hair amongst the – predominantly male – speakers on stage at conferences. Now, as already mentioned, OneWeb and Starlink are grabbing attention, as are Blue Origin and Virgin Orbit. SpaceX's first Falcon 9 commercial launch was only in 2012 but it's fair to say that it is now an established player. On the ground side it has been more a case of consolidation, accompanied by new software players such as AWS entering the market. As for the grey hairs, I didn't count at Satellite 2021, but it's fair to say that many of the speakers and attendees, were lacking those, and around 20% of approximately 300 speakers were ladies.

Grey hairs apart, these change in the industry were clearly reflected in the delayed Satellite 2021. Instead of the usual opening session with the key geostationary (GEO) operators, speakers for the first session included only one GEO operator, Arabsat. The other three were all LEO operators: Iridium, SpaceX and OneWeb. Moderating the panel, Christopher Baugh, President, NSR pointed out that: "the industry doesn't have a supply problem, it has a demand problem." In the latest edition of "Global Satellite and Launch Markets," NSR forecasts that over the next 10 years, satellite

***"...The industry may also have a messaging problem, as well as an over supply problem..."***

manufacturing and launch order volumes will reach nearly 24,700. A far cry from the 10 to 20 commercial geostationary satellite orders per year, that used to be the norm. Euroconsult in the latest edition of its report, "Satellite Connectivity and Video Market," forecast that the total global capacity will expand from 3.7Tbps in 2020 to 23Tbps in 2022 and over 50Tbps by 2026. Last year 97% of capacity added came from Non-Geostationary Satellites (NGSO). Given this potential for serious over-supply, it is hardly surprising that the one thing that all the panelists were agreed upon, and articulated by Neil Masterton, CEO, OneWeb, was the necessity of meeting customer needs at "a price point that makes sense to them." Presumably, also at a price point that that closes the business case. Quite a challenge, given the billions invested upfront in the LEO constellations.

The industry may also have a messaging problem, as well as an over supply problem. OneWeb and Starlink are getting so much media attention at the moment, that some customers are getting confused about the continued relevance of GEO systems. Hadi Alhassani, VP and Chief Strategy Officer, Arabsat commented that this confusion is leading to customers "not committing to any service because they don't want to bet wrong and end up with a defunct operator." That hesitation is understandable, given that switching to a LEO system would not only involve working with new suppliers

and partners, it would also involve an investment in new ground systems.

The ideal solution of course, would be an integrated terminal that could access both Non-Geostationary Satellites (NGSOs) as well as GEOs. This point was made more than once on different panels during Satellite, being mentioned by both Tom Choi, Executive Chairman, Airspace Internet Exchange, and Karl Fuchs, SVP Technology, iDirect Government.

For some business users, this dream is about to become reality. In October, SES is scheduled to launch the first three satellites of its next generation Medium Earth Orbit (MEO) constellation, O3b mPOWER. In the same month it will also launch SES-17, its advanced GEO satellite. These launches mark the first step in the integration of SES' multi-orbit fleet, with the ultimate aim of creating a totally interoperable network. O3b mPOWER and SES-17 both use a new software control system, known as ARC – Automatic Resource Controller. ARC manages dynamic changes in real-time by controlling both the ground and space resources, (satellite payload, gateways and user terminals). The software has been designed to leverage the flexibility of digital payloads by concentrating the power in different beams as and when needed, as well switching seamlessly between SES-17 and O3b mPOWER, depending on the latency requirements of the application. Controlled by ARC, the ground terminals for



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O3b mPOWER seamlessly switch between orbits as and when needed. Cruise ships will be the first segment to take advantage of this flexibility.

While incredible changes have been taking place in space, the ground segment has generally lagged behind in terms of innovation, particularly with regard to developing technology to leverage the increased power and flexibility of new satellites. Promulgating this issue, is the fact ground systems lack interoperability, due to the prevalence of proprietary standards. Not only does this mean that customers can be “locked-in” to a particular supplier, it also makes integration with terrestrial systems more challenging. AWS has recently entered the ground segment with its Ground Station as a Service (GSaaS), a fully managed service, enabling users to control the satellite communications as well as process data and interface with Cloud and terrestrial services, and Paul Mattear, Principal Business Development Manager for AWS, emphasized this lack of interoperability saying, “One of the issues that we have with ground infrastructure is a lack of standards across the board.”

This may be about to change. In the last month, two separate industry groups have been formed with the aim of establishing interoperability between space and terrestrial network systems. The Digital Intermediate Frequency Interoperability (DIFI) Consortium was formed under the auspices of the IEEE Industry Standards and Technology Organization (ISTO), and includes Intelsat, Kongsberg Satellite Services, Kratos Defense and Security Solutions, Kymeta, Microsoft, Hawkeye 360 and the US Navy. The stated mission of this group is

“to enable the digital transformation of space, satellite, and related industries by providing a simple, open, interoperable Digital IF/RF standard that replaces the natural interoperability of analog RF signals and helps prevent vendor lock-in.”

Members of the other consortium, the Digital Interface Standards Working Group (DISI) currently include Communications & Power Industries (CPI), DataPath, Datum Systems, Gilat Satellite Networks, SES, ST Engineering iDirect and Wavestream. This group is focusing on digitizing the interface between the modem and RF components, so as to take full advantage of developments in virtualization, cloud computing and network virtualization technologies, as well as improve the performance and scale of satellite hub, gateway and modem equipment. In an open letter to the industry, Frederik Simoens, CTO ST Engineering iDirect said: “We need to make sure that when we output a digital signal, it can talk to as many vendors as possible, so we’re not limiting ourselves to only a few selected vendors that can interoperate with the signal. Once we know that everybody talks in the same language, I think the move toward full virtualization of the modem infrastructure will become much easier.” In the same open letter, Tom Cox, VP Business Development and

Sales, Wavestream, commented that if the industry isn’t able to become more agile to keep pace with all the changes both on the ground and in space, it would make it more difficult for integrators to sell satellite solutions versus terrestrial solutions.

According to ST Engineering iDirect, DISI is reaching out to the DIFI, the other industry group to see how the two could work together.

If either or both of these groups can succeed in steering the different players in the ground segment towards common standards, we could start to see more economies of scale in ground equipment which in turn should help both speed development and lower the price of the ground component, which in turn may help the operators close their business case. As Stuart Daughtridge, VP Advanced Technology and Business Development, Kratos Defense and Security Solutions succinctly stated: “If your ground segment can’t support it, it doesn’t matter how great your satellite is.”



**Elisabeth Tweedie** is Associate Editor of the Satellite Executive Briefing has over 20 years experience at the cutting edge of new communications entertainment technologies. She is the founder and President of Definitive Direction ([www.definitivedirection.com](http://www.definitivedirection.com)), a consultancy that focuses on researching and evaluating the long-term potential for new ventures, initiating their development, and identifying and developing appropriate alliances. She can be reached at: [etweedie@definitivedirection.com](mailto:etweedie@definitivedirection.com)





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# SNG and Flyaway Antennas for Broadcast Markets

by Bernardo Schneiderman

Flyaway antennas and Satellite News Gathering (SNG) equipment are essential for the broadcast and video markets. According to a recent NSR study, The Land-Mobile Communication market will grow from US\$ 1.39 billion in 2019 to US\$ 2.98 billion in 2029, a growth rate of 7.9% over the decade. Despite the moderate impact of COVID-19 in the short term, in the Communication on the Pause (COTP) segment, NSR forecasts growth from US \$400 million to US\$ 700 million in the next 10 years.

Satellite can provide Communications On The Move (COTM) or COTP for various sectors. COTM refers to vehicles and other moving conveyances such as ships, trains, etc. equipped with a satellite dish able to establish communication with a satellite network and maintain communications while the vehicle is moving. COTM has vital applications for first responders, disaster recovery, emergency preparedness, remote access, Satellite News Gathering (SNG) in key verticals such as enterprise, broadcast, government/military, maritime, utilities, oil & gas, mining, among others.

The basic principle of COTM is that equipment is fitted with an antenna that can establish communication without the need to stop or pause. COTM is not to be confused with Communication on the Pause (COTP) which requires that the satellite equipment be stationary to function.

This article will provide an overview of some of the major manufacturers in the market and technologies

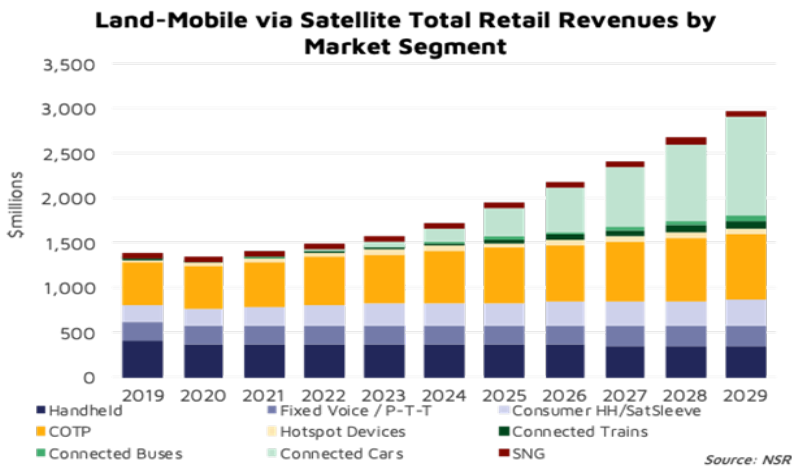
available for communications on the pause focusing on the Broadcast SNG applications. The majority of the manufacturers for driveaway solutions use parabolic antennas in general supplied by the world's largest manufacturers such as Prodelin and Skyware, among others. They develop software and control mechanism (Servo-motor) for positioning to close the link with the Satellite that the customer programs in the controller unit. This segment provides antennas in b C-band, Ku, Ka and X-Band with various diameters (from 60 cm–2.0 meters) for a variety of applications.

The other segment are Flyaway antennas which can be hand-carried in small cases to a site and assembled on the spot to uplink the news or content from remote locations. The antenna could be manually or automatic pointing to the satellite to establish the link. The antenna cases could be transported in planes or land/maritime vehicles. The antenna on the site is mounted on a tripod with the option of manual or automatic positioning to close the link with the Satellite.

