BRYAN, GARNIER & CO

ASTROCAST

BUY – TPNOK85

The connected planet

Tech innovations

How communications networks support an ever more connected world

October, 2021

Market Data:

ASTROCAST

BUY

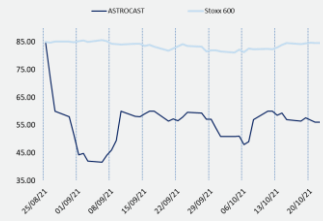
TP NOK85

Bloomberg	ASTRO:NO
Reuters	ASTRO.OL
Share price	NOK56
Market Cap.	NOK2,221m
E.V.	NOK1,551m
12m high / low	NOK85 / NOK41.7
Free Float	12%
Ytd Perf.	-

Shareholders (pre IPO)

Founders	34%
Institutional investors	33%
Business angels	15%
Management	6%
Others	12%

1Y performance



Fiscal year end 31/12	2019	2020	2021e	2022e	2023e
Financial Summary					
EPS	-	-	-0.53	-0.62	-0.77
Restated EPS	-	-	-0.53	-0.62	-0.77
% change	-	-	-	-17.2%	-23.5%
BVPS	-	-	0.74	1.06	1.18
Operating cash flows	-	-	-0.55	-0.46	-0.49
FCF	-	-	-0.73	-0.68	-1.03
Net dividend	-	-	0.00	0.00	0.00
Average yearly Price	-	-	-	-	-
Avg. Number of shares, diluted (k)	-	-	38,943	38,943	38,943
Valuation (x)					
EV/Sales	-	-	NM	NM	53.05x
EV/EBITDA	-	-	NM	NM	NM
EV/EBIT	-	-	NM	NM	NM
P/E	-	-	NM	NM	NM
FCF yield (%)	-	-	NM	NM	NM
Net dividend yield (%)	-	-	NM	NM	NM
Profit & Loss Account (EURk)					
Revenues	1,336	519	1,280	10,728	33,954
Change (%)	-	-61.2%	146.6%	738.1%	216.5%
Adjusted EBITDA	-395	-4,488	-16,103	-17,196	-17,519
EBIT (current)	-902	-4,937	-20,843	-23,908	-28,719
Change (%)	-	-447.3%	-322.2%	-14.7%	-20.1%
Financial results	-106	35	-181	-734	-1,714
Pre-Tax profits	-1,008	-4,902	-21,024	-24,642	-30,433
Tax	0	0	0	0	0
Net profit	-1,008	-4,902	-21,024	-24,642	-30,433
Restated net profit	-1,008	-4,902	-21,024	-24,642	-30,433
Change (%)	-	-386.3%	-328.9%	-17.2%	-23.5%
Cash Flow Statement (EURm)					
Operating cash flows	-398	-4,449	-21,537	-17,906	-19,201
Change in working capital	-4	39	-5,434	-710	-1,682
Capex, net	-9,670	-4,279	-7,082	-8,732	-21,000
Free Cash flow	-10,068	-8,728	-28,619	-26,638	-40,201
Dividends	0	0	0	0	0
Capital increase	4,706	3,269	40,000	37,000	35,000
Net debt	-120	5,350	-8,100	-19,228	-18,313
Balance Sheet (EURm)					
Tangible fixed assets	2,981	3,899	3,899	3,899	3,899
Intangibles assets	8,581	11,398	13,740	15,760	25,560
Cash & equivalents	620	420	9,873	24,001	25,086
current assets	6,746	8,219	8,363	10,147	14,532
Other assets	3	5	5	5	5
Total assets	18,931	23,941	35,880	53,813	69,083
L & ST Debt	500	5,770	1,773	4,773	6,773
Provisions	0	0	0	0	0
Others liabilities	8,231	8,403	5,186	7,761	16,464
Shareholders' funds	10,199	9,945	28,921	41,280	45,847
Total Liabilities	18930	24118	35881	53813	69084
Capital employed	10,200	10,568	25,724	41,082	47,649
Ratios					
Operating margin	-67.5%	-951.3%	-1628.4%	-222.9%	-84.6%
Tax rate	0.0%	0.0%	0.0%	0.0%	0.0%
Net margin	-75.5%	-944.5%	-1642.5%	-229.7%	-89.6%
ROE (after tax)	-8.8%	-49.6%	-72.1%	-57.9%	-62.6%
ROCE (after tax)	-8.8%	-46.7%	-81.0%	-58.2%	-60.3%
Gearing	-1%	54%	-28%	-47%	-40%
Pay out ratio	0.0%	0.0%	0.0%	0.0%	0.0%

Source: Company Data; Bryan, Garnier & Co ests.

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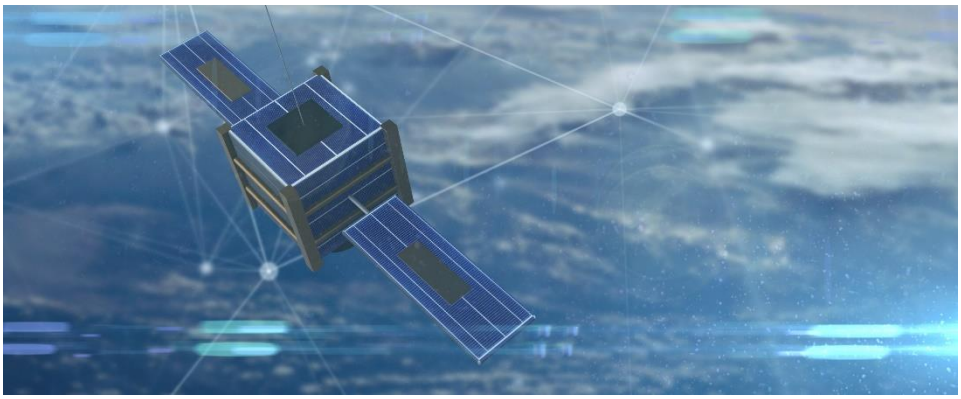
THEMATICS

As of September 2020, Bryan Garnier & Co's Equity Research is becoming more thematic-focused. This note is specifically addressing and illustrative of the following thematic

Tech Innovations

How communications networks support an ever more connected world.

The connected planet



IoT is not just a promise anymore. The demand is exploding, driven by organisations' evergrowing needs for efficiency and sustainability, while the rise of IoT is supported by the continuous developments in networking and computing technologies which enable greater efficiencies in the collection, transmission, analysis and processing of data.

Though a disruption is currently underway in cities and urban areas with the new, innovative applications being deployed on LPWANs, remote areas on land, oceans, and skies are untouched. Cellular technology only covers about 10% to 20% of the earth's surface, the new LPWAN technologies cover even a fraction of that, while existing satellite solutions, which could seem better suited to cover the remote areas of the world's surface, had so far been unable to efficiently address IoT requirements.

As the designer, manufacturer and operator of a low cost nanosatellite constellation tailor made for IoT communications, Astrocast proposes to address the issue and target the lucrative market of IoT in non dense areas.

EXECUTIVE SUMMARY

Executive Summary.

Founded in 2014, listed on the stock exchange since August 25th this year, Astrocast is developing a global nanosatellite constellation and low-power modules to ubiquitously connect efficiently and at ultra-low-cost, millions of IoT devices in remote, rural and maritime areas.

The demand for IoT is exploding all over the world, but current satellite solutions do not properly address IoT needs over the 90% of the world's surface which are not covered by traditional cellular technologies. Potential for IoT in these low-density areas is very significant with 30 million connections expected by 2025.

Astrocast has already 10 satellites up and running in space, ahead of most of its direct competitors. Thanks to key industrial partnerships with Airbus, CEA/LETI, the European Space Agency (ESA) and Tier 1 satellite operator Thuraya, Astrocast is able to provide an infrastructure that is optimized for IoT like no other in terms of both cost, availability, form factor and power consumption.

Business development is still at an early stage, first commercial revenues are expected this year. But commercial traction appears strong, as the new deal with Telefonica shows, the commercial pipe is good and we expect a sharp ramp up in revenues as soon as in 2022. Demand should grow alongside technological developments and we estimate Astrocast could reach c. CHF143m in revenues by 2025, slightly more conservative than the group's guidance.

In the meantime the group will keep on investing in the development of its constellation as well as in marketing and sales. We estimate Astrocast will need to raise an additional CHF80m over the next 4 years, with breakeven EBITDA expected in 2024.

Our TP for Astrocast stands at NOK85 (using a mixed DCF/Peers multiple approach), ie 52% above the current share price. We are initiating the coverage of Astrocast with a Buy recommendation. Although the pace of IoT take up rate is a risk to our investment case, we see strong catalysts: 1/ The IoT market in non-dense areas is set to sharply accelerate as cheap technologies become available, with environmental concerns as a clear driver here; 2/ Astrocast has developed a leading technology together with top notch partners; 3/ Astrocast constellation is already operational and the company enjoys a first mover advantage; 4/ Astrocast's business model relies on a high share of recurring revenues; 5/ New low earth orbit constellations are becoming strategic assets for ubiquitous coverage of the earth. Speculative scenarios in the sector are not to be excluded, as Patrick Drahi's bid on Eutelsat recently showed.

Résumé

Fondée en 2014, cotée en bourse depuis le 25 août dernier, Astrocast développe une constellation de nanosatellites et des modules de faible puissance pour connecter à un coût optimal des millions d'appareils IoT dans les zones les moins denses du globe (zones rurales, déserts, océans, montagnes…).

Si la demande en Internet des Objets explose, aucune solution ne répondait cependant aux besoins exprimés sur les 90% de la surface du globe qui ne sont pas couverts par les technologies cellulaires traditionnelles. Le potentiel de l'IoT dans ces zones à faible densité est pourtant très important, avec 30 millions de connexions attendues d'ici 2025. Astrocast a déjà 10 satellites en service en orbite, en avance sur la plupart de ses concurrents directs. Grâce à des partenariats industriels avec Airbus, le CEA/LETI, l'Agence spatiale européenne (ESA) et l'opérateur de satellites Tier 1 Thuraya, Astrocast a développé une technologie permettant de fournir un service de connexion ultra optimisé pour l'IoT en termes de coût, de disponibilité, de capacité d'intégration et de consommation énergétique.

Le développement commercial est encore à un stade précoce, les premiers revenus commerciaux sont attendus cette année. Mais la dynamique commerciale est forte, comme le montre le récent accord avec Telefonica, le portefeuille d'affaires en cours de discussion est bon et nous prévoyons une forte montée en puissance des revenus dès 2022. La demande devrait croître parallèlement aux développements technologiques et nous estimons qu'Astrocast pourrait atteindre un CA d'environ 143 millions de CHF en 2025, légèrement inférieur aux prévisions du groupe. Entre-temps, le groupe continuera à investir dans le développement de sa constellation, dans le marketing et les ventes. Nous estimons qu'Astrocast devra lever 80 millions de CHF supplémentaires au cours des 4 prochaines années, avec un EBITDA à l'équilibre estimé en 2024.

Notre objectif de cours pour Astrocast s'élève à NOK85 (approche mixte DCF/Comparables), soit 52% au-dessus du prix actuel de l'action. Nous initions Astrocast avec une recommandation à l'achat. Bien que le rythme d'adoption de l'IoT constitue un risque pour notre cas d'investissement, nous voyons de solides catalyseurs : 1/ Le marché de l'IoT dans les zones non denses doit accélérer fortement avec la mise à disposition de technologies bon marché et la dynamique liée aux préoccupations environnementales; 2/ Astrocast a développé une technologie de pointe avec des partenaires de premier plan ; 3/ La constellation d'Astrocast est déjà opérationnelle, la société bénéficie d'une prime au premier entrant; 4/ Le modèle économique d'Astrocast repose sur une part élevée de revenus récurrents ; 5/ Les nouvelles constellations en orbite basse deviennent des actifs stratégiques pour couvrir l'intégralité du globe. Les scénarios spéculatifs dans le secteur ne sont pas à exclure, comme l'a récemment montré l'offre de Patrick Drahi sur Eutelsat.

BRYAN, GARNIER & CO

Section 01

Market opportunities

Meeting the exponential demand for cost-effective IoT solutions in non-urban areas

The new data revolution is driven by IoT

The promise of IoT is to be able to make better decisions by having access to information that is locked in proprietary systems and connecting remote sensors directly. With IoT, this data can be collected from across the operation, analyzed, and made available to decision makers. IoT allows companies to monitor, learn and respond to changes in internal and external conditions much faster than in the past. With IoT, companies are:

- Digitally connected – all systems are connected and monitored centrally.
- Data driven – new data is now available for analysis with AI and will drive better real-time decisions.
- Model based – allowing data to automatically influence and affect the existing plan, as they are inherently linked through a common data model.

Justifying spend on automation and operational efficiency by buyers has been traditionally easiest across all technology suppliers. With the benefits offered to organizations, IoT is on the cusp of one of the evergreen segments at the right price point. However, a significant portion of IoT setups have a major connectivity problem: hundreds of millions of devices that need to communicate, but do not have cost-effective, battery-friendly networks to do so. This need is likely to become more urgent in the years ahead due to the proliferation of connected devices and the variety of possible use cases. This need for better data and improved analytics will also drive the creation of new applications and new ways to connect these remote devices.

Demand for IoT connectivity is exploding. Market size estimates vary greatly depending on the marketing research firm, but all forecasts point to very significant figures. Cisco and Ericsson have estimated 50 billion IoT connected devices in 2020, GSMA Intelligence, which is more conservative, still points to 25 billion IoT connections by 2025.

