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Space Launch Market Analysis

HIE- Due Diligence Support

February 2021

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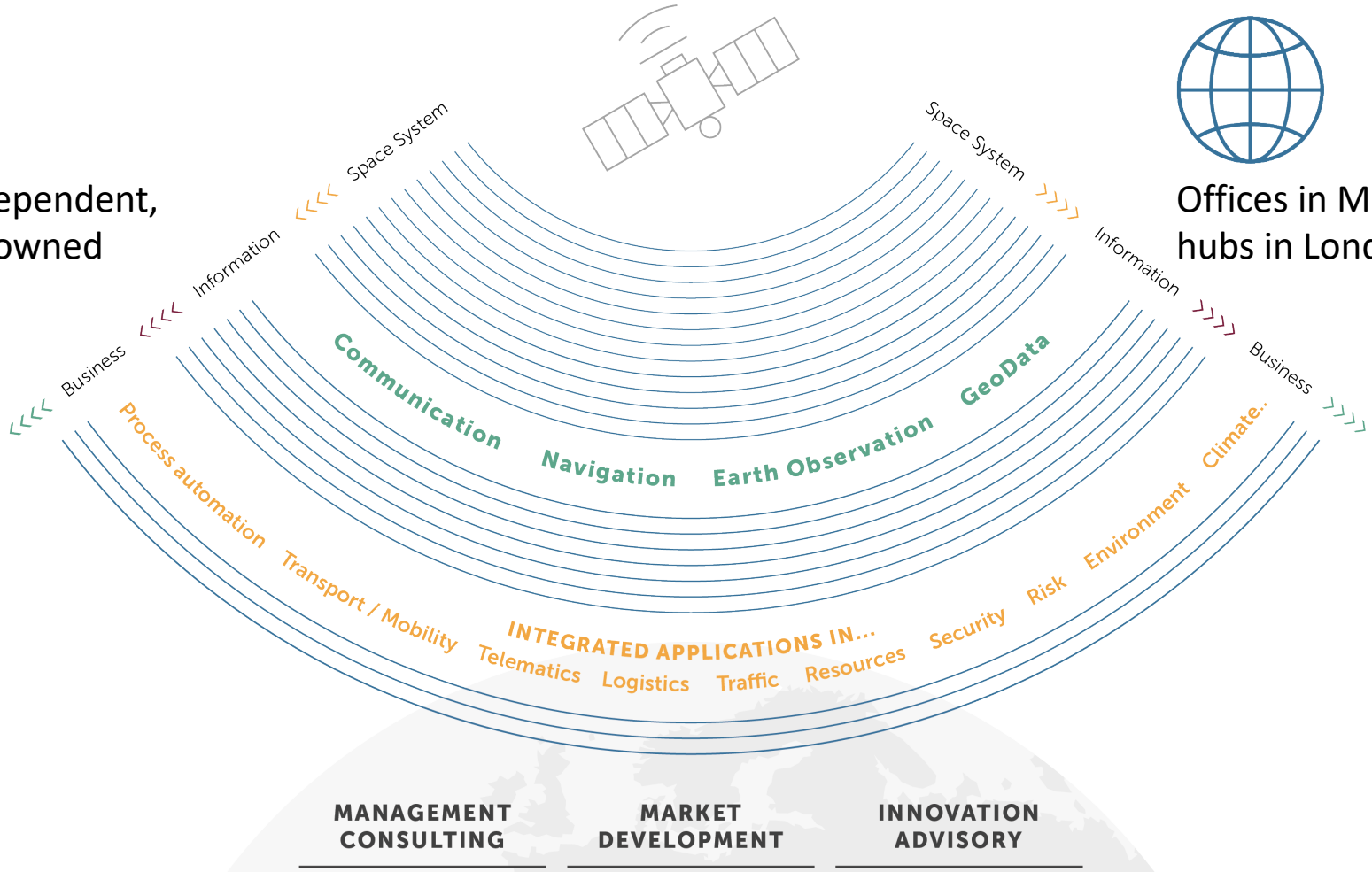
HIE commissioned a market analysis to identify the UK's global positioning and opportunities in the space launch sector

- The **UK aims to increase its share of the global space economy to 10% by 2030 and has embraced an ambitions commercial spaceflight initiative**
- In this context, Highlands and Islands Enterprise (HIE) has commissioned RSM UK Consulting and its subcontractor SpaceTec Partners (STP) to conduct an independent assessment of the current near Space launch market opportunities
- STP is an independent management consulting firm specialised in the space sector and its application domains, with a track record of contracts with both institutional and commercial stakeholders across Europe and abroad
- STP has conducted an extensive **market analysis of the space launch sector**, which **has shown that opportunities exist for the UK to be at the forefront of the global and European small satellite launch market**
  - The **UK is likely to launch a small orbital launcher in Europe by 2022-2025**
  - The **total addressable market for small rockets (payload <=500 kg) launched in 2020-2031 from the UK is 3814 small satellites, equivalent to a mass of 146 metric tonnes**, of which 95t are commercial satellites, and 45t civilian, 6t military in the medium case scenario
  - This corresponds to a total addressable market of **c.a. over 970 dedicated cumulative launches in for micro-launchers launched from the UK (of which 631 commercial), which translates into a market potential over the period of ca. $5.8 B in launch revenues and ca. $490 M in spaceport services revenues**
  - Competition is fierce, nevertheless the UK is well positioned to reach a relevant share of this market, provided different framework conditions are met

STP is an independent management consulting firm specialised in the space sector and its application domains

100% independent, privately owned

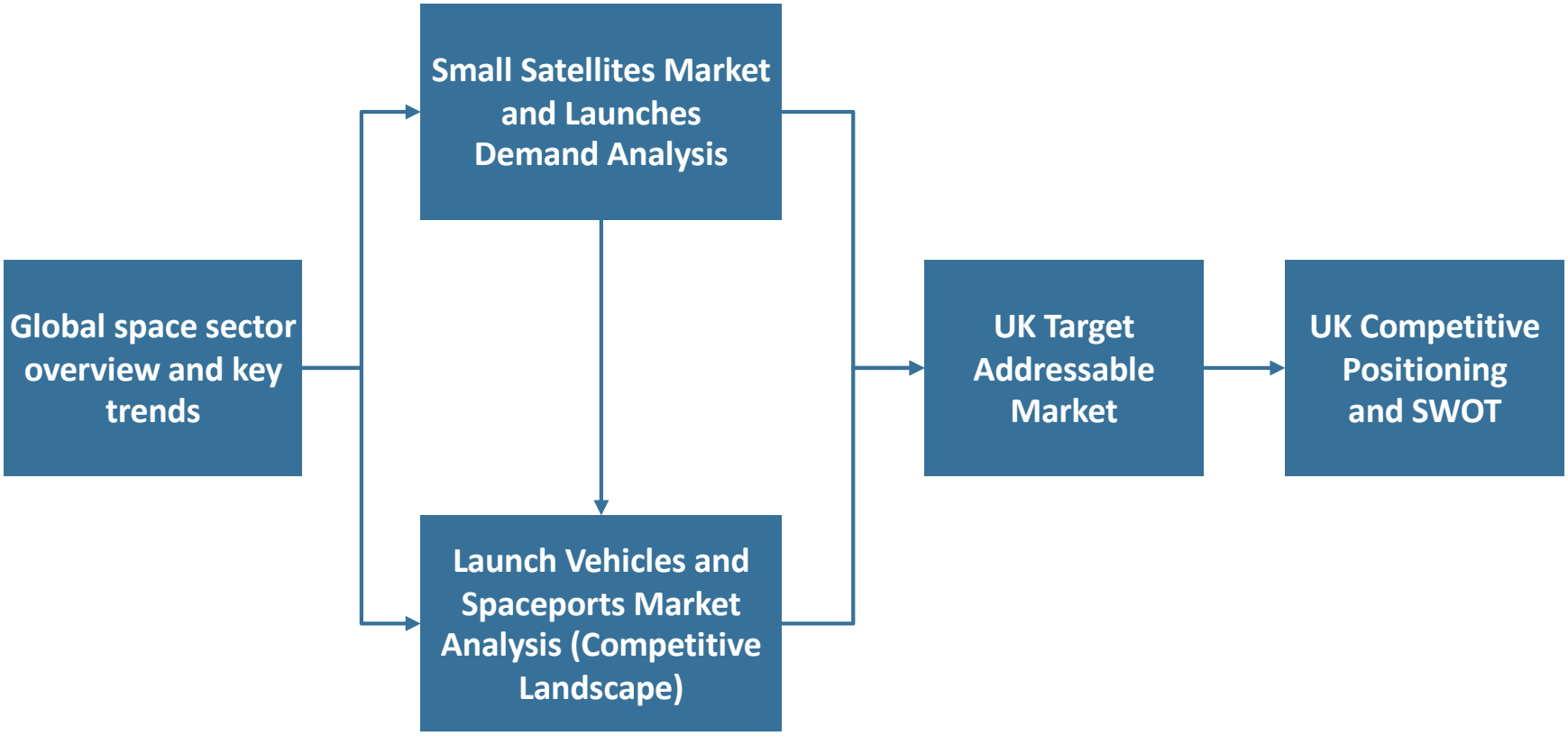
Offices in Munich and Brussels, hubs in London and Vienna



SpaceTec's Sweetspot - "Where space meets business"

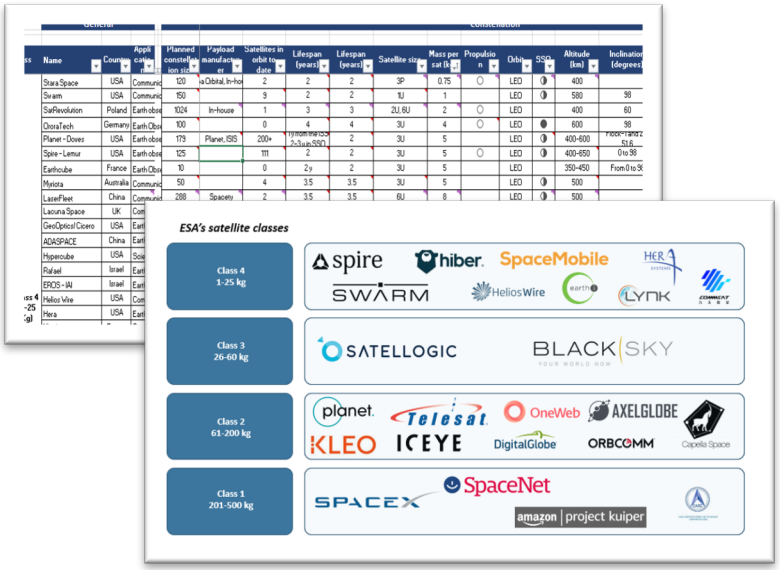
The performed market analysis followed a five-step approach

The analysis provides a comprehensive overview of the market for small commercial and institutional satellites, as well as rockets used for launching them, thus identifying the UK Total Addressable Market (TAM) and competitive positioning on a global scale