The market supplies these antennas in petals that are mounted in the field and can be 2, 4, 6 or 8 petals in general carbon fiber due to being lighter and both in the C, Ku, Ka and X bands with diameters ranging from 60 cm up to 2.0 meters in general.

## Antenna Research Associates (ARA)

ARA is an American company with over 55 years of experience in the design, development and manufacture of antennas and RF systems for military and civil applications. These antenna and RF systems are





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used in a variety of industries including: Communications Networks, SATCOM Unmanned Aerial Systems, RADAR, RF Surveillance and Jamming for Electronic Warfare, Spectrum Operations and Border Patrol, Public Safety Networks and markets civilians. ARA products cover all commercial and military frequency bands from 10 Hz to 80 GHz and antenna types optimized for specific bands. Multi-octave antenna systems are available for fixed, mobile and tactical applications.

AQYR Technology, designs and manufactures satellite communication systems in the US and commercial global defense network with its one-button auto-acquisition capabilities. Aqyr has been part of Antenna Research Associates since September 2020. Originally part of Windmill International Inc., a leading defense industry program management firm, AQYR Technology now aligns its SATCOM suite of full system products with ARA's antenna solutions for Electronic Warfare, Police, Military Communications, Satellite Communications and Radar Markets.



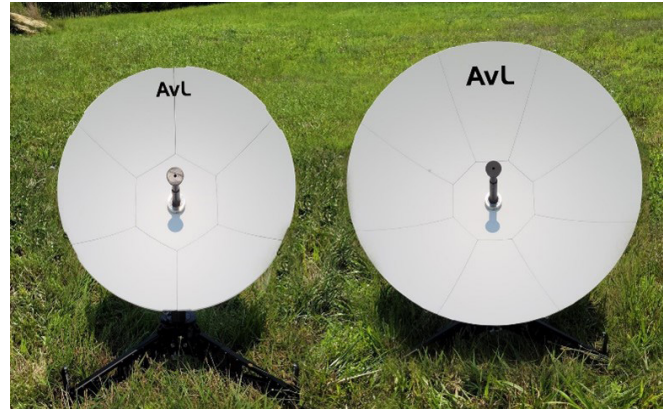
**TYPHOON 1.0 M Ku-Band**

ARA antennas include: Typhoon 1.0-meter Ku Band automatic positioning flyaway and Saterra Ku/Ka/X automatic positioning flyaway with diameter of 60 cm, 80 cm, 1.0 meter and 1.2 meters— to be launch 4Q 2021.

**AVL Technologies**

AvL Technologies, Inc. is a privately held US company specializing in the design, development and production of mobile satellite antennas and positioning systems. AvL provides system integrators with complete antenna system products and positioners, product development and services that maximize technical and commercial benefits for its customers with cost, performance, quality and reliability requirements.

AvL provides satellite terrestrial terminal solutions and support for SNG (Broadcast) customers, mobile broadband Internet access, disaster relief, oil and gas data backhaul, and defense and homeland security around the world. AvL offers the world's widest range of



**AvL 75cm / 98cm Tri-Band Terminals**

satellite antennas for vehicle, flyaway and fixed ground station mounting applications ranging in size from 60cm to 5.0M. Thanks to state-of-the-art manufacturing capabilities, cutting-edge design and development.

Krystal Dredge, Marketing Director of AvL said that nearly all AvL Technologies antennas enable broadcast and video streaming, "but AvL's SNG customers prefer 1.2m and 2.4m vehicle-mount antennas with Ku- and Ka-band capability. Some of our broadcast customers prefer flyaway terminals sized at 85cm or 1.2m," said Dredge.

AvL launched several new products at the recent SATELLITE 2021 show including a new 75cm / 98cm Tri-Band Terminal and a new 2.4m Ultra-Light Manual-Point Antenna. The 75cm / 98cm Tri-Band Terminal is unique because the base 75cm Terminal enables an upgrade to a 98cm ultra-lightweight manual point flyaway with a quick-change reflector and feed kit. The antenna reflector does not need to be disassembled and the RF kit does not need to be removed – the reflector and RF kit are removable together and can be replaced with a snap-into-place 98cm reflector and RF kit.

The new 2.4m Ultra-Light Manual-Point Antenna is ultra-lightweight and has a small two-case pack-up. The 9-piece carbon fiber reflector is designed to operate in X, Ku and Ka-band with new bayonet-style feeds and quick-change RF kits. A C-band capability is in the planning as an upgrade kit. The antenna is modular with numerous BUC and LNB options, and it supports RF or modem peaking. This manual operation antenna functions on an aluminum space frame, which enables set-up or pack-up by one person in minutes. Once the antenna is set-up and anchored, the antenna is easily repositioned using simple, ergonomic pointing assist features – no anchor adjustments needed – for fine tuning to one satellite or pointing to a different satellite.





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## FEATURE

In regards of the new wave of LEO and MEO Satellite constellation, AvL has designed and produced many Ka-band MEO terminals for SES/O3b, but primarily for government and military. "Recently AvL has begun upgrading GEO antennas for MEO capability, including a 1.2m vehicle-mount and a 2.2m flyaway, and these are now in testing. Currently in development are a 1.3m and 2.4m X/Y antennas that will operate with GEO, MEO or LEO networks, and we're continuing our development on an ESA," said AvL's Krystal Dredge.

AvL antennas include the following:

- 85 cm. 1.0 or 1.2 meters Mobile Broadband Ku-Band Flyaway Antennas with carbon fiber reflector;
- 1.2 m Flyaway or Driveaway Ku-Band Mobile VSAT System;
- 85 cm Integrated Auto-Acquire Flyaway Terminal with 1.0 m and 1.2 m options;
- Ka-Band Mobile Broadband Antennas for 85 cm, 1.0 m and 1.2 m;
- Ku-Band Mobile Broadband VSAT Antennas – 1.0 m and 1.2 m; Mobile Broadband Vehicle Mount/ Driveaway Ku-Band Antennas - 85cm, 1.0m, 1.2m, 1.4m, 1.5m and 1.6m, 1.8m, 2.0m and 2.4m

### C-COM Satellite Systems

C-COM satellite Systems pioneered the one-button automatic deployment VSAT market-with more than 8,500 units in the field in more than 100 countries.

C-COM has developed Comm-on-the-Pause (COTP) antennas that operate in all major satellite bands (Ka, Ku, C and X-band), in sizes (from 75 cm to 2.4 M) and in various formats (Driveaway, Flyaway and Motorized Fixed). The iNetVu® 7000 Controller series allows users in any vertical market to connect to any satellite in less than 2 minutes with just the touch of a button, providing voice, video and data to users around the world.

iNetVu® product users include world governments, military, oil and gas companies, broadcasters, emergency responders, hospitals (telemedicine), banks (mobile banking), schools (mobile education), racing teams, mining companies, and many other sectors.

The company is currently involved in the design of the next-generation COTM antennas for the Ka-band market. These new antennas will address the delivery of "always on" Ka broadband solutions in ground, moving vehicles such as cars, trains, buses, etc.



SNG with C-COM Ka-band terminal

Leslie Klein, President of C-COM Satellite System gave us some highlight of company products for the broadcast and video streaming as described below: C-Com offer a Manpack, 1.5M and 1.8M Ku and C band vehicle mount and 1.8M Flyaway as well as .98M Ka/Ku and 1.2M Ka and Ku solutions.

In regards of the new wave of Leo and Meos Satellite constellation, Klein mentioned that C-COM is in the final stages of developing an electronically steered low profile, conformal Ka-band antenna for LEO/GEO and MEO markets.

C-COM antennas include the following:

- 75 m, 98 cm, 1.20 m, 1.5 m and 1.8 m Driveaway Ka-band antennas
- 98 cm, 1.20 m, 1.5 m and 1.8 m Ku-band driveaway antennas
- 1.5m and 1.8m Driveaway C-band antennas
- 60cm, 80cm and 1.0m ManPack Antennas in Ka, Ku and X Bands
- 74cm, 98cm and 1.2m Ka Band Antenna Flyaway
- 98 cm, 1.2 m and 1.8 Ku Band Flyaway Antennas
- 1.8 m Flyaway C-Band Antennas



**Cobham Satcom**

Cobham is an England-based multinational company with several divisions. The Satcom division manufactures satellite and radio communication terminals that work in the most challenging and remote environments on land, at sea and in the air. The high-performance products are marketed under the EXPLORER, SAILOR and Sea Tel brands.

The Cobham SATCOM EXPLORER line of Satcom Vehicle Terminals covers the BGAN, Fly and Drive VSAT and Drive-Away VSAT vehicle systems, serving a wide range of users. State-of-the-art BGAN and VSAT systems keep the vehicles of military, police, media and humanitarian organizations connected when they are in motion and when they arrive on site.

Cobham's satcom division has a factory based in Denmark.



Cobham antennas include:

- Explorer 8100 Auto-acquire Drive-away Land VSAT antenna in Ku and Ka band is 1.0 m & 1.2 m
- Fly-Away auto deploy vsat in Ka-band at 60 and 75 cm

**Communications and Power Industries (CPI)**

CPI is a global manufacturer of electronic components and subsystems primarily focused on the communications and defense markets. The company develops, manufactures and globally distributes technology solutions used in generation, amplification, transmission and reception and microwave signals for commercial and military applications. CPI serves clients in the communications, defense, medical, industrial and scientific markets.

In June 2020, CPI acquired the global anten-

na systems business of General Dynamics SATCOM Technologies, renaming it CPI Satcom & Antenna Technologies and integrating it with CPI's existing antenna systems operations to create the Technologies Division of CPI's Antennas and Satcom.

