

Worldwide Satellite Magazine

SatMagazine

January 2023

A SpaceX Falcon 9 ready on the Cape Canaveral SFS launch pad to initiate the Transporter-6 mission with 114 smallsat payloads aboard. Photo is courtesy of SpaceX.

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InfoBeam, Features + Future Look

Planet Labs	4
Ovzon.....	4
Flann Microwave	5
SpaceX.....	6
GMV	8
Kleos Space	10
SpaceX.....	35
Atheras Analytics — Author: John Yates	11
Beam Communications — Beam editorial team	12
Bridge Technologies — Author: Simen K. Frostad.....	13
Calian Advanced Technologies — Calian editorial team.....	14
D-Orbit — Author: Lorenzo Ferrario	16
EM Solutions — Author: Georgios Makros	18
Exobotics — Author: Nadeem Gabbani	19
Flann Microwave — Author: Ian Burnage	20
The Forrester Report	
2023: These predictions are definitely a certainty... well, probably	22
Author: Chris Forrester, Senior Columnist	
IBM Space — Author: Naeem Altaf	25
Intelsat — Author: Murat Yavuz	26
Mission Microwave — Author: Steve Richeson.....	27
Momentum — Author: Jessica Pieczonka	28
ND SATCOM — ND SATCOM editorial team	29
QuadSAT — Author: Joakim Espeland.....	30
SCOUT Space, Inc. — Author: Eric Ingram	32
Satcoms Innovation Group (SIG) — Author: Helen Weedon	33
Space Data Association (SDA) — Author: Joe Chan	34
Spiral Blue: The Future of Floods	35

Advertisers

Advantech Wireless Technologies	3
AvL Technologies.....	7
Comtech Telecommunications Corp.....	1
CPI SATCOM Products.....	5
SatNews Digital	38
SmallSat Symposium 2023.....	9
Space Foundation Space Symposium	21

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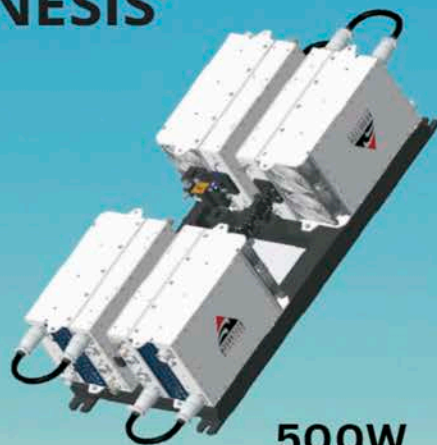
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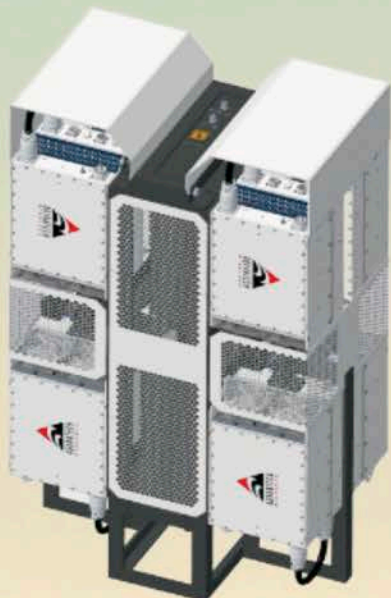


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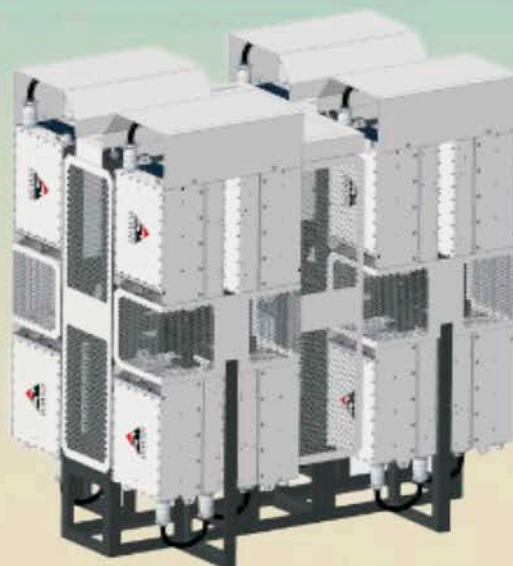
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**500W
Linear
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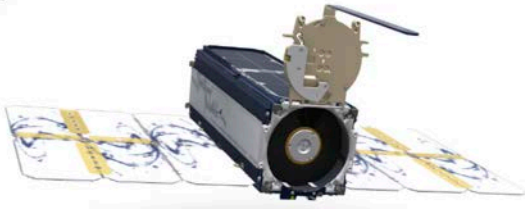


**1kW
Linear
Power**



**2kW
Linear
Power**

Planet Labs plans to launch 36 SuperDove smallsats with SpaceX



Planet Labs PBC launched 36 of their SuperDove satellites, Flock 4y, on a SpaceX Falcon 9 on Tuesday, January 3, 2023, at 9:56 a.m., ET (14:56 UTC).

Flock 4y launched on **SpaceX's Transporter-6 mission** from Space Launch Complex 40 at Cape Canaveral Space Force Station (SFS), Florida.

These 36 SuperDoves will replenish Planet's current fleet of approximately 200 satellites on-orbit, working to provide a continuous, and complete view of the world from above every day.

Each Planet SuperDove is equipped with eight spectral-bands and improved on-orbit capacity that helps to quickly deliver sharp, analysis-ready data to Planet's customers.

The data collected by Planet's SuperDoves allows organizations in agriculture, government — both intelligence and civilian agencies — forestry, sustainability, and other industries to make informed, timely decisions.

Further, a select number of these Planet SuperDoves will be adorned with artwork and quotes that celebrate the legacy of Star Trek creator, Gene Roddenberry, as a part of Planet's collaboration with The Roddenberry Foundation's Boldly Go Campaign.

The Roddenberry Foundation launched this campaign in 2021 to celebrate Gene's hopeful vision of humanity's future — one of inclusion, scientific progress, and cooperation.

Five of the Planet SuperDoves on this mission have artwork laser-etched onto their side panels inspired by the more than 1,500 submissions to the Boldly Go campaign, which asked the world to share what gives them hope for humanity's future.

This is Planet's eighth overall launch with SpaceX. Since its founding, Planet has launched over 500 imaging satellites, more than any commercial company in history.

www.planet.com



Ovzon receives SAS orders worth millions of Swedish Krona

Ovzon



Ovzon has received from partners **Swedish Space Corporation (SSC)** and **Nigma Conseil** first orders for the company's SATCOM-as-a-Service (SAS)



Ovzon's SAS combines the firm's ultra-small, mobile satellite terminals, highly resilient and high-performance satellite networks with services and support from **Ovzon's Network Operations Center (NOC)**.

With this contract, Ovzon deepens their collaboration with SSC, which acts both as the main party in dialogue with customers, mainly within the Swedish government, and as a partner in the delivery of the service. Both are important parts of the end-to-end solution that has now been created to meet the specific and critical needs of these end customers.



Nigma Conseil provides world-class communications solutions, security, business intelligence, and digital security consulting for clients across the globe. Ovzon's fully managed (24/7) SAS delivers reliable solutions to customers with the highest demands for secure, no-fail, easy-to-use SATCOM.

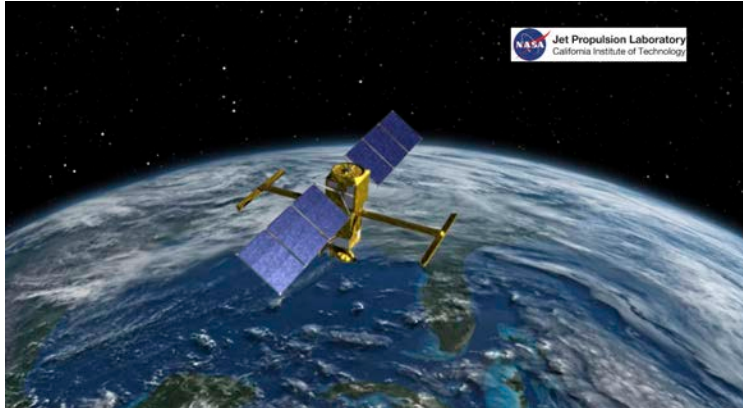
"We are very happy and proud to receive this first order in collaboration with SSC as well as the opportunity to work with our new French partner, Nigma. We provide the customer with a world-leading and highly efficient satellite communication service based on Swedish technology and innovation. The service enables a new level of capability needed in a world of heightened geopolitical unrest. Of course, we also hope for continued cooperation around our satellite Ovzon 3 and its unique features with increased mobility, performance, and resiliency. Ovzon 3 will further strengthen the ability of customers who must be able to conduct vital societal functions and protect critical infrastructure during operations in complex and vulnerable situations. We look forward to working with both SSC and Nigma to meet the growing demand for superior performance, mobility, and resiliency in their markets," said **Per Norén**, CEO.

Flann Microwave assists with NASA's SWOT satellite development



In 2015, **Flann Microwave** was selected by **NASA's Jet Propulsion Laboratory (JPL)** to provide critical hardware for the high-resolution radar components on a new multinational satellite, that being the **SWOT** satellite.

The **Surface Water and Ocean Topography (SWOT)** satellite is the first-of-its-kind to survey the surface water on Earth, observe ocean surface topography and measure the changes in these bodies of water over time.



The NASA/JPL illustration above depicts the Surface Water and Ocean Topography (SWOT) satellite, a mission led by NASA and the French space agency Centre National d'Études Spatiales (CNES). The scientific heart of the SWOT satellite is the Ka-band Radar Interferometer (KaRIn) instrument, which will measure the height of water in Earth's lakes, rivers, reservoirs, and ocean. To do that, KaRIn will transmit radar pulses to Earth's surface and use two antennas – seen to the left and right of the spacecraft bus – to triangulate the return signals that bounce back. Mounted at the ends of a boom 33 feet (10 meters) long, the antennas will collect data over two swaths of Earth's surface at a time, each of them 30 miles (50 kilometers) wide and located on either side of the satellite.

Launched on December 16, 2022, from **Vandenberg Air Force Base** in California aboard a **SpaceX Falcon 9** rocket, the SWOT satellite was jointly developed and managed by NASA, the French Space Agency, the Canadian Space Agency, and the UK Space Agency.

Following JPL's previous adoption of Flann Microwave's high-precision test and measurement product range, the SWOT is the first collaborative spaceflight project between Flann and NASA. Due to the critical performance requirements of the project, Flann worked in close collaboration with the engineers at JPL to develop custom-made waveguide equipment for spaceflight operations.

Flann's innovative waveguide equipment was designed to withstand the rigors of spaceflight and help provide higher accuracy and precision measurements of Earth's lakes, rivers, reservoirs and oceans, as well as mapping ocean surface height, in greater detail than previous measurement systems.

Flann's uniquely-designed microwave components were installed on the satellite and linked to NASA's high-resolution, state-of-the-art, radar interferometry systems to help accurately measure Earth's surface water, weather and climate predictions as well as assist in freshwater management.

Tamlin Pavelsky, the SWOT Science Team Lead (2022-2024), said, "SWOT will usher in a new golden age for the science of rivers and lakes. Right now, we can measure how the amount of water in lakes and reservoirs changes for a few thousand lakes worldwide. With SWOT, we'll be able to observe millions, [...] help[ing] us to understand changing risks from flooding, opportunities for sustainable water use, and the fundamental natures of these important natural systems."



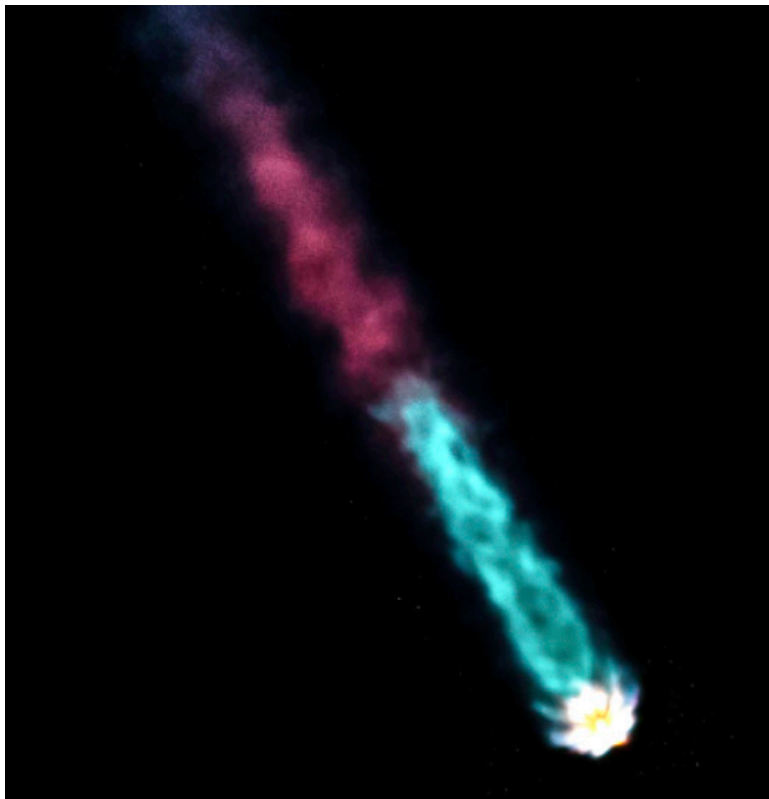
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Launched: SpaceX's 2Gen Starlinks + ImageSat International's EROS-C3



On Wednesday, December 28th at 4:34 a.m., ET, **SpaceX** launched 54 **Starlink** satellites to LEO from Space Launch Complex 40 (SLC-40) at Cape Canaveral Space Force Station in Florida.