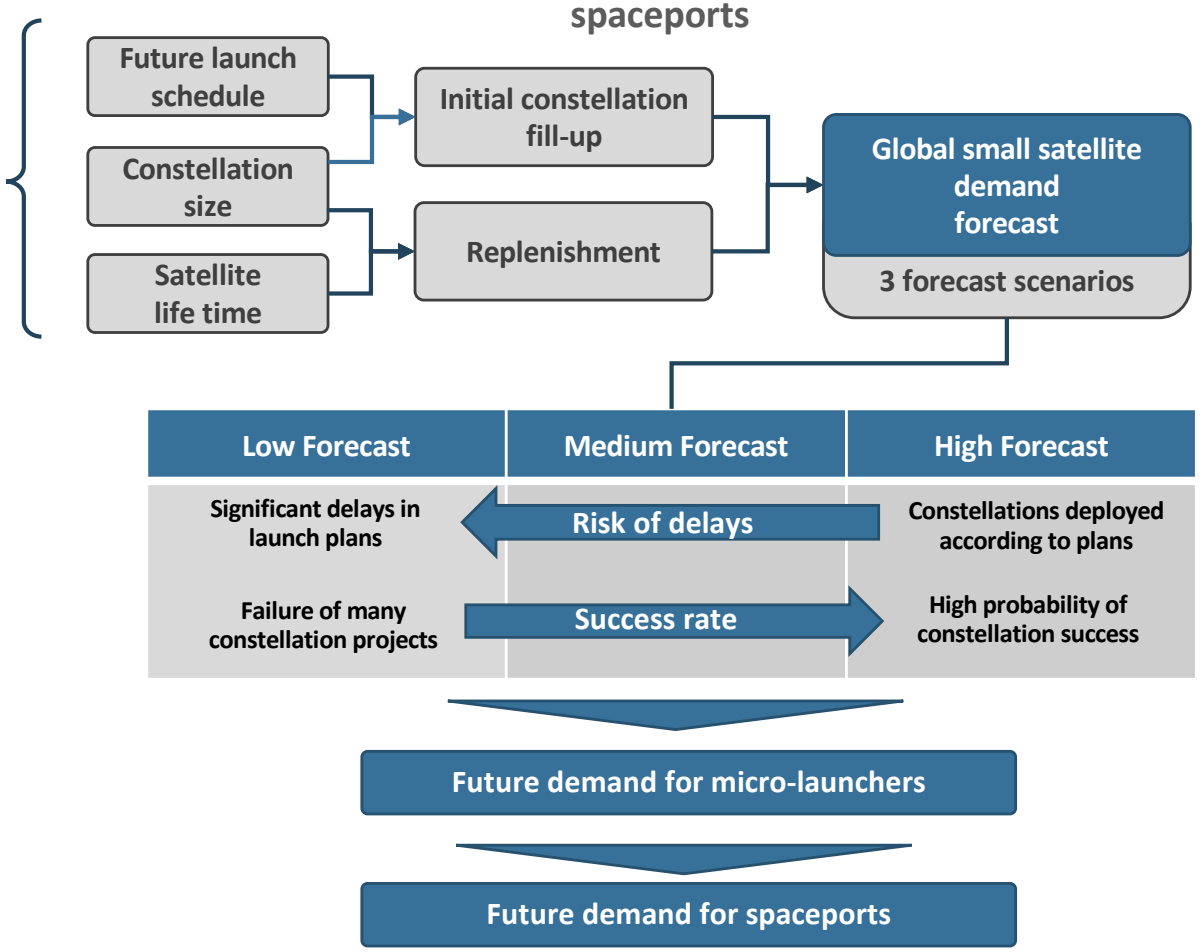
SpaceTec satellite launch demand forecast scenarios, are based on a detailed bottom-up analysis with focus on small sats (<= 500 kg)

Mapping of constellations and satellites



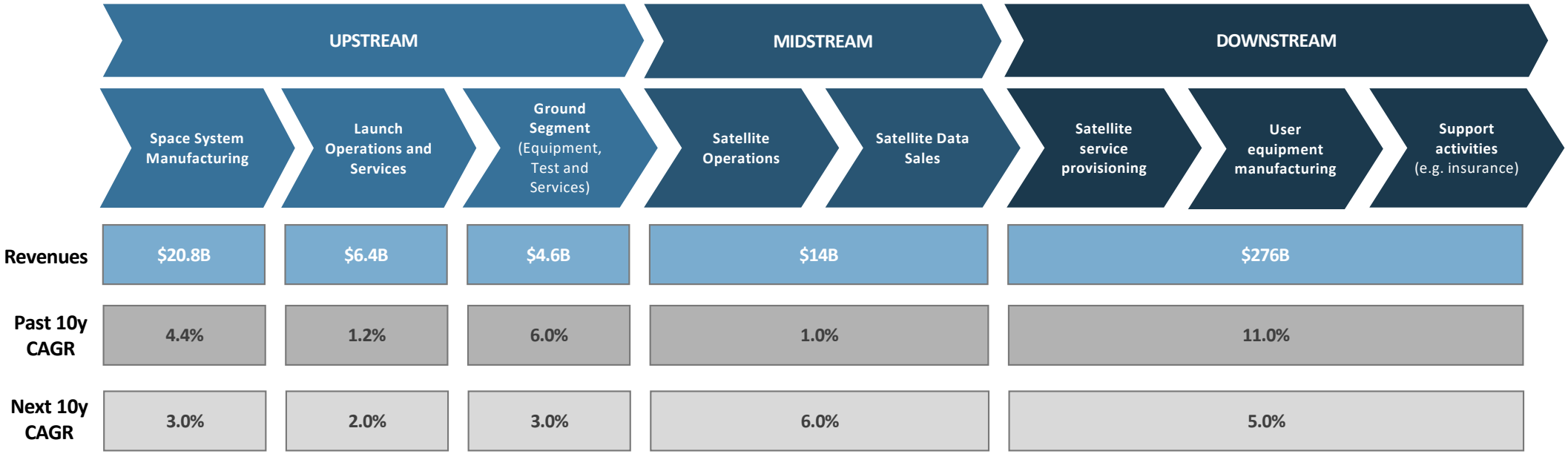
Source: SpaceTec Partners Analysis

Bottom-up analysis of the future launch demand of launchers and spaceports



While the space economy is driven by the downstream revenues, the upstream segment, including launch services, is the backbone of the sector

Global Space Market Revenues 2018 ($ Billion) and CAGR (%)



Source: Euroconsult Report 2019, SpaceTec Partners Analysis

The launch industry is considered by investors as being high risk

Market failure/additionality – previous research

	Risk assessment of market segments and business models along five discriminators							
	Launch industry	Satellite manufacturing	Satellite services	Ground equipment	National security	Manned and robotic space science and exploration	Space tourism (incl. habitation)	Energy, mining, processing and assembly
Product/ technology	◑	◔	◑	◑	◑	◑	◕	●
Asset intensity	●	◕	◑	◔	◑	●	●	●
Demand	◑	◔	◔	○	◔	◕	◕	●
Competitive landscape	◑	◑	◔	◕	◔	◑	◕	◑
Regulation	◕	◑	◕	◔	◑	◑	◕	◕
Risk summary	◕	◑	◑	◔	◑	◕	◕	◕

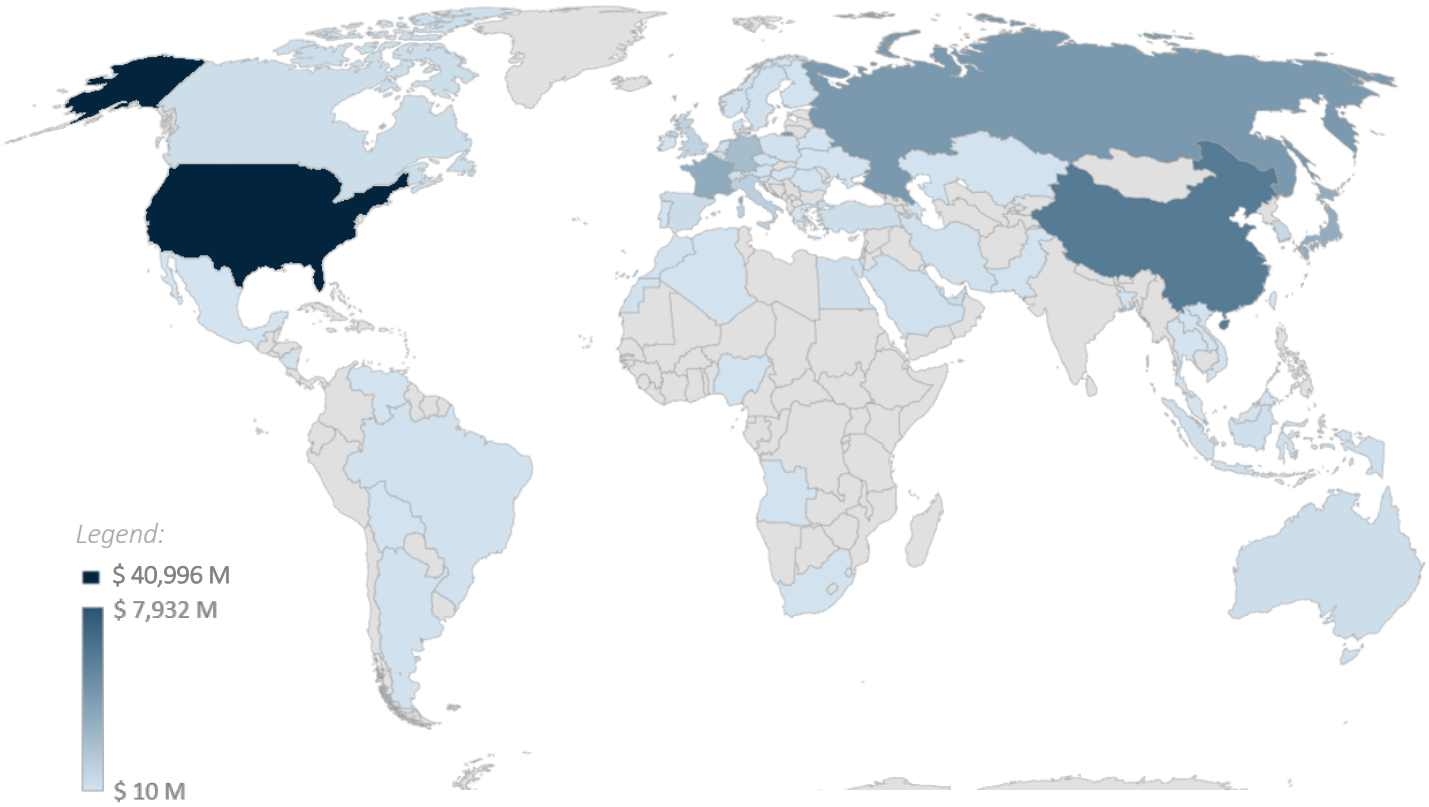
Risk assessment of market segments and business models along five delineators

Legend: ○ – Low Risk ● – High Risk

Source: SpaceTec Partners- European Commission/ European Investment Bank report: "The Future of the European Space Sector", 2019

The space sector relies on large institutional investments

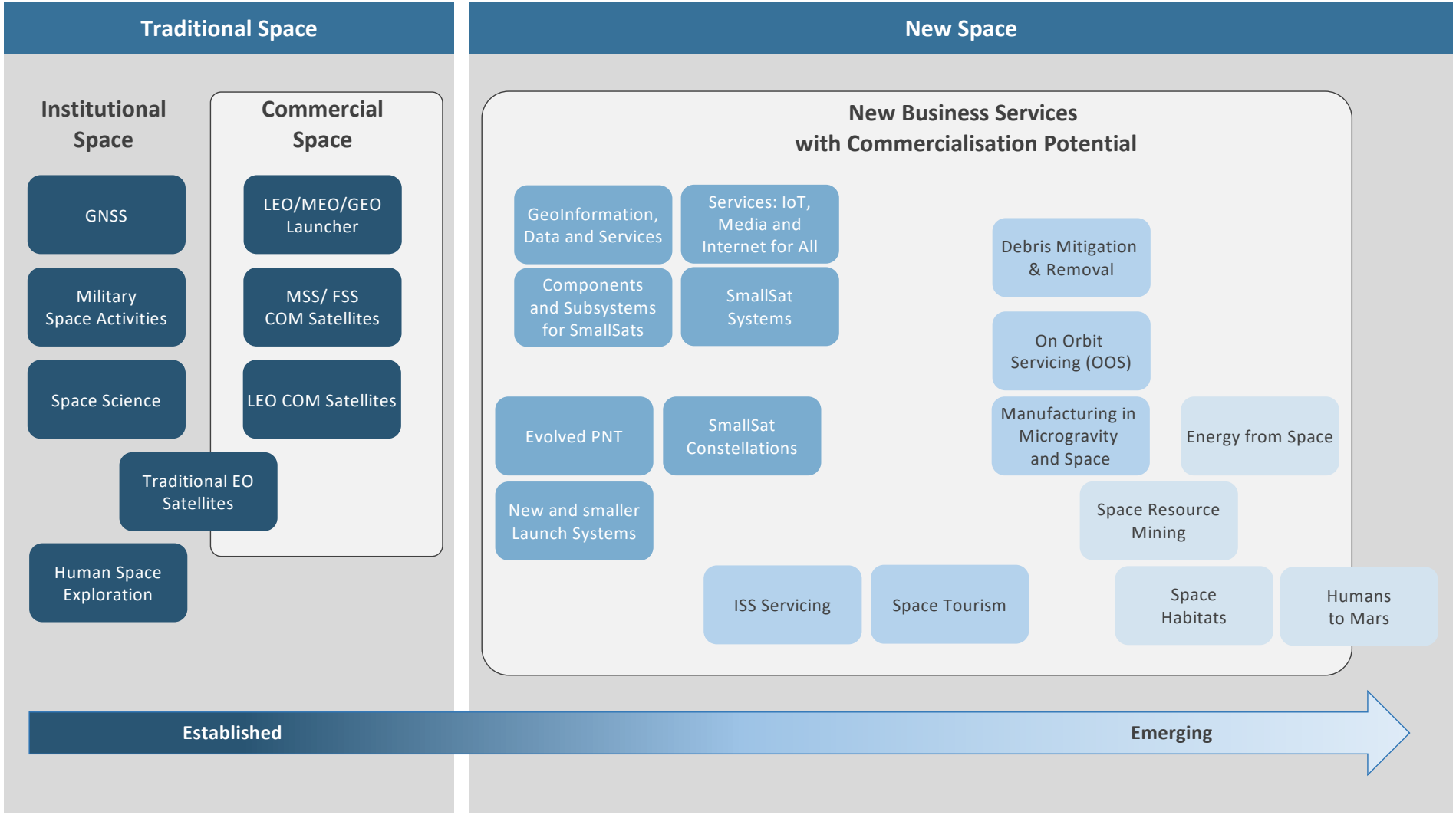
World Government Expenditures for Space Programmes (2018*)