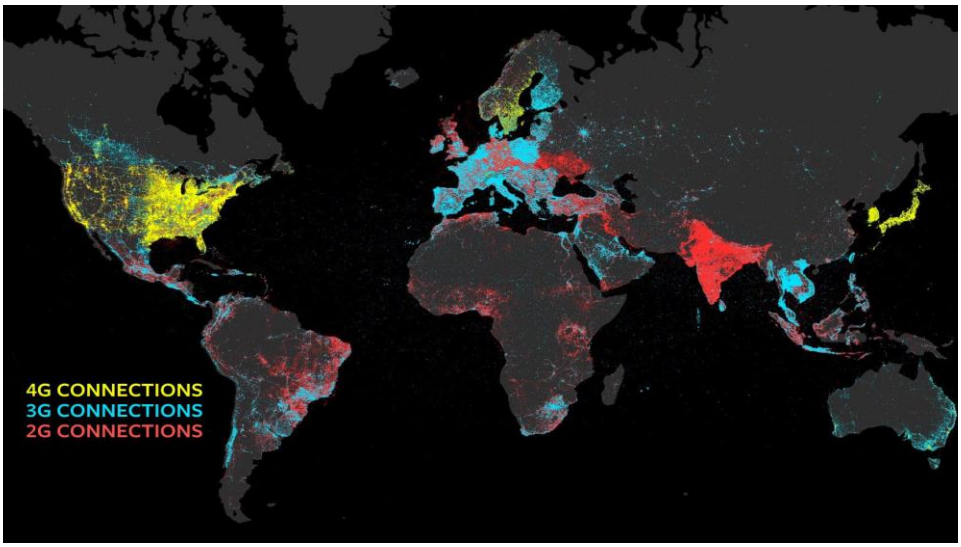
Growth in IoT is driven by a number of markets where usage of advanced technologies has increased drastically to reduce manual interventions. This prompted the advent of Machine to Machine (M2M) or IoT applications and networks. The rise of IoT is supported by the continuous developments in networking technologies, which enable greater efficiencies in the collection, transmission, analysis and processing of data.

In particular, alongside the IoT variations of traditional cellular networks (LTE-M, NB-IoT), and the upcoming 5G technology, Low Power Wide Area Networks (LPWAN) like LoRa and (formerly Sigfox) are experiencing double-digit growth by addressing basic data communication needs with optimal power and TCO efficiency. Strategy Analytics has predicted that by 2022, roughly five billion connections will be on LPWAN networks (i.e. a third of GSMA's total IoT market estimates). The industry analyst firm IDATE projects that LPWAN units shipped will grow from 109 million in 2017 to 339 million in 2025).

WAN and cellular networks coverage will remain limited, requiring innovative satellite solutions for IoT

Though a disruption is currently underway in cities and urban areas with the new, innovative applications being deployed on LPWANs, remote areas on land, oceans, and skies are untouched. While cellular technology seems pervasive, it only covers about 10% to 20% of the earth's surface and the new LPWAN technologies cover only a fraction of that.

Fig. 1: Cellular coverage of remote areas



Source: LoRa Alliance, 2019(does not include data for certain countries, notably China)

On the other hand, existing satellite solutions, which could seem better suited to cover the remote areas of the world's surface, have so far been unable to efficiently address IoT requirements. Satellite IoT is not a new idea or use case but it has been very difficult or almost impossible to implement both technically and as a viable business case. Indeed, despite the huge potential in the Satellite IoT market, it has been facing numerous challenges for current implementations:

- Economic viability of hardware and connectivity.
- Antenna/module sizes.
- Power management.
- Signal interference issues.

From GEO Satellites to LEO small and nanosatellites, the normalisation of satellite launches

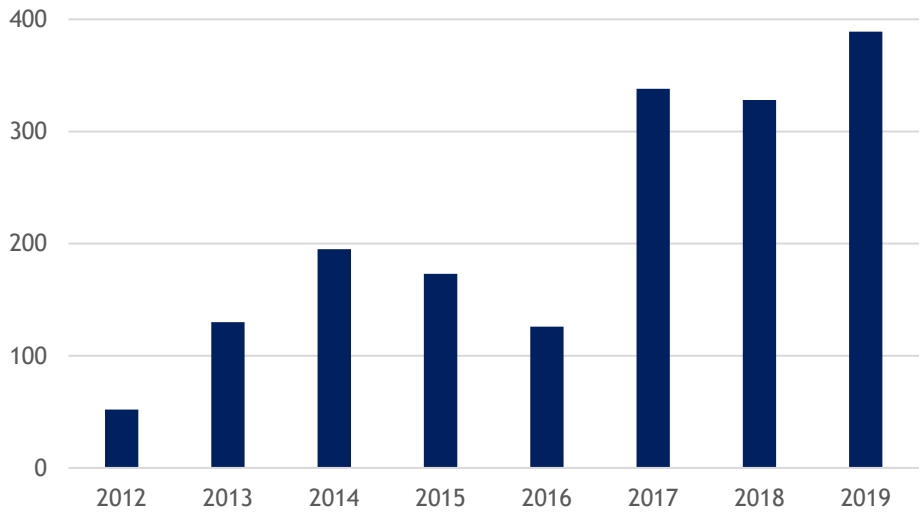
Recently, some of the challenges highlighted above have been solved by pioneers in space-tech:

- Affordable satellite launch prices as a service – led initially by SpaceX with the Falcon 9 rocket, Indian Space Research Organization (ISRO) with the PSLV rocket and currently by other companies including Arianespace and RocketLab and numerous new entrants.

- The established ecosystem of specialist vendors - from insurance to module partners to manufacturing, suppliers of technology, products and services, a diverse and widespread base of suppliers are established in the market.
- The development of nanosatellites ability through a smaller payload with better technology to be able to achieve performance that in the past had taken larger, costlier satellites.

Over the last few years, the satellite market has witnessed a significant increase in the number of satellites launched, due to high growth in the smallsat market. On average between 2012 and 2016, 135 smallsats were launched per year versus 350 on average over the last three years (excluding 2020). The 389 smallsats launched in 2019 represented 7x as many as in 2012.

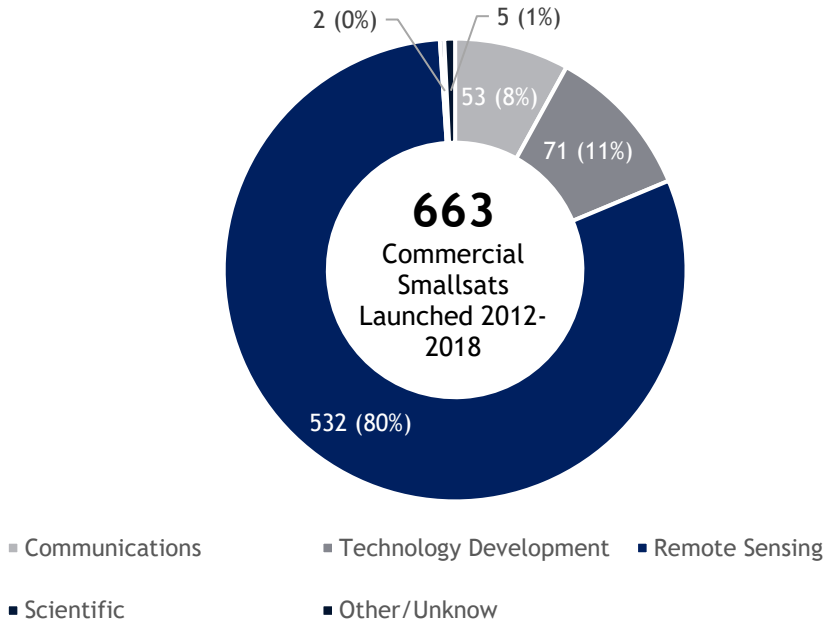
Fig. 2: Smallsats launch per year, 2012-2019 (in number of launch)



Source: Bryce Space & Technology

Smallsats refers to satellites that weigh less than 500kg and include the five smallest mass classes defined by the FAA, i.e. femto, pico, nano, micro and mini. While commercial GEO satellites mostly address communication needs (TV, fixed satellite services and broadband), 80% of current commercial smallsats addresses remote sensing applications. The most active commercial operators in the smallsat segment launched in LEO over the last seven years have been Planet, Spire, and Orbcomm, which together account for more than 70% of the market (55% for Planet alone). Major satellite players such as Inmarsat, Eutelsat, Intelsat and SES, which focus on heavier satellites in geostationary orbit, are absent from the top 10.

Fig. 3: Commercial smallsats by application



Source: Bryce Space & Technology

The nanosatellite segment refers to satellites weighing between 1kg and 10kg. With 193 satellites launched in 2018, the total number of nanosats launched increased by almost 20x between 2012 and 2018. Most nanosatellites comply with the Cubesat standard, which recommends a modular structure composed of one to six units of 10x10x10 cm3, and are referred to as 1U, 3U or 6U satellites. Nanosatellites operate most commonly in LEO.

Low Earth Orbit (LEO) is used by Earth-observation satellites that operate at altitudes between 450 to 1,000 km above Earth, with the most common between 500 and 650 km. The angle of the plane of the orbit to the equator is always higher than 60°, and their velocity is approximately 7.4 km/s, so they take about 100 minutes to complete one revolution of the planet and cover 14 orbits in a day. Because they are moving fast, they only remain within view of any given point for about 10 minutes. As a result, they must be capable of performing their mission autonomously without intervention from a satellite control center.

Geostationary Earth Orbit (GEO) has so far been the most traditional use case for the commercial satellite market, to serve telecommunications and direct to home TV needs. Traditional operators in these markets include companies like SES, Intelsat, Eutelsat, DirectTV, Echostar, Inmarsat and others. GEO is a circular orbit in the plane of the equator with an altitude of 35,786 km from the surface. A satellite in GEO takes 24 hours to complete one revolution of the planet. As a result, a geostationary satellite appears fixed in space, meaning the satellite's signal can be received without having to repoint the receiving antenna all the time. The satellite is moving at a speed of about 3 km/s.

Sitting between GEO and LEO, Medium Earth Orbit (MEO) is far less used. MEO is notably populated by navigation satellites in the GPS and Galileo constellations. For navigation purposes, LEO orbits would require too many satellites to ensure constant visibility, while GEO orbits do not cover the entire globe. MEO satellites operate at altitudes of 19,000 to 23,000 km and at a velocity of just under 4 km/s.

With the success of SpaceX over the past decade, launching a nanosatellite for commercial purposes has become a far more common event than it used to be, and the smallsat market has grown alongside the growth of SpaceX and the focus of the PSLV

launch vehicle from ISRO as well as the Vega launch vehicle launched by Arianespace and to a lesser extent the Antares vehicle from Orbital. Growth in the smallsat and nanosatellite market has led to the development and operational capabilities of numerous new launch vehicles, focused on this market. These include the Electron vehicle developed by RocketLab, Virgin Orbit, Firefly, Orbex, Relativity Space, as well as countless others. Current market estimates have 120 launch vehicles being developed with about 30 that have publicly announced their funding. Only a handful of these small launch vehicles will be able to succeed long term and ultimately it will depend on the amount of government support each vehicle receives.

With the traditional players launching mature launch vehicles, the success rate in the industry has been very strong. A common goal for all launch vehicles is to maintain a success rate of more than 95%. Companies like Arianespace, SpaceX and ISRO are all performing at levels above that at the moment which has driven down insurance rates for the industry. However, with the influx of new launch vehicles, there will be a period of uncertainty as these new vehicles will undoubtedly go through a period of growing pains.

All these developments have opened the door for new entrants in the satellite industry which have started to develop low-cost, low-power, nanosatellite constellations to address the last remaining challenges of satellite IoT, aiming to ubiquitously connect hundreds of millions of existing and potential devices in remote, rural and maritime areas.

30 million IoT connections expected in non-dense areas by 2025

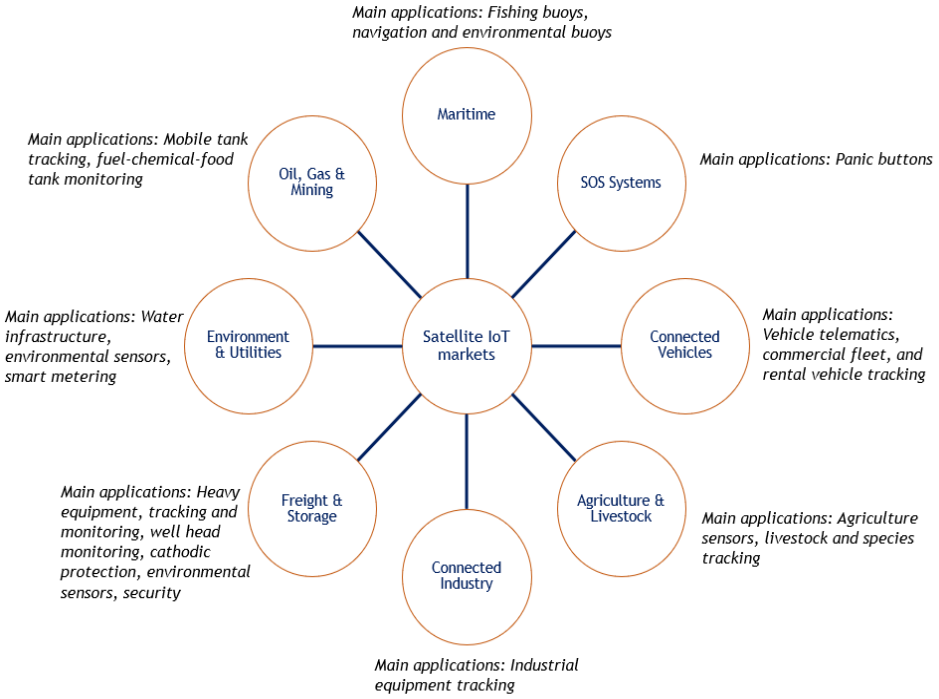
The fusion of affordable satellite connectivity and IoT represents a multi-billion-dollar market as it creates new opportunities for numerous vertical industries to collect data and accurately analyze it.

There are dozens of sectors and applications where the advantage of satellite communications is especially pronounced, and we have identified eight major market areas: 1/ Maritime, 2/ Agriculture and Livestock, 3/ SOS systems and panic buttons, 4/ Connected vehicles, 5/ Connected Industry, 6/ Environment and Utilities, 7/ Freight and storage, 8/ Oil & Gas and mining.

Demand is expected to accelerate as new technologies become available, with use cases multiplying (most of the applications being developed on LoRa today did not exist three years ago). Brand new applications could include drones for agriculture, automated animal/fish feeding systems in remote areas, as well as medicine and vaccines monitoring. Demand for this type of connectivity could be driven by new markets and projects such as the “One Belt One Road” infrastructure push to connect China to Europe and to East Africa through Central Asia. Most of these trade routes pass through remote areas with little to no connectivity. The supply chain and logistics tracking requirements for goods moving on these routes will be huge, requiring reliable monitoring solutions provided by satellites.