This was the 11th launch and landing for this **Falcon 9** first stage booster, which previously launched **GPS III Space Vehicle 04**, **GPS III Space Vehicle 05**, **Inspiration4**, **Ax-1**, **Nilesat 301**, and now six **Starlink** missions.

This launch marked the first of Starlink's upgraded network. Under the company's new license, SpaceX is now able to deploy satellites to new orbits that will add even more capacity to the network.

Ultimately, this enables SpaceX to add more customers and provide faster service — particularly in areas that are currently over-subscribed. According to the company, Starlink now has more than 1,000,000 active subscribers across the globe.



Photo of the SpaceX launch of the ISI EROS-C3 satellite from Vandenberg SFB.

Then, on Thursday, December 29th at 11:38 p.m. PT, a **Falcon 9** launched the ImageSat International (ISI) EROS C-3 (Earth Resources Observation Systems C) mission to a LEO from Space Launch Complex 4E (SLC-4E) at Vandenberg Space Force Base in California.

According to the company, Starlink now has more than 1,000,000 active subscribers across the globe.



Artistic rendition of ImageSat International's EROS-C satellite.



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GMV a key provider for the SouthPAN advanced positioning project in Australia and New Zealand

GMV is developing two core elements of the **Southern Positioning Augmentation Network (SouthPAN)** system, a joint initiative of the Australian and New Zealand governments to provide the two countries with satellite navigation and precise positioning services. These systems have applications in industries as diverse as agriculture and road, air, maritime, and rail transportation, as well as in the field of geomatics.

GMV has signed an agreement with **Lockheed Martin Corporation** to develop the processing and control centers for SouthPAN. The purpose of this project is to provide a **satellite-based augmentation system (SBAS)** for navigation and **precise point positioning (PPP)** services. GMV will also be responsible for monitoring both of these services in the region and for ensuring compliance with the committed performance levels.

SouthPAN is the first system with these characteristics available in the Southern Hemisphere. With this new program, Australia and New Zealand will be contributing to improved global coverage and interoperability for services of this type, by joining the list of countries and regions that already have their own SBAS system, such as the USA (WAAS), Europe (EGNOS), India (GAGAN), and Japan (MSAS).

In Australia, the development, entry into service, and operation of the SouthPAN system are being supervised by the Australian government's geoscience agency, **Geoscience Australia**, in collaboration with New Zealand's equivalent agency, known as **Toitū Te Whenua Land Information New Zealand**. In 2020, the two agencies signed the **Australia New Zealand Science, Research, and Innovation Cooperation Agreement (ANZSRICA)**. During the next 20 years, the Australian government will be contributing 1.4 billion Australian dollars to the SouthPAN project.



On September 26, 2022, just two weeks after the agreement had been signed, the initial services were provided by activating transmission of the system's first signals. This was a very significant milestone, because SouthPAN is the first project where an industry consortium provides an SBAS system as a service, rather than as a turnkey system.

GMV will be responsible for developing two key subsystems for SouthPAN: the **Corrections Processing Facility (CPF)** and the **Ground Control Centre (GCC)**. The company will also be responsible for monitoring the system in the region and for ensuring that it complies with the committed performance levels. In addition, GMV will be providing support for the system's operation and maintenance.

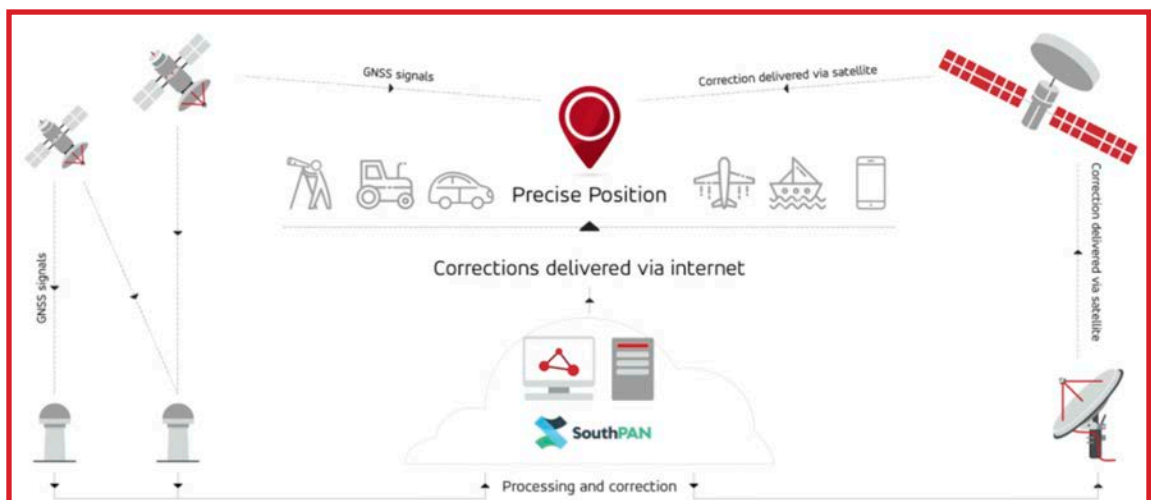
The CPF is in charge of generating correction messages for the signals being transmitted

by the GPS and Galileo satellites. This is a process that improves precision for the system's users by producing accuracy to as little as 10 centimeters. The CPF is also responsible for detecting malfunctions in the satellites and generating warnings for the users. This will allow use of SouthPAN by civilian aircraft as a navigation system during various flight operations, including precision approaches to runways for landing. Safety-of-life services such as these will be available in 2028.

The control center, in turn, remains in operation 24 hours a day, 7 days a week, and it will perform all the functions needed to monitor and control the system. It will also provide information to the community of users about the system's operation and availability of its services.

SouthPAN represents a major commitment between the Australian and New Zealand governments to provide essential satellite positioning services across the Australasia region. New Zealand's Minister for Land Information, has described the joint Australia-New Zealand initiative as a game-changer for the economies of both nations, indicating that SouthPAN provides crucial digital infrastructure for the future, with actual benefits expected to increase over the project's lifespan.

According to **Miguel Romay**, GMV's Satellite Navigation Systems General Manager, "this contract is the result of years of effort and dedication. We feel very honored and fortunate, because some engineers may work for their entire career without the opportunity to work on a project with the importance and societal impact that SouthPAN will have. In addition to strengthening GMV's position as a global leader in the field of satellite navigation, this contract will generate dozens of long-term jobs for highly qualified individuals, while also allowing young engineers and a whole range of other professionals to join one of the best navigation teams currently existing in the world."



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Kleos Vigilance Mission intelligence released to customers

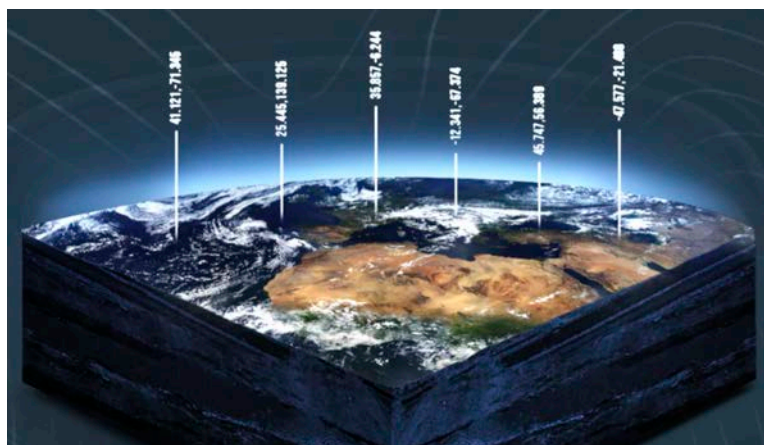
Kleos Space S.A. has successfully processed RF data collected by the company's Vigilance Mission (KSF1) satellites through its signal processing technology platform to create its geospatial intelligence (GEOINT) product, LOCATE, which has been released to initial customers alongside other intelligence collected by the Vigilance Mission.

The Kleos proprietary technology platform uses signal processing techniques to convert the raw data collected from sensors onboard Kleos' RF data collection satellite constellation that is designed to collect and downlink RF data accurately and with redundancy, or potentially from other sources, into actionable intelligence.

The technology platform performs signal analysis and processing operations to detect and locate targets, cooperative or not. The geospatial intelligence product output from the technology platform (LOCATE) provides the frequency of the detected transmitter, the reception time, the transmitter coordinates, and the confidence ellipse parameters. LOCATE provides a valuable intelligence, surveillance, and reconnaissance (ISR) capability to governments and commercial entities.

It complements other intelligence sources to improve the detection of illegal and/or hidden activity such as piracy, drug, and people smuggling, illegal fishing, pollution, and border challenges.

Recent advancements in Kleos' ground signal processing technology now allow the company to deliver the LOCATE geospatial intelligence product with as few as two satellites in formation, a reduction from the previous minimum of three.



Kleos Guardian LOCATE graphic: Cost-effective data-as-a-service delivered via encrypted API — Tip and cue assets or existing datasets to improve ISR capabilities — Use data to send alerts — Enhance detection of illegal activity and improve border security — Quicker decision making and responses — Easily integrate with multiple sources to improve deployment and automation

The next mission, the Patrol Mission (KSF3), is launching on SpaceX Transporter 6 and is now expected to launch in January of 2023.

Kleos CEO, Andy Bowyer, said, "Our geospatial intelligence is now available to initial customers, with additional data volumes being made available as we bring more of our satellite constellation online. Our technology delivers actionable intelligence from sensor collections, helping solve some of the world's greatest societal, economic, and environmental challenges."

kleos.space



The algorithm advancements will also facilitate the ability for Kleos' processing platform to ingest raw data from other sensors

in addition to those owned by Kleos, potentially accelerating the volume of intelligence available to customers with the possibility of lower CAPEX spending.



Atheras Analytics notes that the satellite telecommunications sector has entered a phase of major change that will continue to make significant impacts during 2023 in the delivery of ubiquitous consumer and enterprise broadband through the use of High Throughput Satellites (HTS) and Very High Throughput Satellites (VHTS).

These satellites are able to deliver more than x20 the data capacity of traditional satellites at a fraction of the cost per bit. In parallel, there is an increasing growth in the use of non-GEO platforms for the delivery of these services. The delivery of these high throughput data services requires the use of the high frequency Ka- and Q/V-bands and a much larger number, on the order of tens or hundreds, of gateways.

The challenge in using these higher frequency bands are the effects of weather attenuation. Operators are faced with the complexity of designing ground networks and selecting appropriate gateway locations that will minimize link outages from weather. Once operational, the challenge is in predicting these outages in advance so that services can be switched to alternate/diversity sites before the outage occurs to maintain the highest possible service availability for end-users. The Atheras Analytics SGD Optimization Toolkit contains all of the tools that operators need to address such crucial challenges.

Our access to many years of global weather data combined with our proprietary, AI-based, Outage Prediction Algorithms in our Design Tool, can help operators select the best possible gateway locations to reduce

the chance of outages caused by regional weather conditions.



The company's Operational Tool predicts gateway outages caused by region-specific weather conditions. This tool can be configured to provide forecast switching plans at the start of each shift, updated every 15

minutes, which can then be executed either manually or automatically using an API. When an outage is predicted, the system alerts the user via an API and recommends the best available alternate gateway ahead of an outage.

atherasanalytics.com



*What we are witnessing today is the coming of age for satellite communications (SATCOM), as personal communication devices (PCDs) extend into the mass consumer market, a segment **Beam Communications** is more than familiar with, as the company has been supplying solutions for consumers since 2002.*

The rapid expansion of the market has been in play for years. If you look at the earnings results of some of the key industry players, such as **Iridium Communications**, these companies are only now enjoying sufficient scale and consumer awareness to be consumer relevant.

That is why 2023 is shaping up to be a most exciting period for the SATCOM sector, as the momentum in the PCD space continues to grow significantly. I am predicting two key developments that underpin my outlook for the year.

The first is the trend for consumers to embrace lower cost, local holiday experiences, rather than overseas travel, which often involves staying in large cities.



In contrast, those who enjoy local holidays tend to spend more on outdoor activities, such as hiking, caravanning and boating. These endeavors often take holiday makers out of cellular coverage and will prompt many to turn to personal SATCOM solutions, such as Beam's **ZOLEO**, to stay connected.

The second driver is the launch of direct-to-device satellite services. For instance, the buzz that **Apple** created by including a rudimentary satellite function in the **iPhone14** has bolstered consumer awareness of the importance of having a near-constant connection.

We'll see more mobile phone manufacturers looking to include such functionality as the year progresses. However given the limitations of such services, that will leave many wanting deeper services and consumers will be looking for a more reliable, standalone, global offering.