CPI manufactures the following types of antennas:

- Mobile Antennas in Ka, Ku and X bands in sizes of 1.2m, 1.4m, 1.8m, 2.4m to be mounted on vehicles
- Quick Deploy Antennas (Flyaway in C, Ka, Ku and X in sizes 1.2m, 1.8m and 2.4m manual override.
- Flyaway antennas in the Ka, Ku and X bands manually or upgraded to a motorbike in sizes 60 cm., 96 cm, 1.0 m, 1.25 m 1.4 m, 1.8 m and 2.4 m.

**RF Mogul**

Since its inception in 2011, RF Mogul has been dedicated to designing and manufacturing high-end mobile HDTV and Internet automatic distribution antenna systems.

The company is headquartered in Utah, USA. This location supports all product design, manufacturing, sales, customer support and distribution. RF Mogul promote the fact that RF Mogul product is designed and manufactured in the USA. The company's focus in drive away solution for both Ku and Ka-band Antennas.

RF Mogul antennas include the following:

- Auto-Acquire drive away Antenna for VSAT System Ku band to be mounted on vehicles has diameters of 84 cm, 96 cm and 1.20 m



*...designed for perfect signals*

## "FlexLink K4" Switch Matrix



## "QLink" Quad RF-over-Fiber



## "HQ Series" Line Amplifiers



## "PwrMxG" Dual RF Power Meters



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- ▶ **Single & Quad Redundancy Switches**
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### ThinkKom's ThinSat 300 low-profile, lightweight, vehicle-mounted antenna

- Auto-Acquire drive away Antenna for VSAT System Ka-band to be mounted on vehicles has diameters of 90 cm and is licensed to the Hughes network in the USA.
- Auto-Acquire drive away Antenna for DTH system reception Satellite in the Ka/Ku band to be mounted on vehicles has diameters of 70 cm and is licensed to work on the Directv, Dish and Bell network in the USA.

### Thinkom Solutions


ThinKom Solutions, Inc. is a leading provider of innovative, highly affordable, compact broadband multi-beam antennas and products for aeronautical, vehicular, user terminal, gateway, satellite and man-portable applications. The company's primary products uniquely enable near-term worldwide availability of high-data-rate connectivity across all major satellite communication frequency bands. ThinKom offer for the Broadcast market portable Satellite Antenna solution and is the first manufacturer that offered com on the move antenna.

Bill Milroy, CEO and co-founder of ThinKom Solution said "we've always look to the broadcast market as a very important market. We introduced years ago, our ThinSat 300, which is our Ku Band on the move product, designed for the satellite news gathering, application. We have about 300 of those out in the field. Some of our customers are doing as much as 8 megabit per second in return links which is enough to do HD broadcast from the field."

ThinSat 300 phased array is a low-profile, lightweight vehicle-mounted antenna that provides

high-quality voice, data and video communications-on-the-move (COTM) in Ku-Band. It supports robust IP networks, streaming video and voice-over-IP applications on- or off-road at high rates of speed without stopping the vehicle to deploy a fixed satellite dish or waiting for a blockage recovery.

ThinPack is flat-panel ultra-portable antenna, users in the field can stream video and has Worldwide satellite coverage (Ku, Ka and X bands). Compatible with wide-beam and HTS Satellite services and is Network and modem agnostic with speed Up to 20Mbps down x 10Mbps up.

"We continue to manufacture Thinsat 300 but we have a new product that we've been developing, which is based on our Ka band, for those people who prefer to use Ka band systems. This Ka band system is based on our KA2517 systems, which is a little bit smaller. We are retrofitting some of our antennas to have that LEO capability. Even our ThinSat 300 could work on LEOs systems. Our Ku band, KU3030 which is for the aero market, bringing broadcast services to, to in-flight aeronautical user and also internet services. That started as a GEO-only solution, but we are doing a variant of that now on Panasonic, which will be both GEO and LEO capable," said Milroy. 



**Bernardo Schneiderman** is the Principal of Telematics Business Consultants. He can be reached at: [info@tbc-telematics.com](mailto:info@tbc-telematics.com)

# Satellite Earth Observation Market

by Prateek Yadav

The satellite-based earth observation satellite industry has evolved significantly in the past decade. Particularly, the supply side has seen novel technologies and new systems being carried into operation. In addition to the impact of cloud, the satellite-based earth observation industry finds itself at the junction of two revolutions, the one of one of commercialization of space and the Big Data coupled with artificial intelligence. Satellite-based earth observation refers to the use of remote sensing technologies to monitor marine, land, and atmosphere. Satellite-based earth observation depend on the use of satellite-mounted payloads to collected imagery information and data about the Earth's characteristics. The images are then further processed and analyzed to get variety of information that can assist a very wide array of industries and applications.

According to European Association of Remote Sensing Companies (EARSC), the Earth Observation sector endures to grow at a decent rate of ~10% per year. The demand

for satellite-based earth observation and their data is growing, as markets for applications become progressively diversified and providers are able to bring solutions for users who previously would not have been targeted. Two major zones where demand is experiencing speedy growth within emerging economies, where solutions support the



growth of a country in many ways, agriculture, including urban expansion, and natural disaster challenges; and in the intelligence community, above all for security and defense. Defence and intelligence is the largest vertical, accounting for ~43% of the market, followed by public authorities, energy/natural resources, services, and then agriculture.

The current advent of economical small satellite technology has helped enable satellite based EO firms to alter their business models,

based on the profusion of near real-time, low resolution imagery. As microsats become inexpensive to manufacture owing to miniaturization and commercial off-the-self components, new players are disrupting the market by introducing large constellations into orbit. This as a result provides ever-increasing production and access to new data.

Some of the prominent players operating in the satellite-based earth observation market are Maxar Technologies, Planet Labs Inc., L3Harris Technologies, Inc., UrtheCast Corp., ImageSat International N.V., Airbus SE and

Others. In past few years, the satellite-based earth observation market has witnessed numerous advances in the forms of product developments, partnerships, and others, which direct strong development of the market and denotes firm growth in the future. For instance, in May 2021, BlackSky Holding, Inc. announced to expand its earth observation satellite with launch of two satellites on Rocket lab's twentieth mission. Further, the launch of new imagery satellites can consistently increase capacity to deliver first-to-



know insight for its customers. Also, in March 2021, BlackSky Holding, Inc. entered into a partnership with ST engineering Geo-Insights, an earth observation and geospatial analysis company to offer expanded satellite imaging solutions and analytics insights portfolio for the customers in Southeast Asia region. In November 2020, European Space Imaging launched 10 new earth observer satellites to expand its satellite imaging portfolio. The expansion of its portfolio is part of its strategy to enhance the data delivery capabilities of the company. Further, these satellites will collect more than 4 million sq. km satellite images per day in very high-resolution imagery.

In addition, location-based services gaining immense popularity. This is due to high-resolution imaging for the creation of highly accurate, and real-time maps. Location-based services help during, rescue events, natural calamities, flood and for weather forecasting to develop forthcoming programs to abridge the situational events which offers lucrative growth opportunities for the satellite-based earth observation market. For Instance, In September 2020, China launched a satellite named as HY-2C to monitor ocean. HY-2C was launched from the Jiuquan Satellite Launch Center in northwest China. HY-2C can provide round-the-clock observation of wind speed & direction, wave height, all-weather, sea surface height, and temperature. Also, in June 2019, around 3 Canadian satellites that signify the next generation of satellite-based earth observation technology were deployed under the Canadian government's project named as RADARSAT Constella-

***"...The current advent of economical small satellite technology has helped enable satellite based EO firms to alter their business models..."***

tion. The images from these satellites are used for a wide range of purposes, including monitoring sea ice, disaster management, and agricultural & forestry management.

Impact of COVID-19 on the satellite-based earth observation market

The COVID-19 crisis led to inimical economic situations in the market across the globe. Governments of different nations imposed stringent lockdowns and momentary closure of manufacturing units that impacted the overall production and sales across all areas. The satellite industry also witnessed a slight downturn in 2020 owing to the COVID-19 crisis. International lockdowns impacted the design, research and development, and manufacturing and launch activities of companies active in the satellite-based earth observation market. Stressed global markets with a great emphasis on undertaking the adverse economic situations,

owing to the pandemic are also foreseen to cause uncertainty in demand for a considerable number of years.

The COVID-19 pandemic has also unlocked opportunities for existing satellite operators. The demand for satellite-based earth observation and satellite communication has grown considerably during the pandemic. The operators are using the data collected from their satellites to examine the effect of COVID-19 on the earth's environment. For instance, Japan Aerospace Exploration Agency (JAXA), National Aeronautics and Space Administration (NASA) and European Space Agency (ESA) announced to document planet-wide changes in the environment and human society, they had joined forces to use the shared scientific power of their satellite-based earth observation data in response to the COVID-19 pandemic.



**Satellite-Based Earth Observation Market - Download Report**

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**Prateek Yadav** is a seasoned professional with more than 3 years of experience in Market Research, and Business Consulting, working under the spectrum of Automotive & Transportation and Aerospace & Defense domains. Prateek conceptualizes and implements a scalable business strategy and provides strategic leadership to the clients. His forte lies in market analysis, deep-dive research, customer assessment, and sustainable market strategy, among 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. For more information on research studies from Allied Market Research go to: [www.alliedmarketresearch.com](http://www.alliedmarketresearch.com)

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# NGSO Market to Reach More Than US\$300 Billion Revenues Between 2021-2035

A new report by Orbofleet's entitled 'Global Non-Geostationary (NGSO) Satellite Communications Market' has found potential US\$300 Billion opportunities across multiple market verticals between 2021-2035. The 2021 edition report taps onto the most significant and promising markets that are set to flourish with the growth of satellite broadband connectivity. It also provides a detailed insights into the market drivers, investment landscape, emerging technologies, and the key amplifiers of the upstream market segment.

Broadband demand has grown exponentially since 2020. And as the global communications market has set course to embrace new technologies, NGSO satellite connectivity will be crucial to serve the global connectivity needs. Orbofleet's report provides a comprehensive analysis on types of applications and the potential business opportunities across multiple markets including mobility, government, consumers, and enterprises.