Among them all, three main categories of use cases for satellite IoT communications stand out, all only requiring low bandwidth: 1/ asset tracking (monitoring the location of high value assets: cargo logistics, animal tracking, equipment monitoring…), 2/ Telemetry/Telematics and analytics (monitoring of devices and information processing: meter reading, vehicle diagnosis, fuel or fishery management, systems monitoring, weather data, route or dispatch optimization …), 3/ Safety, security and emergency (authentication systems, security and panic alerts, emergency assistance, theft prevention, …), which require moderate/low latency.

Fig. 4: High potential demand for low-power satellite IoT offering



Source: Astrocast

Northern Sky Research (NSR) points out that while the majority of connected IoT devices will connect via terrestrial means, there remains a niche for low cost satcom services to deliver uninterrupted connectivity for devices operating outside of terrestrial network footprints and move in and out of terrestrial networks.

At the end of 2020, Inmarsat had 1.2m satellite IoT subscribers, whereas Iridium and Globalstar had 1.1m and 0.4m subscribers respectively, with a total of 3.4m units estimated globally by Berg Insight. BIS Research analysis reports the global satellite M2M and IoT network market is expected to witness significant growth over the forecast period 2018-2023, due to the rising demand of fast and flexible wireless communication across various industries. According to BIS Research analysis, the global satellite M2M and IoT network market generated USD617.3m in 2017 and is estimated to grow at a CAGR of 32.6% during 2018-2023. Rethink Technology Research's 2019 report on the Satellite IoT market indicates that while only accounting for 2.5 million units globally in mid-2019, the Satellite IoT market is expected to grow at a compound annual growth rate (CAGR) of c. 50%, reaching 30.3 million connections by 2025, twice the estimate of Berg Insight. A similar number can be drawn from BIS research estimates while other market research firms suggest even greater numbers. Frost & Sullivan reported that while only accounting for 25.5 million units globally in 2015, the satellite IoT market is expected to grow at a faster pace than any other satellite market, with a CAGR of 19.9%, which implies more than 150 million connections by 2025, but we believe this includes all forms of M2M satellite connections.

As highlighted in the table below, and based on the various independent research sources, we estimate the total Satellite IoT market could reach 34m units and EUR4.5bn by 2025. This is still less than 1% of the total estimated 2025 IoT market in number of connections.

Fig. 5: Satellite IoT market estimates (in millions of connections)

Source	Independent research data	BG 2025 market volumes estimates	BG 2025 market value estimates
Frost & Sullivan	25m units in 2055 19.9% estim. CAGR	158m	USD9.3bn
Berg Insight	3.4m units in 2020, growing to 15.7m in 2025	15.7m	EUR2.3bn
BIS Research	USD617m market in 2017 32.58% 2018-2023 estim. CAGR	Low end: 36.6m (2017 estim. arpu) High end: 53.6m (2020 estim. arpu)	USD5.9bn
Rethink research	2.5m units in 2019, growing to 30.3m in 2025 EUR5.23bn 2025 market estim.	30.3m	EUR5.23bn
Average (excl. Frost & Sullivan)		**34m**	**EUR4.5bn**

Source: ReTHINK Research, BIS Research, Frost & Sullivan, Berg Insight, Bryan Garnier & Co estim.

Environmental and societal concerns are a clear driver

In particular, we view environmental concerns as a strong driver for the adoption of IoT in non-dense areas. IoT technologies can indeed help address a number of environmental and social oriented use cases such as:

1/ Disaster prevention. The technology can be used to protect population and anticipate/prevent disasters (Examples: Study abnormal emissions from a nuclear power plant, particular movements announcing tsunamis or tornadoes…).

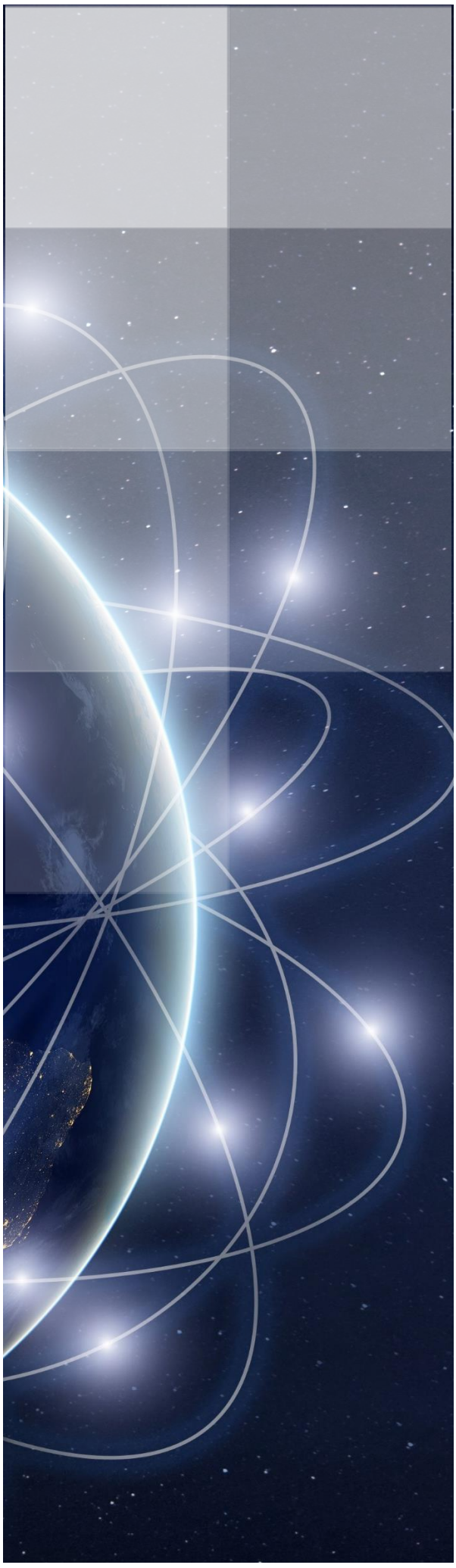
2/ Energy Optimisation. IoT connections allow energy optimization and Co2 emission reductions (Examples: Optimize vehicle maintenance, increase supply chain efficiency, reduce fishing fuel consumption…).

3/ Water and soil monitoring. Monitoring of ocean surfaces and soils in low density areas (Examples: Monitor water scarcity in remote areas, optimize crop fields watering, monitor water for quality, pollutants, thermal contaminants, chemical leakages… monitor soil quality for agriculture…).

4/ Wildlife and biodiversity tracking. Wildlife and biodiversity have been arduous to track due to their mobility and isolated habitat (Examples: Iberian Lynx, previously considered as the feline the most threatened in the world, has been rehabilitated though IoT support, helping scientists to understand its way of life and habitat).

5/ Healthcare and humanitarian relief. A satellite network can be used to reach isolated or sick populations (Examples: Remote care for isolate persons, automation of drug supply chain based on remaining stocks, targeting of sick animal in a herd to isolate it and minimize the antibiotic supply...)

As far as ESG considerations are concerned, we point out Astrocast is only focusing on civil applications, allowing to export the technology anywhere without any restrictions. Astrocast's technology will not be involved in armed conflits as the company is not active in the Defense/Military segment. Also, as Astrocast headquarters are based in Geneva, the company enjoys strong proximity with major NGOs, and is having advanced discussions with a number of them.



BRYAN, GARNIER & CO

Section 02

Technology

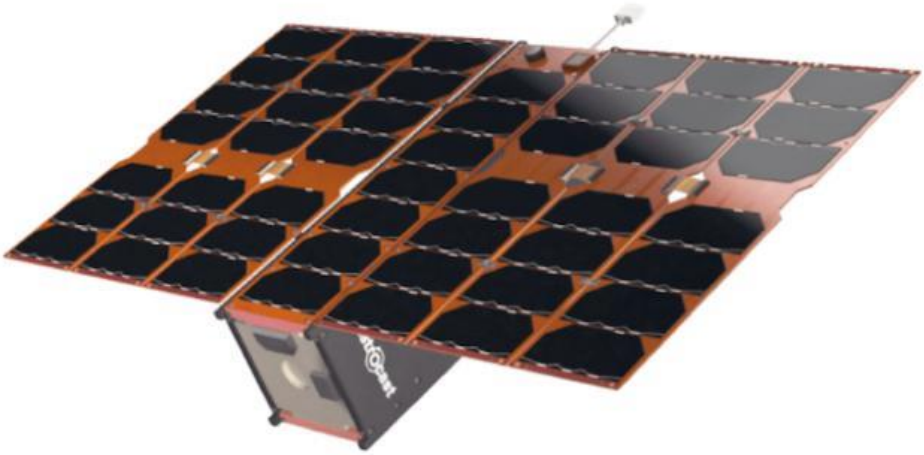
A leading technology tailor-made for IoT applications

An already operating constellation

Astrocast is the **designer**, **manufacturer** and **operator** of a low cost, optimised nanosatellite constellation for bi-directional IoT communications.

Twelve satellites have already been launched into orbit and are fully operational. The first two were launched in 2018 and 2019, for testing and customer pilot testing purposes, while the other 10 were launched in H1 2021 and are ready for commercial service.

Fig. 6: Astrocast nanosatellite model



Source: Astrocast

Astrocast's constellation sits in the LEO segment, with orbits ranging from 500 to 600 km above Earth, along with Planet, Spire, Iridium as well the recent smallsat constellation initiatives such as Starlink, Oneweb and Telesat (with larger micro satellites aiming at providing ubiquitous broadband connectivity rather than IoT services and with up to thousands of satellites launched by each constellation). Objects in LEO move at around 7-8km/s and rotate 14 times around the earth in one day. Because the satellites in LEO are not geostationary relative to the Earth, it is necessary to have multiple satellites to ensure continuous coverage of a specific zone of the world.

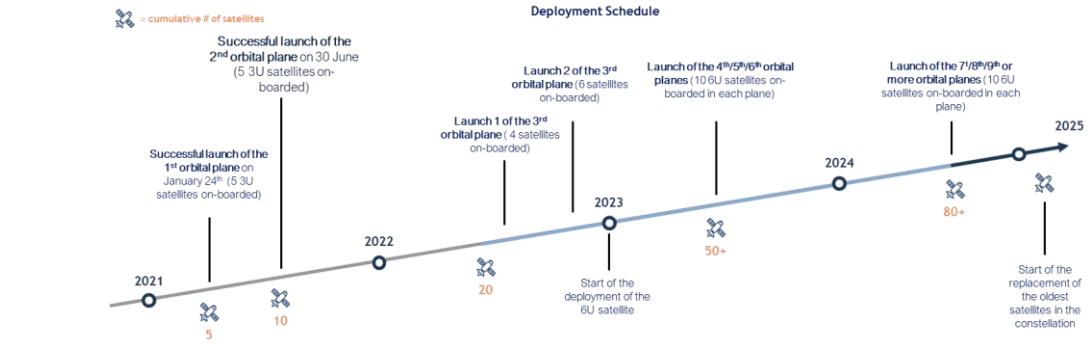
The full target constellation will be made up of 100 satellites, of which 80 will be on polar orbits, 20 on equatorial orbits to further reduce latency, of which 20 are in orbit spares for redundancy purposes (two per orbital planes). The deployment of the constellation will be progressive, based on the schedule and availability of suitable launches. The next two launches planned for 2022 will carry 4 and 6 satellites respectively, around Q2/Q3 and Q4 respectively. Subsequently, additional orbital planes are to be launched between 2023 and 2024 to densify the constellation and drive down latency. Satellites launched in 2022 will embark new technologies intermediate

between 3U and 6U. As soon as 2023, satellites launched will be 6U (vs 3U before, ie 8kg vs 5kg), will triple M2M payload capacity, use an inter-satellite communication technology that will drastically reduce latency, and will also have a beam radius increased from 800 km to 1500 km.

All Astrocast satellites embark propulsion mechanisms which ensure collision avoidance (and are also used if needed for placement into orbit).

Spare satellites are deployed on the same orbital plane as operational satellites. Spare satellites will be kept in safe mode to reduce the risk of failure and the deterioration of components and regular health checks will be executed. Optionally usage could include R&D testing of new technologies.

Fig. 7: Deployment schedule



Source: Astrocast

The frequency of the message update Astrocast will be able to provide its customers will depend on progress in the constellation's deployment. The higher the number of active satellites, the higher the update frequency can be. Initially, Astrocast provides global coverage with a worst-case latency of up to 15 hours, or equivalent to a maximum of two messages per day. This will allow the company to begin commercial sales, targeting applications looking for no more than daily updates and further promote its technology. Once the complete constellation is launched by the end of 2024, Astrocast will be able to offer updates every 10 to 15 minutes. Considering that Astrocast's addressable market does not seek a true real-time coverage (government and military), the number of satellites planned within the constellation appears to be the appropriate compromise between the size of the beam/coverage and the power available on the satellite.

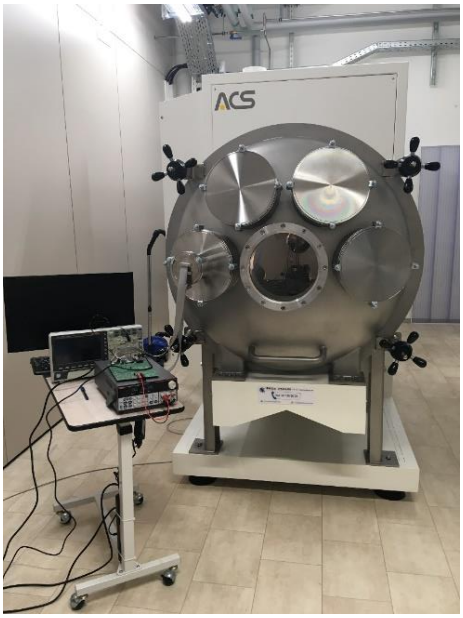
Replacement of the oldest satellites should begin in late 2023 or early 2024. Astrocast will launch an average of 30 satellites a year for the ongoing renewal of the constellation. This could be reduced if the three-year lifetime is exceeded. However, for conservative purposes we assume a 3.3-year renewal cycle. This should allow Astrocast to continually improve satellite technology and add new service features and functionalities.