By extension, Beam's long-standing partner, Iridium Communications, is likely to continue to do well, given its leadership position in the PCD market, particularly in light of its new, **Iridium Certus** offering, which will open new markets during 2023.

Beam is proud to be part of this story as we have secured a \$12 million contract to develop and supply an innovative, Iridium Certus device.

www.beamcommunications.com



Author: Simen K. Frostad, Chairman, Bridge Technologies



*While **Bridge Technologies** has been well known within the broadcast industry as evangelists for IP, what we believe in the most is monitoring.*

Monitoring is what matters, regardless of broadcast platform and, without it, service disruption is inevitable. In markets with low switching costs and high choice, service disruption can be a death knell for broadcasters.

This means identifying potential disruption in satellite broadcast is crucial, not the least of which is because satellite still remains a central mechanism for linear TV delivery in most of the developing markets. Satellites continue to offer complimentary, on-demand abilities in progressive markets where IP infrastructure remains underdeveloped.

While the importance of monitoring for disruption remains vital on a year-in-year-out basis, our predictions for 2023 will necessarily pertain to what we think might be the main sources of that disruption.

With the global political climate increasingly... unstable, what we've started to see is the deliberate jamming of satellite-based broadcast by entities in political opposition, particularly where that content might be religiously, ideologically, politically or linguistically 'contentious'.

A range of national broadcasters, including one of the most significant broadcasters in the UK, have been taking large orders of our satellite-specific monitoring probe — the **VB272** — to deal with precisely this risk of politically-motivated interruption/jamming of satellite broadcasts.

This continued interest from major broadcasters highlights how important satellite remains within the industry. This also means that at Bridge Technologies, pushing forward the depth and quality of insight that can be achieved in satellite monitoring will be a key part of our development strategy during the upcoming year.





Calian has identified some powerful emerging trends in the space ground systems, revolving around higher frequency ranges, increased antenna performance, optimization through orchestration and digitization of the gateway.

Communication Ground Systems + Services and Satcom Products

Calian continues to see next-generation satellite networks migrating to Q/V-band gateway ground equipment as satellite network operators expand the capacity of their systems. Calian leads the way in deploying a continent-wide Q/V-band gateway network, using best-of-breed in Q/V band technologies, including their own composite carbon fiber antenna. With on-air tested performance, this innovative ground gateway solution makes Q/V band feeder links a reality.

Antenna + RF Systems

The digitization of the ground system opens the door for a whole new range of innovative ground gateway architectures to support virtualization and diversity. The wide-band RF over IP offering from their Satcom Products division will enable operators to increase system capacity while simplifying their total block diagrams. As part of the **DIFI Consortium**, Calian will support interoperability across a variety of vendor platforms to create a robust modular ground system infrastructure.

The rapid expansion of space-based broadband networks is fulfilling the need for increased bandwidth and lower latency. The ground gateway systems to support these networks require innovation, especially in gateway systems. To address this future need, Calian has developed a full-motion, Q/V, four meter, LEO tracking gateway system. Once again leading the way, Calian will provide the first commercial solution to verify this link between the ground and the LEO satellites. Link validation will include payload performance to produce propagation measurements and tracking performance to understand the effects of scintillation, doppler and weather at these very high frequencies.



Calian antenna and RF system

The Calian approach to system engineering for advanced SATCOM networks enables the company to understand and appreciate the needs of their customers. Calian builds their products to meet these needs. As they develop products and services for the market, Calian can optimize a customer's network at the system level, thus simplifying operations, reducing total costs and improving performance.

Situational awareness has become a necessity for satellite operators to react quickly to service disruptions. For many years, Calian has provided carrier monitoring systems that notify service providers immediately if any of their carriers or services require attention. In 2023, Calian will add Illuminator to their portfolio. The new product provides cost-effective software-based carrier monitoring to their popular **Decimator Spectrum Analyzer** product to provide situational awareness.

Decimator D4 Spectrum and Signal Analyzer



Software Defined Solutions

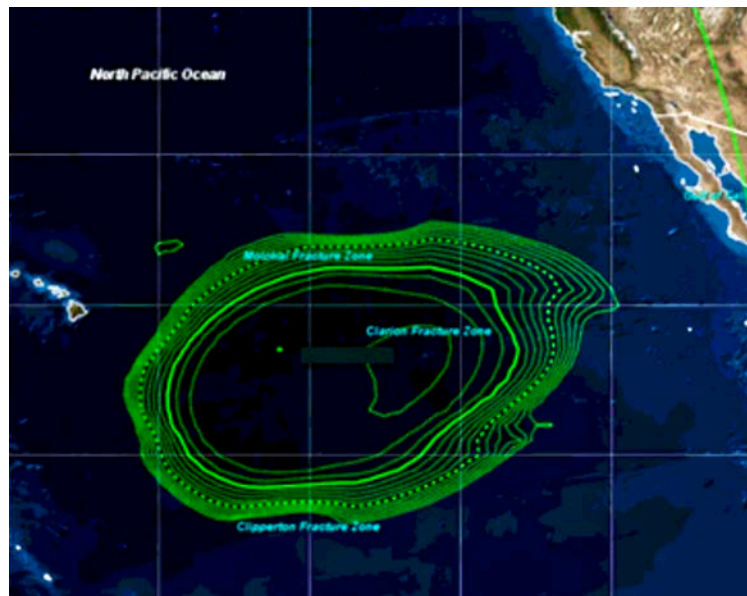
The Software Defined Solutions division provides innovative software solutions to the satellite industry, simplifying the management, operation and orchestration of complex satellite networks. As more customers continue to outsource software development for these complex systems, 2023 is expected to be another busy year for this division.



Satellite Planning and Management Solutions provides software for planning, managing and operating complex satellite communication networks. This consists of planning tools and real-time solutions that dynamically orchestrate configuration changes and resource allocations between the payload and ground segment as demand fluctuates. New, highly flexible digital communication payloads drive the demand for these advanced tools, and in response, Calian will be releasing their Satellite Capacity Management System under new licensing and deployment models, including SaaS. This advanced software system is

used by satellite operators and service providers to plan and manage satellite capacity, including link budget analysis, transponder loading analysis and multiple planning modes.

Beam Coverage of Planning Management System



Network Management Solutions provides operational monitoring and control of mission-critical, Earth station equipment. This business line is based on the long-standing Calian **Mon-A-Co** product, a best-of-breed element manager geared specifically for RF ground systems, and the newly released Calian **Central Management Platform (CMP)**, a management system for consolidating all the ground segment status and data into a single consolidated view for NOC operations. The CMP has been architected to support cloud and virtualized deployments. Over the next year, Calian will be refreshing Mon-A-Co based on the infrastructure created for the CMP, giving it improved data management, a modern web-based GUI, improved configurability and scalability, plus new deployment options. Expect to see an announcement of a new and enhanced Mon-A-Co product later in 2023.

Calian will continue to explore emerging trends in 2023, and they are looking forward to continued growth, challenges and opportunities in the year ahead.

Various authors at Calian, Advanced Technologies, contributed to this article including Patrick Thera, President of Calian Advanced Technologies, Darren Schlageter, Vice President, Communication Ground Systems, Dan Baril, Senior Vice President—Space, and Peter Waskowic, Vice President Satcom Products. To contact our Calian experts, email commsystems@calian.com.

Calian Advanced Technologies is a global supplier of highly technical solutions, services and products to the aerospace and defence, satellite, wired and terrestrial wireless, test and measurement, agricultural technology, GNSS technology and nuclear industries. They provide infrastructure for satellite ground systems including antennas, antenna/RF systems, and software defined solutions for controlling and monitoring satellite network resources, equipment and services. Their engineering, nuclear and technical solutions teams are some of the most highly sought experts in their fields.

Advanced Technologies also designs and manufactures Calian and OEM-branded communication products for wired and wireless applications and power management and control products for military vehicle applications. Additionally, they provide third-party build-to-print electronics/electromechanical engineering, manufacturing/test and product lifecycle management services for customers in commercial and defence/security markets.

www.calian.com/solutions/satcom/

Author: Lorenzo Ferrario, Chief Technical Officer

D-Orbit is a commercial space company that specializes in space transportation and logistics and offers last mile delivery solutions enabled by the company's **ION Satellite Carrier**, a proprietary, orbital transfer vehicle (OTV) designed to host a batch of satellites, transport them across orbits and then release them individually into custom, orbital slots.

During the same mission, ION can also accommodate multiple, third-party payloads that can include innovative technologies that have been developed by startups, experiments from research entities as well as instruments from traditional space companies that require on-orbit testing.

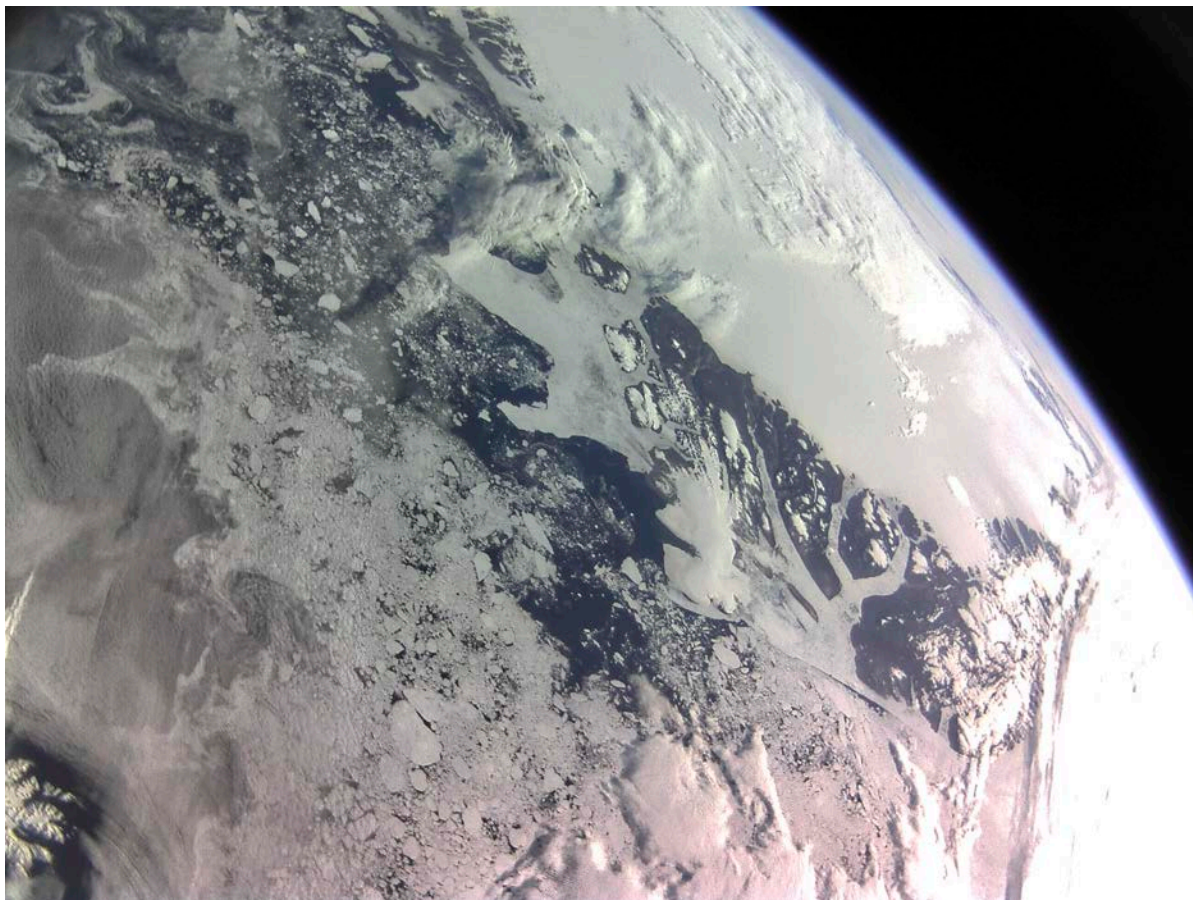
ION's ability to travel across orbits increases the flexibility of the launch vehicle, irrespective of payload capacity, thereby enabling deployment schemes that would be too complex and expensive to achieve with a launch vehicle alone.

After six successful commercial orbital logistics missions in two years (as of November 2022), D-Orbit is moving on with its roadmap plan along four lines of business.

Orbital Transportation + Payload Hosting

D-Orbit's core ION-enabled line of business is **orbital transportation** and **payload hosting**. After several successful missions, D-Orbit is still experimenting new, orbital configurations, such as an upcoming mission involving two IONs orbiting simultaneously to perform experiments that will allow the company to acquire the skills required to operate an increasingly large fleet.

The vehicle itself is constantly evolving: the company systematically uses the spare capacity of each flight to test on-orbit, innovative technologies and procedures prior to implementation. With multiple missions already planned for 2023, D-Orbit is now reorganizing the production process through the implementation of lean, manufacturing methods that will help reduce waste, optimize processes, cut costs, and reduce the time to market.



A picture of Iceland taken by D-Sense, D-Orbit's multi-sensors, camera-equipped attitude determination and control module, aboard ION Satellite Carrier.



Artistic rendition of D-Orbit's ION Satellite Carrier.