- Public investments represent the cornerstone of the funding in space activities, consisting of **ca. $71 B in 2018***, and growing at 3% CAGR as compared to $52 B in 2008
- Government space activities include military applications for imagery and communications and civil activities including weather forecasting, science, and human exploration
- In addition, governments, particularly those of the United States and Europe, also procure commercial space services, especially launch, satellite imagery and communications, to meet mission requirements
- Governments also seek to stimulate economic growth through space activities.
- **Around 90 nations have government space budgets, at least 9 of them over $1 B, and nearly 20 close to $100 M**

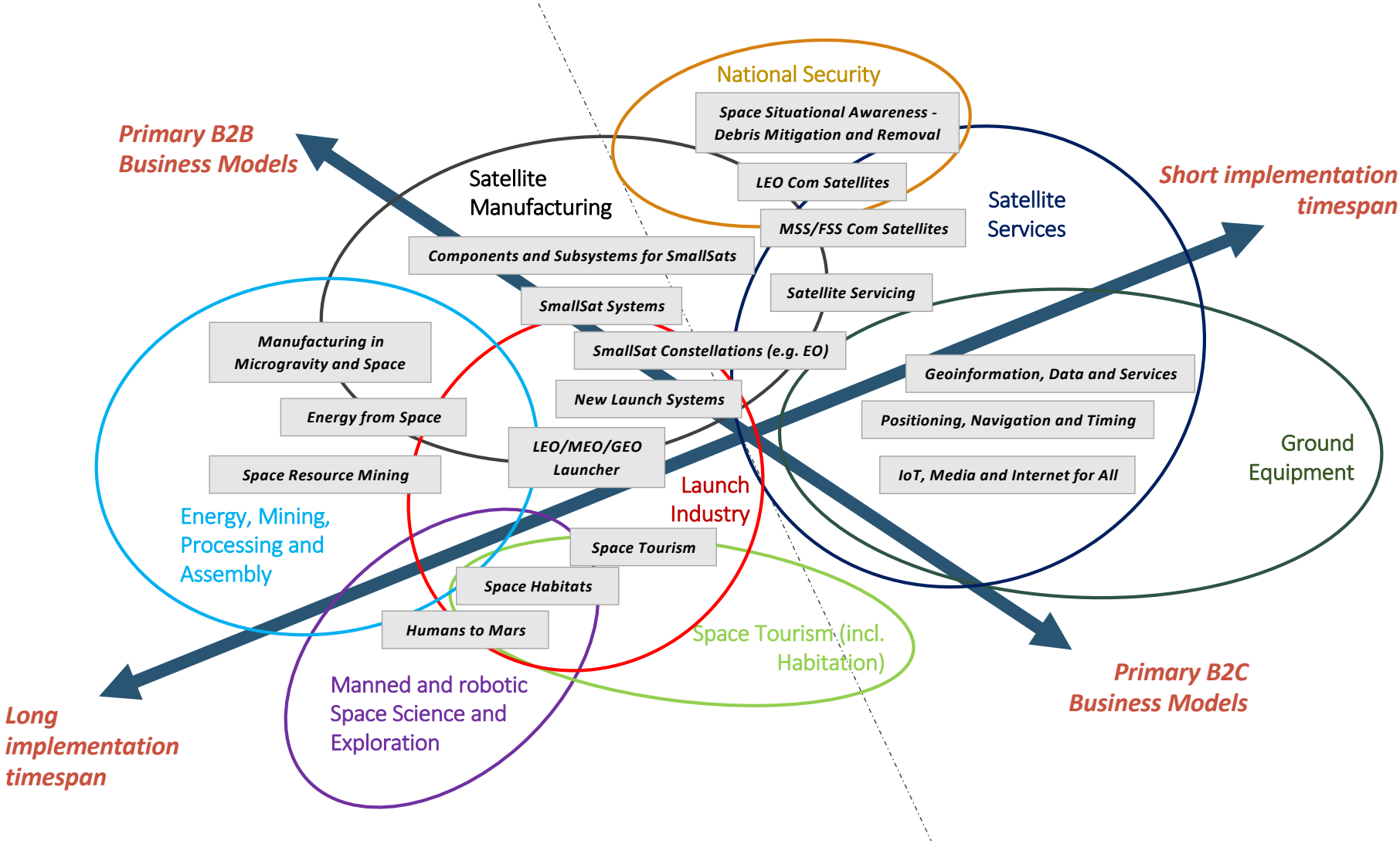
(*) according to Eurospace data, and $80-85B according to Bryce and Space Foundation
Only countries with budgets > USD 10 M are represented
Sources: Euroconsult, OECD, 2019, Bryce Space, SpaceTec analysis

NewSpace is gradually evolving into new commercial fields beyond the traditional space sector (e.g. constellations of small sats, smaller rockets)…

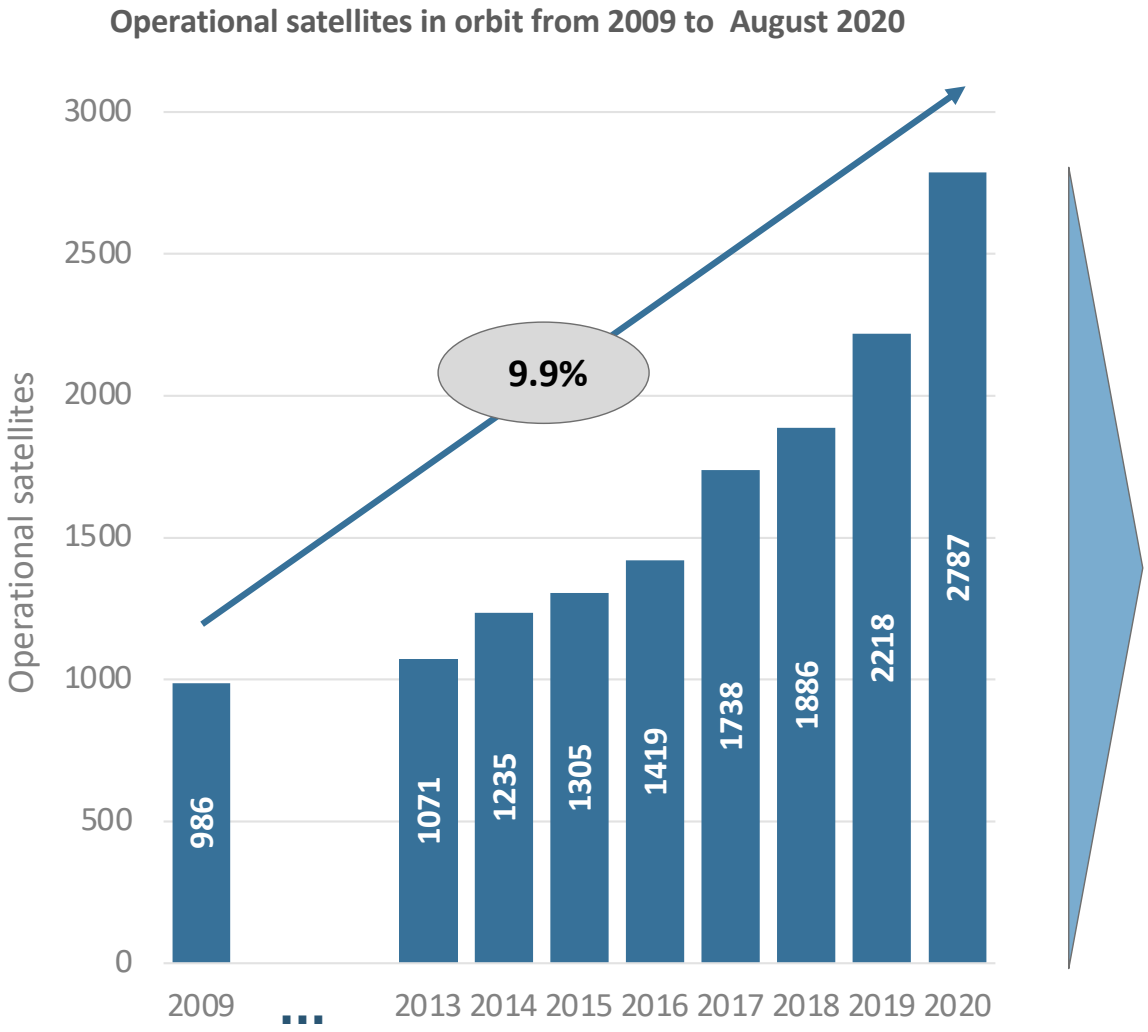


Source: SpaceTec Partners Analysis

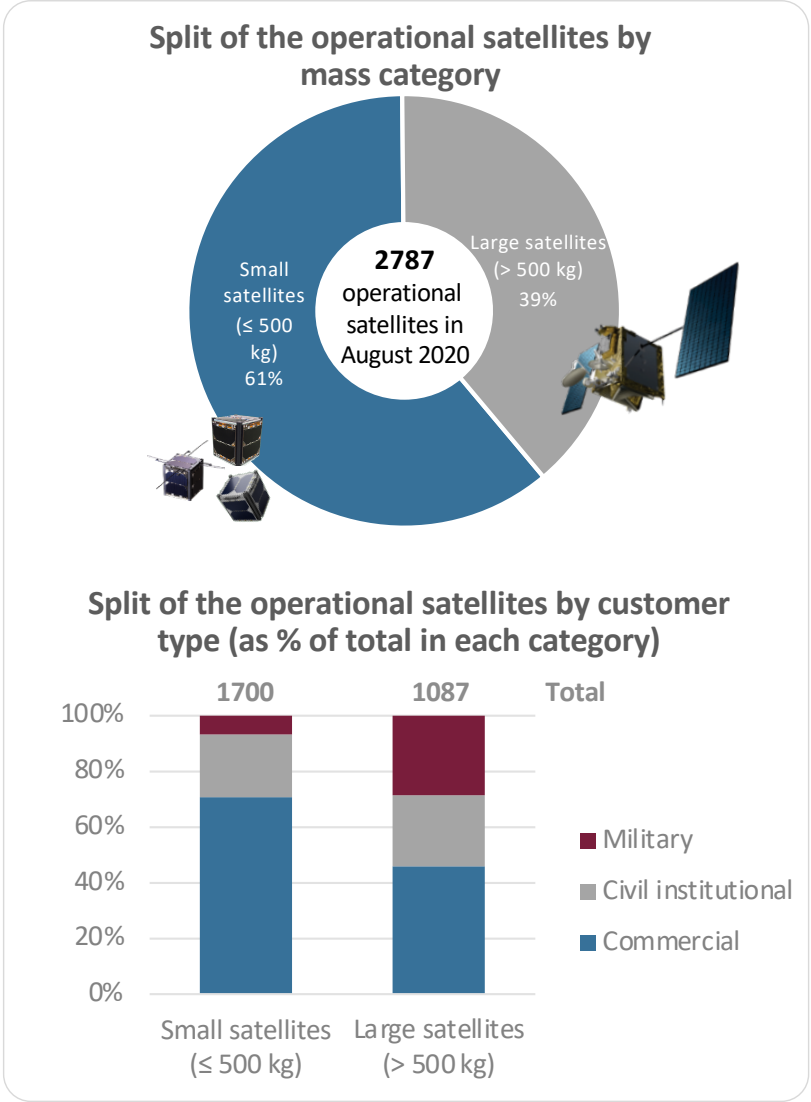
… and new business models not only thriving on technological advancement, but also on shorter cycles, and bold trade-off of risk, cost, and time to market