Even with a cadre of new companies entering the market, the launch of satellites and the space industry remain a highly technological and complex environment where expertise and know-how is key to make the right choices (technology, suppliers) in order to optimize costs and performance while minimizing risks. The first three successful launches (for a total of seven satellites) confirms Astrocast team's good track-record in space and satellite launches. Suppliers include Spaceflight, D-Orbit, and others, but Astrocast is expected to take a conservative approach to the launch vehicles picked, making sure reliability/cost is optimal. For the first missions, Astrocast launched its satellites twice on Falcon 9 (SpaceX) and once on PSLV (ISRO).

Astrocast benefits from insurance programs covering launch risks, as well as third party liability coverage for in orbit collision risks.

The satellites are assembled by Astrocast and based on the Astrocast team's experience with SwissCube and numerous other missions.

Fig. 8: Astrocast's Thermal Vacuum Chamber for satellite development and testing

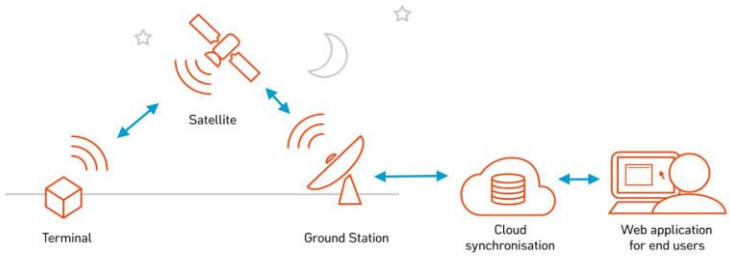


Source: Astrocast

Communication between the customer's assets and Astrocast's satellites passes through terrestrial ground stations. These ground stations are located in strategically picked locations around the globe. Astrocast will not build its own network of ground stations but will rely on both existing and established ground stations and new space ground station providers. This will reduce Astrocast's overall CAPEX requirement and simplify the licensing process, unlike some competition. This decision is meant to balance cost and risks. At least one ground station in the polar region will be used as the core of the network as it guarantees at least one contact per orbit per satellite. Other ground stations in various regions will be used to reduce the system latency and increase the system capacity.

Astrocast has two ground station partners: Kongsberg Satellite Services (KSAT) and Leaf Space. KSAT is a well-established provider of communication services based in Norway. KSAT operates more than 15 ground stations that cover the entire globe and is therefore able to provide a support for every orbit. Leaf Space, based in Italy, will be Astrocast's second source. Astrocast will use Leaf Space to support the expansion of its constellation. In total, 14 ground stations (in seven locations) will be deployed, two with KSAT and 12 with Leaf Space to provide up to two connections per orbit, per satellite. With the arrival of the intersatellite link (2023) this will provide an almost real-time connection with all the constellation satellites.

Fig. 9: Astrocast's communication architecture



Source: Astrocast

The Mission Control Center is based at Astrocast's facilities in Switzerland and uses flight-proven software. Data management and web application interface for end-users are developed on a cloud-based infrastructure.

Astrocast's system will be bi-directional, which means that the customer device will be able to send to as well as request information from the satellite. The upstream message size can fluctuate from 1 to 160 Bytes, while downstream information can reach up to 40 Bytes in one packet. The maximum number of connections a satellite can support depends on the daily message traffic in volume and size. According to Astrocast, estimated connected units by 2025 imply capacity utilisation of less than 25% of the constellation resources, and the company expects no future capacity constraints.

Data will be delivered to the user via an API. The web application is expected to evolve with the products to provide more and more data analytics functionalities. These tools will include additional data about the terminals including limited geolocation, weather, firmware revisions, RSSI information, configuration settings, etc.

Chipset and protocol developed in partnership with blue chip aerospace players

In addition to the satellite themselves, Astrocast is developing modules to collect and transmit data from sensors or other customer assets, which is then collected by the satellite constellation.

Initially, the company only offers ready-to-use modules that include the Company's ASIC and other components for customers who simply want to have access to the Astrocast network and do not need a high level of integration in an existing system.

Fig. 10: Astrocast module

Source: Astrocast

Astrocast also provides a development kit. The WiFi board provides a low latency development environment using WiFi to simulate the satellite connection and allows

users to test the interface between their assets and Astrocast's hardware platform, while the satellite board allows users to connect their assets to Astrocast.

By 2023, Astrocast plans to offer an enhanced ASIC chip that will integrate more components. In addition, to being embedded in Astrocast's modules, the new ASIC version will also be available as a standalone device. This offer will address high volume customers who want to integrate a cost-effective and very low-power chip into their existing hardware.

Astrocast will also be developing some of its own vertical market applications which the company can bring to market directly to consumers. This will give the company the ability to control the development and sale of high margin opportunities. An example of this is a panic button. This will be a small device with integrated GPS that can provide localization in case of emergencies. Astrocast says it will work with insurance and roadside assistance companies on a version of this product for automobiles and will also work with maritime VARs on a version for small craft boat owners.

Fig. 11: Astrocast panic button prototype

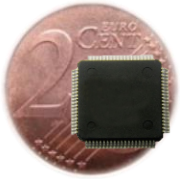
Source: Astrocast

CEA/LETI partnership

Astrocast's communication terminal is based on a miniaturized L-band Application Specific Integrated Circuit (ASIC) developed by the CEA/LETI under Astrocast's lead. CEA/LETI is a subsidiary of France's nuclear and renewable energy commission. CEA/LETI is one of the most prolific organisations for applied research in microelectronics and nanotechnologies. Through several spin-offs, the organisation created successful and large publicly-traded companies such as STMicroelectronics and Soitec.

CEA/LETI is used to working with startups. We believe CEA/LETI is therefore a suitable partner to support Astrocast's development. Current contractual terms between CEA/LETI and Astrocast stipulate that the CEA/LETI will support the ASIC design as well as the manufacturing process of the chip for Astrocast. CEA/LETI's ASIC will be manufactured by EUROPRACTICE, a subsidiary of TSMC which is the world's leading foundry, and the assembly and packaging will be handle by OSAT partners such as Presto Engineering, Serma Technologies, and Synergie-Cad.

CEA/LETI will also ensure the production scalability and the necessary improvements of the chip going forward. Like Astrocast's contract with Airbus, the exclusivity of CEA's IP used to develop the ASIC will be limited to nanosatellites using narrowband.



Thanks to the compactness of the ASIC developed with the CEA/LETI, less than 10x10 mm2, the first version of the terminal will already have a very small footprint. The proprietary random-access protocol, is optimised for IoT data, aiming to optimise capacity and spectrum utilisation. These features combined with access to L-band spectrum results in a low power terminal that has similar power consumption to ground IoT systems. Security is guaranteed by state-of-the-art authentication and encryption techniques (256-bit encryption with multi-level security). The Astrocast terminal can be easily integrated

and connected into customers' assets via a simple and reliable standard communication bus (initially UART/SPI).

Airbus partnership

In addition to its partnership with the CEA/LETI, Astrocast is working closely with Airbus Defence and Space on the development of the Terminal ASIC and on the low-level machine-to-machine (M2M) protocol. With its deep expertise in satellite communications and space-based applications, Airbus provides valuable know-how in all communication components. For many years, Airbus has been working on terrestrial and satellite communication technologies for IoT. It has developed a low cost, open and secure connectivity solution known as the Universal Network for the Internet of Things (UNIT). Airbus UNIT technology is an innovative communication protocol enhancing transmission and reception between the satellites and earth equipment, including the ground terminals incorporating the UNIT chip on the one hand and the on-ground server on the other.

Airbus has identified Astrocast as the right partner to penetrate the fast-growing IoT market. The two companies have entered a contractual relationship by which Airbus provides Astrocast with the protocol necessary to make the satellites, the ground stations, and the customers' devices communicate. Airbus is engaged in satisfying all the necessary protocol evolutions Astrocast's system may require.

The patented data protocol is a low power and low communication rate protocol optimised for Astrocast's target market providing two-way communication capability for over-the-air upgrades and intersatellite link for reduced latency with ground station (to be launched in 2023).

However, Astrocast will have the exclusivity of the UNIT technology until 2024. This exclusivity is limited to non-governmental constellations of nanosatellites using narrowband. Astrocast is in active discussions with Airbus to extend the exclusivity.

We believe Airbus could also help Astrocast with production of the satellites if needed and ongoing enhancements through its ownership of Surrey Satellite Technology, a leading small satellite manufacturer.

We view the collaboration between Astrocast and both CEA/LETI and Airbus as one of the keys differentiating factors for Astrocast's technology and relevance in the market. For several years now, Airbus and the CEA/LETI have been working closely together to develop an innovative M2M solution to enable devices to communicate anywhere in the world, at a reasonable price. The close relationship between the CEA/LETI and Airbus allows for very efficient integration of the components, a key factor in obtaining a module with a very small footprint and very low power consumption.

Access to L-band providing a competitive advantage

Thuraya, a UAE-based GEO satellite operator, focused on satellite phone service and maritime communications via L-band, is partnering with Astrocast through an agreement to coordinate the company's L-Band frequency allocations. Thuraya has a worldwide distribution network for its satellite voice and data products that is expected to be leveraged through a marketing and distribution agreement between the two companies to help sell Astrocast products going forward.

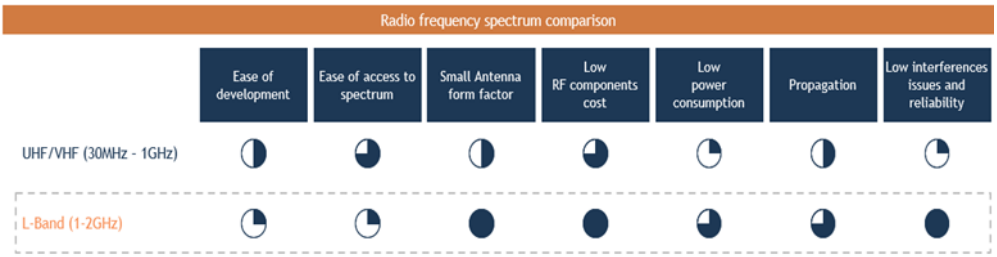
The choice of L-band for spectrum provides the optimal compromise between antenna size and range, and offers optimal propagation properties. L-Band enables the use of miniaturised antennas on the ground terminal, and high-gain antennas on Astrocast's nanosatellites. We believe it is the best overall band to provide Satellite IoT services:

- Compared with Ka and Ku-bands, such as the ones used by Kepler's terminals, the L-band frequency is not affected by weather-related perturbations such as

rain fade, ensuring better propagation guarantees. Also, the power needed to operate in the L-band is lower than in the Ka and Ku-bands, which makes it an ideal band for small embedded IoT devices needing long lasting batteries, and which reduces the total cost of ownership for the customer.

- Compared with UHF/VHF bands, such as those chosen by Hiber, Swarm and Myriota, L-band also has several advantages. Firstly, it enables the use of smaller antennas, which reduces the cost (on average in the industry antenna represents c.25% of the terminal cost, vs 5%-15% for Astrocast) as well as the space needed on the connected objects. Second, L-band is allocated globally, which makes the interference risk lower, especially with military applications. Third, UHF bands are more subject to reflection issues with the ionosphere, depending on solar cycles, which limits the overall performance of the system. And finally, the amount of spectrum available on UHF/VHF is very limited, which raises saturation risks.

Fig. 12: L-band Infrastructure vs UHF/VHF



Source: Astrocast

In addition, access to L-band spectrum provides a high barrier to entry.

For a start-up satellite operator to get its own L-band through the ITU standard process is a long and complex process which can take more than two years and involves extensive legal efforts. Furthermore, it will also need coordination agreements with other owners of L-band spectrum (who have no obvious interest to cooperate) before a final decision can be rendered on access to the spectrum. Making the case for the obvious hurdles for any start-up, for an operator owning L-band spectrum to agree to partner another operator in its spectrum on a global basis requires a strategic fit.

In our view, the agreement between Thuraya and Astrocast shows Thuraya viewed Astrocast as the right strategic partner, with the right platform and technical knowledge, to address a complementary market inaccessible to Thuraya with its geostationary focus.

Although Thuraya owns a global license, Astrocast will still need to obtain administrative landing rights/regulatory clearances from the various countries where it will operate. However, the process to obtain this is expected to be fairly smooth, as meeting the regulatory standards on the combination of L-band and IoT is straightforward, and Thuraya should be available to provide its support if necessary.

Astrocast's agreement with Thuraya covers two-thirds of the globe as the only region not addressed by Thuraya's license is the Americas. In order to provide its service in this region, Astrocast is currently in discussions with existing players in this market to address potential partnering schemes for this region. These discussions are currently in preliminary stages and are progressing.

The agreement with Thuraya includes mutual exclusivity until 2024, with an option to extend. The agreement runs for 3.5 years and came into effect in Q2 2020. Astrocast is currently in discussions regarding renewal of the agreement with Thuraya.

Best positioned in the competitive landscape

Terrestrial competition is not appropriate in a number of IoT use cases

Two main categories of wireless communication networks exist:

- Short range networks such as WiFi, Bluetooth, ZigBee, Near Field Communication (NFC)
- Wide Area Networks (WAN) that include cellular networks and Low Power WAN (LPWAN) such as LoRa, SigFox and satellite networks.

The choice between the different technologies mostly depends on their respective pricing, network coverage, required throughput, and power consumption constraints. Especially when considering battery-powered IoT devices that are expected to run between seven and 10 years, there is an important trade-off to make between the performance of the network in terms of bandwidth and data speed and the power it will drain over time.

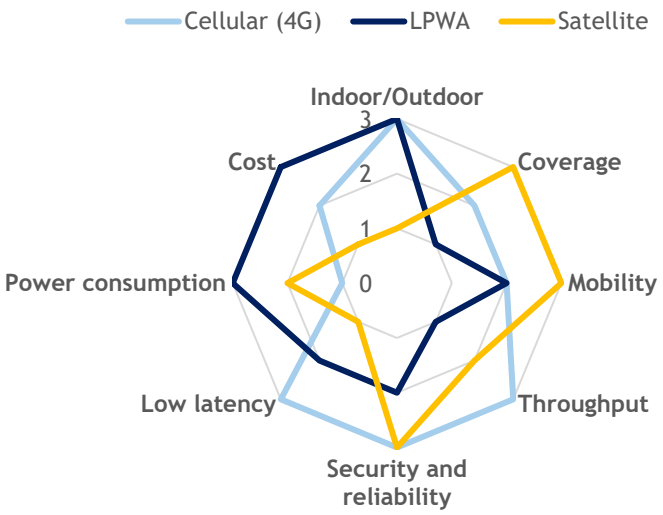
Astrocast's satellite technology seeks to overcome the shortcomings of other WAN solutions that fail to address a significant part of the IoT market.