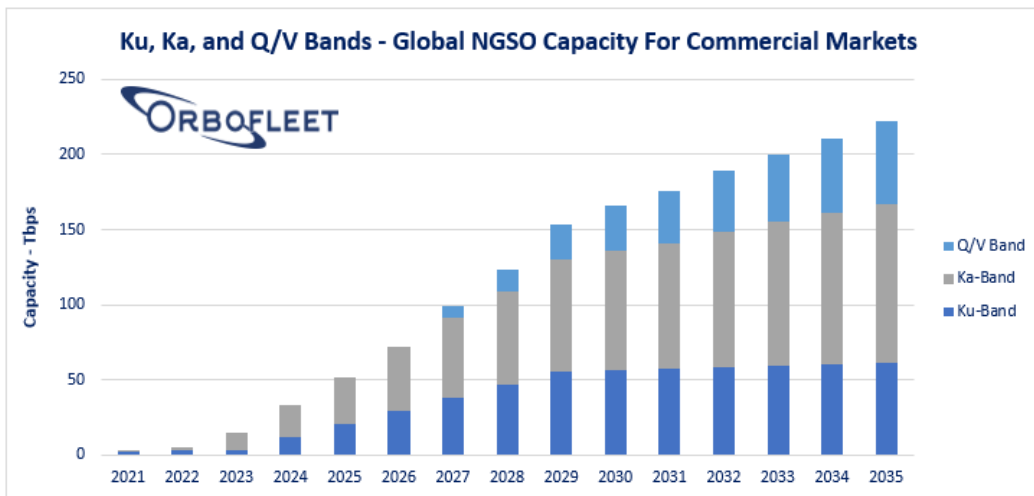
The unparallel growth of New Space investment through both government and private investors has amplified opportunities for NGSO satellite operators. The report also forecasts several aspects of investments with a potential return behind every billion-dollar invested in a company. Simultaneously, it also provides extensive insights on the unparallel technologies driving growth in quality and

reducing satellite capacity prices.

"The worldwide robust demand in connectivity is elevated since the pandemic. NGSO will help serve this demand with high-speed connectivity as fast as Fiber (or higher) by not only reducing capacity and equipment prices but also helping companies explore multitude of opportunities in both upstream and downstream market", says report co-author and CEO of Orbofleet, Rami Ibrahim.

Orbofleet's forecasts of NGSO capacity in Tbps for businesses signifies a fourfold increase in demand from 2021 to 2035. The demand of utilization of different spectral bands will be on rise as NGSO operators roll out their services worldwide. Aligned with these developments, NGSO report also assess regional capabilities as well as the inception of Q/V band in the commercial sectors. According to Orbofleet's market findings, NGSO market will accelerate

the utilization of satellite capacity in the broadband market. The Ka-Band demand will be skyrocketing on a global scale, as well as the Q/V Band demand under the Extremely High Frequency (EHF), will increase gradually. These dynamic progress in utilization different high-frequency bands will lead to the low operational expenditure (OPEX) leading to the opening of business gateways for the new downstream customers



as well as fulfilling their requirements. Further, the report forecasts that by 2022, the Ku-Band capacity will exceed 3 Tbps to provide capacity services targeting businesses and government markets. While the other NGSO operators focused Ka-Band will surpass 40 Tbps by 2026. Simultaneously, the Q/V-Band will gain momentum commercially exceeding 50 Tbps by 2035.

Numerous companies, organizations, and agencies are participating and engaging in amplifying the upstream and downstream market capabilities. These robust developments are further uplifting the innovative curve of the satellite industry. Orbofleet's 2021 edition of NGSO report dissects this nucleus of emerging opportunities and presents actionable insights to help commercial, civil, and military sectors better understand and create a strong foothold in the NGSO market.

### About the Report

The Global Non-Geostationary (NGSO) Satellite Communications (SatCom) Market study is a high-end product value addition report produced by Orbofleet, that is curated to help investors, private companies including operators, service providers, government organizations, and startups to find, identify, participate, and expand their existing and new businesses. The report pro-

***"...The unparalleled growth of New Space investment through both government and private investors has amplified opportunities for NGSO satellite operators..."***

vides a complete assessment of the present and future market opportunities, forecast (supply and demand), investment drivers, and a brief outlook on government programs to help companies successfully bid for high-quality public/government projects. Our market study identifies several unexplored markets, capital requirements, and deep analysis of business opportunities to leverage this expanding market.

In this report, we also provide regional investment analysis for NGSO SatCom market along with in-depth research and analysis of emerging technologies in both upstream and downstream markets. The analysis of emerging technologies is not limited to but focused on the latest innovation in very-small aperture terminal (VSAT), 5G, internet of things (IoT), hybrid networks, small satellite launchers, satellite capacity leasing, inter-satellite links (ISL) and optical communications including Innovation in Laser Communications.

### About Orbofleet

Orbofleet is a commercial space and satellite market research, consulting, and strategy advisory firm based in Strasbourg, France. With over 15

years of experience across multiple verticals of the space industry, Orbofleet's team has successfully accomplished several consulting and research projects across Asia, Europe, Middle East, and the USA. Our decade long market leads, and research inputs have helped our clients achieve desirable results for their businesses. Orbofleet's broad expertise in market research, business and technology consulting, custom training courses, case studies, RFP support, and management, aims to support new space initiatives; primarily for private and government agencies operating in the satellite communications, space situational awareness (SSA), deep space communications, space tourism, satellite-based earth observation and laser communications, satellite manufacturing and launch segment. For more information on our services and products visit our website [www.orbofleet.com](http://www.orbofleet.com)

### Requesting the Report

To request the Global NGSO Satellite Communications Market Report contact Orbofleet at:  
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# Clouds on the Ground

by Robert Bell

Satellite operator SES recently announced that it was seeing strong uptake for its Cloud Payout service, as customers embraced it for management and playout of linear TV channels over satellite. Creating the service was a shrewd move for a satellite operator that generates 60% of total sales from its video business. After initial resistance, US and European broadcasters have been shifting media management and playout to the cloud to take advantage of its robust content management and scheduling applications and the scalability of the cloud. In its press release, SES cited an Ethiopian broadcaster, which suggested that the customer uniquely trusted SES to successfully guide its entry into cloud processing.

When clouds appear in the sky, it's no surprise. When they appear on the ground, it's fog. The situation with teleport service providers adopting cloud technology so far remains a bit foggy.

## Adopting at their Own Pace

Over the summer, WTA published a report, 2021 Cloud Forecast for Teleport Operators, which updated a 2018 report on the same topic. With 92% of enterprises running at least a portion of their computing in the cloud today, we wanted to see how far along the sector was in putting the cloud to work for customers.

In 2018, teleport operators were moving slower than the business world in general, eying the trade-offs between flexibility and risk reduction on the one hand and the potential for greater profit and greater control from running a service on their own infrastructure on the other. Another reason for the reluctance to move to the cloud was the time, effort and cost of upgrading legacy systems to run in a virtualized environment. Most were only taking cautious steps towards integrating their systems and services into public clouds. One of the operators commented at the time: "I think cloud services are never going to be a growth engine for us."

Today, operators are unanimous in expecting their use of the cloud to grow significantly, though the pace of actual adoption varies widely. For many, it is a matter of surrendering to the inevitable. Others see it as the key

to future growth. One large service provider with a lot of broadcast clients commented that: "In general the broadcast sector is the most advanced. Media supply chains have been migrating to the cloud for the last five years, with many channels of linear playout being originated from the cloud

now." Echoing that sentiment, another large player that considers itself a leader in cloud adoption commented: "We have many cloud projects on both the infrastructure and service layers. Some of them are already in production and used by our customers, such as live4K playout and digital cinema delivery, and all of our projects are now fully oriented towards cloud-based infrastructure."

On the other hand, a smaller regional operator serving media customers said: "At the moment we rarely encounter them asking for cloud, they just want the service (playout and time delay) and don't mind how it is delivered."

Two of the regional operators, both with a variety of customers, identified retail as the one of the most advanced sectors. "Supermarket chains seem to be ahead of the game," one of those operators said. "They operate on a low margin, so they have been an early adopter and are continuing to adopt at a faster rate than other sectors." Respondents also identified another low-margin, high volume business, retail gas stations, as among the most advanced.

## It's About the Skills

What determines how ready teleport operators are



to adopt public cloud services? Sunk costs in existing technology are certainly a factor. Executives told us that they expect adoption to accelerate as existing equipment comes up for replacement. Security is an issue for operators as well as some customers, despite the fact that cloud services have proven far more secure than in-house IT operations. Perceptions aside, there can be security risks when it comes to ingress and egress to the cloud over the public internet. That risk is eliminated when service providers gain a “direct connect” relationship with the cloud operator, which enables a private fiber link from server to server.

But such practical considerations may not be the most important. One service provider suggested it was more about the installed base of people than equipment. “The degree of advancement depends on the teams that the operator has in place,” he said. “Some are more experienced, particularly the younger ones; the older aerospace guys with a ton of experience don’t get the cloud. On the other hand, if the staff are too young, they don’t get space.” He went on to add: “Furthermore, some companies are just too small. They lack the resources to implement the move to the cloud.”

Some new entrants in the ground-segment-as-a-service space have built their management applications in the cloud from the beginning, and they are very satisfied with the flexibility, security, resilience and reliability of the platforms. As one executive put it, “We’ve integrated many customers through our cloud platform already. AWS is designed for this. It lets customers launch their own applications and lets us get the data to their applications.”

### Size Matters

For others, size of company does seem to matter. A few midsize regional operators have found both success and difficulties in the cloud. One executive described deploying Office 365 and MS Teams for a few customers and finding it a challenge. “It’s not an easy journey,” the operator said. “There are some complex elements that have to be factored in. Particularly in some parts of the world, there are a lot of sensitivities around moving to the cloud, including security and staffing levels.”

Another regional operator that is offering third-party applications in the cloud sees this as a competitive advantage, saying: “It gives us an edge in the capability portfolio. Offering third-party applications is a way of

maintaining revenue in a commoditized market. Connectivity as a service has become a commodity business, meaning that price points are declining. Even if the volume increases, revenue is flat, so it is important to move to where you can add value to grow wallet share.”