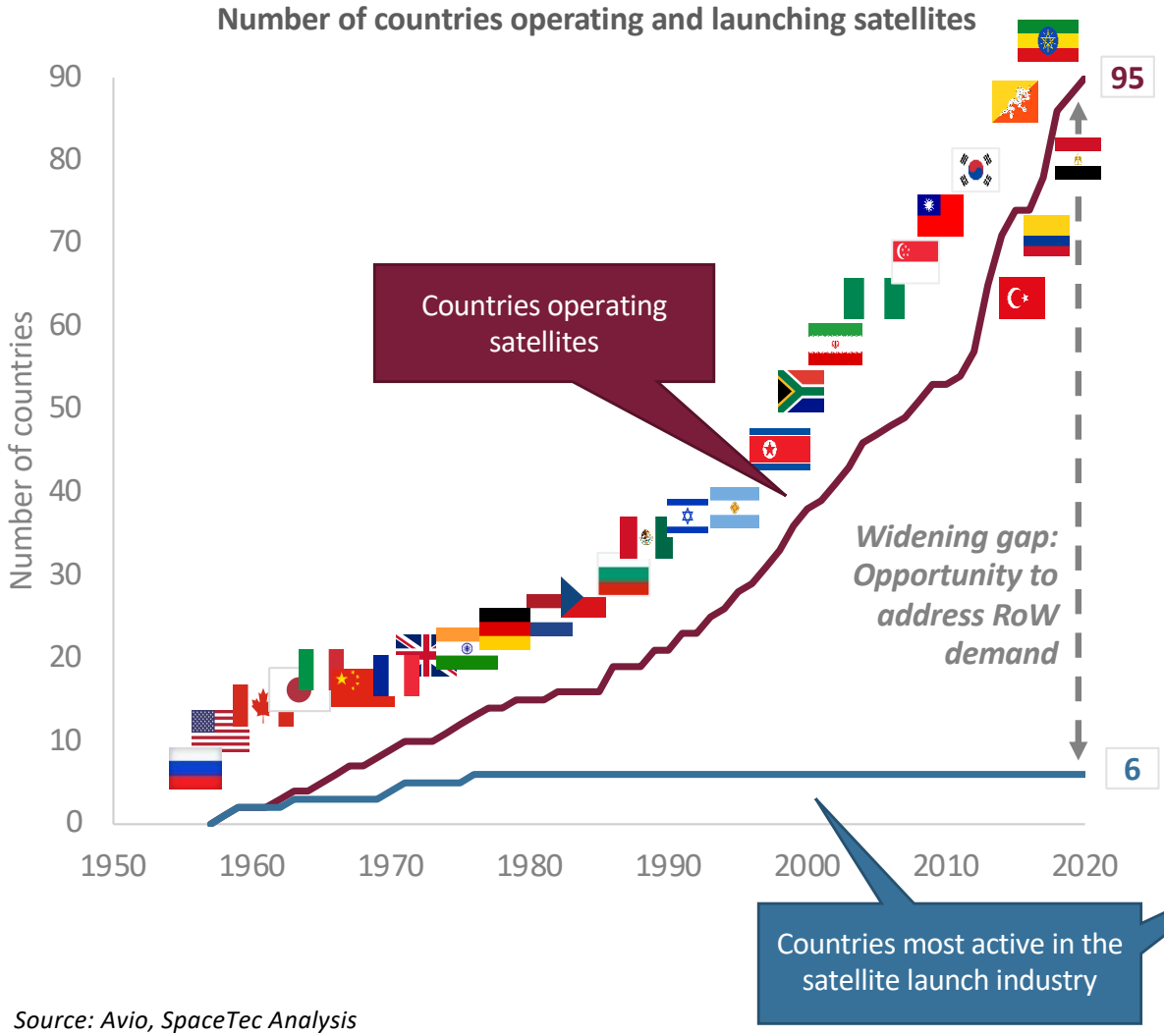
As satellites become cheaper and smaller, more and more satellites have been launched in recent years, leading to ca. 3000 operational satellites in 2020



Source: UCS, SpaceTec Partners Analysis



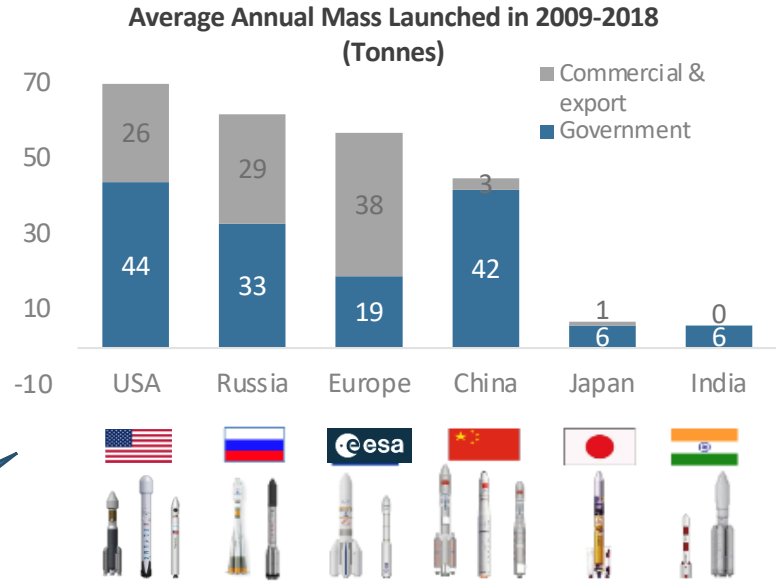
Over time, 95 countries have grown satellite capabilities, but few currently have launch capacity. Gaining access to space capability will position UK among leading space fairing countries



Source: Avio, SpaceTec Analysis

Key insights

- Out of 195 worldwide, **95 countries operate satellites**
- **6 countries launched more than 95% of the total mass of satellites in 2009-2018**. USA, Russia, EU and China are the most active countries in the launch sector
- Most countries rely on these 6 actors to deploy both their commercial and institutional satellites
- Gaining access to space capability as a strategic impact



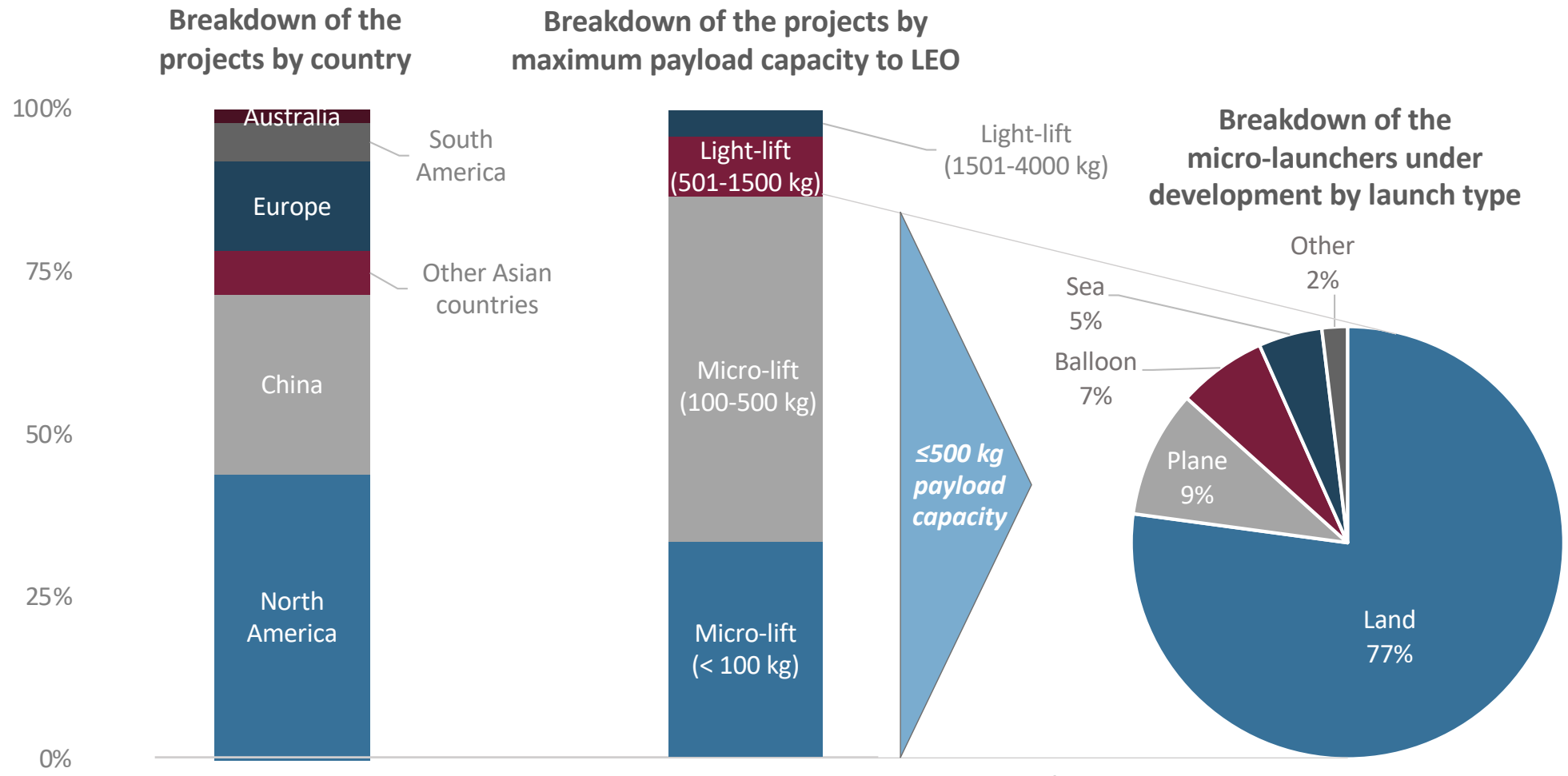
Several micro-lift rockets are emerging to offer flexible launch capabilities to global commercial smallsat constellation operators

Rocket classification by payload capacity to LEO

	Heavy-lift	Medium-lift	Light-lift	Micro-lift
				
	Payload to LEO **> 10,000 kg** **Estimated launch price** **$45 – 400 M**	**Payload to LEO** **4,000 – 10,000 kg** **Estimated launch price** **$30 – 400 M**	**Payload to LEO** **500 – 4,000 kg** **Estimated launch price** **$5 – 50 M**	**Payload to LEO** **<= 500 kg** **Estimated launch price** **$1 – 10 M**
Target market	• Heavy- and medium-lift rockets **mainly serve to launch the large satellites** (2 – 6 tonnes) to high orbits (MEO or GEO) • Large rockets **often offers piggyback and ride-share lifts for smaller satellites** • **Rarely the largest rockets are dedicated to the launch of SmallSats**. The main exception is SpaceX's Falcon 9, deploying large batches of Starlink constellation • Heavy-lift rockets are also used to launch astronauts or cargo to the ISS		• Light-lift rockets are **often dedicated to the launch of medium satellites** (0.5 - 2 tonnes) to LEO or higher orbits • Light-lift rockets **offer also rideshare launches for SmallSat**	• Micro-lifting rockets are an **emerging class of rockets**, designed to provide **dedicated**, **frequent and flexible launch services,** offering greater flexibility in selecting launch parameters (orbit, date, etc.)
Operational Rocket examples	Falcon 9 (SpaceX - US) Atlas V (ULA - US) Ariane-5 (Airbus - EU) Long March-5B (CALT - CN)	Soyuz (OKB-1 - RUS) GSLV (ISRO - IN) Long March-4B (CALT - CN) Antares-230 (Northrop Grumman - US)	Vega (Avio - IT) Long March-6 (CALT - CN) PSLV (ISRO - IN) Rokot-KM (Khrunichev - RUS)	Electron (Rocket Lab - US/NZ) Kuaizhou 1A (ExPace (CASIC) - CN) Hyperbola-1 (i-Space - CN) Epsilon (JAXA - JPN)

Emerging market, with around 100 projects under development

Ca. 100 projects globally announced to be developing a launcher to address the SmallSat launch demand, >80% micro- and mainly vertical