Cellular networks are the most used today for M2M/IoT communications particularly because of the size of the existing coverage on a global scale. However, cellular networks have several constraints. On the one hand, while cellular networks can provide very low latency and high bandwidth for large over-the-air updates, these networks are based on more expensive hardware and data plans. On top of that, they are not tailored for low power applications. On the other hand, coverage of the most affordable cellular solutions that are suitable for IoT applications, i.e. 2G and 3G networks, have been declining in favour of more recent networks.

In many instances, IoT does not require expensive data plans, nor does it need millisecond latency. In this respect, LPWAN and satellite networks are designed to limit the cost and power consumption of the system. These technologies have limited throughput and longer latency, but are well suited for asset tracking, telematics/analytics, security, or emergency applications.

Nonetheless, satellite solutions like the one provided by Astrocast are the only way to obtain ubiquitous coverage of the earth. GSMA estimates that around 80% of the global population has access to cellular networks, however, cellular coverage represents only 10% of the total surface of the earth, often leaving rural and maritime areas uncovered. LoRa and SigFox also fail to properly address these environments as their gateways need an internet connection with the network server.

Fig. 13: Satellite vs terrestrial communications



Source: Bryan, Garnier & Co

5G is often mentioned as an alternative to legacy cellular or LPWAN technologies as far as IoT is concerned. The current available version of 5G mostly addresses ultra-broadband use cases, but the future version known as "standalone 5G" and which is expected to be deployed by 2023, will indeed address IoT needs as well. However, we believe the technology could be more suited to the most advanced IoT business cases than LoRa for example as far as terrestrial use cases are concerned. 5G for satellite implementations are also discussed, which could in theory represent a threat to Astrocast's technology. 5G is put forward by players such as Omnispace and AST in particular. However, we believe it is still a very long shot here. Standards have not been fully released yet for 5G over Satellite, making it hard to develop technology for the moment. Also, relying on cellular technology might need complex coordination with cellular players and regulators across the globe. And finally, we believe investments in the technology could be massive and far greater compared with the relatively low CAPEX of Astrocast. And here again, we believe Astrocast has a timing advantage as its technology is already fully operational.

Existing satellite solutions do not appropriately address the market opportunities

One of the key aspects considered heavily in evaluating the relevance of the different technologies is pricing.

Astrocast focuses on providing an IoT network to address remote areas and urban LPWAN applications that need a satellite backup. These applications do not require high data speed or high bandwidth which significantly limits the constellation and the hardware costs. This contrasts with the established satellite operators such as Iridium and Orbcomm that have a more sophisticated and expensive fleet to address a broader range of services. Therefore, their current offerings are too expensive for IoT applications that typically require very little data per month.

Astrocast is targeting pricing similar to that for equivalent LPWAN services for daily transmissions. Higher data volume services should be priced well below existing satellite services.

Fig. 14: Astrocast's pricing vs competition

Company	iridium	ORBCOMM	inmarsat The mobile satellite company	astrocast
Coverage	Global	Global	Global	Global Low-Power Solutions
Hardware Cost	$100-150	$100	$500	<$50 (module) — <$8 (ASIC)
Service Cost	~$1/KB	~$5/KB	~$1.5/KB	~$0.16-$1/KB
# of satellites	81	12	13	5 to 100
Weight	860kg	170kg	6000kg	<10kg
Estimated cost per satellite	$33m/sat.	$6.5m/sat.	$200m/sat.	~$250/sat.

Source: Astrocast

While users can purchase connectivity through LPWANs for as little as a few dollars per year for a few kiloBytes of data, current satellite operators like Iridium and Orbcomm charge upwards of USD10 per month. Because of Astrocast's inexpensive network architecture and global coverage, the group can charge a fraction of this price for the same amount of data.

Astrocast's cost differentiation vs other satellite players stems from the following:

- - Its satellites cost a fraction of the new constellations being launched by Iridium and Orbcomm. Weighing around 5Kg, each nanosatellite will cost less than USD500k to manufacture and launch. The total capital cost to build the network will be around CHF50m compared with hundreds of millions for Orbcomm and billions for Iridium Next.
- - Since Astrocast is only focused on IoT applications, it can build much less expensive infrastructure. This also means it can charge a fraction of what the others charge for data services.
- - The ASIC developed with CEA/LETI gives the company a very low-cost entry for customers wanting to integrate satellite connectivity directly into their hardware.

However, these satellite operators are established companies with working products: repricing cannot be ruled out to compete against new entrants, by offering a stripped-down service offering. Additionally, prospective customers are more likely to invest in constellation specific terminals for networks that have an established track record. For many IoT products, lifecycles of 10+ years are typical and customers want to make sure that a service will be operational for that duration.

Iridium currently markets its 9,603 terminals in bulk for around EUR80 to its very large customers and closer to EUR100-120 for it more modest customers. With the launch of its new constellation, Iridium NEXT, the group is more focused on higher revenue opportunities, especially those in the aviation markets. These could, in fact, represent potential partners for Astrocast, to allow Iridium to diversify its constellation portfolio.

Orbcomm is mainly focused on M2M asset tracking and monitoring applications. It provides full, end-to-end solutions in a number of vertical markets, not just terminals and network connectivity. It is quite strong in the container tracking market, though it also has customers in many other industries. As with Iridium, it could be a potential partner for Astrocast to allow Orbcomm to diversify its constellations portfolio.

M&A with Iridium or Orbcomm cannot be excluded either. For instance, Orbcomm has acquired 12 companies since 2011 including SkyWave.

Emerging competitors lack Astrocast's competitive edge

Fig. 15: Satellite IoT connectivity competitors listed by criteria

Company	MYRIOTA	kinéis	SWARM	hiber	astrocast
Antenna size					
Frequency	UHF/VHF	UHF	VHF	UHF/VHF	L-Band
Peak power		TBD		TBD	
Two-way	Planned	Planned	Planned	Planned	Demonstrated (available Q3-21)
Latency	Medium	Medium	Low	Low	Low
Multicast	TBD	TBD	TBD	TBD	Planned
Encryption	AES 256 bit	TBD	TBD	TBD	AES 256 bit
Estimated cost per device	<$50	TBD	$119	TBD	<$50
Deployment (% of const.)	<5%	<5%	~50%	<5%	7%

Source: Astrocast

The IoT satellite communications market has become competitive in the past year with several new companies planning constellations. There are several new space companies including Hiber, Myriota, Fleet, Kepler and Swarm that are specifically targeting the low data rate, high latency, ultra-low power IoT market.

Myriota

Myriota, based in Brisbane (Australia), has a very strong technical leadership team with former Research Professor, Dr. Alex Grant as CEO and former research fellow Dr. David Haley as CTO. The company has filed for 20 M2M/IoT related patents and seems to have more than eight granted so far. The group raised c. USD15m in April 2020 in a round led by Main Sequence Ventures. Based on its slow hiring patterns and limited marketing, it seems this funding is heavily tranched. The team has recently grown to 40+ employees. exactEarth is one of their investors. Myriota will also use exactEarth's AIS satellite constellation for its satellite M2M component at the start.

Myriota's USD50 terminal module is VHF/UHF-based and has been designed for a battery life of five years (vs 10 years targeted for Astrocast). The group has announced its data plan pricing and is mainly focused on high latency customers looking for once or twice daily update. Its development kit was first announced in 2016 and launched in 2019. The Myriota terminal sends 24 Byte data packets, and its full constellation is expected to have a latency of 90 minutes. Due to the VHF/UHF frequency used, the group's antenna will be much larger than those of Astrocast. It has received a small contract from the Australian Military for a black box monitoring device for soldiers and it appears that the developer kit only offers one-way communication.

Myriota currently serves "a few hundred" pilot customers based on four of exactEarth's satellites. It has launched three new satellites through Rocket Labs' "They Go Up So Fast" mission, in March 2021, and plans to reach a constellation of more than 100 satellites by 2023.

At present, Hiber, based in Amsterdam, appears to be the most direct competition to Astrocast. It appears to be ahead of Astrocast in deployment of its system and has announced that development of the radio module has been finalised and shipping of development kits has begun, which can only be used for prototyping/testing purposes until the Hiber network has been released for commercial use. However, the group has not released any specifications. The picture it shows of the radio module is an unpopulated board and the picture of the development kit is only a rendering. Hiber's stated manufacturing costs are as low as USD50 in units of 1,000 and it says this will drop to USD20 with greater volume. By comparison, Astrocast is expecting manufacturing costs of around USD20 in medium volume manufacturing runs. Hiber's development kit sells for EUR795.

Hiber has raised EUR11m in equity and recently secured EUR26m in venture funding from the European Innovation Council Fund and private investments to support its launch and commercial efforts. It has an ITU filing, in the 430 MHz satellite band and has established a joint marketing partnership with Iridium. Hiber is planning for an initial 18-24 six-unit CubeSat constellation orbiting at 700 km, later to be expanded to 50. Its satellites will be designed and manufactured by Innovative Solutions in Space (ISIS) with a payload developed by Hyperion Technologies.

Hiber has been more aggressive commercially than Astrocast and claims to have signed up 70 pilot users with many more ready to come onboard. It is staffing up its sales and customer support functions now. We believe Hiber's weaknesses lie in technical staff and perhaps even technical understanding, with these functions outsourced. Its satellites are twice the size of Astrocast's current satellites and will subsequently cost more to build and launch. However, with fewer satellites, the total cost of its constellation may be roughly the same as Astrocast.

From a technical standpoint, given the limited number of satellites in Hiber's constellation, elevation angles should be lower (down to approximately 0/5° vs 30/35% for Astrocast) which could raise propagation issues in case of surrounding buildings or mountains. For this reason, Hiber's terminals should also need more power to send the signal to the satellites (longer distance from the module to the satellite). In addition to UHF/VHF specific constraints, this should make Hiber's solution much less power efficient than Astrocast's. Lastly, Hiber has gone through several changes to its senior management since its inception which may lead to changes in its strategic direction.

Swarm Technologies raised a total of over USD36m with investors including Social Capital, 4DX Ventures, and NJF Capital, and Sky Dayton, founder of the internet service providers EarthLink and Boingo.

Swarm's satellites, each one-fourth the size of a single-unit CubeSat, are designed to provide two-way communications for IoT sensors and devices around the world. Swarm's proposed constellation consists of 150 satellites with deployment altitudes ranging from 400 to 550km and orbital inclinations ranging from equatorial to polar. The satellites will use frequencies in the 137-138 MHz band for downlink and in the 148-149.95 MHz band for uplink. Their frequency choice will require a much larger antenna than Astrocast's (lower frequencies require larger antennas).

Swarm was fined USD900,000 by the US Federal Communications Commission in 2019 for launching four satellites on an Indian rocket last January without permission. The company has since launched the first 12 satellites from its commercial constellation in September 2020, which join its existing nine experimental satellites in orbit.We understand Swarm's satellites do not have propulsion for collision avoidance as Astrocast has.

Fig. 16: Astrocast antenna (small white patch) vs UHF/VFH competitors

Source: Astrocast

Fleet is another Australian satellite operator. Fleet has publicly talked about a 140-satellite network of 12-unit CubeSats. If it sticks with this plan, its estimated CAPEX would be USD190-220m, which is around 3x higher than Astrocast's. Earlier this year, the group's CTO left, and this is likely to impact the company's ability to move forward. Fleet has no frequency allocations yet, but it does have a filing out of the Solomon Islands, which is believed to be for S-band. Its only announced product is a very expensive LoRaWAN gateway with satellite backhaul. Fleet resells Iridium's satellite hardware and data plans which makes this of limited commercial value.

Kepler is a Canadian satellite operator. It raised USD16m in September 2018 in a round led by Costanoa Ventures and is planning a constellation of 75-140 Ku-band 3U CubeSats. This will equate to a much higher CAPEX than Astrocast's L-Band offering. Its offering is a high speed, 2 Gigabits per second per satellite connection with a Ku band SDR and high gain antenna. Manufacturing of Kepler's satellites is by Clyde Space. Its commercial strengths are unclear at this stage.

Kineis is the French IoT satellite initiative backed by CLS/CNES (CNES is the French public centre for space studies – "Centre National d'Etudes Spatiales"). Kineis is a spin-off from CLS, a CNES subsidiary, a value-added reseller of satellite imagery and satellite communications systems generating EUR128m sales in 2018. The company is notably involved in the management of Argos system. Kineis expects to have a fleet of 25 16U (25-kilogram) satellites in orbit by 2023. The satellites are designed to operate for eight years in 650-kilometer orbits and should provide a latency around 15 minutes. French aerospace company Hemeria (ex Nexeya) is the supplier for the satellite platform, while Thales will handle the payload. Kineis raised €100m to fund the constellation, of which a significant share has been brought by the CNES and CLS, but the recent privatization of CLS provides relatives uncertainties regarding the funding of Kineis in the short term. Indeed, CNES has reduced its stake in CLS from 54% to 34% to notably reinvest part of the money in Kineis while Ardian has sold its 32%, as Ifremer (14%).

To date, Kineis has not developed or launched any proprietary IoT satellites so far, nor presented any specific IoT communications modules or ASICs outside of Argos. Its technology relies on VHF/UHF band, not on the L-band. We understand its application for new UHF frequencies came after Hiber's which may further delay commercial access to spectrum. The company mostly relies on its technical partnership with Thales which is in charge of the development of the RF Payload. Finally, Kineis/CLS are still part of a public institution, and, even though it increases their visibility at first, operating in a competitive private market might prove challenging from a cultural standpoint.

AST is a Texas-based company building a space-based cellular broadband network to operate directly with standard mobile devices based on its extensive IP and patent portfolio. The company has more than 100 employees including engineers and space scientists. AST has outsourced its satellite modules to NEC Platforms, a subsidiary of NEC Group. The company is currently building its Blue-Walker 3 satellite, targeted to launch late in the fourth quarter of 2021. Rather than trying to provide broadband internet services, it's instead partnering with mobile phone providers (similar model to existing satellite phone providers like Iridium). Their commercial offer is unclear at this stage, as they haven't yet commercialized their connectivity solution.