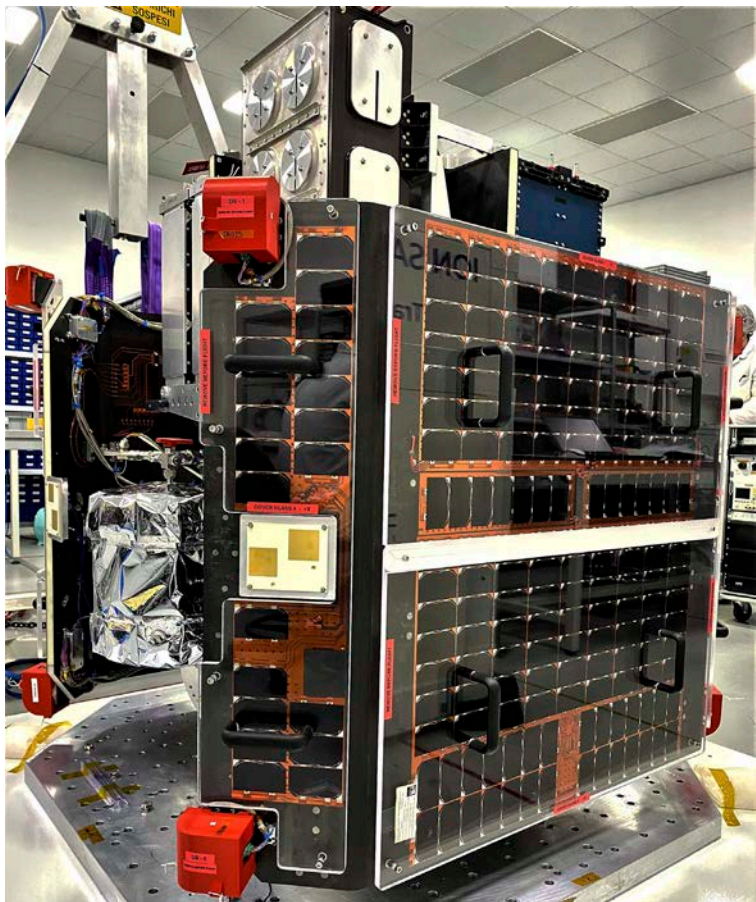


Photo of D-Orbit's ION Satellite Carrier.

Satellite As A Service

The second line of business is a satellite platform based on ION that can be custom ordered to fit the desired payload. Unlike traditional satellite procurements, where the operator is responsible for the operations, D-Orbit will offer a **"Satellite-as-a-Service"** solution where the company will be handling the entire spacecraft's lifecycle, including design, manufacturing, testing, launch, operations, and disposal.

This service will enable the next generation of satellite operators to outsource anything that is not integral to the core business, turning a series of unpredictable variable costs into a recurring subscription.

The first generation of vehicles will be small, observation satellites that are equipped with a high-performance, **synthetic aperture radar (SAR)**, targeting emerging economies, regional governments and any business that requires land monitoring.

On-Orbit Cloud Computing

The third line is the **D-Orbit Cloud Platform**, a pay-per-use orbital infrastructure consisting of interconnected computational nodes installed on D-Orbit's ION fleet.

The platform will provide payload and satellite operators with the ability to process, relay, and store data directly in orbit, reducing the volume of information to downlink. A satellite operator, for example, will be able to run on-orbit a **machine learning (ML)** algorithm on hundreds of images to identify the ones that are relevant for a particular application and filtering out imagery that does not fit the client's criteria. This operation, which reduces by orders of magnitude the volume of data to downlink, turns raw data into actionable information in hours rather than days.

Every new carrier adds an interconnected node to the orbital infrastructure, which grows over time at low cost through a synergy between the transportation and space cloud business.

With an increasingly intense launch schedule lined up for the upcoming years, D-Orbit is planning to rapidly scale the platform to satisfy the need of an ever-growing market.

On-Orbit Servicing

The final line of business is **on-orbit servicing**, an evolution of the current offering of satellite transportation that will leverage modular servicing vehicles that are able to capture satellites, inspect, repair, and refuel them, and then move them into their new, operational slot.

D-Orbit is developing its next generation of spacecraft, a fully modular servicing vehicle designed to provide a wide range of on-orbit services, from LEO to GEO and beyond. This spacecraft is based on the heritage and experience developed through ION and will provide a cost-effective, reliable service to satellite operators. The new services will be initially offered in GEO, where there is an established need to extend the life of expensive satellites that generate high revenues.

2023 Prognostications

The evolution of D-Orbit occurs in a rapidly changing industrial environment — the close of 2022 witnessed the launch of NASA's massive **Space Launch System (SLS)**, the first lunar rocket since the **Saturn V**, with the first flight of the **Artemis** program. The Moon may soon become home to permanent, crewed research stations, such as those found today in Antarctica.

The other significant event is the launch of **Starship**, **SpaceX's** ultra-heavy launcher. This launcher's complete reusability, enormous payload capacity as well as low launch cost per kilo may completely disrupt an industry that has always been pushed to reduce launch mass and satellite volume.

Starship may soon enable spacecraft manufacturers to investigate innovative satellite structures that leverage ultra-wide, deployable structures and materials that were previously considered far too massive, while at the same time allow satellite operators to launch traditional satellites at a fraction of today's costs. The perspective of long-range, crewed missions to explore the solar system is an element that will certainly have major industrial, technological and social consequences that are impossible to anticipate with certainty.

Finally, we can expect that satellite servicing will soon include satellite decommissioning services to tackle an increasingly crowded Earth orbit.

While institutional actors like **ESA** and **NASA** have been driving the development of active debris removal mission concepts and demo missions, the industry has struggled — so far — to find a commercially viable way to fund this activity.

In a scenario where mega constellations are projected to become more and more important for the New Space economy, operators are finally understanding the need to preserve orbital clearance to guarantee current and future sustainability of their own businesses.

Satellite servicing, which will help operators repair and refuel their fleets will also enable the disposal of older satellites, thereby ensuring cleaner orbits that will reduce the overall cost of operations.

www.dorbit.space

Lorenzo Ferrario is the Chief Technical Officer of D-Orbit. He joined the company in 2011 as Mission Analysis Engineer, becoming System Engineer in 2014, and CTO in 2016. Aged 27 at the time, he was one of the youngest CTO in the industry. In 2018, Lorenzo entered the *Forbes* 30 under 30 Europe list for his work on ION Satellite Carrier, D-Orbit's innovative Satellite launch and deployment service.



Author: Georgios Makris, Vice President, Operations

2023 is going to be another busy year for Brisbane, Australia-based EM Solutions as the company kicks off with a record-level of backlog orders and the company looks forward to ambitious expansion plans and lots more 'firsts'.

In early 2023, the first of the company's **King Cobra (Fleet)**, two-meter, maritime terminal systems will become operational with Navies in Europe and Asia-Pacific, requiring a significant ramp up of global support and sustainment activity with the firm's international partners. The systems will undergo a *Completion of Certification for Operation* on multiple military and commercial constellations, including non-GEO satellites, which will be another 'first' for the company's terminals.

Back in EM Solutions' home market, focus continues on the expansion of SATCOM upgrades with the Australian Navy as well as participation with global Defence

prime contractors on next generation Space programs.

Expect more 'firsts' from the team as EM Solutions takes their SATCOM terminals to new heights and demonstrate satellite access in non-Geostationary orbits and in commercial and military bands — further expanding capability for their customers.

The team will also be focused on the next wave of innovation with participation in a number of programs related to antenna, RF, optical and tracking technology with **Australian SmartSat Cooperative Research Centres (CRC)** and their consortium of government and academic partners. Although actively involved in the next generation of antenna technology, EM Solutions' offerings remain concentrated on the evolution, resilience and increased capability provided by parabolic antennas for naval communication in the immediate period.

Post-pandemic, after the past few years of interruption, delays and component obsolescence, EM Solutions is on track to achieve greater stability in their global supply chain. Expansion is on the horizon; the team will be extending its manufacturing footprint in Australia by 1500 square meters to meet the growing demand for the company's **SATCOM-on-the-Move (SOTM)** terminals and these products will be hitting the road to expand the company's presence globally with increased support and service capability in Europe and participation at industry events across North America, Europe and Asia.

www.emsolutions.com.au

Georgios Makris is VP of Operations at EM Solutions and he is responsible for the manufacturing, testing and maintenance of EM Solutions' products. With a keen eye for detail and a passion for quality he manages the expert team of engineers and technicians who carry out complex assembly and testing of equipment to ensure it complies with strict specifications and standards.



EM Solution's King Cobra testing at company facilities in Australia.

Author: Nadeem Gabbani, Founder

2022 was a ground-breaking year for the space industry, providing the platform for the sector to thrive in 2023 with many exciting launches scheduled in the year ahead and the development of the New Space wave through an influx of space start-ups looking to innovate and grow the industry.

First, and foremost, **Exobotics** is looking forward to gaining more customers from outside of the industry up and running by launching CubeSats and bespoke payload systems to bring the benefits of space to our customer's customers. The fast-track program and in-house satellite capabilities allows Exobotics to progress from concept stage and manufacture, test, and launch smallsat systems and bespoke payloads in under 12 months, providing fast access to space. After sealing a number of contracts in 2022, Exobotics hope 2023 will be a big year for those outside the industry looking to get into space.

There are a number of exciting commercial, lunar lander missions

taking place during 2023, including **Intuitive Machines (IM)** and **Astrobotic**, pushing the boundaries of commercial lunar exploration. Having been delayed, IM's new launch is now planned for early 2023, with the goal of carrying out scientific experiments for **NASA** and privately contracted payload slots. If successful, the mission will take IM a step closer to landing humans on the moon before the end of the decade. Astrobotic is another company looking to land on the Lunar South Pole in early 2023, ahead of delivering NASA's **VIPER (Volatiles Investigating Polar Exploration Rover)** to the moon in 2024.

The **nanosatellite (smallsat)** space will be one to watch in 2023, with many new companies entering the industry under the label of New Space. Nanosatellites have seen continual progress in both mass and volume, and with many launches scheduled for the year ahead, it will be interesting to follow the trends that develop. The sector will begin to see a clear picture of where business is coming from, whether it's Earth Observation, in-orbit activities, or beyond.

For a lucky few, 2023 will see a second, all-private, civilian crew board the **International Space Station (ISS)**. Houston-based **Axiom Space** will launch a flight with **SpaceX, AX-2**, to send four people for a 10-day stay on the ISS. The mission follows the success of the AX-1 mission that landed in April, which also held a private four-person crew. The dream of being an astronaut is becoming more and more likely, with three further private lunar flights by SpaceX commissioned by **Jared Isaacman**, the space tourist who led the first all-civilian mission to space, during which a spacewalk is planned.

exobotics.space

Nadeem Gabbani is the Founder, CEO & Principal Engineer for satellite company Exobotics, with eight years' experience in the space industry working across a variety of smallsat missions.



Author: Ian Burnage, Chief Executive Officer

A market-leading designer and manufacturer of precision RF Microwave and Millimetric products, solutions and services, **Flann Microwave Ltd.** stated that the company is ideally placed to capitalize on the rapidly growing, global smallsat market in 2023. The company is anticipating an exciting year of growth building on its more than 60 years of experience with specialist clients across the globe.

A year of steady growth and development from its base in Cornwall, UK, backed by a workforce of highly skilled engineers and professionals, experienced exports of products and services that topped 80 percent during 2022. The company's ability to design, manufacture and validate on site gives the firm the crucial market-competitive advantage of being able to take new designs from prototype to deliverable instruments within short time frames.

During 2023, as the global post-pandemic demand for connectivity global broadband capacity is predicted to continue increasing, Flann expects the needs for ever-higher data capacity and transfer speeds to rise in tandem with this demand. In line with wider market expectations, the company also anticipates an increased drive toward the use of cloud-based computing and government-led initiatives to increase connectivity access to remote areas.

"The satellite industry is currently undergoing a series of transformations to adapt to these new demands, as well as changes in telecom standards like the adoption of 5G networks currently being explored for uses involving satellites in Low Earth Orbit (LEO), with constellations formed of smaller satellites

and High-Throughput Satellites (HTS) taking priority," said Chief Executive Officer, **Ian Burnage**. "As a result, Q-band and V-band are expected to be in increasing demand, with a move toward W-band in future."

High-gain microwave antennas are perfectly suited for smaller satellites with lower power and data transfer capacity requirements. Technologies capable of handling higher frequencies are thus becoming increasingly necessary.

Flann Microwave, which specializes in the design and manufacture of precision, high-quality, high-performance microwave equipment and components in the frequency range of 320 MHz to 500 GHz, is ideally positioned to take advantage of this growth.

The company's extensive knowledge and experience is combined with a growing heritage in the spaceflight market that includes working directly with **NASA's Jet Propulsion Laboratory (JPL)** in



Spaceflight fixed attenuator used on the NASA JPL SWOT satellite to ensure precise phase matching across each arm array.



Sam Brokenshire, Technical Sales Manager at Flann Microwave, holding Flann's W-band spaceflight switch and spaceflight fixed attenuator.



W-band spaceflight switch using bespoke design and manufacture features to meet space harsh demands while providing leading RF performance.

the United States and **RAL Space** in the UK, as well as many other public and private organizations.