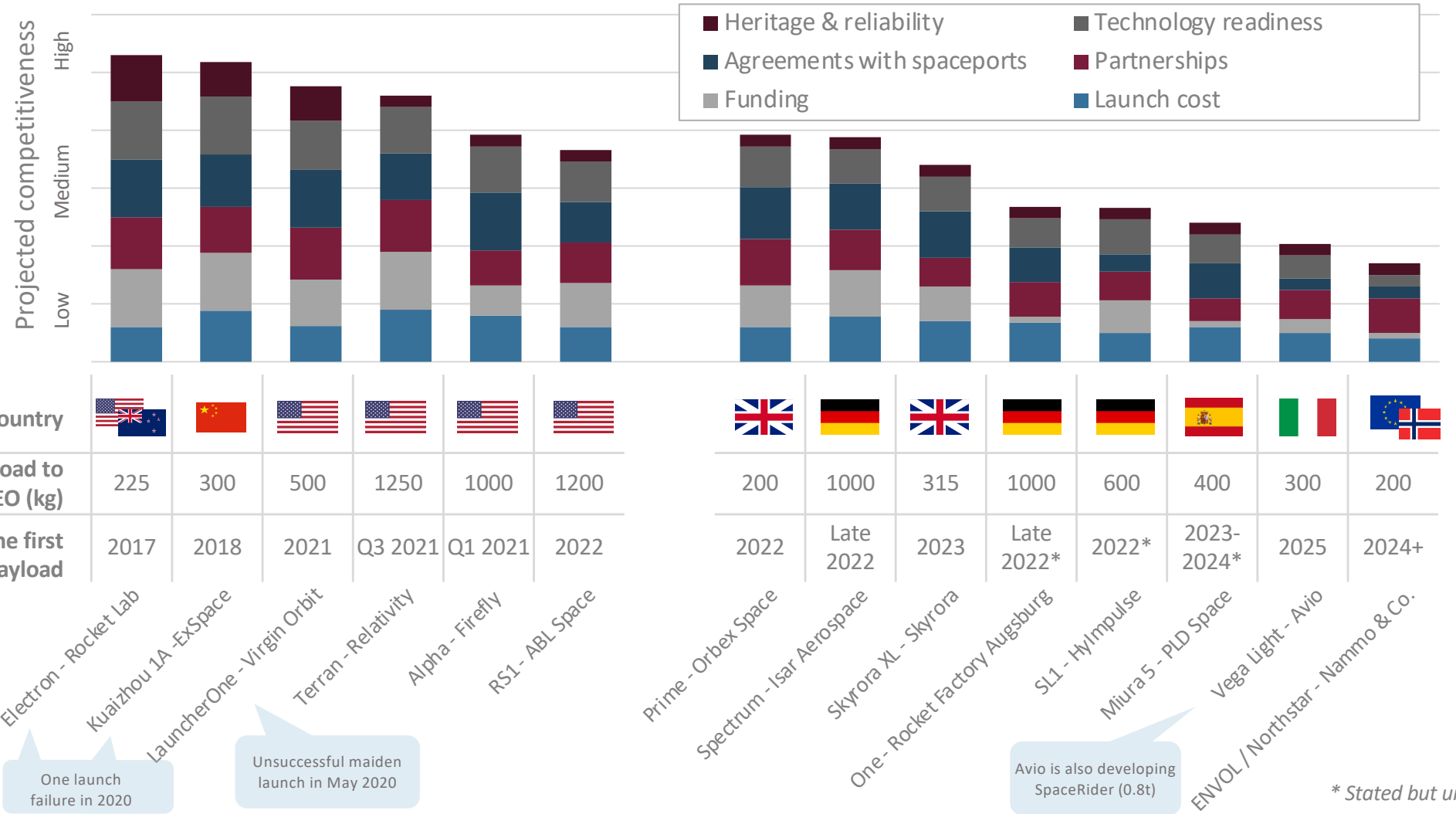


Total= about 100 new projects developing light-lift (501-4000 kg payload capacity) and micro-lift rockets (≤500 kg payload capacity)

Among the existing/ planned small rockets, Orbex, followed by Isar, seem at a more advanced development stage than their European counterparts

Based on public info to date

Projected competitiveness of European small satellites launchers and benchmark against relevant main international launchers



	Electron - Rocket Lab	Kuaizhou 1A -ExSpace	LauncherOne - Virgin Orbit	Terran - Relativity	Alpha - Firefly	RS1 - ABL Space	Prime - Orbex Space	Spectrum - Isar Aerospace	Skyrora XL - Skyrora	One - Rocket Factory Augsburg	SL1 - HyImpulse	Miura 5 - PLD Space	Vega Light - Avio	ENVOL / Northstar - Nammo & Co.
Country														
Max payload to LEO (kg)	225	300	500	1250	1000	1200	200	1000	315	1000	600	400	300	200
Date of the first flight with payload	2017	2018	2021	Q3 2021	Q1 2021	2022	2022	Late 2022	2023	Late 2022*	2022*	2023-2024*	2025	2024+

One launch failure in 2020

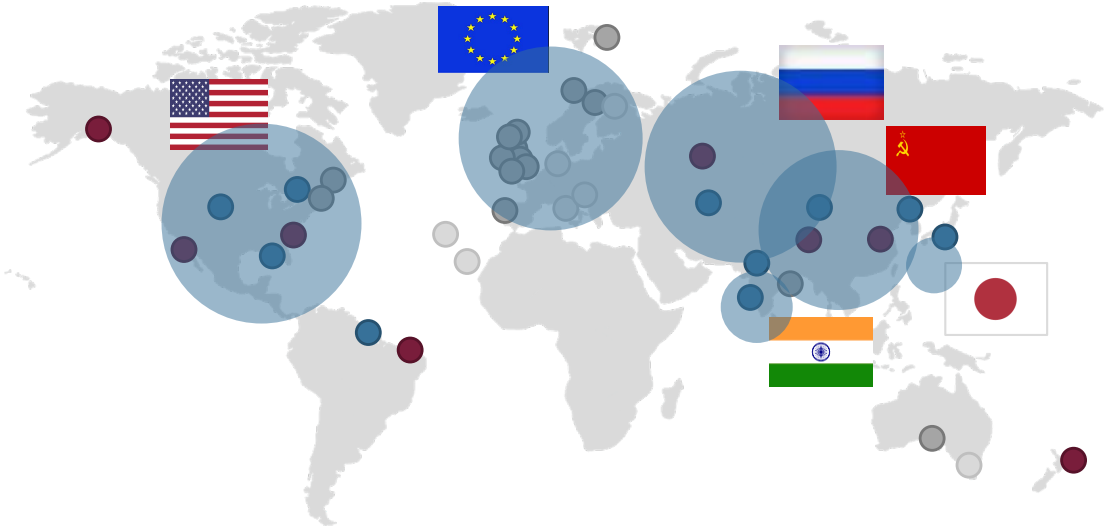
Unsuccessful maiden launch in May 2020

Avio is also developing SpaceRider (0.8t)

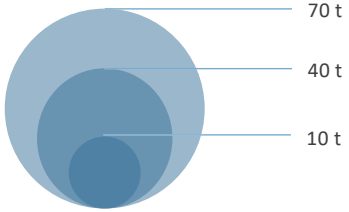
** Stated but unlikely*

Meanwhile, new spaceports are emerging worldwide to address the demand of NewSpace players (e.g. small satellites operators and launchers)

Global spaceport operating or planning to launch commercial satellites



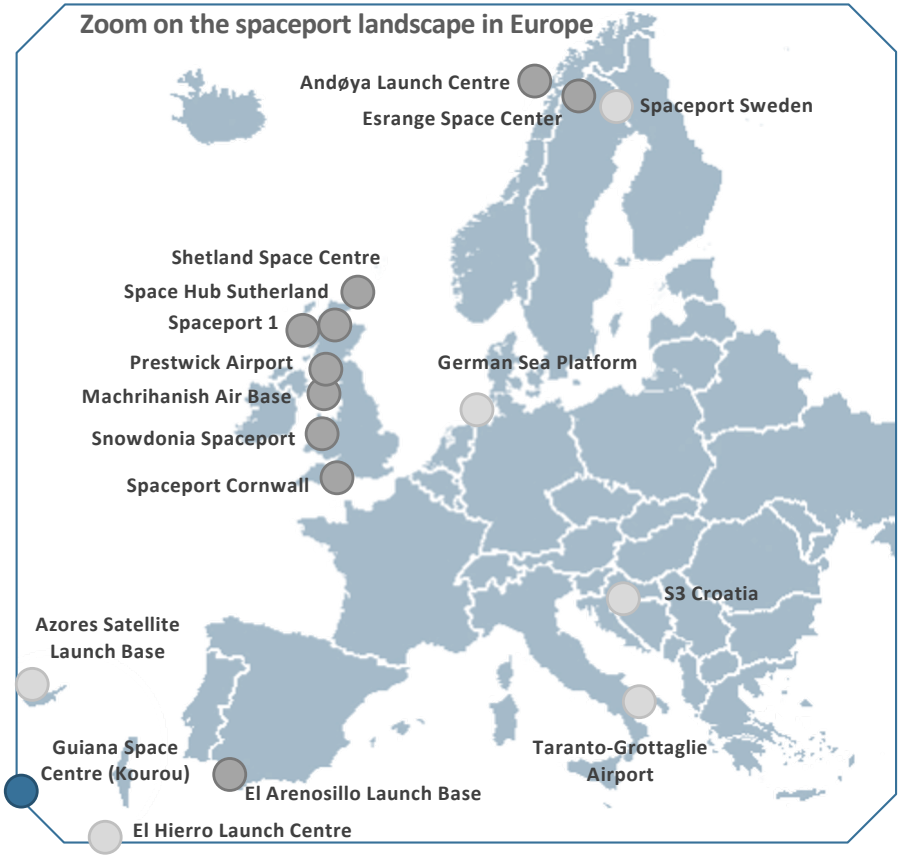
Mass launched in 2009-2018



Mass launched in 2009-2018

- Spaceports supporting mainly large launchers only
- Spaceports supporting small rockets
- Spaceports to launch small rockets by 2025
- Other announced spaceports for small rockets

Zoom on the spaceport landscape in Europe



- The most active spaceports are in the US, Europe (French Guiana), Russia and China.
- **New spaceports for small rocket launches are emerging** all over the world, and especially in Europe
- **7 sites in the UK alone are applying for launch licences**, and plan to cover most types of space launch (vertical and horizontal launch)
- Andøya, Esrange spaceports and a few UK spaceports (TBD) are expected to start operating small rockets by 2025, with the Nordics and 3 UK spaceports ahead of the race

Source: SpaceTec Analysis

Of the 8 benchmarks analysed, only 1 is fully owned by the private sector

Spaceport	Region and latitude North	Development stage	Employees	Owner / shareholder		Commercial revenues versus state support	
				State-owned	Private	State/institute. support	Commercial revenues
Guiana Space tre	France territory in South America, 5.17° N	Operational	1.700 (2016)	●		◔	
Esrange Space Center	Sweden 67.88° N	Operational for sub-orbital	Less than 100 (guessed)	●		●	As of today mainly state in regard to the spaceport
Andøya Space Center	Norway 69.29° N	Operational for sub-orbital	Around 100	◔		●	As of today mainly state
Arenosillo (CEDEA)	Spain 37.09° N	Operational for sub-orbital	–	●		●	As of today mainly state
Azores Spaceport	Portugal 38.15° N	Conceptual	–	●		–	
Spaceport America	US 32.99° N	Operational	50	●		◔	
Spaceport Alaska (PSCA)	US 57.44° N	Operational	60	●		◑	In the last 3 years addressing commercial
Launch Complex 1 and 2	New Zealand 39.26° S US 37.83° N	Operational	Rocket Lab 400-500	○		○ Complex 1	● Complex 2 (to serve US govt.)

Source: SpaceTec Analysis

Of the 8 benchmarks analysed, only 1 is fully owned by the private sector, which is based outside of the EU.

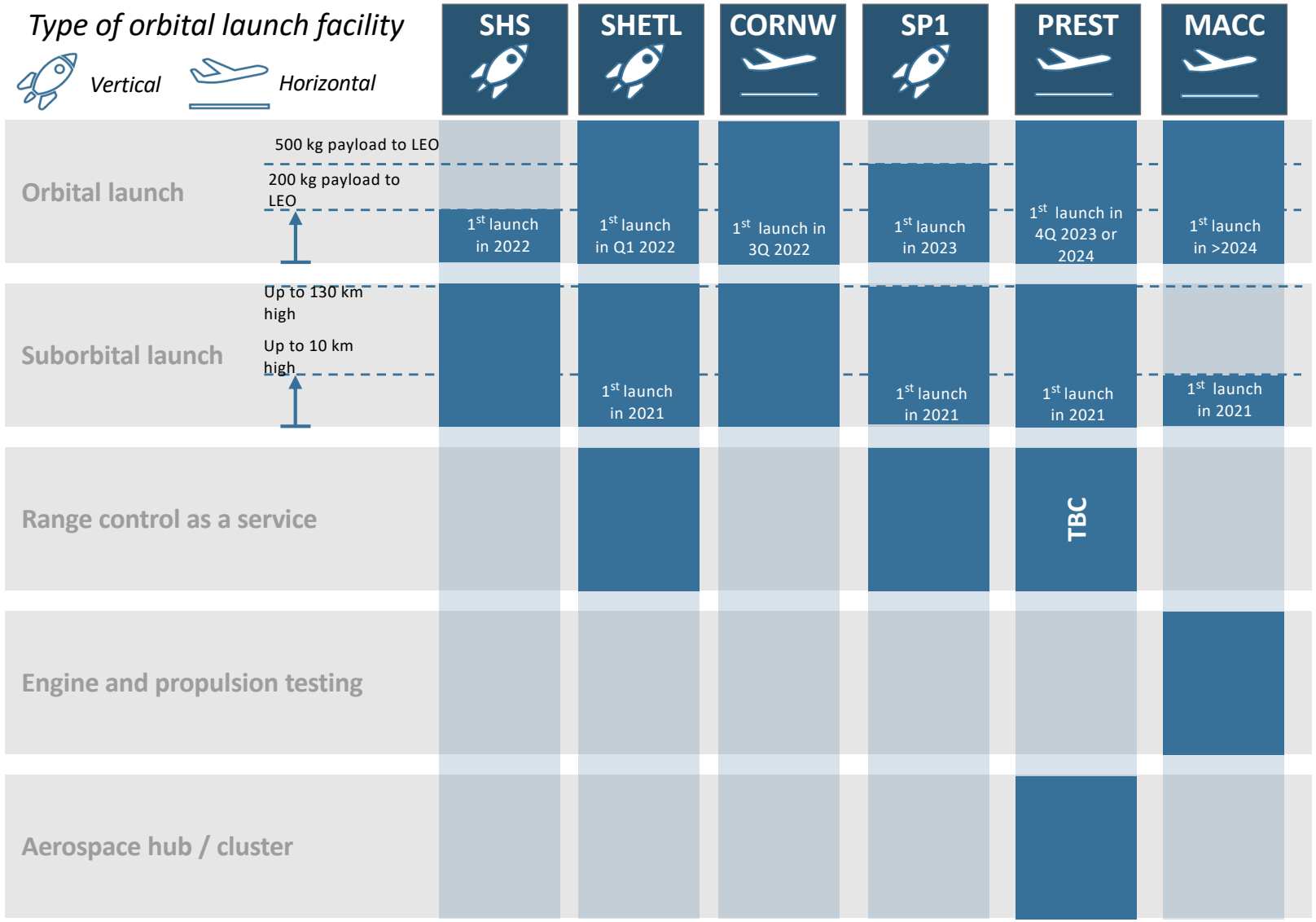
The other 7 spaceports are all fully state-owned, with the exception of Andoya Space Center (however, is still 90% state-owned)