Bigger companies with global operations, however, find it most affordable and have the IT skills in-house to make it happen. One of them has moved all its specialized customer applications for BSS and OSS into the cloud. “For the customer, it is transparent,” the operator said. “Either they have access to a portal or to a set of APIs which are customized to the services that we deliver. This approach has been in use for 10-15 years. Before, the services were on servers in our premises. Now they are in the cloud. It makes no difference to the customer.”

Two other global operators were well advanced on the cloud journey. One of them stated that it was the company strategy to move everything towards cloud applications. “Most corporate applications are on Azure, and we use the Microsoft Office Suite for most employee interactions. This not only reduces the effort required to manage things, it also minimizes issues with our Virtual Private Network (VPN) access.” The other international operator was also heavily invested in cloud applications, saying: “We have replaced almost all internally based systems with managed cloud services. These services are meeting the critical company needs around the security of our corporate, customer and asset data.” An additional benefit of using the cloud for corporate applications is the ease with which new applications can be integrated with existing business systems.

For another large operator, integrating services into the cloud has become second nature. “We are internally developing services that are fully integrated into the cloud, being agnostic as to which cloud provider.” This operator has designed a full cloud service for delivery of digital cinema package (DCP) to theaters, playout for linear channels and video-on-demand as well as a full live video transport solution over the cloud for delivering content contribution all over the world.

### Follow the Snowball

“Like a giant snowball continuing to roll and growing larger every minute.” That’s how one regional operator described the move to the cloud. There are many reasons that operators and service providers see cloud usage growing. Bowing to the inevitable is one. As more




and more business moves to the cloud, service providers who don't offer a cloud solution will find themselves losing customers.

But those who have put a toe in the water do find positive reasons to go deeper. Savings on energy costs and the capital expense of full redundancy for the data center are attractive. "When we use the cloud, we don't need all the power-hungry equipment onsite," said the operator. "We can get by with a smaller generator and smaller UPS, so the energy costs come down. Furthermore, moving to the cloud means we benefit from the built-in redundancy and get more flexibility as well."

For operators of all sizes, being in the cloud makes it easier to expand. As systems grow and new customers come online, there is no need for capital expenditure to purchase additional equipment, and customers can be added with minimum effort. One teleport customer, a consumer service, went from a few users to over one million overnight.

Increasingly, the cloud is being seen as a key enabler for growth. One company has set a goal of putting "a lot more of our business into the cloud, whether that be public or a private one that we create ourselves." Another

operator already has 20% of its business in a virtualized private cloud in its teleport, and is planning on moving that business to a fully secured public cloud. As one of the service providers said: "The cloud is the key to our global strategy." 



**Robert Bell** is Executive Director of the World Teleport Association, which conducts research into the teleport and satellite industry and offers a Teleport Certification program to service providers. The 2021 Cloud Forecast for Teleport

Operators is available for free to members and for sale to non-members at <https://www.worldteleport.org/store/viewproduct.aspx?id=18497754>. A webinar based on the report, "Delivering Hybrid Cloud Services," is available free on demand at:

<https://www.worldteleport.org/general/custom.asp?page=Webinars>

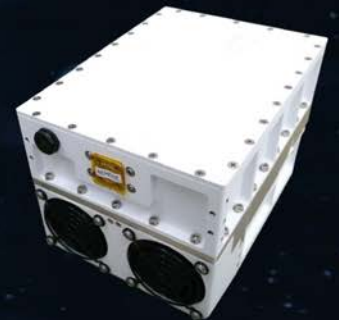
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## ND Satcom's Multi-Band Flyaway Terminal MFT 1500

**@CABSAT visit ND Satcom at booth # B3-36**

ND SATCOM continues to distinguish itself through its commitment to innovation and customer satisfaction. The coming launch of the ND SATCOM FLYAWAY terminal underscores the company's competitive advantage.

One advancement that sets this new terminal apart is its operational wind resiliency: it can withstand and function in very high wind speeds and during severe storms.

ND SATCOM incorporated another clear advantage: the latest version of the premier SKYWAN 5G technology. Customers value the proven high reliability and security that SKYWAN represents. The bar was raised here, too, by integrating the pioneering innovation of Adaptive Coding and Modulation (ACM) for TDMA, thus permitting transmission during heavy rains with adaptive bandwidth control. For the motorized FLYAWAY version, engineers integrated the ACU into the 5G modem, thus minimizing equipment and enabling pointing on SKYWAN or DVB signals.

ND SATCOM pushed the engineering boundaries further by optimizing portability and product longevity for this new FLYAWAY. Carbon was used wherever possible to reduce weight, enhance durability, and provide the extreme stiffness required for Ka-band in high wind conditions. Both the unique 180° azimuth range and integrated feed-booms for various bands expedite setup and use. For an extremely fast setup -, this terminal was designed for easy deployment and dismantling - time and again - while maintaining structural integrity throughout.

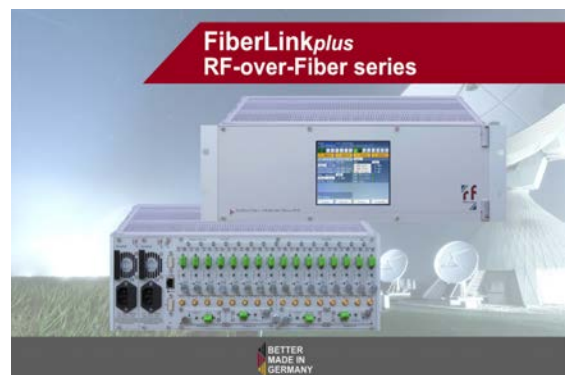
The in-house R&D team in Germany designed and developed the new terminal, rigorously field testing the finished product as well as testing against stringent standards for military products. ND SATCOM FLYAWAY is ready to go: whenever, wherever you are. For more information, go to: [www.ndsatcom.com](http://www.ndsatcom.com)



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- Suitable for outdoor and indoor applications
- Ready for non-redundant or redundant operation
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- Allows mixed TX/RX population e.g. for uplink and downlink applications
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@CABSAT visit RSCC at booth # E3-35



**Russian Satellite Communication Company (RSCC)** is the Russian GEO satellite operator with global coverage. RSCC provides a full range of communications and broadcasting services via its own terrestrial telecom facilities and satellite constellation, which consist of modern Express, Express-AM, Express-AT, Express-AMU type satellites; e.g. video distribution and contribution, DTH, DSNG, broadband Internet access, IP trunking and cellular backhaul, maritime mobility, SCADA, enterprise networks connectivity and other. The company operates various regional satellite TV distribution networks and corporate VSAT networks for fixed and mobility customers. RSCC satellites provide unique coverage and connectivity throughout EMEA, Latin America and Asia.

For more information go to: [www.rsc.ru](http://www.rsc.ru)

## SatService

@CABSAT visit SatService at booth # 212



**SatService GmbH**, a manufacturer and reseller in the field of satellite communications, is pleased to present the latest technologies and sat-nms products at Cabsat. SatService provides competitive and customer dedicated products, with high quality

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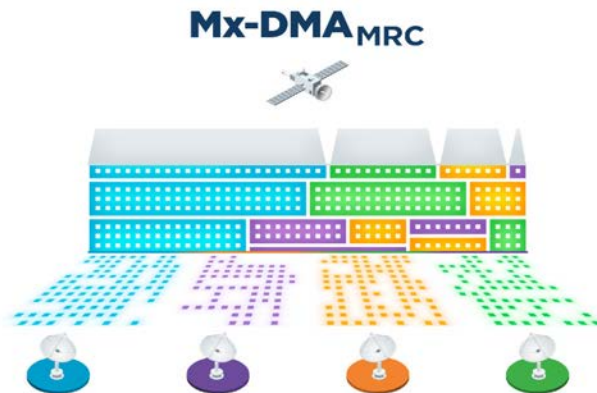
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## Achieve A Greater Return with ST Engineering iDirect's Mx-DMA MRC®

@CABSAT visit ST Engineering iDirect at booth # B3-10

ST Engineering iDirect's Mx-DMA® MRC (multi-resolution coding) brings forth the full scalability of TDMA return technologies to the same SCPC-like efficiency level of Mx-DMA HRC. Achieving this level of scalability and adaptivity while adding the dimension of time required a more innovative approach to the access scheme. The result is 25 times at faster bandwidth allocation along with the ability to now support over 5,000 active terminals per hub demodulator significantly reducing the hardware needed the hub. These advancements allow Service Providers to efficiently share the bandwidth across many different use cases while achieving the lowest total cost of ownership (TCO) and improving service agility, network scalability and capacity fill efficiency.



To learn more, visit: [idirect.net/mx-dma-mrc](http://idirect.net/mx-dma-mrc)

## Spacebridge

@CABSAT visit Spacebridge at booth # A3-30



**SpaceBridge** is a proud developer and provider of satellite network equipment and services, including VSAT HUBs and Terminals for Point-to-Point, Point-to-Multi-Point, and Mesh typologies, as well as SCPC and broadcast modems for GEO and NGSO satellite constellations. SpaceBridge also provides Cloud-Based autonomous managed services for its customers.

SpaceBridge Inc.'s diverse portfolio includes the ASAT™ product line, which serves different verticals with various technologies and applications. Key areas of focus are: Cellular Backhaul for 2G/3G/4G and 5G, Industrial Internet of Things (IIoT), Commercial and Military SatComs-On-The-Move, High-Speed Broadband, Multicast IPTV, Voice-over-IP (VoIP), Videoconferencing, L2/L3 VPN, Virtual Network Operator, and HD/UHD TV Broadcasting. ASAT™ Wave Switch™ innovative, award-winning technology enables dynamic return link selection and switching to the most-appropriate waveform, whether MF-TDMA, ASCPC, or SCPC. Thereby optimizing satellite resource usage for satellite networks and operators.