AST have raised a $110M in a round led by Vodafone and Rakuten in March 2020, and went public in April 2021 after it completed its combination with New Providence Acquisition Corp. It raised $462 million in gross proceeds from the transaction.

In addition to the players listed above, there are additional new space operators such as Spire that could pose a threat if they decided to enter this market. New initiatives such as Starlink or Oneweb, (which are constellations of mini/micro satellites), do not fall in the Astrocast competitor's category, as they seek to provide ubiquitous low latency broadband connectivity, and are not designed specifically for IoT services. Moreover, the difficulties of Oneweb, which filed for bankruptcy last year before being bought back by the by a consortium consisting of the U.K. government and India's Bharti Global, shows the financial challenges faced by these high capex ventures and their depency on high ARPU revenue customers.

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Section 03

Business outlook

An agenda to become a market leader in IoT

An experienced team to lead the company's development

Astrocast has a seasoned management team with a strong track record in Space and IoT. The profiles of key management people are described below.

Dr. José Achache (Chairman of the Board)

Before joining Astrocast as Chairman, José Achache spent 15 years as a researcher in geophysics and an executive manager in French and international space agencies such as BRGM, CNES, ESA or the Group on Earth Observation. He is the founder and CEO of ALTYN, a Swiss Space company designing satellite projects, as well as co-founder of Groupe Plani, a Paris-based company making equipment and services for the video and TV production industry. He occupies the role of Chairman at several space technology companies such as Media Lario, a world leader in advanced optical systems and components for space missions; or Geosatis, providing GPS-based ankle bracelets for tracking and monitoring offenders.

José also held key positions at the Institute de Physique du Globe de Paris as a fellow professor, with the European Space Agency as Director of Earth Observation and as the Secretariat Director of Global Earth Observation System of Systems. He is also the architect of the sentinel series of satellites of the Copernicus/GMES program developed by the European Union.

José Achache is a graduate from Ecole Normale Supérieure in Paris, holds a PhD in Geophysics from University Pierre et Marie Curie and a PhD in Physical Sciences from University Denis Diderot.

Fabien Jordan (Founder & Chief Executive Officer)

Fabien Jordan developed Switzerland's first satellite, SwissCube, a highly successful satellite mission initially projected to have a one-year lifespan but that still remains fully functional in orbit today, 12 years post-launch. Fabien Jordan's SwissCube contributions include his expertise in the electrical developments of the spacecraft while serving as Electrical Systems Engineer for the Swiss Space Center EPFL in Lausanne, Switzerland. Fabien's engineering expertise also spans technical work for the PanCam WAC Instrument of the 2018 ExoMars Mission while at the Space Exploration Institute in Neuchatel, Switzerland. Fabien has therefore developed solid experience in nanosatellite systems engineering and strong connections with the CubeSats community.

Fabien Jordan obtained his Electrical Engineering Degree with a specialization in Energy Systems, from University of Applied Sciences Western Switzerland (HEIG-VD).

Kjell Karlsen (Chief Financial Officer - CFO)

As former President and CFO of Sea Launch, as well as serving on the BOD of Sea Launch AG and Energia Logistics US, Kjell Karlsen helped lead one of the world's most notable and historic commercial space endeavors for 14 years. We view this experience at the helm of a satellite launch provider as well as his vast network in the industry as valuable to Astrocast as the company negotiates launch service contracts, partnership

contracts and readies for a series of key mission milestones. Kjell Karlsen has also led Oslo, Norway-based Kvaerner Inc. as President, and has served Kvaerner Financial Services as Vice President, establishing Kvaerner's US headquarters in Philadelphia and administering operations for all of the company's US divisions. Kjell Karlsen has also served as Executive Vice President and CFO to the Motion Picture Licensing Company, and as First Vice President to Den Norske Bank, an Oslo-based financial institution in Norway.

Kjell obtained his Bachelor's degree in Marketing and Finance from the University of Oregon and his Master of Business Administration (MBA) from Lehigh University.

Federico Belloni (Co-Founder, CTO)

Federico Belloni leads all Astrocast's technology endeavors, bringing to Astrocast proven expertise in the nanosatellite field: along with CEO Fabien Jordan, he is one of the key members of the team that designed and launched SwissCube. Federico's experience with the mission occurred during his tenure with EPFL, where he held roles in Systems Engineering, and in SwissCube Beacon Board Analysis and S-Band Satellite COM Board Analysis.

Federico Belloni obtained his HES engineering degree in Telecommunications from HEIG-VD and his Master in electronics from EPFL.

Corry Brennan (Head of Global Sales)

Corry has more than 20 years' experience in international senior sales and key account management in the telecom and aerospace sectors. Prior to joining Astrocast, Corry was the head of Sales and Business Development of Globalstar's suite of M2M/IoT Devices and Integrator Chipsets. Corry has extensive knowledge and experience of the tracking and monitoring ecosystem in multiple vertical markets. Corry has also been the head of marketing and a key account manager at Eircom (wholesale).

Antonio Waller (VP of Global Sales)

Antonio has more than 15 years of general sales, management and business development experience with a focus on B2B technological sectors, IoT, Fleet Telematics, M2M and Telecoms. In particular, Antonio has been International Business Development Manager at Orbcomm (Europe) between 2015 and 2020.

A diversified go to market strategy

In order to address the numerous targeted markets, Astrocast can employ a wide range of sales channels. Distribution will thus break down into:

1/ direct sales to large application providers and OEMs like Actia, Marine Instruments, Swiss Fresh Water (water kiosks), Survitec (life jackets), insurance companies (panic button for roadside assistance), car companies (backup to OnStar type systems).

2/ Specialised system integrators and resellers such as Marlink (Maritime and land), ITC Global (Maritime, Oil and Gas), Get Wireless (Oil and Gas), Network Innovations (Maritime Oil and Gas) and Numerex.

3/ Telecom providers or IoT Platform providers such as Thuraya (which provides mobile satellite coverage to more than 162 countries in Europe, the Middle East, North, Central and East Africa, Asia, and Australia. They have over 150 local service distributors and resellers), Telefonica, LoRa network operators

4/ Hardware manufacturers and system providers such as Quake, Digi or Sierra Wireless.

5/ Traditional distributors such as Arrow, Avnet, DigiKey, Mouser or Future Electronics, which can support the large number of smaller companies looking to utilize Astrocast chipsets or modules.

Lastly, Astrocast intends to work closely with Swiss government support groups like Swiss Global Enterprise to develop local partnerships and distributor channels where applicable.

Go to market and distribution strategy will eventually depend on the targeted market. Possible distribution partners for each sector are presented below.

- Maritime: traditional distributors such as Arrow, Digikey, Mouser, etc; specialized distributors such as Marlink, or Navarino; value-added resellers like Pacific Data Systems; and direct sales to customers such as Marine Instruments or Zunibal.
- Agricultural and livestock: mostly traditional distributors such as Arrow, Digikey, Mouser, etc, or direct sales with players such as Wildlife Computers Inc. and Pathtrack.
- SOS systems and panic buttons: large B2C distributors such as Amazon or other consumer electronic websites; specialized distributors such as West Marine or Kent Water Sports; and direct sales to companies like Survitec or Lalizas.
- Connected Vehicles: hardware manufacturers such as Quake; direct sales to customers such as Actia; traditional distributors such as Arrow, Digikey, Mouser, etc.
- Water and environment: traditional distributors such as Arrow, Digikey, Mouser, etc.
- Freight and Storage: traditional distributors such as Arrow, Digikey, Mouser, etc.
- Oil & Gas: traditional distributors such as Arrow, Digikey, Mouser, etc. and direct to customers like Haliburton and Schlumberger.

The contribution from indirect sales is expected to grow going forward, reaching c. 80% by 2025.

Landmark contract with Telefonica paves the way for promising and numerous discussions with prospects

Astrocast will fuel its growth by:

- Taking market share from existing, alternative satellite-based solutions that do not provide the same level of service and/or cost efficiency.
- Offering a complement to the existing solutions such as ubiquitous back-up or extended connectivity from urban to less dense areas.
- Providing a solution for connectivity needs that are not addressed today due to technological or cost efficiency shortcomings.
- Growing alongside new needs likely to emerge, together with the increased digitalization of businesses throughout the world.

A landmark deal has already been signed between Telefonica and Astrocast this summer, where Telefonica will rely on Astrocast's solution to extend its own trackers reachability worldwide and enable its customers to collect data in areas that were not

addressed in a cost effective way before. Telefonica, one of the largest telephone network operators and mobile network providers in the world with more than 340 million clients, is aiming to provide a universal tracker using both cellular, LPWAN, Wifi and satellite. Potential contract size is unknown, we believe more than 50k units are at stake each year, but first revenues are not expected before next year.

So far, Astrocast has already generated more than 200 inbound leads and has converted more than 100 of them into prospects. Some players have been selected for pilot testing, and 14 "Astropreneur" agreements have been signed with customers using the recently launched Development Kit (April 2021), with final testing and adjustments ongoing.

Together with the ESA-related revenues (the ESA Artes Global low-cost M2M Service Demonstrator contract signed in 2017 contributed to EUR0.8m in H1 2021, while revenues from the new ESA Artes 4.0 Business Application Demonstration Project with Involi for a total of EUR0.4m are only expected in 2022) these programs will contribute in feeding the topline over 2021, but revenues will remain limited this year, at c. CHF1.28m in our estimate (vs CHF0.8m generated in H1). Also, the commercial ramp up in 2022 could be affected by worldwide semiconductor supply issues, but the company is working on turnarounds and has already secured several tens of thousands of units.

Astrocast prospects include leading international telecom operators, system integrators, industry solution providers, device manufacturers and original equipment manufacturers (OEMs) in relevant vertical markets.

Some of the most advanced discussions include those with 1/ Marine Instruments, a leading manufacturer of fishing buoys, also an investor in Astrocast, on use cases including the back-up to Iridium's solution for connecting tuna fishing buoys (localization/tracking, collection of information on fish), smart meters for aquaculture in remote areas such as shrimp farms in mangroves (collection of biomasses). 2/ Digital Matter, an Australian provider of GPS and IoT hardware, on designing and launching a satellite connected device to be used for tracking of livestock and other mobile assets, to be launched in Australia and then globally. 3/ aartesys, a Swiss provider of IoT sensors and connectivity solutions for a number of industries including utilities, industry, transportation and properties, on use cases such as the monitoring of power lines in remote areas. 4/ Astrocast is also in advanced discussions with an Australian gas tank and cylinder monitoring company currently setting up for global launch, on the remote gas tank and cylinder monitoring at low cost and without the need for sensors inside the tanks.

Attractive revenues opportunities ahead

As highlighted previously we estimate the total market of satellite IoT will reach c. 34 million connected devices by 2025. Given its leading competitive position, it is fair to assume Astrocast will equip c.20% of this market by then (slightly more conservative than the 25% guided by the company), assuming a 5% churn per year at first, then growing to 10%, a little below the level of standard telcos. This assumes incumbent players will struggle to develop an offer in line with the market's expectations, while Astrocast today appears as the most advanced solution among all the new players in the space (see competition section).

Indeed, we expect the company's offering to disrupt the satellite IoT market since no other nanosatellite player will be able to deploy a comparable constellation in such a short timeframe. By 2024, Astrocast will have a global low latency constellation, standard chipsets distributed as a standard for more than a year, and no other equivalent competitive offering expected by that timeframe, which should allow the company to grasp a significant share of the market growth.

Sales of Astrocast devices are expected to accelerate over time by reaching new addressable markets which require lower latency as Astrocast satellite network

densifies. The modules will start to sell as of beginning 2022, with possible negative impact from semiconductor supply shortages throughout the year, while the ASIC chips will only be available from 2023 onwards. ASIC chips will enable Astrocast to work with system integrators on large volume projects. As such, we estimate chips are likely to account for most of Astrocast volumes by 2024 as they help address the fragmented end-markets.

Fig. 17: Annual volume breakdown by products (in k units)

In millions of units	2021e	2022e	2023e	2024e	2025e
Annual modules sales (gross)	-	180	570	780	1,280
Number of modules EoP	-	180	741	1,484	2,616
Annual chips sales (gross)	-	-	390	1,535	2,800
Number of chips EoP	-	-	390	1,906	4,515
Total annual sales	-	180	960	2,315	4,080
Total EoP	-	180	1,131	3,389	7,131

Source: Bryan, Garnier & Co

Astrocast is set to generate three types of revenue stream:

- Hardware: sale of Astrocast hardware consisting of modules and chips.

- Data plans: recurring subscriptions to enable the hardware to access Astrocast's satellite network.

- Consulting and other revenues: sale of consulting and specific maintenance services and other revenues (grants).

Hardware pricing is expected to decrease with the quantity ordered and as the business matures. As far as modules are concerned, we estimate pricing will decrease from CHF40 per unit in 2021 to CHF30 per unit from 2024 onwards, but there could be pricing variations depending on the specific contracts. As far as chipsets are concerned, we estimate pricing will decrease from CHF7 per unit in 2023 to CHF6 per unit from 2025 onwards.

Each end-point (module and chip) is expected to be connected to the IoT network through a recurring monthly data plan which will be priced according to the total monthly data volume to be sent. These connectivity revenues will build-up with the cumulative number of modules sold over the years. Data plans are based on a monthly minimum flat fee estimated between USD0.5 and USD3/month/device, based on the total deployed quantity of devices which includes 5,000 bytes of data sent per month, and an additional fee depending on the total quantity of data transmitted. As such, we estimate the monthly data plan prices could vary between CHF0.5 and CHF5 depending on the application.

Data plan revenues should increase as the application areas requiring more frequent data transmission increase with the reduction in latency of the constellation. At the same time, it is reasonable to expect a data plan price reduction from 2023e as volumes increase sharply, while new use cases such as panic buttons might have very little ARPU.

As a result, we assume the overall average monthly data plan price per connected device will be around CHF1.2, only slightly increasing over time.

We forecast services revenue of c. 5% of total hardware revenue, in addition to R&D/technology grants from European sources which could represent between CHF1m and CHF1.5m every year.