Out of the emerging European spaceports the Nordic ones appear to be ahead of the race, with potential to launch by 2022

Spaceport	Country	Overall Readiness	Launch Type	Target market	Potential anchor customer	Funding sources	Regulation	Potential first flight
Andøya Spaceport	Norway	High	Vertical	Sounding rockets / small launchers	Agreements with RFA; and potentially Nammo, but not mature yet	Mainly public	Draft Bill by 2Q21; launch under existing reg. risky	**2022** (feasible as construction to start in 2021, public funding secured, additional private TBD)
Esrange Space Centre	Sweden	Medium/ High	Vertical	Sounding rockets / small launchers	N/A. No customer confirmed but identifies almost all European operators as potential customers. Interest in US operators but no TSA yet. Signed contracts for engine and stage testing with ISAR and RFA	Public	New reg. Delayed; might launch under existing reg. But unclear how	**2022** (feasible as funding secured and planning ready to start)
Azores Satellite Launch Base	Portugal	Medium	Vertical	Sounding rockets / small launchers	Ongoing concession bid expected to conclude by 2020 but no update available. Several European launch operators involved.	Public so far, expected to be Mixed after bid concession	Primary legislation in place but details to be finalised	**>2023** (date hard to predict until concession is granted and regulatory hurdles are solved)
El Arenosillo Launch Base	Spain	Low	Vertical	Sounding rockets / micro-launchers	PLD Space and Deimos active but none with firm plans for domestic launch	Public	No info available	**>2023/24** (guessed)

Several spaceports with different characteristics are emerging in the UK, with SHS, Shetland and Cornwall in a more advanced stage than others

Preliminary



To assess the Total Addressable Market (TAM) for satellite launches from the UK a step-by-step filtering approach has been applied

Global small satellite (≤500kg) demand forecast in 2020-2031

3 forecast scenarios

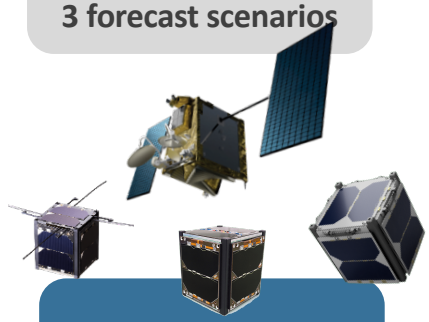
Filter by operator
Satellites of countries with closed domestic markets (e.g. China, Russia), as well as those belonging to shareholders with own rockets (Amazon/Blue Origin, Starlink/SpaceX) are not expected to fly on European/UK rockets

Filter by orbit
Spaceports in the UK are ideal for targeting polar/SSO orbits. At the same time, satellites heading for lower inclination orbits (0-50deg) are likely to be launched closer to the equator.

Filter by need*
Of the smaller satellites, about half need the flexible and dedicated, but more expensive launch services offered by micro-launchers. The rest will rely on ridesharing or piggy-backing launch services.

Total addressable market for ≤500kg satellite launches from UK with MLVs in 2020-2031

3 forecast scenarios



Filter by mass
Most MLVs can mainly launch the smaller satellites (≤200 kg). Heavier satellites will rely on bigger rockets e.g. light lift, medium lift and heavy lift rockets

Total addressable market for satellite launches from UK with MLVs in 2020-2031

3 forecast scenarios

** Interviews with space stakeholders and some news articles report that the majority of satellite operators (around 50-70%) would still currently prefer to launch on larger rocket than micro-launchers, mainly due to the lower launch costs, higher reliability, and current lack of offer. With potential higher confidence built into the micro-launcher solutions, it is expected that by 2031 the share of micro-launchers on the total launch demand of small satellites will range between 30% and 70%, where 70% represents the case in which certain micro-launchers achieve launch prices comparable to those of larger rockets and build a robust launch track record. To address this wide variability of results, three forecasting scenarios have been developed, i.e. scenarios where 30%, 50% and 70% of the satellite operators would opt for a micro-launcher over a larger rocket launch by 2031 whenever there is the choice between the two services. Once again, the medium forecast scenario is considered the most likely to take place.*

Smallsat constellations are the icons of NewSpace, with ca. 150 commercial constellations announced so far, out of which 65 are relevant

ESA's satellite classes

Class 4
1-25 kg

spire SWARM hiber SpaceMobile planet. COMMSAT HERA SYSTEMS HeliosWire earth-i LYNK

Other constellations

Fleet Space	Orbital Micro Systems	Earthcube	Raphael	Astro Digital (Landmapper)
SatRevolution (REC)	Sateliot	Myriota	EROS - IAI	NASA Cubesat Initiative
Planet (Flock / Dove)	Fleet Space	LaserFleet	ADASPACE	Aistech (DANU, HYDRA)
OroraTech	ZeroG Lab (Lingque, Magpie)	Lacuna Space	HyperCubes	Astrocast
PlanetIQ	Theia	GeoOptics (CICERO)	Kineis	Kepler Communications

Class 3
26-60 kg

SATELLOGIC BLACK SKY YOUR WORLD NOW

Class 2
61-200 kg

planet. KLEO Telesat OneWeb AXELGLOBE ORBCOMM Capella Space

Other constellations

Iceye	Maxar (WorldView Legion)	NorStar	GSV-U	Zhuhai Orbita (Zhuhai-1)
Xingyun	Synspective (StriX)	MicroCarb	GSV-V	Synspective (StriX)
Canon	Boeing satellite	Earth-i (Vivid-i)	CAS100	DigitalGlobe

Class 1
201-500 kg

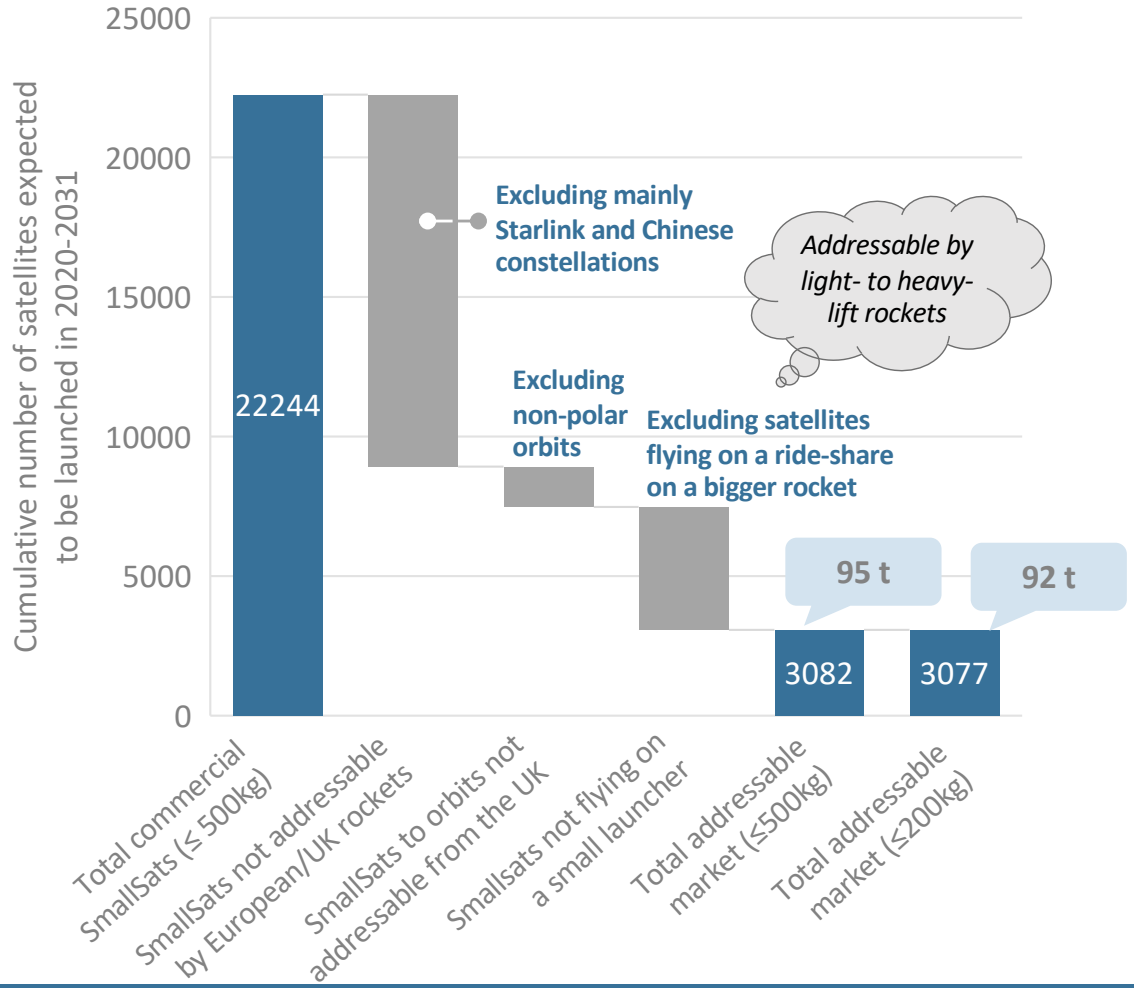
SPACEX SpaceNet amazon | project kuiper

Other constellations

XpressSAR		Galaxy Space (Yinhe)	UrTheCast	Hongyan & Hongyun (CASC)
GW-A59	GW-2			

The estimated commercial small satellites Total Addressable Market (TAM) for micro-launchers launched from the UK is ca. 95 metric tonnes in 2020-31

Forecasted cumulative number of commercial SmallSats addressable to be launched from a UK spaceport in 2020-2031 (medium scenario)



Key figures on the UK's TAM of commercial SmallSats (≤ 500 kg)

3082 SmallSats (95 t)
Most of them below 200 kg
(3077 satellites, total mass of 92 t)

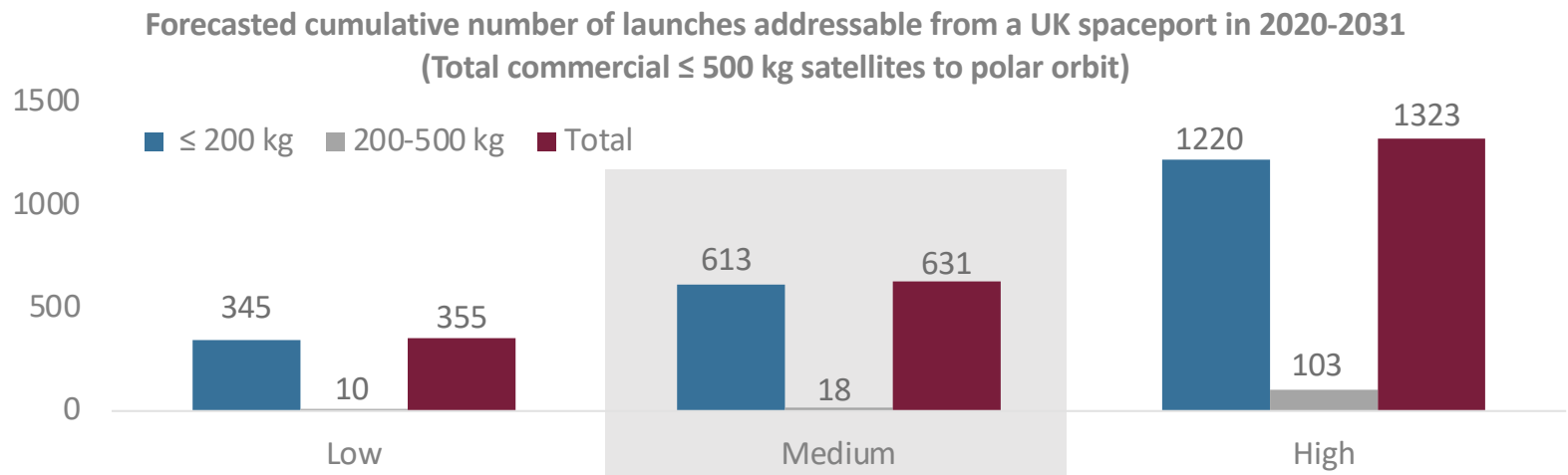
631 cumulative launches
(**53** annual average)