Ian Burnage noted, "We recently supported a West of England Aerospace Forum (WEAF) funded project to develop a W-band spaceflight switch in anticipation of future demand. This will enable us to supply space-grade waveguide instruments, including waveguide switches either fully qualified or using the growing desire for a 'NewSpace' approach."

In addition to waveguide switches, Flann Microwave expects 2023 to witness increasing demand for antenna feed horn systems, especially for **very-small-aperture terminals (VSATs)** and satellite internet access in homes, aircraft and marine vessels, as well as for **Direct-To-Home (DTH)** TV. The company's new, wideband, **orthomode transducer (OMT)** solution is ready to meet Rx/Tx requirements in a single solution.

flann.com

Ian Burnage completed his Master's degree in Engineering at Southampton University and worked at The Barden Corporation for over 10 years, seven of these as MD. For the five years prior to joining Flann, Ian ran his own company providing consultancy and support to businesses transforming their performance. Overall, Ian brings over 25 years of knowledge and experience to support Flann Microwave reaching their ambitious goals.





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The Forrester Report

2023: These predictions are definitely a certainty... well, probably...

Author: Chris Forrester, Senior Columnist



2023 promises to be a pivotal year for European satellite operators. Predictions can be a dangerous pastime and the satellite industry is no exception in that forecasts can go terribly wrong. However, we are fairly confident that our three key predictions are reliable. We examine each of the three in detail in a moment, but in summary they are:

1. **Viasat's purchase of London-based Inmarsat**
2. **Eutelsat's merger with OneWeb**
3. **SES and its introduction of their mPOWER fleet**

Viasat's Acquisition Of Inmarsat

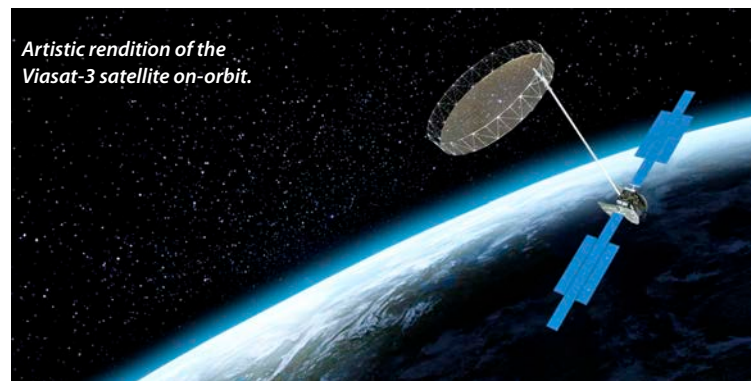
At the top of this list is the upcoming acquisition by California-based **Viasat** of **Inmarsat**. The purchase, valued at an overall \$7.3 billion, was announced in November of 2021. The deal has lately been somewhat bogged down in gaining regulatory approvals — the initial expectation was to have this acquisition close during the second-half of 2022.

The core agreement is intended to create an operation that builds on Viasat's already successful global coverage of high-power, and highly secure, communication. Inmarsat will add its portfolio of satellites and frequencies as well as its planned *communications network of the future* in the shape of **Orchestra**, the firm's L-band LEO fleet which will link their GEO-fleet with terrestrial 5G as well as Inmarsat's **Global Xpress** service.

As we enter 2023, Viasat is patiently waiting for the UK government to wrap its **Competition & Markets Authority (CMA)** phase 2 examination — in particular, as to how a combined Viasat-Inmarsat will lower costs and increase availability of In-Flight Connectivity (IFC). Viasat, in October of 2022, reminded the CMA that **Panasonic** and **Intelsat** control more than 75 percent of the IFC, long-haul, airline market.

Viasat also has another key series of hugely important events happening this year in the shape of their **ViaSat-3** series of satellites. The first (covering the Americas) of this trio of launches will happen shortly — likely in January — on a **SpaceX Falcon Heavy** rocket. Viasat's next two craft that cover APAC and EMEA will follow later this year.

There's another useful addition to Viasat's service offering — a partnership with **Microsoft's Airband** initiative which plans to expand internet access across the globe.



Artistic rendition of the
ViaSat-3 satellite on-orbit.



Mark Dankberg

Time will tell how well these expectations perform, but there's little doubt that, by the end of 2023, the Viasat+Inmarsat+ViaSat-3 — and even the Microsoft relationship — will result in a different business for Viasat chairman **Mark Dankberg** and his team.

Eutelsat's Merger With OneWeb

Eutelsat did not have the best of press during the tail end of 2022. The company was hammered by critics who wanted Eutelsat to suspend broadcasts of channels to Russia (*and Iran*). The blows came thick

and fast and ended up with the French media regulator **Arcom** ordering Eutelsat to switch off three Russian TV channels. However, the influential and highly critical lobby group — the **Denis Diderot Committee** — stated that the move was far from sufficient in its scope.

The Committee, a network of academics and media professionals, was responding to Arcom's decision giving Eutelsat a formal instruction to stop broadcasting the three main Russian channels — **Rossiya 1**, **Pervyi Kanal** and **NTV**. Eutelsat broadcasts the payTV bouquets **Trikolor** and **NTVplus** and some 330 channels to Russia and the signals also cover the occupied territories of **Ukraine** and the nearby **Baltic States**.



The decision followed the referral to Arcom by **Reporters Without Borders (RSF)**, on the basis of a report drawn up by the Denis Diderot Committee. A decision by France's powerful **Council of State** signaled to Arcom that it had

overall jurisdiction over this report, which Arcom had denied for several months.

The Diderot Committee notes that, while this is a first victory, there is still a lot to be done. The Committee also stated that other channels broadcast by Eutelsat include two **Russian Army** channels, two **Orthodox Church** channels (*which supports the aggression and accuses the Ukrainian LGBT community of being responsible for the war*), and the **Grozny TV** channel, under the grip of **Ramzan Kadyrov**. Eutelsat also broadcasts **RT Arabic** (*the former Russia Today*) on three satellites to Europe, North Africa and the Middle East.

These events have little to do with Eutelsat's key move to merge with **OneWeb**. Announced in July of 2022, the \$3.4 billion deal is an all-share transaction, with Eutelsat suspending its dividend for the next three trading years to help fund the agreement.

OneWeb is an embryonic LEO operator and is back on track with its launch schedule, having seen 40 of its satellites launched in December of 2022 and another two batches scheduled for launch during Q1/2023. A batch of 36 of their satellites were — in effect — confiscated by the Russians as a consequence of the Ukraine actions and are sitting at the **Baikonur cosmodrome**.

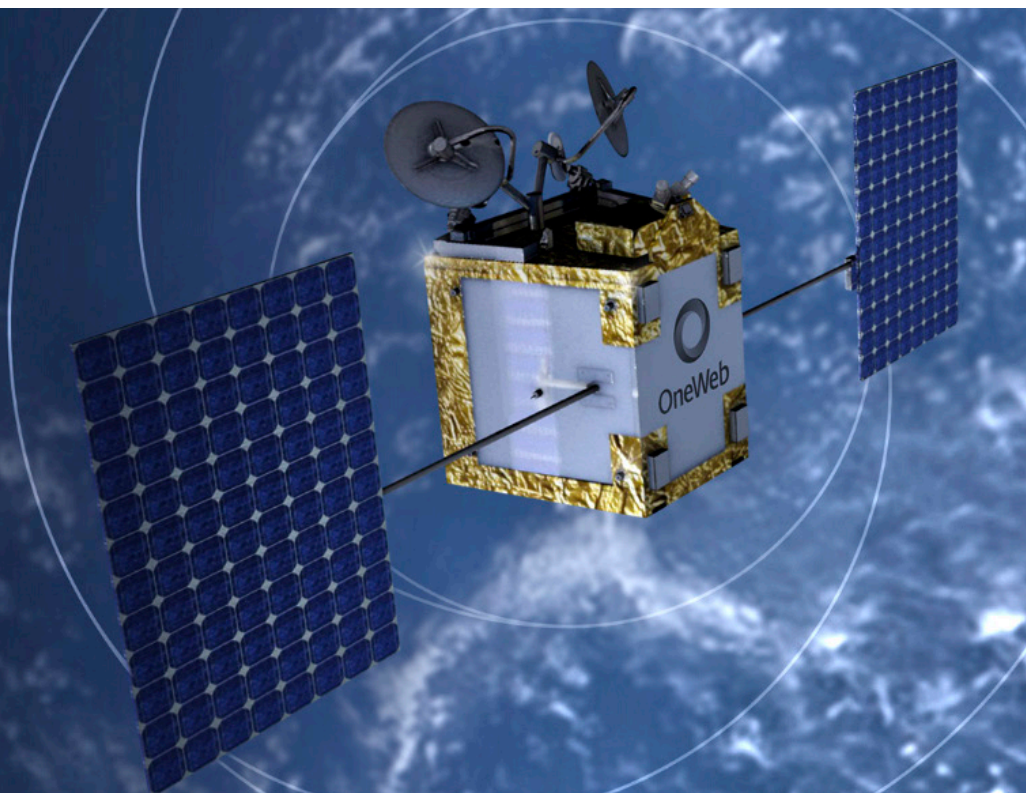
As at January 2023, OneWeb had 502, first-generation satellites on-orbit (*at 1200 kms, and some 80% of the initial planned fleet*). OneWeb will shortly expand its existing debut service to include the U.S., southern Europe, North Africa, India, the Mid-East, Japan, southern Australia, South Africa and parts of South America.

The appeal of OneWeb to Eutelsat is the LEO operator's total lack of debt, as a consequence of its bankruptcy in 2020 and, in that process, wiping out some \$3 billion from investors that included **SoftBank**, **Qualcomm** and **Virgin**. OneWeb has held onto SoftBank and attracted fresh — post-bankruptcy — cash from SoftBank, India's **Bharti**, the **UK government** and **Eutelsat**.

However, the planned merger of OneWeb with Eutelsat is also creating headaches for the government. While the trading prospects are undoubtedly good (*forecasts of \$1.95 billion in combined annual revenues by 2027*), the pair have to navigate more than a few challenges, not the least of which is the position of the French state in its investment holdings in Eutelsat and the similar position of the UK government in OneWeb (*which has a specified 'golden share' in OneWeb*).

When the merger wraps, Eutelsat will own 100% of OneWeb, but it needs the revenue recovery that the joint effort promises. Unfortunately, Eutelsat's market capitalization has fallen by almost two-thirds over the past five years. Shareholders have suffered as a consequence and it is no surprise that the firm's major shareholders have supported the proposal as representing a hoped-for recovery. Those existing Eutelsat shareholders will receive 50% of the enlarged share capital.

However, Europe — in the form of the **European Commission** — wants their own LEO constellation and there are significant questions as to whether the EC will permit Eutelsat to bid for part of that action.



There are two major problems: first is that, currently, there's a potential UK "veto" over OneWeb activity. It is far from clear as to whether that veto can be neutralized. The second relates to minority shareholdings in Eutelsat. There's a Chinese stakeholding (6%) in Eutelsat that is causing worries as well as the aforementioned, Russian trading links with Eutelsat — these are both extremely real headaches.

Christophe Grudler, the member of the European Parliament in charge of the EU's LEO satellite project, announced that *"a rapprochement of OneWeb with the European constellation seems impossible."* He claimed that *"the EU cannot accept a [non-EU member] UK veto on a secure connectivity infrastructure."* He argued that *"the European Union needs to have full control over its satellites without a risk of hindrance by an outside actor."* He added, *"Europe will not compromise on this point."*

Grudler's comments are echoed by **Iain Duncan Smith**, a former leader of the Conservative party and who continues to remain a highly vocal member of parliament. He believes the UK government will have to stop OneWeb's sale for national security reasons. He said, *"China is a direct threat now to the UK and its interests. We simply cannot allow it to have access either to our technology or to gain financial advantage as a result of a British technology company. I am sure now, armed with this information, the Government will block this sale."*

As of this writing, there has been no announced changes, although final modifications to the agreement between the principal shareholders are still possible. But, as we said in the opening paragraph, predictions are a dangerous pastime!

SES + The Debut Of The mPOWER fleet

The third prediction concerns the extremely well-established **SES**, and the expansion of its existing **O3b MEO** constellation. 2023 will see SES launch — and bring into service — a new fleet of 11 mPOWER MEO spacecraft. The first pair were orbited in December of 2022 and two more pairs will launch during early 2023. The final trio will launch during winter 2023-2024, but SES will commence global services by Q3/2023.

The difference with mPOWER over the original O3b fleet is a quantum-leap in capacity and output. Each new craft has 5,000 fully reconfigurable beams, while the existing O3b satellites have ten reconfigurable beams. These new beams can each scale capacity from 10 Mb/s to 10 Gb/s through a single link to a single location. **Boeing** and SES also designed the constellation as a logical extension of cloud services, and SES has extensive partnerships in place with **Microsoft**.

Key to any launch is the return on investment and SES states it has a near, \$1 billion backlog of business ready to be used (*and helped by SES-17, which launched in 2021*). mPOWER's target clients are governments, airlines and the cruise industry. SES is targeting the U.S. and other governments around the world who seek secure communications.