As a result, we estimate 2025 revenues should reach CHF143m, 5% below the low end of the guidance provided by the group ("> CHF150m")

Fig. 18: **Annual projected revenue breakdown (in thousands of CHF)**

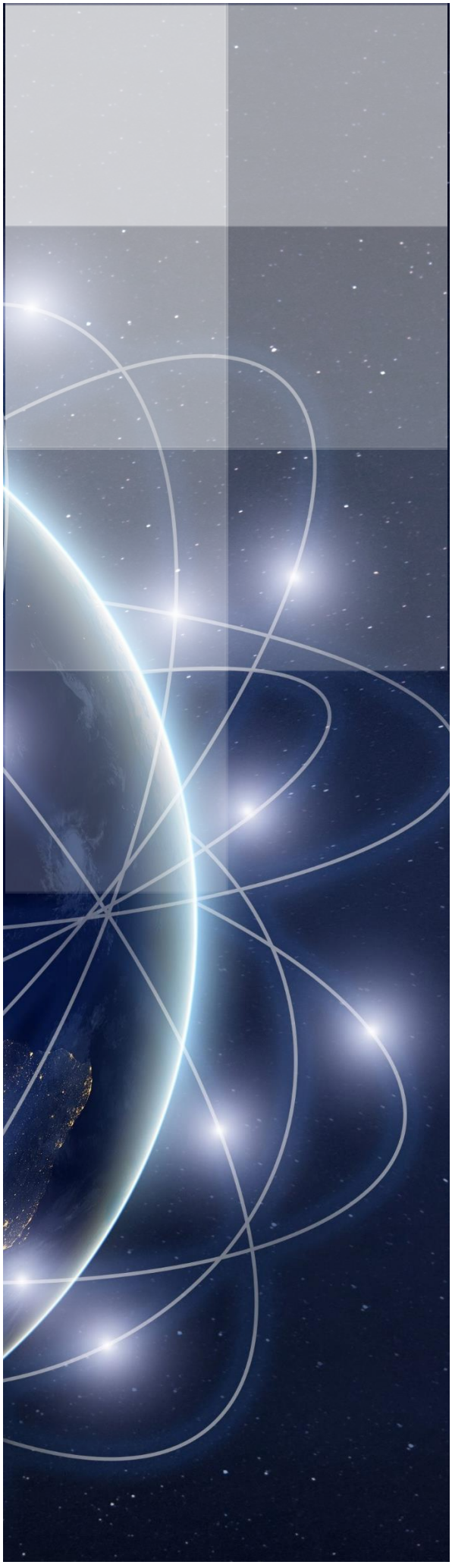
	2020	2021e	2022e	2023e	2024e	2025e
Revenues	519	1,280	10,728	33,954	69,877	143,090
YoY Change		147%	738%	216%	106%	105%
Hardware revenues		-	7,290	22,004	35,637	57,880
% of Sales		0%	68%	65%	51%	40%
Data plan revenues		-	1,188	9,358	29,281	77,878
% of Sales		0%	11%	28%	42%	54%
Others revenues	519	1,280	2,250	2,592	4,959	7,332

Source: Bryan, Garnier & Co

Fig. 19: **Price hypothesis (in CHF)**

	2020	2021e	2022e	2023e	2024e	2025e
Price per chip	-	-	-	7.0	6.6	6.5
Price per module	-	21.0	40.5	33.8	32.7	31.0
ARPU per chip (monthly)	-	-	-	1.0	0.9	1.0
ARPU per module (monthly)	-	0.4	1.1	1.3	1.3	1.6

Source: Bryan, Garnier & Co



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Section 04

Forecasts and Valuation

A clear path to profitability

Breakeven EBITDA expected in 2025

Astrocast's path to profitability involves the accumulation of high margin recurring data plan revenues.

The company's business model is not to make money on the sale of hardware, but rather keep pricing low on modules and chipsets in order to maximise acquisition volumes and the sale of data plans. As such we estimate gross margin from the sale of hardware should remain limited, in the 10-15% range, depending on the module/chipset mix, and including hardware and distribution costs. We expect gross margin to reach more than 60% by 2025, driven by the increasing contribution from the data plans, vs 70% long-term as guided by the company. This includes the cost of ground stations as well.

The main OPEX for Astrocast include leasing of the L-Band spectrum globally plus country-specific market access rights, personnel costs, sales & marketing (on top of distribution costs included in the gross margin), and general & administrative expenses.

Spectrum leasing for the L-Band is secured by the Thuraya contract. We assume a progressive increase in the leasing cost as activity ramps up, with a peak in 2023 assuming an additional fee for L-band licensing in the Americas region (with Thuraya or another partner).

As far as staff costs are concerned, Astrocast has roughly 60 employees at present. The R&D, Satellite Operations and Product teams constitute three quarters of headcount currently employed but hiring should now be focused on getting key sales people onboard to drive the top line. As such, we expect a sharp ramp-up in sales staff over the coming years, and to a lesser extent, in R&D staff to support the development of the chipset in particular. We estimate Astrocast could reach roughly 120 employees by 2025.

Between 2021 and 2023, EBITDA should remain significantly negative as revenues will not yet be high enough to cover the fixed spectrum costs. We reach EBITDA breakeven in 2024, as guided by Astrocast, as the top line continues to increase sharply, driven by the chipset launch in 2023, while opex start to stabilize. Our estimate for 2025 EBITDA margin is 27.6%, vs roughly 30% guided by the company.

Our estimates are presented below.

Fig. 20: **Revenue and EBITDA forecasts (in thousands of CHF)**

	2020	2021e	2022e	2023e	2024e	2025e
Revenue	519	1,280	10,728	33,954	69,877	143,090
Gross Profit	315	(443)	3,859	15,376	37,554	87,400
% of Sales	61%	-35%	36%	45%	54%	61%
Spectrum & license fees	(2,548)	(6,492)	(10,058)	(14,539)	(14,085)	(13,285)
Personnel cost (incl. sales)	(1,526)	(6,202)	(7,487)	(12,238)	(17,293)	(24,000)
Marketing & sales	(83)	(200)	(500)	(1,000)	(1,500)	(3,000)
G&A	(646)	(2,766)	(3,010)	(5,118)	(4,695)	(7,555)
EBITDA	(4,488)	(16,103)	(17,196)	(17,519)	(19)	39,560
% of Sales	-865%	-1258%	-160%	-52%	0.0%	27.6%

Source: Bryan, Garnier & Co

Further funding needed between 2022 and 2026

Astrocast will need funding to cover its start-up losses (sales and marketing efforts to reach breakeven) and its investments in the constellation (cost of constructing and launching the satellites), in R&D alongside Airbus, CEA/Leti and other third parties, as well as in other smaller areas such as infrastructures and IT.

CAPEX are expected to peak in 2023 and 2024 due to accelerated satellite launches as well as R&D hikes related to the development of the chipset.

Fig. 21: Capital expenditure breakdown (in thousands of CHF)

	2020	2021e	2022e	2023e	2024e	2025e
Capital Expenditure	-	(7,082)	(8,732)	(21,000)	(22,700)	(17,000)
% of Sales	-	-553%	-81%	-62%	-32%	-12%
Launches & Satellites	-	(6,075)	(4,050)	(15,000)	(20,000)	(15,000)
R&D & Others	-	(1,007)	(4,682)	(6,000)	(2,700)	(2,000)

Source: Bryan, Garnier & Co

Fig. 22: Research and development breakdown (in thousands of CHF)

	2020	2021e	2022e	2023e	2024e	2025e
R&D		(5,216)	(8,074)	(10,582)	(7,887)	(8,839)
% of Sales		-408%	-75%	-31%	-11%	-6%
R&D from operations		(3,796)	(3,854)	(5,482)	(6,287)	(7,439)
R&D from capitalizations		(1,420)	(4,220)	(5,100)	(1,600)	(1,400)

Source: Bryan, Garnier & Co

Astrocast raised CHF40m when going public at the end of August this year. We estimate total remaining funding needs for Astrocast amount to roughly CHF80m (including the repayment of some exceptional trade payables over H2 2021), before free cash flow turns positive in 2025.

Given the cash available at hand today and the upcoming cash burn, we estimate further financing will be needed by H2 2022. Given the company's stage of development, equity should be the preferred option. As such, we believe a capital increase could happen as soon as late Q1 / early Q2 2022. We estimate another c. CHF40m could be raised to meet the financing needs for another 12 to 18 months.

Capital needs and timing will be influenced by the payment schedule of license to Thuraya, possible export credits or other limited debt facilities. Also, should commercial ramp up be slower than expected, satellite launches can be postponed in order to keep cash flow and funding requirements under control.

Fig. 23: Free cash flow breakdown (in thousands of CHF)

	2020	2021e	2022e	2023e	2024e	2025e
CF from Operations	(4,449)	(21,537)	(17,906)	(19,201)	(4,192)	30,971
Income tax (cash)	0	0	0	0	0	0
Capex	(4,279)	(7,082)	(8,732)	(21,000)	(22,700)	(17,000)
Free Cash Flow	(8,728)	(28,619)	(26,638)	(40,201)	(26,892)	13,971
Cumulated FCF		(28,619)	(55,257)	(95,458)	(122,351)	(108,380)

Source: Bryan, Garnier & Co

Target price set at NOK85, Buy recommendation

Valuation approach and synthesis

In order to value Astrocast, we choose a mix (50/50) of the two following approaches:

1. "2025 peers multiple": we apply a trading multiple to our 2025e EBITDA estimate (y+1 after breakeven), which we discount back to 2021 and add to our 2022-2025 discounted cash flows. We choose 2025 as this is the company's guidance horizon, but this method is very conservative since it does not price superior growth vs peers beyond 2025.
2. "DCF": we use a 10 year DCF starting in 2022. This method enables to capture the expected growth beyond 2025.

Our methodology, summarized in the table below, points to a target price of NOK85, a 52% upside vs the current share price.

Fig. 24: Valuation synthesis

Valuation	CHFk	Methodology
EV from peers multiple 2025	218,539	50% weight
EV from 10 year DCF	491,906	50% weight
EV	355,222	
+/- Net cash/debt	8,100	Projected end 2021
+/- other adj.	0	
Equity	363,328	
Number of shares (m), excl. treasury shares, fully diluted	38,943	
Target price (CHF)	9.3	
Target price (NOK)	85.0	9.1 NOK/CHF fx

Source: Bryan, Garnier & Co

Peers methodology

We use the main listed satellite operators as the basis for Astrocast's peers as they all operate constellations and provide B2B communication services. However, we also include Gamma, a pure UK-based B2B telecom operator delivering double digit EBITDA growth.

Excluding operators posting negative expected EBITDA growth (ie excluding notably Intelsat which is undergoing a Chapter 11 procedure), the average of our sample shows an EV/EBITDA of 12.7x.

Fig. 25: Peers valuation multiples

Company	EV/EBITDA 2021	EBITDA Growth (2020-2023)
Gamma Communications	19.2	12%
Iridium	18.5	8%
ViaSat	9.9	16%
SES	5.2	-1%
Eutelsat Communications	5.6	-3%
EchoStar	3.2	2%
Intelsat	4.9	-11%
Average	**9.5**	**3%**
Average (only EBITDA growth >0)	**12.7**	**9%**

Source: Refinitiv, Bryan, Garnier & Co

We apply the 12.7x EV/EBITDA multiple to our 2025 EBITDA forecast in order to calculate the group's Terminal value, which we discount back to 2021, and which we add to our 2022-2025 discounted cash flows, as summarized below. This points to a total EV of CHF218.5m

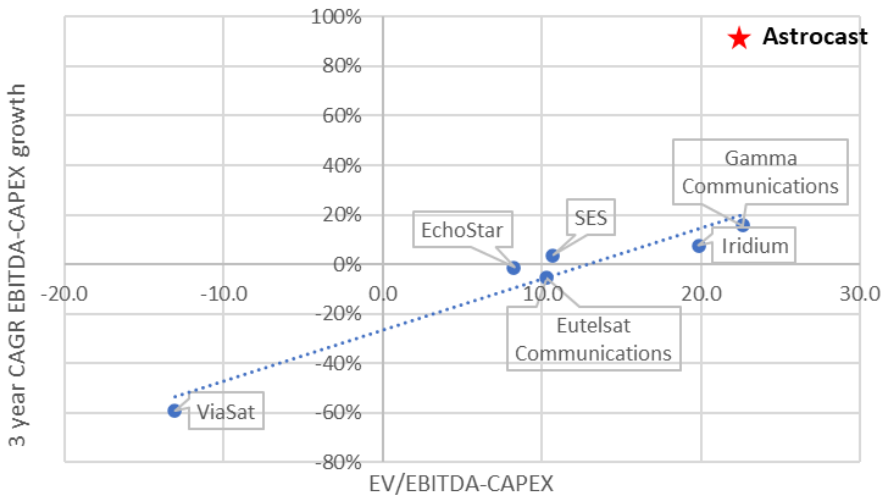
Fig. 26: Valuation using peers multiples

Valuation	CHFk	Methodology
Terminal value	281,240	EV/EBITDA 2025e multiple discounted back to 2021
2022-2025 DCF	-62,702	WACC at 16%
EV	218,539	

Source: Refinitiv, Bryan, Garnier & Co

Using the assumptions above, the terminal value comes out highly conservative. As shown in the graph below, the valuation of satellite providers is highly correlated to their operating free cash flow (EBITDA-CAPEX) outlook. Our 12.7x EV/EBITDA 2025e multiple implies a 22.4x EV/EBITDA-CAPEX 2025e multiple for Astrocat's assumed terminal value , which thus appear as very low given Astrocast's expected cash flow growth beyond 2025 (93% 3-year CAGR in our estimates).

Fig. 27: Peers correlation between Valuation Multiples and Cash Flow Growth



Source: Refinitiv, Bryan, Garnier & Co

In order to better price Astrocast's expected growth beyond 2025, we combine our peers multiple methodology with the DCF approach detailed below.

DCF Methodology

Our DCF assumptions are detailed below.

We factor in Astrocast's early-stage related risk profile by using a WACC of 16%. This is equivalent to applying a beta of c. 2.0, vs c. 1.0 for our sample of peers, with a risk free rate at 0.6% and equity risk premium at 7.9%. Our terminal growth rate stands at 2.5%.