$3.8 B cumulative revenues
for **micro-launchers**
($316 M annual average)

$320 M cumulative
launch service revenues for **spaceports**
($27 M annual average)

TAM scenarios reflecting variations in the success rate of completion and replenishment of planned constellations

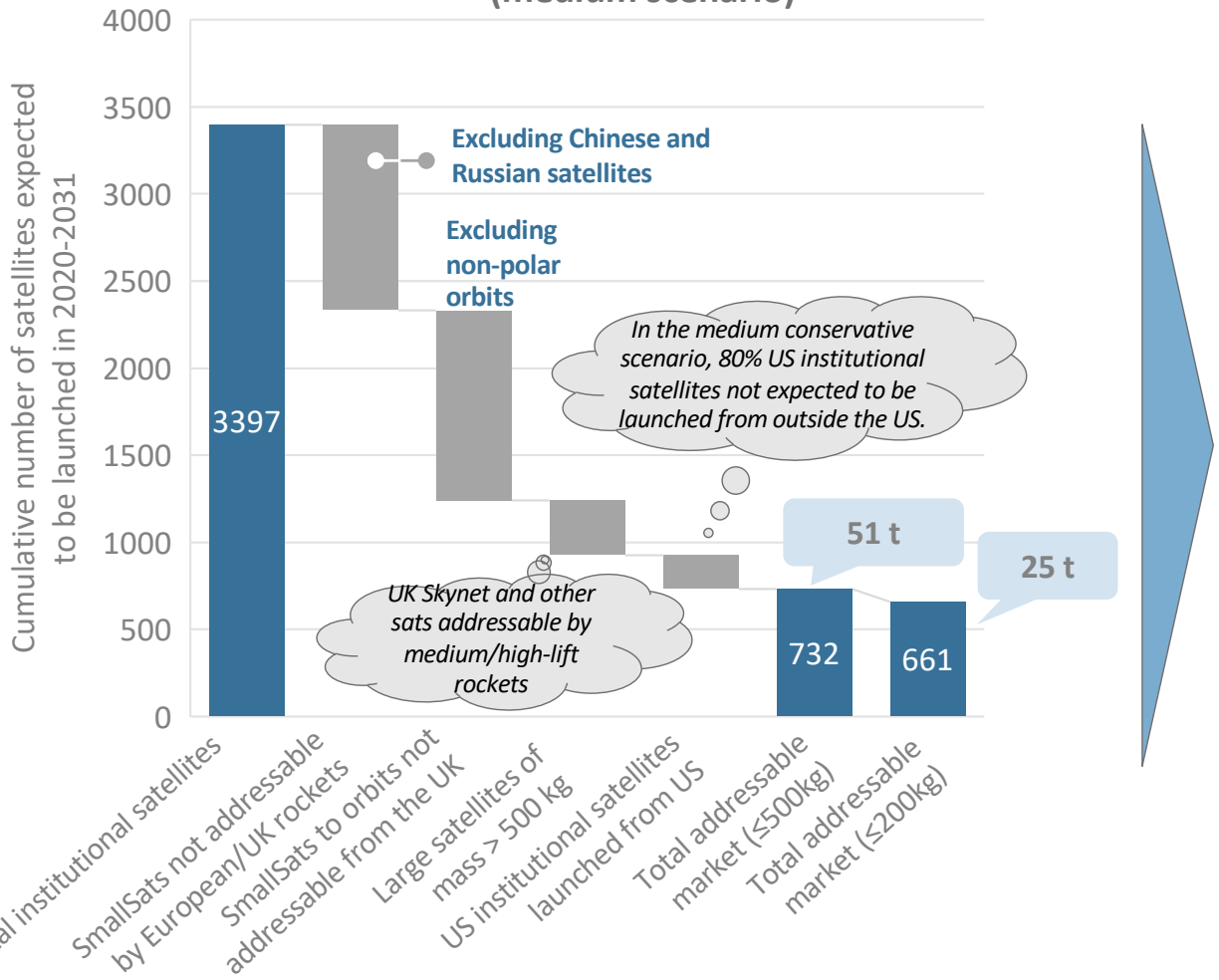
TAM Scenarios



Scenario description		Several commercial constellations will not be completed or replenished. Most satellite launches will deviate from planning.	Some commercial constellations will not be completed or replenished. Some satellite launches will deviate from planning.	Most of the planned constellations will be completed and replenished according to plan
TAM of number of UK micro-launches (up to 500 kg)	Cumulative (2020-31)	355	631	1323
	Average per year	30	53	101
TAM for a micro-launcher launching from UK (above in revenues)	Cumulative (2020-31)	$2.1 B (-45% vs medium case)	$3.8 B	$7.8 B (+105% vs medium case)
	Average per year	$175 M	$316 M	$650 M
TAM launch services revenues for a UK spaceport addressing micro-launchers	Cumulative (2020-31)	$177 M	$319 M	$662 M
	Average per year	$15 M	$27 M	$55 M

The TAM for institutional SmallSats (military and civil sats) that could be launched by micro-launchers from UK amounts to 51t in 2020-2031

Forecasted cumulative number of military and civil institutional satellites addressable to be launched from a UK spaceport in 2020-2031 (medium scenario)



Key figures on the UK's TAM of institutional SmallSats (≤ 500 kg)

732 SmallSats (51 t)
Most of them civil (45t civil, 6t military)
Of these, **661 satellites (25t) with a mass of less than 200 kg**

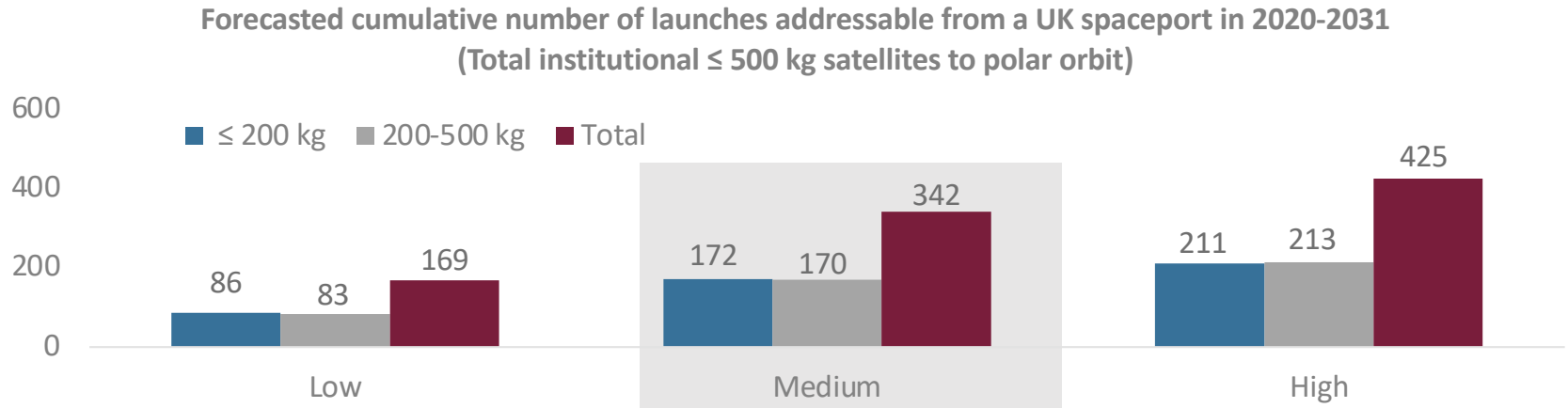
342 cumulative launches
(28 annual average)
of which 170 for ≤200kg sats
(14 annual average)

$2 B cumulative revenues
for **micro-launchers**
($170 M annual average)
of which £1 B for ≤200kg sats
($85 M annual average)

$171 M cumulative
launch service revenues for **spaceports, of which $85 M for the ones addressing** ≤200kg sats

TAM scenarios for institutional markets, differing levels of UK capability in capturing US and the rest of the world demand

TAM Scenarios

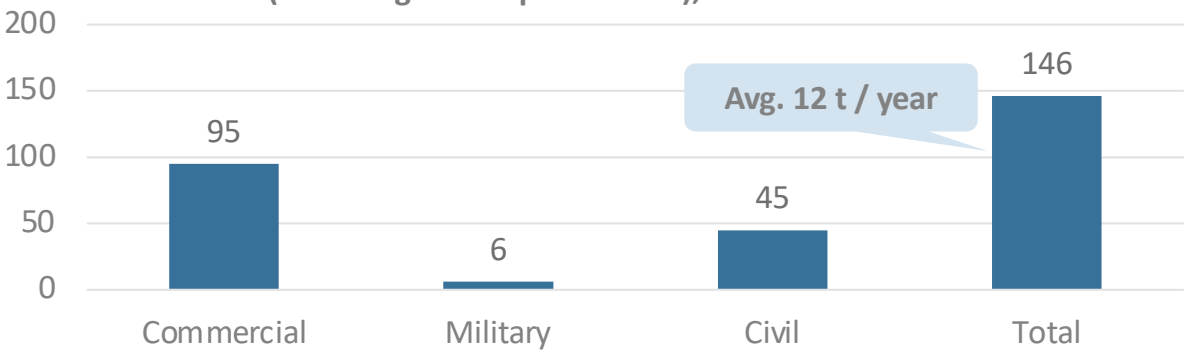


Scenario definition	Military	Including US market and rest of the world (China and Russia excluded)	Including 20% of US market and rest of the world (China and Russia excluded) *	Including 50% of US market and 50% rest of the world (China and Russia excluded)
	Civil	TAM incl. 5% of US, 50% of RoW, excl. Chinese and Russian sats	TAM incl. only 20% of US and excl. Chinese and Russian sats*	Global TAM excluding Chinese and Russian sats
TAM of number of UK micro-launches (up to 500 kg)	Cumulative (2020-31)	169	342	425
	Average per year	30	53	101
TAM for a micro-launcher launching from UK (above in revenues)	Cumulative (2020-31)	$1 B (-50% vs medium case)	$2.0 B	$2.5 B (+25% vs medium case)
	Average per year	$84 M	$170 M	$208 M
TAM launch services revenues for a UK spaceport addressing micro-launchers	Cumulative (2020-31)	$84 M	$171 M	$212 M
	Average per year	$7 M	$14M	$18 M

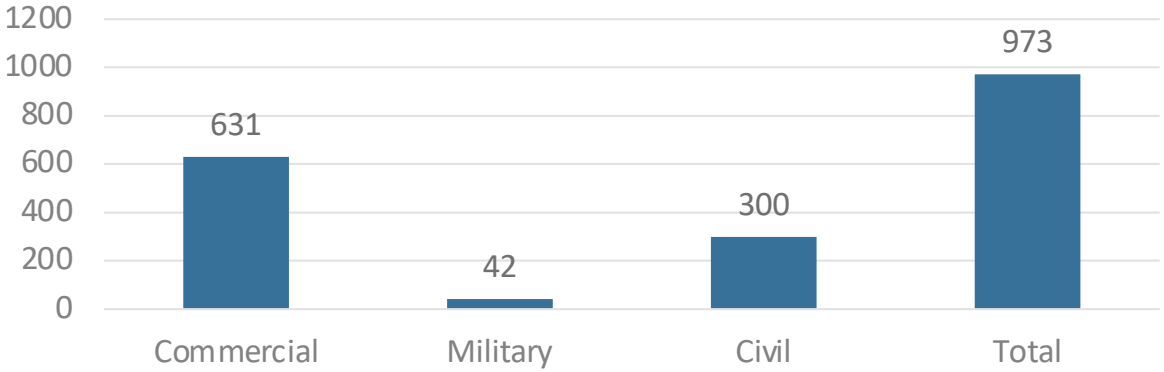
(*): Considering that not all RoW countries have launch capabilities, they will look to launch from elsewhere. In regard to the US market in particular, considering the privileged relationship between UK and US, We consider reasonable. Also see the interest of US launchers and emerging players to UK favourable ecosystem. Also note that there are limited available info about military missions. So military market is likely under estimated.