There's another key event scheduled for the end of 2023 in the shape of the **Federal Communications Commission (FCC)**'s compensation payment for SES's cleared C-band frequencies. The FCC will pay around \$3 billion to SES at the close of this year.

This allows some considerable flexibility for SES. Some of the cash has already been promised to shareholders, but inevitably there will be cash left over — and the prospects for some **Merger & Acquisition** activity. SES Chief Executive Officer, **Steve Collar**, insists that any such investments will have a focus as well as relevance.



Steve Collar

There are our predictions: Viasat will absorb Inmarsat, and launch its ViaSat-3 fleet. Eutelsat will merge with OneWeb but it might have to be flexible with the final terms, and SES will start its mPOWER system and perhaps spend some cash on relevant investment activity.

We promise to review these forecasts as the year unfolds.

Author Chris Forrester is a well-known broadcasting journalist, industry consultant and Senior Columnist for SatNews Publishers. He reports on all aspects of broadcasting with special emphasis on content, the business of television and emerging applications. He founded Rapid TV News and has edited Interspace and its successor Inside Satellite TV since 1996. He also files for Advanced-Television.com. In November of 1998, Chris was appointed an Associate (professor) of the prestigious Adham Center for Television Journalism, part of the American University in Cairo (AUC), in recognition of his extensive coverage of the Arab media market.



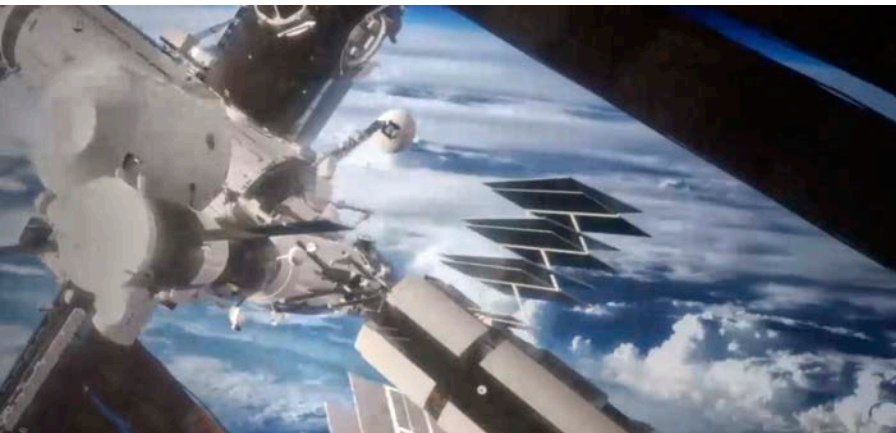
Chris Forrester

THE POWER OF MEO

SES[▲]

Author: Naeem Altaf, CTO

This year will witness exponential technology at the edge of space continuing its advance.



Edge computing is increasingly helping business and public sector organizations better manage and derive more immediate insights from massive amounts of data generated by today's connected devices and mobile phones.

Edge computing takes the computer to where data is being created and can help organizations more quickly obtain critical insights in situations of constrained bandwidth, remote or mobile environments.

The result is improved response times and better bandwidth availability. There's less latency because data doesn't have to be sent in bulk to a data center to be processed.

The time-saving benefits and communication resource savings are clear when it comes to a future space mission, especially long-term ones such as the **Artemis** mission or the journey to Mars.

However, these innovations have applications on Earth, as well. In industries such as banking, edge computing can be used for analyzing ATM video feeds in real time for consumer safety.

In the public sector, edge solutions can be applied to assess the health of remote IT systems or equipment.

In retail, edge solutions could be used to personalize the shopping experiences for customers, as stores rapidly communicate specialized offers in real-time.

In the automotive industry, edge computing can help progress an autonomous cars' ability to make decisions in real-time.

With properly equipped instruments, local information can be computed as well as relayed back to human crews without the need of sending all the raw data — just the desired results.

As 2023 progresses, edge computing applications, using modern **artificial intelligence (AI)** and cloud technologies, will help us better obtain the critical and actionable insights to help perform computing operations more effectively, whether they are in space or here on Earth.

We will also start observing the edge from terrestrial networks being extended to the edge in space in **Low Earth Orbit (LEO)** and beyond.

A wide spectrum of hybrid computing, from laptop to computers in space, will help us to expand an ecosystem for developers, researchers, academia, industry partners.

They will be able to collaborate, build and deploy applications through access to highly sophisticated instruments onboard and technology in space, hence creating a **Space API Economy** in this new space era.

www.ibm.com/industries/space

Author Naeem Altaf is a Distinguished Engineer as well as the CTO of IBM's Space division. He has 22 years of experience with IBM and leads work for company with NASA and SETI for the Frontier Development Lab program. Naeem was recently appointed as a technical advisor for Explore Mars. He is a computer science graduate of the University of Texas at Austin.



Naeem Altaf

Author: Murat Yavuz, Vice President, Corporate Strategy



Photo of the launch of Intelsat's Galaxy 35 + 36 satellites.



*In 2023, **Intelsat** is ready to drive positive change in satellite communications (SATCOM).*

The company's experience and capabilities, developed over more than 50 years, have positioned the company as pioneers in space and continue to help us anticipate future connectivity demands and lead global network unification.

Intelsat's worldview is this: partnership and collaboration among satellite operators is the path to solving the world's connectivity needs.

Intelsat will continue to lead the way in industry trends, evident in the drive to establish software-defined networks. Our technology will work across multiple orbits and multiple bands in a single, software-defined, 5G space and terrestrial network that sets the standard and will deliver a technology-agnostic, open architecture network.

The resulting "plug-and-play access" for customers represents a transition from bespoke solutions to seamless integration within the broader global telecom ecosystem.

We are convinced that such a nimble approach will enable Intelsat to adapt to future demands and needs – even applications yet to be dreamed up.

Key beneficiaries of this approach will be the mobility — land, air, and sea — and government sectors, which will remain significant drivers for our business, enabling us to innovate rapidly in the next three to five years.

Intelsat's Commercial Aviation business today is vertically integrated, where we will continue to enhance our managed-services offering to provide everything from the core, integrated satellite and terrestrial network to the passenger experience inflight enabled by the onboard system. We also look to replicate this managed-service model in other business sectors.

Intelsat will continue to support innovation in the satellite hardware industry, as well. We recently commissioned a start-up manufacturer to build our **Intelsat 45 (IS-45)**, a small, geosynchronous satellite.

Furthermore, we will be looking for more opportunities to bring together complementary capabilities to drive competition and innovation, similar to the partnership we forged with **OneWeb** last year.

That cooperative effort will leverage the best capabilities of both coms' networks, relying on hundreds of satellites in both geostationary and low earth orbits.

It is clear to us that no one player or proprietary technology can deliver on the promise of dependable and efficient global connectivity.

For this reason, in 2023, Intelsat will continue to make significant investments to lead the creation of the next-generation unified network and build partnerships within the industry to benefit customers and end users.

www.intelsat.com

Author Murat Yavuz is the Vice President of Corporate Strategy for Intelsat.



Author: Steve Richeson, Vice President

Mission Microwave customers can look forward to the company's continued growth and support in 2023.

The year starts with a strong backlog of customer orders after delivering record results in 2022.

The company continues to expand and grow its team while customers provide additional requirements for solid state amplifiers in maritime, tactical, aviation and multi-orbit terminals.

The company's priorities of people, products, process and profitability enables it to stay focused on customer success in a very dynamic environment. Mission expects 2023 to be particularly strong for the company's newest high power products.



Mission Microwave's Ka-Band 400 watt MOAB SSPA

These new products include BUCs and SSPAs of up to 800 watts in X-band and 400 watts in Ka-band.

Mission Microwave products fill a currently under-served gap in the market for these complex and high value amplifiers.

The 400 watt Ka-band product (*photo, above*) in particular has been welcomed by the industry as a replacement for legacy 500 watt TWT amplifiers.

The lower total cost of ownership, increase reliability and proven performance of these products in multi-carrier applications has won strong support from the company's tactical and commercial customer base.

During the 2023 calendar year Mission microwave customers can expect to see:

- **Increased performance from the continuing evolution of the product lines.**
- **New higher power SSPAs, BUCs and transceivers in support of the IFC, mobility, and gateway markets for Non-Geo constellations**
- **Continued deployment of high power Ka-band amplifiers as TWT amplifiers are phased out in favor of the more reliable Solid State products**



Mission Microwave Ka-band Titan (200W), Javelin (100W or 500W) and Stinger (25W) BUCs

- **Growing success of our customer base as they take advantage of Mission Microwave products leadership in performance and reliability.**

Mission's customers continue to provide a strong market for the company's signature **Stinger**, **Javelin** and **Titan** BUCs that have become the standard for tactical terminals and high performance transportable and **Communication-On-The-Move (COTM)** applications.



Mission Microwave's Ku-Band 55 watt Stinger BUC

2023 starts with a solid foundation as the company's customers look forward to growing demand for "Made For A Mission" Ka-band terminals as new MEO and GEO constellations are launched and deployed.

Having overcome the challenges of 2022, Mission Microwave expects 2023 to be another in a long string of growth years as the company's customers build on their successes in the fastest growing segments of the SATCOM market.

missionmicrowave.com

Author: Jessica Pieczonka



Artistic rendition of the Momentum Vigoride OSV

Momentum Inc. wrapped up 2022 with significant accomplishments and a focus on taking strides toward achieving its vision in 2023.

"2022 was a big year for Momentum. We conducted our first mission, delivered eight customer payloads to orbit, expanded our services to new geographies, signed service agreements with civil and commercial customers, and continued to test and advance our technology to support the future of space infrastructure," said Momentum Chief Executive Officer, **John Rood**. "As we look ahead to next year, our focus remains on delivering for our customers, testing our technologies in space, and innovating our services to meet the needs of a thriving space economy."

First Flight

Momentum established initial flight heritage of its **Vigoride Orbital Service Vehicle (OSV)** that launched on the **SpaceX Transporter-5** mission in May of 2022. Vigoride welcomed payloads for **FOSSA Systems**, **Orbit NTNU** and **California State Polytechnic University** among its customers. FOSSA's payload featured multiple picosatellites as part of a constellation to provide global and real-time **Internet of Things (IoT)** connectivity for industrial applications. Orbit NTNU's payload, **SelfieSat**, supported a student-led initiative from Norway. California State Polytechnic University's payload, **BroncoSat-1**, featured a technology demonstration. In total, Momentum deployed eight satellites from its Vigoride OSV and a third-party deployer.

New Business

Momentum secured multiple new agreements in 2022 to serve the needs of low-Earth orbit customers, including **NASA**, **LuxSpace**, **CUAVA**, and **CONTEC CO**. These customers join a backlog of others scheduled to fly with Momentum in 2023. In addition to these contracts, Momentum and **Sidus Space** signed a Memorandum of Understanding (MOU) to explore launching **LizzieSat™** satellites onboard Vigoride. The MOU also seeks to foster collaboration between the two companies to use their joint capabilities to seek new opportunities together, expanding both firms' reach.

Advancing Technology

The Momentum team continued to develop and test its technology during 2022 with a focus on integrating lessons learned from the inaugural mission, including comprehensive ground testing of Vigoride's solar arrays and **Microwave Electrothermal Thruster (MET)**. The team

also accelerated work related to the **TApe Spring Solar Array (TASSA)**. These large sheets of flexible solar cells are bonded to tape springs. To stow, they are tightly coiled around a mandrel. After launch, motors unroll the mandrel, deploying the solar array.

"Momentum has patented the principles behind TASSA, and we aim to demonstrate it in 2023," said Momentum Chief Technology Officer, **Rob Schwarz**. "TASSA can coil around a 4" diameter mandrel, compared to the 12" ones used for other rollout solar arrays. It can also experience thermal distortions without buckling. We anticipate creating operational and cost efficiencies with this technology."

In addition, technology development to support Rendezvous and Proximity Operations has advanced, including a successful design review in October with Momentum's technology partners. The team is looking forward to a flight demonstration with **Vigoride-7** targeted to launch on the **SpaceX Transporter-8** mission, slated for June of 2023. Rendezvous and Proximity Operations will enable future Vigoride

vehicles to interact with other objects in space, paving the way for a next-generation reusable OSV and in-space services such as debris removal, end-of-life de-orbit, relocation, and mission enhancement.

Looking Ahead

Momentum has signed **Launch Services Agreements** with **SpaceX** to reserve space on the next four **Transporter** rideshare missions that are targeted to occur during 2023. The next Vigoride OSV is slated to fly on the **SpaceX Transporter-6** mission, targeted for launch in January of 2023. This flight will mark Momentum's second demonstration mission of its Vigoride OSV.

Mission priorities include hosting **Caltech's Space-based Solar Power Project payload**, deploying **Qosmosys' Zeus-1** payload, and testing Vigoride's performance in space, particularly related to its MET propulsion. The MET is designed to use water as a propellant and produce thrust by expelling extremely hot gases through a rocket nozzle. However, unlike a conventional chemical rocket engine, which creates thrust through a chemical reaction, the MET is designed to create a plasma and thrust using microwave energy.

Using the MET, Momentum aims to offer cost-effective, efficient, safe, and environmentally friendly propulsion to meet the demands for in-space transportation and infrastructure services. The Vigoride OSV and its MET are next-generation systems enhanced from the previous versions that flew on the Company's first demonstration mission earlier this year.