Fig. 28: DCF valuation

in CHFk	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Revenue	**1,280**	**10,728**	**33,954**	**69,877**	**143,090**	**222,820**	**312,288**	**386,504**	**432,431**	**458,123**	**471,732**
YoY growth	146.6%	738.1%	216.5%	105.8%	104.8%	55.7%	40.2%	23.8%	11.9%	5.9%	3.0%
EBITDA	**-16,103**	**-17,196**	**-17,519**	**-19**	**39,560**	**75,200**	**121,748**	**179,482**	**200,331**	**211,726**	**217,495**
% of rev.	-1258.0%	-160.3%	-51.6%	0.0%	27.6%	33.7%	39.0%	46.4%	46.3%	46.2%	46.1%
D&A	-4,740	-6,712	-11,200	-16,273	-18,827	-19,824	-19,200	-19,200	-17,297	-17,180	-17,454
Oth. non-cash exp.	0	0	0	0	0	0	0	0	0	0	0
EBIT	**-20,843**	**-23,908**	**-28,719**	**-16,292**	**20,733**	**55,376**	**102,548**	**160,282**	**183,033**	**194,547**	**200,040**
% of rev.	-1628.4%	-222.9%	-84.6%	-23.3%	14.5%	24.9%	32.8%	41.5%	42.3%	42.5%	42.4%
Cash taxes	0	0	0	0	0	0	0	-9,495	-10,843	-26,847	-27,606
NOPAT	**-20,843**	**-23,908**	**-28,719**	**-16,292**	**20,733**	**55,376**	**102,548**	**150,787**	**172,191**	**167,699**	**172,435**
Delta WCR	-5,434	-710	-1,682	-4,173	-8,589	-8,845	-11,093	-13,011	-8,051	-4,504	-2,386
CAPEX	**-7,082**	**-8,732**	**-21,000**	**-22,700**	**-17,000**	**-17,000**	**-17,000**	**-17,000**	**-17,297**	**-17,180**	**-17,454**
FCF	**-28,619**	**-26,638**	**-40,201**	**-26,892**	**13,971**	**49,356**	**93,655**	**139,976**	**164,140**	**163,195**	**170,049**
Disc. FCF	0	-23,041	-30,078	-17,404	7,821	23,898	39,225	50,709	51,434	44,233	39,868
Sum of disc. FCF	186,665										
Disc. TV	305,242										
EV	**491,906**										

Source: Bryan, Garnier & Co

New Space SPACs valuations are not relevant valuation references

Investors should not be mistaken by the attractive valuation ratios put forward in the recent New Space SPACs transactions: these should not be considered as relevant references for Astrocast. As highlighted in the table below, the business plans set forth in these transactions promise astonishing value creation in only a few years, with outstanding revenue growth as well as profitability levels. This is even more true for ventures not having any operational satellite up and running in space yet. These highly aggressive forecasts mechanically drive valuation ratios down, but we believe the probability of failing to deliverer on the promises is high: more realistic forecasts would point to much more significant valuation multiples. On the contrary, Astrocast's guidance and our model for the company appear much more realistic and conservative than most New Space Spacs launched recently.

Fig. 29: New Space SPACs valuations

SPAC	AST Space	Astra	Momentus	RocketLab	Spire	Astrocast
Satellites up in space ?	No	No	No	Yes	Yes	Yes
From… (rev 2021)	c. 0	c. 0	c. 0	70	70	c. 0
… to (rev 2025)	1070	1501	1960	749	913	143
% EBITDA (2025)	95%	46%	61%	22.4%	47%	27.6%
EV/Sales 2025	1.3	1.4	0.6	5.4	1.3	2.5
EV/EBITDA 2025	1.4	3.1	1.0	24.3	2.9	9

Source: Company data, Bryan, Garnier & Co

Catalysts to offset risks

We are initiating Astrocast with a Buy recommendation. Our Target Price points to significant upside and we view several important catalysts:

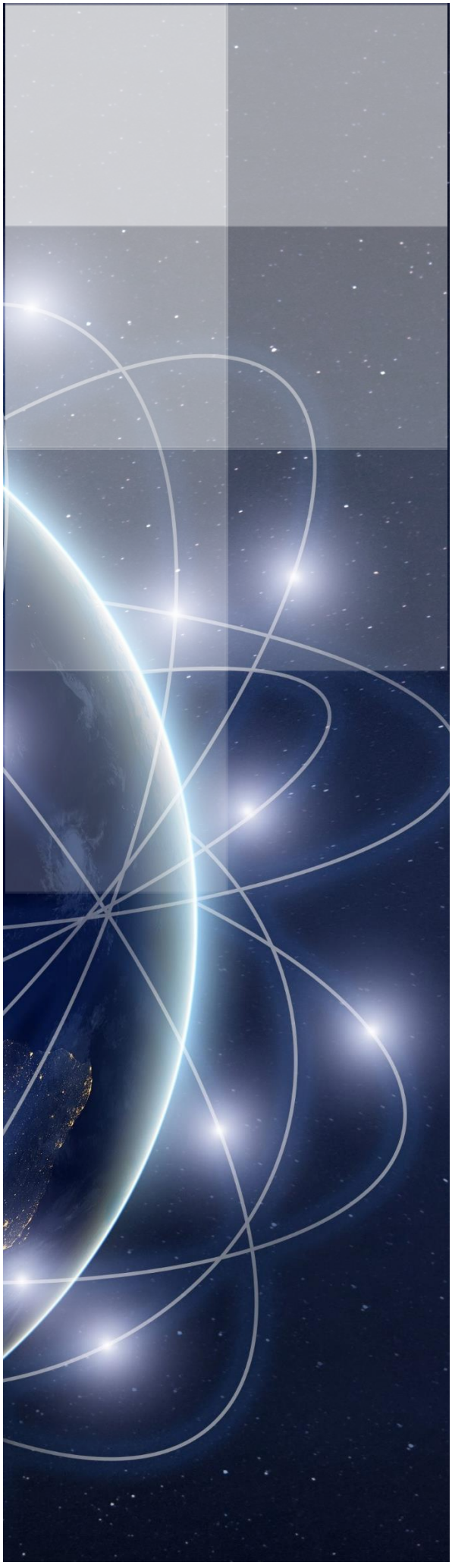
- The IoT market is set to sharply accelerate in the coming years, with specific demand for non-dense areas for which standard IoT technologies are not well suited, with environmental concerns as a clear driver here.
- Astrocast has developed a leading technology in partnerships with top notch research institutes and industrial partners.
- Astrocast constellation is already operational and the company is well placed to take a significant share of the market as the first mover in affordable ubiquitous IoT coverage technology.
- The share of recurring revenues is high in Astrocats's business model.
- Satellite constellations are becoming strategic assets for future ubiquitous coverage of the earth. Speculative scenarios pushing valuations up in the sector are not to be excluded, as Patrick Drahi's bid on Eutelsat recently showed.

On the other hand we see the following items as the main risks to our investment case:

1/ Slower commercial ramp up. Customer take up rate could be slower or lower than planned (for structural reasons such as slower development of IoT, or operational ones such as slower ramp up of sales team efficiency at Astrocast). In that case, Astrocast could adapt its cost base (marketing and sales notably) and slow down the pace of launches, so as to keep cash flow and funding requirements under control. We believe the postponement of a 10 satellite launch can help save c. EUR5m with minimal impact on commercial take up. As far as the semiconductor supply shortage issue is concerned, the company has been working on turn arounds, and several tens of thousands of units have already been secured. Should cost be impacted we believe Astrocast will have the ability to pass part or all of the price increases through, as most contracts are still under discussions.

2/ Dependency on Thuraya for the L band provider. Thuraya could refuse extending its agreement with Astrocast beyond 2024 or take advantage of the situation to increase the price for the sub licensing agreement. Astrocast said it was in discussion with an alternative L-band provider for the coverage of the Americas (not covered by Thuraya). We believe these discussions could also be the opportunity for Astrocast to study an alternative to Thuraya, as a backup plan or for negotiating power purposes. Also, we believe Thuraya is rather dependent on this agreement from an financial standpoint: indeed, we estimate the revenues from Thuraya's sub licensing agreement with Astrocast could represent more than 10% of its main shareholder Yahsat's profit. As such, the negotiation for the renewal of the agreement between Astrocast and Thuraya could actually appear as an opportunity for Astrocast to lower its license costs.

3/ Stronger than expected competition. We have explained in the "competition" section why we believe Astrocast's technology is ahead of – or complementary to - all alternative technologies identified so far. We cannot rule out the emergence of a new technology but this appears very unlikely: we doubt this is the focus of majors providers, and it will take much time and money for any competitor to catch up on Astrocast given the company's technological stage. The competition's will to grow on Astrocast's market could actually fuel a speculative scenario for the group.



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Section 05

Appendixes

Appendix

Fig. 30: P&L Astrocast

P&L	2018	2019	2020	2021	2022	2023	2024	2025
Total Revenues	356	1,336	519	1,280	10,728	33,954	69,877	143,090
Gross profit	307	1,333	315	(443)	3,859	15,376	37,554	87,400
Gross margin	86%	100%	61%	-35%	36%	45%	54%	61%
Total operating expenses	(1,422)	(1,728)	(4,803)	(15,660)	(21,055)	(32,895)	(37,573)	(47,840)
EBITDA	(1,115)	(395)	(4,488)	(16,103)	(17,196)	(17,519)	(19)	39,560
Margin (% of sales)	-313%	-30%	-865%	-1258%	-160%	-52%	0%	28%
R&D cost	(1,696)	(5,552)	(6,508)	(1,420)	(4,220)	(5,100)	(1,600)	(1,100)
Cash EBITDA	(2,812)	(5,947)	(10,996)	(17,523)	(21,416)	(22,619)	(1,619)	38,460
Total D&A	(123)	(508)	(449)	(4,740)	(6,712)	(11,200)	(16,273)	(18,827)
% of sales	-35%	-38%	-87%	-370%	-63%	-33%	-23%	-13%
EBIT	(1,238)	(902)	(4,937)	(20,843)	(23,908)	(28,719)	(16,292)	20,733
Margin (% of sales)	-348%	-68%	-951%	-1628%	-223%	-85%	-23%	14%
Financial results	(87)	(106)	35	(181)	(734)	(1,714)	(2,034)	(2,034)
Income before tax	(1,326)	(1,008)	(4,902)	(21,024)	(24,642)	(30,433)	(18,326)	18,699
Income tax	0	0	0	0	0	0	0	0
Consolidated net income	(1,326)	(1,008)	(4,902)	(21,024)	(24,642)	(30,433)	(18,326)	18,699

Source: Company data, Bryan, Garnier & Co

Fig. 31: Cash flow Astrocast

Cash Flow	2018	2019	2020	2021	2022	2023	2024	2025
Net income of continued act.	**(1,326)**	**(1,008)**	**(4,902)**	**(21,024)**	**(24,642)**	**(30,433)**	**(18,326)**	**18,699**
D&A (incl. amort of non current and acqu. Assets)	123	508	449	4,740	6,712	11,200	16,273	18,827
Financial result	87	106	(35)	181	734	1,714	2,034	2,034
Income tax	(1)	0	0	0	0	0	0	0
Change in working capital	0	(4)	39	(5,434)	(710)	(1,682)	(4,173)	(8,589)
Cash flow from operations	(1,117)	(398)	(4,449)	(21,537)	(17,906)	(19,201)	(4,192)	30,971
Income tax paid	1	(0)	0	0	0	0	0	0
Operating Free cash flow	**(1,116)**	**(398)**	**(4,449)**	**(21,537)**	**(17,906)**	**(19,201)**	**(4,192)**	**30,971**
Acquisition of tangible and intangible assets	**(2,682)**	**(9,670)**	**(4,279)**	**(7,082)**	**(8,732)**	**(21,000)**	**(22,700)**	**(17,000)**
ow launches	0	0	0	(3,375)	(2,250)	(9,000)	(12,000)	(9,000)
ow satellites	0	0	0	(2,700)	(1,800)	(6,000)	(8,000)	(6,000)
ow R&D	0	0	0	(1,420)	(4,220)	(5,100)	(1,600)	(1,400)
ow others	0	0	0	413	(462)	(900)	(1,100)	(600)
Investing cash flow	**(2,682)**	**(9,670)**	**(4,279)**	**(7,082)**	**(8,732)**	**(21,000)**	**(22,700)**	**(17,000)**
Capital increase	4,314	4,706	3,269	40,000	37,000	35,000	0	0
New debt raised	0	500	5,270	(3,227)	3,000	2,000	0	0
Debt reimbursment	0	0	0	(770)	0	0	0	0
Other financing costs	(87)	(106)	35	(181)	(734)	(1,714)	(2,034)	(2,034)
Potential export credit	0	0	0	2,250	1,500	6,000	0	0
Others (ex: change on other financial debts)	908	7,324	(6)	0	0	0	0	0
Financing cash flow	**5,135**	**12,424**	**8,568**	**38,072**	**40,766**	**41,286**	**(2,034)**	**(2,034)**
Discontinued activities	0	0	(0)	(0)	(0)	(0)	(0)	(0)
Change in cash and cash equivalents	**1,337**	**2,357**	**(160)**	**9,453**	**14,129**	**1,085**	**(28,926)**	**11,937**
Opening cash and cash equivalents	2	1,556	3,913	3,752	13,205	27,334	28,419	(507)
Closing cash and cash equivalents	1,556	3,913	3,752	13,205	27,334	28,419	(507)	11,430

Source: Company data, Bryan, Garnier & Co

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Stock rating

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BUY

Positive opinion for a stock where we expect a favourable performance in absolute terms over a period of 6 months from the publication of a recommendation. This opinion is based not only on the FV (the potential upside based on valuation), but also takes into account a number of elements that could include a SWOT analysis, momentum, technical aspects or the sector backdrop. Every subsequent published update on the stock will feature an introduction outlining the key reasons behind the opinion.

NEUTRAL

Opinion recommending not to trade in a stock short-term, neither as a BUYER or a SELLER, due to a specific set of factors. This view is intended to be temporary. It may reflect different situations, but in particular those where a fair value shows no significant potential or where an upcoming binary event constitutes a high-risk that is difficult to quantify. Every subsequent published update on the stock will feature an introduction outlining the key reasons behind the opinion.

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Negative opinion for a stock where we expect an unfavourable performance in absolute terms over a period of 6 months from the publication of a recommendation. This opinion is based not only on the FV (the potential downside based on valuation), but also takes into account a number of elements that could include a SWOT analysis, momentum, technical aspects or the sector backdrop. Every subsequent published update on the stock will feature an introduction outlining the key reasons behind the opinion.

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