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## The New C-Band IBUC G for Multicarrier Application is Now Available

@CABSAT visit Terrasat at booth # B3-35

**Terrasat Communications** presents the new state-of-the-art 400W/500W IBUC G for multicarrier application. The new GaN IBUC G model now supports multicarrier transmissions across the full C-band spectrum. The 500W model produces +54 dBm of linear output power and is ideal for all high data rate multicarrier applications such as maritime, broadband, broadcast, and network hubs. All IBUCs allow the operator to customize configurations & manage alarms & sensors for real-time network management and control backed by a 3-year warranty. IBUC reliability is baked into the IBUC G design and verified through intensive individual unit testing.

For more information on the available units, go to: [www.TerrasatInc.com](http://www.TerrasatInc.com)



## Walton De-Ice Systems



**W. B. Walton Enterprises, Inc.** AKA Walton De-Ice has been the satellite industry leader in Earth Station Antenna De-Ice systems for over 40 years. Beginning with our flagship, Hot Air Plenum De-Ice as the most economical and efficient method of keeping snow and ice from accumulating on antennas ranging in size from 3.7 meter up to 32 meters.

As the industry has evolved and antenna size requirements became smaller Walton De-Ice has lead the way in providing methods of signal protection such as our patented Snow Shield and Ice Quake/Rain Quake for antennas ranging in size from 0.65 meter up to 6.5 meters. Available in heated or passive solutions, when considering budget and operating budget no other method of antenna de-icing compares in cost and efficiency.

With the emergence of LEO Tracking antennas and mobile solutions the Walton Portable Radome has no competition when protecting terminals from weather such as rain, snow, ice, heat or blowing sand. Virtually invisible to RF and the ability to withstand wind up to 85 MPH/137 KPH

For more information, go to: [www.de-ice.com](http://www.de-ice.com)

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## iKO Media Group: Providing Innovative End-to-End Solutions to Take Your Channel to the Next Level

The global COVID pandemic has changed how content is consumed and distributed globally. With restrictions to movement in place and many working from home, there has been a marked increase demand for high quality broadband services and content. The challenge to content owners and service providers is to deliver what their audiences want, when they want it, where they want is in the most reliable and cost-effective manner.

One company has been on top of these trends and is ready to take your channel to the next level. iKO Media Group (iKOMG) is an end-to-end media service provider for broadcasters and content owners. They provide tailor-made solutions focused on customer needs through dedicated service to a wide range of global and local networks.

While the industry was coping with the global pandemic, iKOMG has been expanding its portfolio of innovative services. Earlier this year, the company announced the launch of their new Electronic Program Guide (EPG) creation solution, iKOMAX. This advanced solution allows TV channels to be in the frontline of EPG technology without the prohibitive expenditure of both human capital and equipment.

iKOMAX offers a holistic cloud-based system for both playout and automatic EPG. The solution boasts the additional advantage of quick and easy remote access, so it is simple to use from anywhere, a crucial advantage in these challenging times. Some of the features offered as part of the iKOMAX solution include automatic installation and up-to-date channel list, regional channel numbering, ability to add channel logo and category, program guide with illustration in multiple languages (currently English and Arabic).

“During COVID-19, we introduced our cloud playout solution, iKOCLOUD, that allows our customers to keep their business running, from any where in the world with a simple laptop and Wi-Fi connection. Keeping both their health and businesses safe.” said Mark Demichovski, VP Sales Operation, iKO Media Group.



Most if not all Free-to-Air (FTA) channels that are broadcasted on Direct to Home (DTH) platforms do not offer EPG information to their viewers which means that the viewers are not getting any information on screen on the show he is watching or any other information about the next shows. iKOMG successfully implemented an EPG solution for Sat.Tv, an FTA platform on Eutelsat. The EPG solution was fully enabled by iKOMG's iKOMAX.

iKOMAX and iKOCLOUD are a welcome new addition to the portfolio of services that iKOMG provides broadcasters and content providers. iKOMG provides customized solutions from broadcasting and content distribution solutions to an automated, high-capacity content management service, disaster recovery solutions, Over-the-Top (OTT), IP delivery and offerings for sports and live events, occasional use delivery, among others.

iKOMG differs from other service providers due to a holistic approach it takes in providing services and a keen ability to offer the best-suited technology-based solutions for TV channels and content owners. iKOMG delivers effective solutions customized to specific budgets and requirements without compromising on quality of service. A summary of iKOMG services include:

**Satellite Broadcasting.** From its teleport in Rome, Italy and other facilities, iKOMG can transmit to over a dozen satellites and can receive transmissions from over 20 satellites, which allows them to distribute content for its customers globally.

**Fiber and IP Delivery.** The company uses the latest technology to forward content. iKOMG uses its own fiber optic network to reach all continents and the most advanced IP protocols





## TV CHANNEL OWNER, WE CAN HELP YOU WITH EVERYTHING!

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- Playout management
  - Cloud services
- Disaster recovery for tv channels
- Occasional use delivery of sports and events
  - Fiber and IP delivery
- OTT and online services
- Content aggregation
  - EPG creation

For more information:

**[sales@ikomg.com](mailto:sales@ikomg.com)**

**[www.ikomg.com](http://www.ikomg.com)**

iKO Media Group is a boutique end-to-end media service partner for broadcasters and content owners. We provide tailor-made solutions focused on our customer needs. A leading and trusted partner to hundreds of global and local networks, iKOMG is identified with expert knowledge, dedicated service and professionalism.

## COMPANY SPOTLIGHT

Global Footprint Of Over 35 Satellites Around The World

Satellite broadcast for channels

Fiber and IP Delivery

Payout management

OTT & Online solutions

Cloud services

Content aggregation

DR Services & TV Program guide

Sport & Event services

Reception  
Content prep  
Hosting  
Delivery

Fiber  
IP (Zixi, SRT, HLS, RTMP)

iKOBX  
iKOCLOUD  
iKOPLAY

iKOFLOW  
iKOMAX  
iKOLIVE

iKOFLOW  
iKOFLOW Sport  
Vixi

iKOMAX  
iKPLUS  
iKOCLOUD

iKPLUS  
Global satellite delivery  
IP Delivery  
Project management  
iKOLIVE  
iKOFLOW Sport

### iKOMG provides complete, end-to-end solutions for broadcasters and content distributors.

as Zixi, SRT, RIST, UDP, ASI, RTMP, HLS to receive and forward any content their customers may need.

**Playout Management:** iKOBX is an automated, high-capacity content management facility. It provides a seamless workflow to keep a channel on-air by combining scheduling, ingest, playout, interactive graphics, QC checks, preparation and monitoring. iKOPLAY is a powerful tool, providing all the features you need to plan and import playlists, monitor playout servers and manipulate the rundown. iKOCLOUD is a cloud-based system, automated, high-capacity platform for content management services.

**OTT and Online Solutions.** iKOFLOW APP offers an innovative OTT platform for media distribution that allows you to have access to all your viewers worldwide 24/7. iKOFLOW OTT solutions come readily integrated with many features such as Video on Demand (VOD), User registration, Payment and Billing Services, among others.

**Cloud Services.** iKOCLOUD is an automated, high-capacity cloud-based system for content management services. iKOPUS a cloud-based channel monitoring system. Channels are streamed straight from the teleport source into the system iKOMAX allow you to create an electronic program guide from every program list format, enabling visibility on Eutelsat's sat.tv platform.

**Content Aggregation:** iKOMG can pick content from anywhere in the world. Content from different sources is prepared for air per the delivery platform technical preferences. Once collected the package of channels is hosted and delivered as bouquet.

**TV Program Guide.** iKOMAX allows you to create an electronic program guide from every program list format, enabling visibility on sat. tv. iKOFLOW enables a backup content feed set and selected by you delivered in case of failure. iKOLIVE Integrate your streaming services with your social media accounts, deliver your content directly to your YouTube, Facebook or Instagram live.

**Sports and Events Services.** For sports and other live events iKOMG can provide confidence monitoring link, global satellite capacity, streaming and IP delivery. iKOFLOW Sport APP is an enhanced OTT platform for sports leagues/ sports channels providing content delivery and also a revenue stream for the content rights owner.

With its comprehensive portfolio of services that can be customized for any client's requirements, you literally can leave all your content management and distribution to iKOMG, so you can focus on your core business. For more information go to: [www.ikomg.com](http://www.ikomg.com) or send an e-mail to: [sales@ikomg.com](mailto:sales@ikomg.com)



# A 'National Space Strategy' for the UK?

by **Martin Jarrold**

As facilitated by GVF, the editor-in-chief of this publication, Virgil Labrador, will be presenting a business outlook analysis during the SatExpo Summit at CABSAT 2021 and asking, "What are satellite operators betting on?" With the digitalization of all industries, and changes in the way we live, work, learn, communicate and consume entertainment, Virgil Labrador will examine how satellite operators can make sure they are developing the right offerings and targeting the right sectors to compete and thrive in an increasingly crowded market, a market which continues to thrive in GEO, expand in MEO, and evolve in LEO.

One of the LEO satellite mega-constellations centrally featured in discussion during a recent webinar in the GVF-SEG series was OneWeb. Launching its first satellites in February 2019 and continuing to grow the constellation until March 2020, the company – due to financial difficulties caused by the Covid-19 pandemic – filed for Chapter 11 bankruptcy protection. OneWeb maintained its satellite operations center for its already orbited satellites while the bankruptcy process determined the disposition of corporate assets. The company ex-

ited bankruptcy in November 2020, after being sold to the Government of the United Kingdom and Bharti Global. Since then, having secured additional investments from SoftBank, Hughes Network Systems, Eutelsat, and Hanwha Systems, OneWeb continues to orbit its planned satellites, with the constellation due for completion in 2022, though services between 50° N latitude and the north pole will start sooner.



Why this recap on the status of OneWeb? After all it is only one of a number of NGSO constellations being built. It is because the investment in the company by the government of the UK has more recently been placed into a broader context, a context established by publication of the first ever UK National Space Strategy (NSS). Released towards the end of September, this docu-

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ment lays out Government plans, in the words of Prime Minister Boris Johnson, to put the UK in the "front rank of the global space industry"

The GVF webinar, The UK Space Landscape: A Force for Disruptive

Change, was broadcast over Zoom on 30 September, just days after the NSS was published. (The webinar recording is available on-demand at <https://gvf.org/webinar/the-uk-space-landscape-a-force-for-disruptive-change/>.) The webinar provides a detailed analysis of the newly

emergent opportunities following on from the publication of the Strategy, although the document has not been met without some considerable critique, as explored in the webinar discussion between panelists who, for different reasons, are at the cutting-edge of the country's accelerating space industry advances.