"Momentum is rallying around its near-term focus of demonstrating the capabilities of its initial services in Low Earth Orbit," said Rood. "In 2023, we'll continue to develop our technology to build reliability, flexibility, and responsiveness to the critical mission demands of the industry like de-orbiting, in-space satellite maintenance and repair, and other advanced in-space transportation and infrastructure services."

Author Jessica Pieczonka is the Vice President of Communications at Momentum.



Author: ND SATCOM editorial team



The war in Ukraine, with its global impact, was reverberating across the world in 2022. The pandemic was also still present, although government regulations and health measures have been modified, step by step.

The enormous degree of flexibility, agility and commitment required in these circumstances defined those companies that will make it through these times with an improved bottom line.

ND SATCOM is certainly among those firms. The company's stable leadership prevails as the path of investing in new technologies and new market opportunities are diligently pursued.

In 2022, ND SATCOM launched a variety of innovative products that exceeded customer expectations and extended its outstanding SKYWAN 5G solution for providing secure communications to military and governmental customers as well as for others.

In order to reach existing and new customers worldwide, ND SATCOM uses new communication channels via social media and its own interactive platform, securely hosting live meetings, demos, and trainings.

Fostering Stability + Growth

In 2022, ND SATCOM's sales volume developed positively and far exceeded the planned revenues, with the defence market a strong driver.

This year, growth will again be sustained by the successful installation of SKYWAN 5G solution across multiple government customers worldwide as the core component within most projects.

The human factor is a key component of this performance. The outstanding experience and engagement of the entire team reflects the brand quality and reliability that customers expect.

Expansion Of The Solutions Portfolio + Products

At the German **AFCEA**

conference in Bonn in May of 2022, ND SATCOM presented the **Multi-band FlyAway Terminal (MFT)** family.

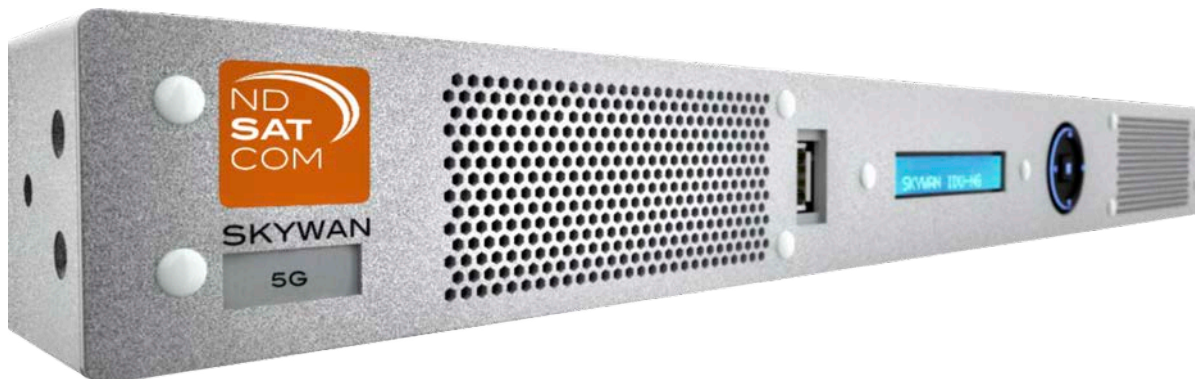
One advantage that sets this new terminal apart from others is its operational wind resistance: this terminal can withstand and function in extremely high wind speeds and during severe storms.

Customers value the proven high reliability and security that SKYWAN offers and has proven time and time again. In 2023, the MFT family will be expanded by launching an automated version that will include auto-pointing functionality.



Based on customer feedback, this will decide whether further variants will be implemented.

The evolution of ND SATCOM's flagship product, the SKYWAN 5G modem, was, of course, one of the main tasks of the R&D team in 2022 and will also hold true this year.



An updated and enhanced version of its software was released at the end of 2022 that included the support of **X.509** certificates, which is a major step in completing the SYKWAN feature set for providing **transmission security (TRANSEC)**. This path will be continued in 2023 in order to maintain SKYWAN's top position in the market of secure satellite communications (SATCOM).

During the last few years, ND SATCOM's portfolio for broadcast customers has been continuously modernized and expanded: starting with the **HPA 4-series** and the new **RCU 6000** controllers, the next generation of uplink components has been successfully launched to continue ND SATCOM's long and ongoing success story of uplink devices. Finally, the next generation of antenna control units — the **ACU 6000** — will be ready and launched in 2023 to complete the portfolio.



Developed, designed and assembled by ND SATCOM, the **SKYRAY** antenna family will also receive an update by launching the **SKYRAY 2000** antenna: using the latest developments in material science, refining the design and deploying an enlarged antenna size of 2000 mm instead of 1900 mm, will improve both the usability and the technical characteristics of this product.



Major Projects For 2023

With its unique turn-key solutions, ND SATCOM provides secure, resilient and high-performance SATCOM to customers.

In 2023, a project will be rolled out for the police and the disaster management of the **German Federal State of Niedersachsen** in order to make them independent of any terrestrial infrastructure, especially when scenarios such as flood, fire or power outage occur.



In addition, more and more armed forces, especially in Eastern Europe, will receive additional terminals using the SKYWAN technology.



Another highlight in 2023 will certainly be ND SATCOM's unique SATCOM solution for helicopters. After successful demonstration in 2022, this technology will be deployed to the first choppers in 2023.



Customers value the ease of use on any type of helicopters without any special calibration procedure — the solution achieves a throughput of as much as 10 MBit/s, with only one antenna being deployed to the helicopter.

Staying In Touch

Face-to-face meetings and trade shows became possible again in 2022 and will continue to be an important part of 2023 as well — whether it's the **SATELLITE** show in Washington D.C., the **MSPO** in Poland or the **IBC** in Amsterdam.

With more trade shows and travel possible once again, ND SATCOM will strengthen existing relationships with customers and partners — and build new ones — by leveraging the company's global network of offices and partners.

A special event will take place again in 2023 – the ND SATCOM in-house exhibition "**NDS Factory Event**" at the headquarters in Immenstaad, located at the Lake Constance in southern Germany.

We look forward to welcoming our customers and partners — and we look forward to installing product reliability in 2023 and beyond.

www.ndsatcom.com

Author: Joakim Espeland, Chief Executive Officer



The SATCOM industry continues to evolve at a fast pace — over the coming months, we will see more LEO launches, an increase in multi-orbit environments as well as a need for better ground infrastructure to support it.

As the industry strives to meet the demand for increased connectivity and high availability, the need for new antenna technology is becoming increasingly evident.

Though there have been disruptions in both launch and satellite manufacturing capabilities, we are yet to see a scalable rollout of ground segments designed to accommodate this new generation of technology.

At the same time, LEO is already essential if we want to deliver quality and universal telecommunications services on the edge, in air and at sea and for

emergency response.

Over the coming months, we will see it become essential for developing smart cities, driverless cars, delivery drones and the next generation industry 4.0.

All of this development and shift will mean that the ground system needs to adapt to ensure it can provide continuous connectivity in a complex and challenging multi-orbit and multi-frequency environment.

The important question will be whether we can optimize or innovate quickly enough to accommodate the rapid deployment of satellites as to avoid harmful interference in space as well as to remain in full control over each space craft at all time.

The availability of accurate testing will continue to be vitally important, as will ensuring appropriate training such as the courses offered by the Global VSAT Forum.

Having standardized antenna performance requirements, such as the Satellite Operators Minimum Antenna Performance guidelines, will be increasingly important.

It is crucial that innovation across the ground segment is encouraged and funding is made available to drive forward development.

At **QuadSAT**, we strongly believe that we have an important part to play in enabling the industry to develop a ground segment that supports future network success.

quadsat.com



The QuadSAT team

2023 will be a year of opportunity, expansion and growth for **SCOUT** and the space industry at large, from LEO to the lunar ecosystem.

The Virginia-based company is a leading spaceflight hardware, software and data provider developing solutions for improved safety and transparency in space.

2023 Challenges Outlook

To start, our not-so-great prediction for 2023 is the continuation of labor shortages from 2022 that have contributed to the supply chain

issues and woes in the space industry.

On the good news front, we expect **Venture Capital (VC)** investments in this sector to pick up in 2023, even though 2022 was overall a healthy year with a bit of a doom and gloom narrative toward the second half of the year. A number of factors, such as inflation, market corrections and interest rate hikes, hit their peak in 2022 and we expect 2023 to feel calmer and, overall, more stable.

Opportunities in 2023

One of the most exciting and notable events we're looking forward to in 2023 for SCOUT and the space community is the progression of the **Artemis** program and the larger, lunar ecosystem.

We're positioning ourselves into this market with our **NITE OWL** program, which includes an advanced, long-range, on-orbit vision system that is designed for dual-use, cislunar applications. NITE OWL is a solution to the current cislunar SDA and lunar surface security problem, and it will position SCOUT as a leading SDA provider in the cislunar domain.

In 2022, we partnered with a cohort of companies from around the world to accelerate innovative SDA capabilities into those markets.

In 2023, we're looking forward to additionally building our pipeline of customers, vendors and capabilities with those partners to increase our ability to support and enhance the awareness of the space environment with commercial data tools for shared security and prosperity.

scout.space

Author Eric Ingram is the Chief Executive Officer of SCOUT Inc.



Author: Helen Weedon, Managing Director



*As 2023 unfolds, **SIG** notes that the satellite industry is certainly facing a number of significant challenges, all of which will only increase in number as the skies become more and more crowded and the demands for seamless connectivity continue to increase.*

The new, multi-orbit environment and the challenges this technology delivers will mean the industry needs to respond quickly and effectively. A significant part of this need will require working together across companies and orbital regimes to benefit the entire environment.

At SIG's recent workshop at SES in October of 2022, there was a recurring theme around the need for standards, whether such are for cloud adoption, antenna performance, space situational awareness (SSA), or interference resolution.



It is clear that the future will come with more standards and additional guidelines and working to make certain these needs are correct will involve global collaboration to ensure they are realistic while having a positive impact on the industry.

No-one wants standards for standards' sake.

As LEO launches continue to roll-out, and as we continue to see multi-orbit environments increasing in number, there will also be a growing need for new ground station equipment that is designed to meet the new challenges multi-orbit environments bring to the industry and to the customers. It will be exciting to see the innovation being developed and produced during 2023.

At the same time, those same standards, together with more effective testing, will be important to ensure that new technology can meet global demands and assist operators to deliver seamless services.

satig.space



Future Look

The Space Data Association (SDA)

Author: Joe Chan, Chairman



The Space Data Association realizes there is little doubt that, as we move forward into 2023, space will continue to become more and more crowded.

As the number of space objects and debris in orbit continues to increase, operators need more reliable estimation of the **Probability of Collision**.

Data exchange is critical in order for the industry to minimize the number of false alerts that add to operator's

workload. This is particularly important for operators with satellites that maneuver often, such as those spacecraft equipped with electric propulsion.

The need for fit for purpose **Space Traffic Management** services is greater than ever. As the space environment grows ever more busy and complex, new tools and mechanisms are needed to tackle the challenges that the industry faces.

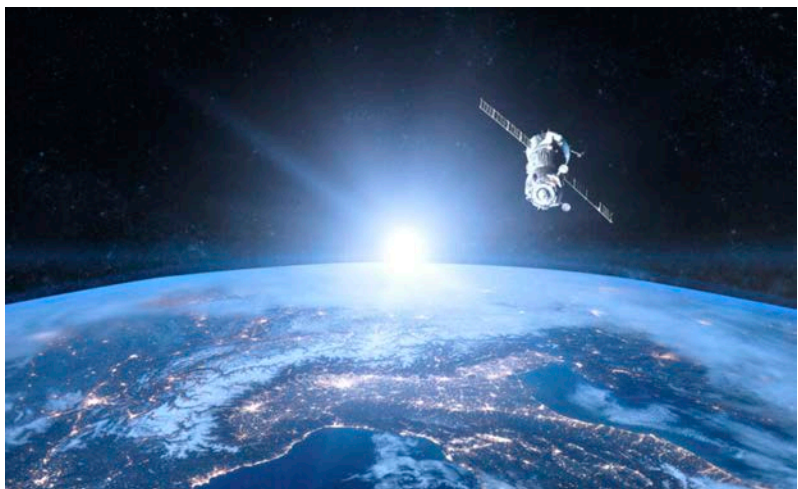
It is crucial that governmental bodies take a more active role in **space situational awareness (SSA)**. The SDA supports the **U.S. Department of Commerce's** development of improved SSA capabilities, building on data fusion contribution for more accurate orbit prediction, and more reliable probability of collision computation.

Dialog and exchanges with **European Space Surveillance and Tracking (Eu Sst)** to understand their capabilities, their legal framework as well as discuss SDA requirements will be ongoing. There is a real need for a much more cohesive approach, which would involve governments around the world taking their first steps toward working together to establish a coordinated Space Traffic Management service that would benefit all space users.