The estimated TAM for a UK spaceport results in 146t smallsat mass to be launched to polar orbits, equivalent to over 970 launches of small rockets

Forecasted cumulative satellite metric tonnes addressable to be launched from a UK spaceport in 2020-2031 (<= 500 kg sats to polar orbits), medium scenario



Forecasted cumulative number of small rocket launches addressable from a UK spaceport in 2020-2031 (for <=500 kg satellites to polar orbits, medium scenario)

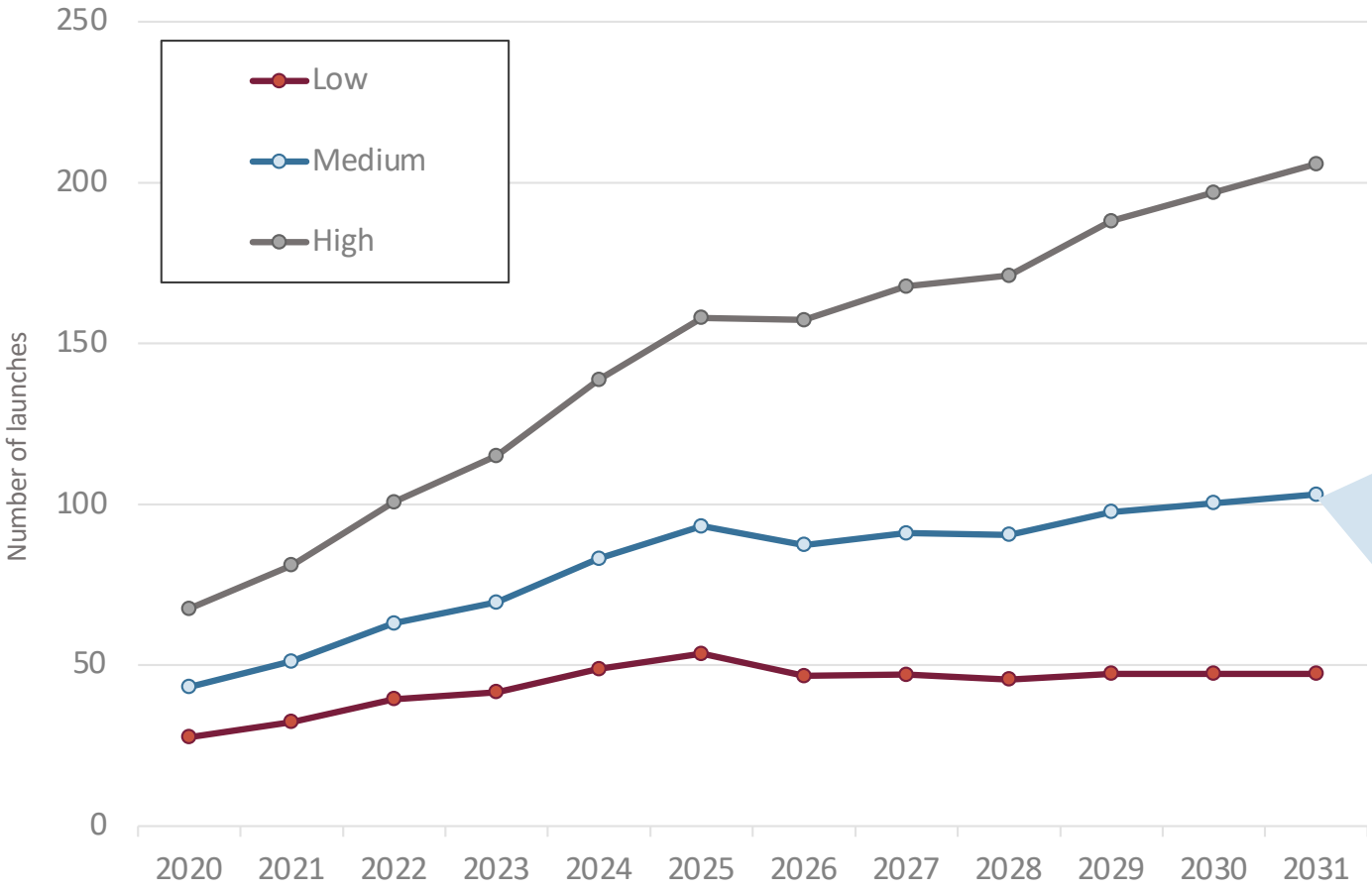


Key figures on the UK's TAM of small satellites (≤ 500 kg)

- **Rockets launching from the UK could address a market of around 146 t for 2020-2031, of which 65% are commercial satellites**
- If launched by micro-launchers, this translates to a TAM of 973 launches, i.e. an average of 81 launches per year
- The UK might address the **launch** demand of **institutional satellites from countries that do not have launch capacities** (e.g. Canada)
- Given its good relations with the US and similar launch regulations, the UK is **well positioned to address both the US commercial and institutional demand**
- As part of ESA, the UK could **serve as a launch hub for small ESA satellites**
- Part of this UK's TAM can be captive TBC, e.g. UK commercial constellations (e.g. Spire), military satellites (Oberon to be deployed) and UK geo-return as part of ESA (e.g. ESA ClydeSpace constellation)

Bringing to a total TAM for micro-launches from the the UK between 50 and over 200 in 10 years (81 annual average in the medium scenario)

Projected number of micro-launches of commercial and institutional small satellites that can be addressed by a UK spaceport



Source: SpaceTec Partners Analysis

Medium Scenario

973 cumulative launches

$5.8 B cumulative revenues for **micro-launchers** (ca. $480 M annual average)

Ca. $490 M cumulative launch service revenues for **spaceports** ($40 M annual average)

Interviews revealed the need for flexible and cost-effective launch solutions, and the current lack of supply for such services

> Rocket Lab is more expensive, but it launches on time. Price is not the only point we take into consideration.
>
> CEO of a NewSpace constellation

> We' re considering small rockets for their launch flexibility, e.g. if we have a big gap in launch cadence. However, at the moment micro-launchers don't really offer such frequent launches and flexible scheduling. [...] Players like us would use micro-launchers if they were really responsive, if you could sign a contract and throw within two weeks.
>
> CEO of a NewSpace constellation

> The price of small rockets is a big issue. We would only use a micro-launcher if there is a customer who has time priority and is therefore willing to pay the premium, and we would piggy-back. [...] We would like to launch in batches of 6-8 satellites.
>
> CEO of a NewSpace constellation

> I need an injection in the right orbit at a schedule that fits my business at a cost that I can afford. Not all rockets can inject your satellite batch in the right orbit. The envelope that wrap this all is reliability. A start-up cannot afford a failure on the launch pad.
>
> CEO of a NewSpace constellation

> When you launch a lot of satellites, everything is well regulated. With large rockets, the issue of regulation becomes a nightmare. We plan to use dedicated launches.
>
> CEO of a NewSpace constellation

> Our plan is to launch all the constellation in nine months. It's possible that we cannot do this with just one company. [...] We need rockets that can bring the satellites 5 by 5. [...] We were interested to launch the constellation for around €30 million in 5 launches.
>
> Director of Innovation of a NewSpace constellation

Interviewed stakeholders

Satellite operators and manufacturers				Rocket manufacturers and spaceport operators	
Surrey Satellite Technology	Iceye	Kepler Communications	Fleet	Rocket Factory Augsburg	CNES
ISIS Space	Inmarsat	Axelspace	OneWeb	Hyimpulse	Andoya Space Centre
Satellogic - Aleph	Kleo Connect	NorthStar Space Data	Kinéis	Ariane Group	Southern Launch

This analysis is rather conservative for different reasons

- The **commercial demand forecast is based on a selection of the currently announced small satellite constellations** (e.g. ca. 70 out of the 150 announced, including for example just one mega constellation instead of 4 anticipated) and assumed likelihood of success/ delay (driving the low, medium and high forecast), in any case **not speculating on potential upcoming/ unknown new ones** e.g. stimulated by more and more affordable satellite manufacturing and launch costs

- It **focuses on small rockets** (launchers with a maximum payload capacity lower than 500 kg) and not on larger rockets who could address the ride-share part of the addressable market or lift heavier payloads

- It **does not consider** the longer-term **launch demand** for **hypersonic flights** and/or **space tourism**

- **The analysis of the military demand is based on a projection of the of the existing "known" international assets , thus does not include the launch of classified satellites**

- **In regard to the UK captive institutional demand of launches the current analysis does not include a detailed analysis of the UK government planning** (e.g. associated to the 20th November 2020 government announcement of UK defence space budgets rise, or associated to the UK increased investment in ESA)

The importance of UK first mover advantage: geopolitical/ strategic vs market opportunity

Geopolitical/ strategic

Performing a first launch from UK before other European countries (i.e. by 2022) would:

- Provide **independent access to space** (a strategic asset in the space value chain)
- Demonstrate the UK's capability within the space sector and in doing so:
  - **Elevate the UK's positioning** among other traditional space fairing countries
  - Demonstrate **progress** in achieving the UK Government's **stated strategy for the sector**
  - Attract **media attention** and therefore **wider awareness** of UK launch ~~(~~and wider space~~)~~ sector capabilities and potential investment opportunities

Market

In relation to the market opportunity:

- **Institutional market**: 1st mover advantage is not critical as the space base choice is driven by national level agreements (e.g. UK launching US government missions)
- **Spaceports with committed anchor customers**: 1st mover advantage is not critical as the customers choice of spaceport is driven by strategic and business model drivers and the spaceport's competitiveness/ viability is determined by the location, number of launches secured and its income/cost model
- Excluding the above, **1st mover advantage would be critical** to secure initial customers (new space launchers) not yet affiliated/ bonded with other spaceports, who are ready to launch **by 2022** (based on our analysis this likely equates to only one or two)

UK is well positioned to be at the forefront of the global small satellite launch market

UK SWOT

Strengths

- Ambitious targets and strategy to increase UK space sector market share by 2030. UK became the f4th contributors to ESA after France, Germany and Italy
- Solid national space capabilities especially in the small satellite sector and in NewSpace
- Positive VC environment dedicated to space (e.g. UK based Seraphim Capital)
- The UK can adapt its regulations to meet the clients needs quicker as it does not require approval of 26 other countries.
- Only personal jurisdiction is applicable in the UK, lowering the barrier to enter the market, simplifying the landscape
- The UK and US concluded the TSA to smoothen US participation in space launches from the UK

Weaknesses

- UK is located on an Island, adding logistical challenges for firms based in continental Europe (nevertheless this is the case also for other emerging sites in Europe)
- Lack of EU funding for UK spaceports means that a spaceport is a riskier venture, as the burden is solely on a national level
- Uncertainty around future EU-UK space sector relationship due to Brexit

Opportunities

- No EU spaceport consistently launches small satellites, this means UK/ Scotland would benefit from the first-mover advantage
- As a third-party country, the UK is not subject to EU laws and regulations, meaning that is an attractive option for companies who want to minimise red tape
- Upside potential from an upcoming demand of UK national institutional missions (not specified in the present forecast to date)
- Opportunity to be the preferred European continent country from American players (both institutional and commercial) thanks to the historical link between UK and USA government
- Also opportunity to play a pivotal role among the Commonwealth states

Threats

- There is a risk of the EU implementing protectionary measures such as making EU companies must use EU sites
- Several countries pushing for their own spaceports, meaning there is heavy competition in the market
- If all UK spaceports are beat to the race of first to market by European spaceports, and the EU develops Europe wide regulations, many launch companies will not see a major benefit in re-registering in the UK
- Nevertheless, realistically (non-UK) new launch companies that would be ready to launch by 2022 would probably limit to maximum one or two

In order to capture a relevant market share of the TAM several actions should be undertaken

- Establishment, as soon as possible, of a flexible regulatory framework to allow emerging launch service providers to obtain a UK license - this would help retain gained Launch Service Provider to keep launching from the UK instead of seeking licensing elsewhere (note recent intelligence advises that other European countries are behind UK on this);
- Assuring a high level of political and strategic intent to create a national captive market (e.g. buying launching capacity to support academic and research satellite programmes, as well as institutional remote sensing and technology demonstration missions);
- Ensuring supportive trade and security agreements with key partners (e.g. USA, key EU Member States, for example Germany and Italy, five allies, NATO partners for military capability);
- Balancing technical and market risks across a diversified, yet complementary, project portfolio;
- Securing agreements with anchor customers to deliver a robust order pipeline;
- Creating a robust innovation eco-system to support the national space sector e.g. strengthen centres of excellence and cluster support, support R&D across the space sector value chain; and,
- Attracting and incentivising foreign direct investment within different aspects of the UK sectors value chain