Responsible for holding the UK



Government (i.e., the Executive) to account is Parliament (i.e., the legislature). The legislature has within its committee structures an All-Party Parliamentary Space Committee, the Vice-Chair of which, Mark Garnier MP, joined the webinar discussion, along with: Nick Flitterman, Managing Partner of Portland Advisers (the Moderator); Chris McLaughlin, Chief of Government, Regulatory & Engagement, OneWeb; Gary Wade, Future Transformative Programme Lead, Satellite Applications Catapult; and, Anthony Baker, CEO, SatelliteVu. This comprised a formidable team in conveying how the United Kingdom is now leveraging on its long history in space-related activity and is now aiming to build itself into a key global center for a wide range of space business opportunities.

Their further perspectives – that of (1) the LEO mega-constellation with British government investment, (2) of an organization bringing together industry and academia to promote capability innovation in the UK's satellite technologies, and (3) a start-up Earth observation company focused on high resolution thermal imagery – provided much food for thought and a continuing dialogue at a time when the global space and satellite business environment is rapidly expanding, creating opportunity to compete in what is something of a new space race.

Illustrated by the increasing number of smaller space-active nations – for which the establishment of a national space agency and development of a space presence has become, amongst other objectives,

a new means of exhibiting national power, or at least exhibiting the aspiration to achieve it – awareness of the strategic significance of space as having a vital role in the functioning of a modern economy, of an effective military, and of various services critical to society, has become entrenched.

The UK, contrary to what the less well-informed may think, is not, however, one of these smaller and only recently space-active nations. It has a long and significant history in space activities, with limitations to the full exploitation of its potential usually being down to lack of consistent governmental budgetary commitment. Until 1971 the UK had its own satellite launch capacity based in Australia, with the Black Arrow rocket's final flight orbiting to LEO the Prospero satellite in that year. Frequent lack of funding commitment led to the UK being lost to development of more major space capabilities, except with the more obvious example of military communications and the Skynet program. But the UK has been a leader in the realms of developing a world-class space science base and leveraging this to enable domestic satellite technology development (e.g., Surrey Satellite Technology, SSTL, successful academic spin-off and now part of Airbus Group; and more recently, on the ground segment side in the context of a multi-orbit satellite environment, the example of Isotropic Systems) and contribute to European consortia for scientific and commercial satellite construction.

The governments of the old-  
October 2021

er and bigger space-active nations have always put money on the table when Earth observation and imaging, weather forecasting, military strategy and tactics, government intelligence gathering and surveillance, etc., were concerned. The UK has usually been behind that global curve..., but maybe this is about to change.

I mentioned above that the NSS has been critiqued. Ironically, one reason is precisely because it is the product of a not insignificant joint effort of many parts of government (around ten major departments and agencies), the respective interests of which must be reconciled. If the reconciliation works, despite spanning the many policy interest areas, the UK will have taken the first steps to achieving a comprehensive and integrated plan for national space activity. However, successfully spanning and reconciling different departmental agenda is not enough. The NSS must also guarantee effective implementation of measures to enable the standalone strategic development of the business of space. This would be founded on an economic model wherein, for example, entrepreneurs (not the billionaire type, but the seeking for seed funding type) can get coordinated, multi-faceted, government-backed A-to-Z support (i.e., not just in regulatory matters) for bringing to fruition space business ideas that are not necessarily a part of the policy agenda of any of the NSS contributing departments/agencies, but which have their own inherent merits. Decision-making within the administration of such a model will probably need to be undertaken by

the scientists who understand the whys and wherefores of space business project proposals, rather than by government officials.

The NSS has perhaps offered up more questions than it answers, and those answers need more specificity and substance. However, as recognized during The UK Space Landscape: A Force for Disruptive Change webinar, the NSS is a good start.

Some of these pending questions are: Where to next? What precise direction is indicated on the roadmap of the nation's space landscape? And will government be focused on facilitating expansion of a space-friendly finance environment to bring in the money to support bigger programs of space-related capacity-building and research and development? How and who will decide on the metrics to be used to gauge the success of this capacity-building and R&D, and therefore measure if the UK is indeed building "one of the most innovative and attractive space economies in the world".

We know that the UK Ministry of Defence (MoD) is to publish its own separate space strategy, not surprising given that the UK's space business history has had a strong slant towards military communications, as alluded to above with reference to the Skynet program. The NSS is certainly strong on advocacy for integrating civil and military space, so we must await the MoD's take on this.

From my perspective, working for GVF, a UK-registered entity, I

**“...Some of these pending questions are: Where to next? What precise direction is indicated on the roadmap of the nation's space landscape?...”**

am keen to understand if the NSS brings any, yet unrealized, implications for the UK's longer-term relations with the European Space Agency (ESA). [A note to readers – The European Union and European Space Agency are separate institutions and the UK's "Brexit" from the EU did not change its membership of ESA.] GVF, working with various of its member companies, has partnered with ESA on projects including, most recently, with the Danish start-up QuadSAT with its drone-based antenna testing technology.

The UK's National Space Strategy document is just an early step on what we must hope becomes a clear-

ly drafted roadmap, and there will be more to say and write about it in due course.

I haven't written much here about CABSAT. I won't be in Dubai, but various GVF colleagues and representatives of GVF member companies will be supporting the exhibition and the SatExpo Summit. At the GVF booth you'll find my excellent colleagues: Riaz Lamak, GVF's Lead on Humanitarian Assistance & Disaster Response and who also delivers GVF Training Certification; and Mazen Nassar, who is also a GVF Training Certification Instructor.

Until next time... Keep well, stay safe!



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

**Companies to Watch at CABSAT 2021:**

- ARABSAT** booth no.D3-10
- Comtech Satellite Network Technologies** booth no. PD-503
- Gazprom Space Systems** booth no. 1040
- Integrasys S.A.** booth # F3-35
- ND Satcom** booth no. B3-36
- RSCC** booth # E3-35
- Satservice** booth # 212
- Spacebridge** booth no. A3-30
- ST Engineering iDirect** booth # B3-10
- Terrasat Communications** booth no. B3-35

## OneWeb Completes TrustComm Acquisition

**London, U.K., September 22, 2021**--OneWeb, the low Earth orbit (LEO) satellite communications company, announced that it has completed its acquisition of Texas-based TrustComm Inc., a provider of managed satellite communications and professional services to commercial and governments organizations. OneWeb announced the planned acquisition of TrustComm in May 2021 and received all necessary regulatory approvals enabling the transaction to close.

Following consummation of this transaction, TrustComm will become known as OneWeb Technologies Inc, a wholly owned subsidiary of OneWeb.

Under the terms of a Proxy Agreement with the United States Government, OneWeb Technologies will be tasked with providing governments of the "Five Eyes" alliance (U.S., U.K. Canada, Australia, and New Zealand); NATO; the U.N. and other strategic partners with global, next-generation, satellite connectivity. Led by former TrustComm CEO Bob Roe, OneWeb

Technologies will be focused on meeting the complex needs of government customers.

High-throughput, low-latency communications capacity in underserved and denied environments has long been an issue for the military and others, and




OneWeb's network is poised to address those challenges with security at the heart of its end-to-end managed services offerings.

Neil Masterson, CEO of OneWeb said: "Closing this deal represents an incredible opportunity for OneWeb to take the security first, high-performance, low-latency service we will deliver to the enterprise and make it available to meet government users' needs.

We are thrilled to welcome OneWeb Technologies to the family - an organization with a proven track record of serving complex, integrated user requirements of government users. We look forward to making OneWeb's network available as a vital tool to help advance government priorities."

Earlier this year OneWeb successfully demonstrated OneWeb's satellite-based communications system to the U.S. Defense Department with data rates up to 500Mbps at latency levels as low as 32ms. The demonstration also illustrated the seamless handover of connectivity between LEO satellites passing overhead.

OneWeb is on track to deliver coverage above the 50th parallel North later this year - reaching areas that have historically been hard to connect with spread out communities and challenging terrain. This includes Alaska, Canada, and the wider Arctic Region. OneWeb will deliver global coverage by the end of 2022. 

## Seraphim Space Acquires Arqit Quantum


**London, UK, September 21, 2021**--Seraphim Space Investment Trust plc (LSE: SSIT) announced the acquisition of the holding of Arqit Quantum Inc. from the Seraphim Space LP (Seraphim Space Fund). As set out in the IPO prospectus, Seraphim Space will acquire four assets from the Seraphim Space Fund for newly issued ordinary shares in the Company. This acquisition represents the second of those transactions to complete.

Arqit is a leader in quantum encryption technology designed to eliminate the threat of cyber-attack and data theft. The business has a unique quantum encryption Platform-as-a-Service which makes the communications links of any networked device secure against current and future forms of attack - even from a quantum computer. On 7 September, Arqit completed its proposed merger with Centricus Acquisition Corp. The combined company has been renamed Arqit Quantum Inc. and its shares have commenced trading on NASDAQ under the new ticker symbol "ARQQ" for Arqit common stock.

In accordance with the relevant sale and purchase agree-

ment entered into at the time of the IPO, the company has acquired for cash 2,421,634 shares in Arqit valued at 27,328,785.50 and the partners of the Seraphim Space Fund have used substantially all of this cash (net of tax) to subscribe for 26,296,402 new ordinary shares in the Company at a price of 100p per share. These new ordinary shares rank pari passu with the existing ordinary shares in issue. The valuation is based on the volume-weighted average price per share for the interests owned by the Seraphim Space Fund in Arqit for the five days trading from and including the date of Arqit's listing.

As a result of this issue, the total number of ordinary shares in issue now stands at 212,129,854 and the total number of voting rights in the Company is 212,129,854. There are no shares held in treasury.