While there remain a lot of questions about what the next 12 months will bring in terms of Space Traffic Management and Space Situational Awareness, one item that we can be sure of is that the members of the SDA will continue to work together to ensure that space safety and sustainability remain a priority within our industry.

www.space-data.org/sda

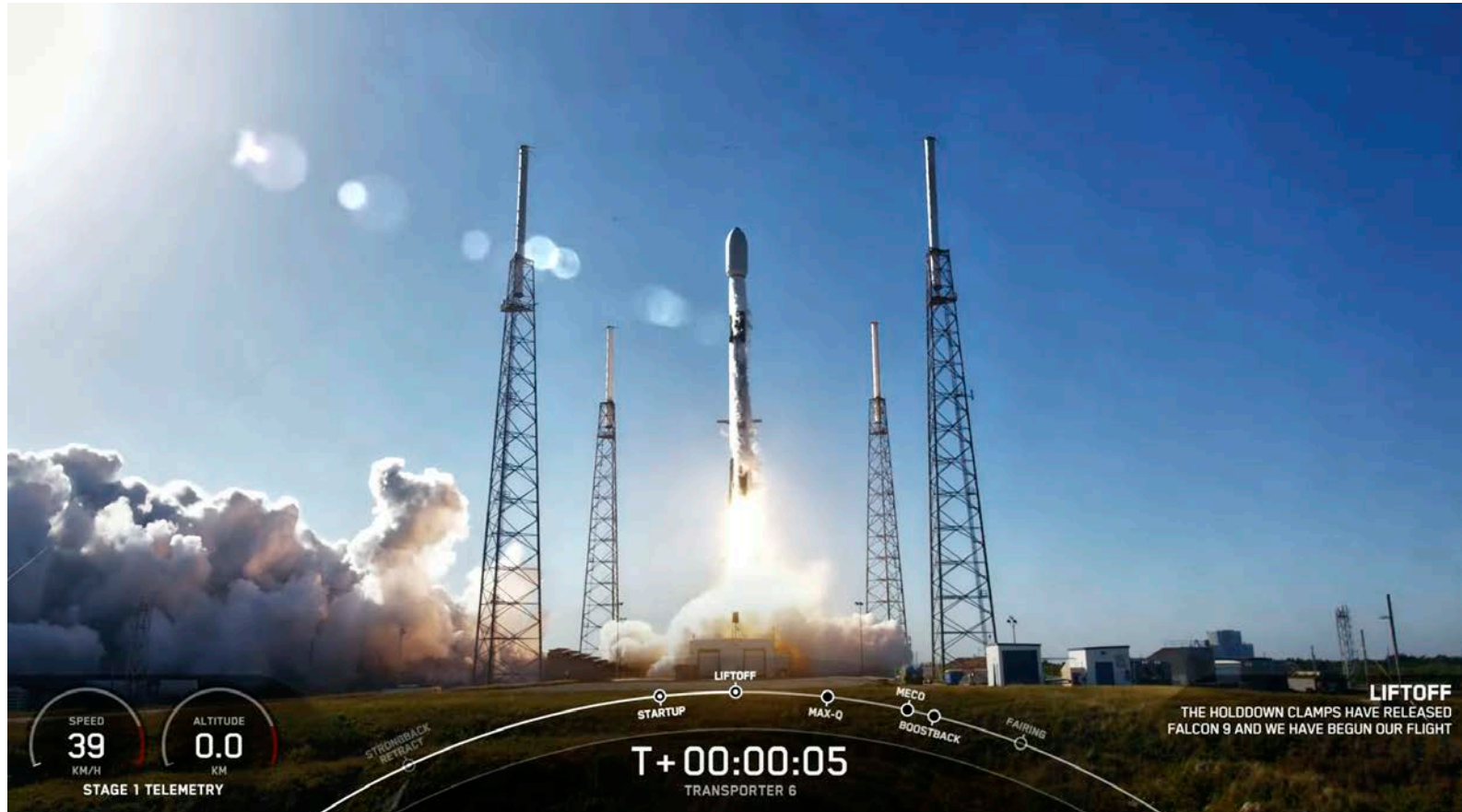
Author Joe Chan is the Director of Flight Dynamics at Intelsat. He oversees the FDS operation and engineering of more than 70 geostationary satellites that Intelsat currently operates. He has been with Intelsat for 24 years. Prior to joining Intelsat he worked at Goddard Space Flight center on the TOPEX/POSEIDON and Mars Observer projects.



SpaceX briskly moves 114 smallsat payloads to orbit with their Transporter-6 mission

A SpaceX Falcon 9 rocket launched the company's **Transporter-6** mission from Space Launch Complex 40 (SLC-40) at Cape Canaveral Space Force Station in Florida on January 3, 2023.

Transporter-6 is SpaceX's sixth dedicated smallsat rideshare mission. There are 114 payloads on this flight, including smallsats and **orbital transfer vehicles (OTVs)**, for deployment.



The first stage booster supporting this mission previously launched **GPS III-3, Turksat 5A, Transporter-2, Intelsat G-33/G-34** and 10 **Starlink** missions.

The deployment order of the smallsats...



The Falcon 9's first stage decelerating toward a soft landing at Cape Canaveral.

Following stage separation, the Falcon 9's first stage accomplished a soft landing at **Landing Zone 1 (LZ-1)** at Cape Canaveral Space Force Station.

KuwaitSat-1 / BDSat-2 / SharedSat 2211 / LEMUR 2 EMMACULATE / LEMUR 2 FUENTETAJA-01 / ConnectaT1.2 / GAMA Alpha / BRO-8 / Menut / Huygens / LEMUR 2 DISCLAIMER / STAR VIBE / LEMUR 2 STEVEALBERS / ISILAUNCH Kleos KSF3-A / Birkeland / SPACEBEE-156 / LEMUR 2 MMOLO / ISILAUNCH Kleos KSF3-B / ISILAUNCH Kleos KSF3-C / LEMUR 2 PHILARI / ISILAUNCH Kleos KSF3-D / First Flock 4Y / EWS RROCI / SpaceBD ISILAUNCH Polytan from Kiev / Second Flock 4Y / Guardian-alpha / Third Flock 4Y deploys / Fourth Flock 4Y / SpaceBD Sony Sphere-1 EYE / ISILAUNCH ClydeSpace NSLSat-2 / ISILAUNCH Sternula-1 / Fifth Flock 4Y / Sixth Flock 4Y / Seventh Flock 4Y / Eighth Flock 4Y / Ninth Flock 4Y / 10th Flock 4Y / 11th Flock 4Y / 12th Flock 4Y / 13th Flock 4Y / 14th Flock 4Y / 15th Flock 4Y / 16th Flock 4Y / 17th Flock 4Y / 18th Flock 4Y / 19th Flock 4Y / 20th Flock 4Y / 21st Flock 4Y / 22nd Flock 4Y / 23rd Flock 4Y / 24th Flock 4Y / 25th Flock 4Y / 26th Flock 4Y / 27th Flock 4Y / 28th Flock 4Y / 29th Flock 4Y / 30th Flock 4Y / 31st Flock 4Y / 32nd Flock 4Y / 33rd Flock 4Y / 34th Flock 4Y / 35th Flock 4Y / 36th Flock 4Y / Lynk Tower 3 / Albania 1 / Lynk Tower 4 / YAM-5 / NewSat 34 / Albania 2 / X22 / X21 / First Umbra / Second Umbra / NewSat 35 / ION SCV-007 GLORIOUS GRATIA / ION SCV-008 FIERCE FRANCISCUS / Launcher Orbiter SN1 / X27 / Skykraft 1 / Vigoride 5 / CHIMERA LEO 1 / EOS SAT-1

Imagery is courtesy of SpaceX via the company's real-time streaming of this launch.

THE FUTURE OF FLOODS

Author: Mei He, Spiral Blue

*In early July of 2022, the East coast of Australia was battered by yet another “once in a lifetime” weather incident, within five months of the previous event. The February-April flooding cost **22 lives** and **\$4.3 billion** in insured losses. The impacts of these floods continue to emerge even today.*

Climate Changes Disasters

The climate is changing and we must as well. The nature of nature is shifting and so must the way we live in it. Cutting edge satellite technology can be used to monitor, predict, assess, and mitigate the severity of natural disasters.

How can we use satellite imagery to enhance the way we monitor, predict, mitigate, and respond to natural disasters within the climate emergency?

The ultimate disaster management solution is prevention.

HOW DOES CLIMATE CHANGE AFFECT FLOOD RISK?

WARMER & WETTER ATMOSPHERE

A warmer atmosphere can hold more moisture – approx 7% more for every degree of warming.

MORE ENERGY FOR STORMS

The extra heat in the atmosphere means there is more energy for weather systems that generate intense rainfall.



MORE INTENSE DOWNPOURS

More moisture in the atmosphere means we get more of our rainfall in the form of short, intense downpours. This increases the risk of flash flooding.

COASTAL FLOODING

Climate change is also increasing risks of coastal flooding due to higher sea levels.

 CLIMATECOUNCIL.ORG.AU | crowd-funded science information

NASA's new OCO-2 satellite will peer into the carbon cycle like never before

Around half of the carbon dioxide released into the air remains there, according to readings from monitoring stations on the ground. Another third is dissolved into the oceans, the world's largest sink.

Carbon dioxide in the oceans causes seawater to become more acidic, bleaches coral reefs and threatens the delicate balance of marine ecosystems.

But where does the rest of the carbon go? The numbers don't add up.

OCO-2 will shed new light on this old mystery. It will tell us precisely where the missing carbon is going, and whether our planet will continue to absorb it in the future.

OCO-2 will tell us where the carbon is going...

and give us clues to where we will end up

Are the 'natural' disasters that were observed in 2022 really 'natural'?

Artistic rendition of the O-CO2 Observatory.
Image is courtesy of John Howard / JPL



Mitigating carbon emissions from human activity requires more well informed decision making.

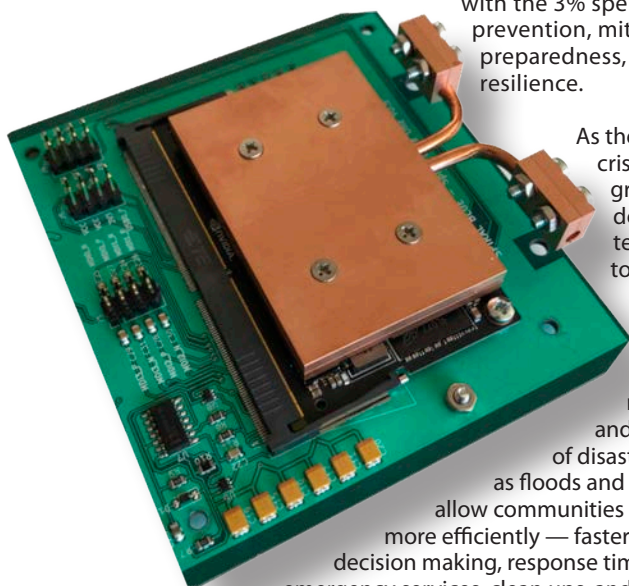
This information can be provided by satellites, such as NASA's Orbiting Carbon Observatory-2 space satellite (see the artistic rendition on the next article page).

This satellite will monitor carbon levels, and provide information as to where the Earth is headed in the context of the climate emergency.

Monitor, Predict + Respond

As the floodwaters recede, the clean up begins. Communities devastated by human exacerbated disasters are left to pick up the pieces.

A **Productivity Commission report** in 2015 found that an estimated 97% of federal disaster funds were spent on recovery, in comparison with the 3% spent on prevention, mitigation, preparedness, and resilience.



As the climate crisis becomes greater, so does the technology to combat it. The ability for faster

monitoring and prediction of disasters, such as floods and bushfires, allow communities to recover more efficiently — faster alerts, decision making, response times from emergency services, clean ups, and faster damage assessment.

We must adopt quicker, more efficient recovery mechanisms as the severity of disasters inevitability increase.

What Is Spiral Blue Accomplishing?

Spiral Blue is developing the **Space Edge Computer** (see product photo, bottom left column) — an onboard computing system that uses **machine learning (ML)** to process images captured on **Earth Observation (EO)** satellites. This increases the volume of useful data that can be delivered, and decreases lead times which is critical to natural disaster management.

Implementing these solutions will allow for prediction, better informed decision making, and more efficient response and recovery during disasters, which will save lives.

Spiral Blue is looking to collaborate with local councils and government in order to put developing technology in the hands of those who need it.

The Future Of Floods

Natural disasters are here to stay as the climate crisis spirals. We have a responsibility to prevent, predict, monitor and ultimately respond to disasters, such as the floods that devastated NSW and the East coast of Australia in 2022.

Satellite imagery saves lives by monitoring, predicting, and analyzing carbon levels and weather systems.

This allows for better decisions making to prevent disasters, and increase preparedness for when it strikes.

In addition to prevention, satellite imagery can streamline recovery efforts by providing information to first responders and insurers more efficiently.

The climate is changing, and so must we.

www.spiralblue.space

Spiral Blue is a Sydney, Australia,-based SME focused on building the next generation of Earth observation services with Artificial Intelligence (AI) and Space Edge Computing. The company has applications in defence, city planning, utilities, and other industries. Founded in 2018, the company recently launched the first Space Edge Zero prototypes to orbit and is now continuing to gather further in orbit performance data. Spiral Blue is a member of the Wolfpack Space Hub.



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