The above figure of 212,129,854 may be used by shareholders as the denominator for the calculation by which they may determine if they are required to notify their interest in, or change to their interest in, the Company under the FCA's Disclosure Guidance and Transparency Rules. 



# SATELLITE INDUSTRY FORUM

18 November 2021 | 9.30am – 3pm SGT

## SESSION HIGHLIGHT: ASIAN OPERATORS – LEADERS' GROWTH STRATEGIES

10:40am – 11:20am SGT

Asia Pacific presents huge opportunities for satellite. It is home to vast country populations and widespread geographies where there is still a lack of terrestrial infrastructure, especially for remote, underserved communities. However, satellite operators are still assessing the pandemic's impact on the market as they plan for the road ahead. This session will discuss critical issues facing the operator business, what their growth strategies are for the short, mid-and long term, and how are they prepping for the LEO invasion.

### PANELISTS



**Roger Tong**  
Chief Executive Officer  
AsiaSat



**Yau Chyong Lim**  
Chief Operating Officer  
MEASAT



**Nick Leake**  
Head of Satellite and  
Space Systems  
Optus



**Terry Yamashita**  
Group President  
Global Business Group  
SKY Perfect JSAT



**Moderator:  
Peter Jackson**  
Chief Executive Officer  
PJ Square

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## AAC Clyde Space Appoints Stefania Mandirola as COO

Uppsala, Sweden, September 29, 2021-

AAC Clyde Space has recruited **Stefania Mandirola** as Chief Operating Officer (COO) as part of a strengthening of its management team to meet the broader needs of the group that now spans six companies on three continents.



**Stefania Mandirola**

Mandirola will take on the COO role from October 6.

AAC Clyde Space has acquired three companies in the United States, Netherlands and Sweden; set up a new space company in South Africa; and had rapid organic growth. To further support this development, Kulwinder Bhumbra will join the group as HR Director in November.

Following these key additions, the executive management team has been reshaped with Peter Anderson appointed the Chief Commercial Officer of the group and Dino Lorenzini becoming the Chief Scientific Officer of AAC Clyde Space.

Mandirola joins AAC Clyde Space from Rolls-Royce Aerospace where she has held various leadership positions, most recently as Head of Supplier Management. She holds a Master of Science from Politecnico di Milano.

Kulwinder joins from Volvo and brings more than 10 years' experience in HR roles and has worked through a variety of change initiatives.

These latest appointments follow Dr Andrew Carrel joining the Group in May 2021 from a position as CTO of Rezatec, a specialist company in geospatial analytics. He has worked in the space industry for over 20 years.

The executive management team will now consist of CEO Luis Gomes, CFO

Mats Thideman, COO Stefania Mandirola, CTO Andrew Strain, CCO Peter Andersson, Vice President of Future Programmes Andrew Carrel, HR Director Kulwinder Bhumbra as well as the Chief Scientific Officer, Dino Lorenzini.

## Berger and Hutcheson Named Co-CEOs of Kymeta

Redmond, Wash., September 7, 2021--Kymeta announced today that **Walter Z. Berger** and **S. Douglas Hutcheson** have been named Co-Chief Executive Officers of Kymeta.

Starting September 1, 2021, Berger, formerly Kymeta's President and Chief Operating Officer,



**Walter Z. Berger**

will serve as President and co-CEO. Hutcheson, formerly Kymeta's Executive Chairman, will serve as Executive



**S. Douglas  
Hutcheson**

Chairman and co-CEO. Their combined breadth of telecommunications and technology experience will further strengthen the company's continued advancement forward and launch Kymeta into the next phase of growth.

Berger and Hutcheson joined Kymeta in May of 2019 and began their co-CEO duties effective September 1, 2021.

## Key Executive Appointments at iKONG

Pfaffikon, Switzerland, Sept. 15, 2021--iKONG Media Group, a leading global end-to-end service provider for broadcasters and content owners, announced two key executive appointments. **Mark Ber-**

**enshtein** has been appointed Vice President of Global Sales - North America & Special Accounts and **Ayellet Bar** as Marketing Director at iKONG Media Group.

Mark Berenshtein will join iKONG's global sales team and will be responsible for North America and special accounts, developing new business opportunities and creating customized solutions to customer needs. As VP of Global Sales, Berenshtein will lead development of strategic sales plans based on company goals to promote sales growth and client satisfaction for the organization. Specific responsibilities include business and market development, strategic direction for promotion and advertising, sales growth, and client satisfaction.

Berenshtein has a wealth of experience in the Broadcasting industry and brings with him over 17 years of Sales and broadcasting consulting experience. He spent 17 years working for MX1 (formerly known as RRMedia), and was responsible for building long-term relationships, efficiently operating company offices in east Europe with special focus on CIS market - negotiating with customers and partners.

As iKONG's Marketing Director, Ayellet Bar will be responsible for the development of an overall organizational marketing strategy including the management of all of the new and existing marketing programs and company brand as well the enhancement of iKONG's social marketing initiatives.

Bar will be responsible for conceiving and executing marketing strategies and tactics that drive growth. In addition, she will help overall brand development and messaging in the satellite broadcasting and media delivery and management industry. Bar brings over 10 years of progressive education and marketing experience to the position including working in Strategic Marketing Management, B2B Positioning and Digital Marketing Management, brand positioning, event project management and communications strategy.







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# CABSAT 2021: Live and in-Person in Dubai

The world's most pivotal names in satellite, media, production, entertainment and technology are set to reconnect, live, in-person at CABSAT 2021 this month in Dubai, UAE. More than 160 companies and brands from 38 countries will present their latest innovations and ideas that will alter the course of the content journey – in a transformed world.

Brace yourself for maximum impact, with an incredible showcase of products and solutions, exciting and engaging conferences with industry makers and breakers, and new business partnerships leveraging the value of face-to-face events, all in a safe space.

It's all possible only at CABSAT this year, taking place during the Expo 2020 Dubai which kicks off on October 1st. The World Expo is one of the largest event globally featuring 191 country pavillions and will run through March 2022. CABSAT 2021, the premier event for satellite and distribution for the Middle East and North Africa market will be held from October 26-28 at the Dubai World Trade Center.

This year's edition of CABSAT will feature the SATEXPO SUMMIT. The Summit gives you the opportunity to meet in-person, the most diverse and comprehensive global space and satellite industry executives, engineers, government officials and solution providers.

The Summit will cover how space and satellite technology have played a pivotal role in the evolution of many other industries which include the government and military, commercial business enterprise, mobile communication, maritime and space sectors.



**More than 160 companies and brands from 38 countries are expected to exhibit at CABSAT 2021 in Dubai.**



CABSAT will also feature its Content Congress with its theme of "Revealing the Next Frontier of Content."

The COVID-19 pandemic has undoubtedly sparked irreversible global change across major industries, including media, creating new forms of cross-border regional collaboration. The Content Congress will unfold the survival plans of small OTT players, the current lifespan of linear, how Gen Z are condensing and consuming content, the 4C's of AI and how cinemas will adapt to the huge rise in stay-at-home viewing.

The NextGen Content @ CABSAT will celebrate the best the region has to offer. In a nutshell it's the one marketplace content creators, distributors and buyers in the Middle East and Africa will gather to exhibit the latest content offerings, explore production and co-production opportunities, network with the industry's movers and shakers and discover the hottest new formats.

To secure your free visitor pass to CABSAT go to:

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## The Satellite Markets 20 Index™

Company Name	Symbol	Price			Price Change	
		October 7	52-wk Range		Last Month	From Jan 15
<b>Satellite Operators</b>						
Thiokol Public Company Limited	THICOMLEK	10.80	4.92	14.10	4%	18%
Eutelsat Communications S.A.	ETLPA	12.38	8.06	12.45	24%	32%
APT Satellite Holdings Limited	APSHK	2.34	1.70	2.95	-8%	11%
Echostar	SATS	25.90	19.75	28.37	-1%	5%
SES S.A.	SESF	7.81	6.12	8.55	7%	3%
<b>Satellite Manufacturers</b>						
The Boeing Company	BA	226.48	141.58	278.57	4%	6%
Motor Technologies	MOPL	28.04	21.05	58.75	-13%	-44%
Lufthansa Technik AG	LUT	351.78	319.81	396.99	-1%	-1%
QinetiQ	QINSE	37.1	33.15	49.85	-4%	-16%
Raytheon Technologies Corp.	RTX	218.37	159.42	236.86	-4%	5%
<b>Equipment Manufacturers</b>						
C-Dem Satellite Systems Inc.	CSLV	2.58	2.13	4.48	1%	-4%
Comtech Telecommunications Corp.	COMTL	23.19	14.23	30.40	-9%	4%
MMI Industries Inc.	MMI	9.84	8.52	15.29	-3%	-19%
VeriStar Inc.	VSTAT	57.80	29.82	61.35	16%	59%
Global Satellite Networks Ltd.	GSNT	8.49	4.89	22.69	-13%	16%
<b>Service Providers</b>						
QinetiQ	QINSE	45.32	24.51	47.05	0%	39%
Globalstar Inc.	GSAT	1.55	0.29	2.98	-30%	74%
Orbcomm Inc.	ORBC	11.49	3.32	11.55	0%	36%
Sirius XM Holdings Inc.	SXSI	6.29	5.67	8.14	-1%	8%
Trimble Inc.	TMBL	62.90	46.78	96.49	-13%	19%


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 Index Value Sept. 6, 2021	Percentage Change last month	Percentage Change since Jan 15 2021
Satellite Markets 20 Index™	2,999.69	-1%	21%
S & P 500	4,399.76	-3%	15%

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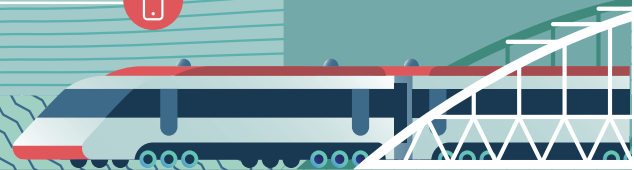


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