

QUARTERLY REVIEW OF GLOBAL PRIVATE INVESTMENT

# GENERATION SPACE INDEX

Q4 2022



GENERATION  
SPACE

The general economic pullback has affected the whole startup landscape. Annual private SpaceTech investment is down ~25% compared to the record high of 2021, yet 2022 is still higher than all years before 2021. Whereas 2021 was the year of the mega-round, 2022 is the year for new space startups. Seed deals are up ~50% this year, an indicator that investors still see potential for strong returns from the sector and many companies were formed in 2022. Number of deals grew significantly in Europe and Asia indicative of many new startups forming in those regions.

Despite the pullback, PE/VC dry powder remains near all time highs. As such, we expect strong capital deployment to resume as economic uncertainty starts to clear.

Quarterly investment began a downward trend in Q3 2022 and remained about level in Q4, at about half the level seen during H1'22. On a TTM basis, 2022 investment stood at \$8.9bn, down from \$12.2bn at Q3 2022 and likely due to Sierra Space's large Q4'21 round falling out of the comparison period. In general, TTM Q4'22 investment levels were at levels last seen in Q2'21, 18 months prior. This follows a bumper year of investment and positive sentiment seen in the market in 2021.

Segments of the Space economy demonstrating growth:

- While growth investing has experienced a pullback due to investor price sensitivity in valuations, and aversion to businesses with high burn rates, early-stage deal making reached all time highs. We recorded 198 Seed deals in 2022, vs 127 in 2021. This means 50% more investment-worthy space startups formed in 2022 than 2021!
- Asia and Oceania regions saw growth in investment year on year versus 2021, while more mature geographies saw a pullback. This demonstrates the emergence of these early space economies and could indicate healthy investment markets in these regions going forwards.

Companies making up the Build and Product categories (mostly space hardware and data platforms respectively) saw a YoY increase in investment. Growth in Build investment can be attributed to more 'picks and shovels' type businesses, and growth in Product has been seen as data platforms seek to aggregate and understand the explosion in data from satellite constellations.

## Highlights

**\$8.9BN**  
invested in last 12 months

**\$1.2BN**  
invested in Q4 (\$1.2bn in Q3 22)

**270**  
on Seraphim Investment Index (370 in Q3)

**214**  
on Seraphim #Deals Index (214 in Q3)

**\$182M**  
biggest deal closed in Q4 (Volocopter)

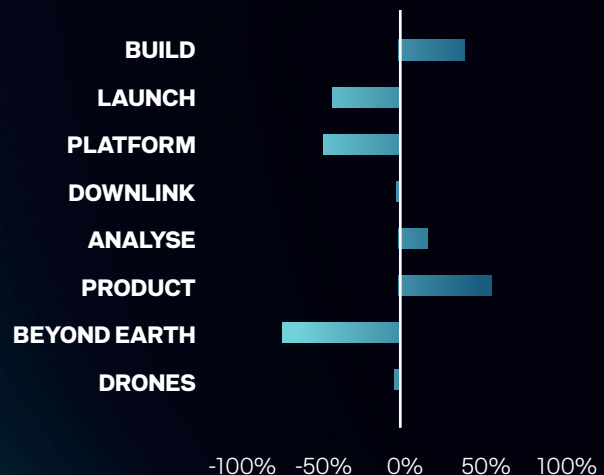
**\$50M**  
biggest non-UAV deal closed in Q4 (Axiom)

**\$11.6M**  
average deal size in Q4 (vs. \$12.8m Q3)

**\$3.2M**  
median deal size in Q4 (vs. \$4.6m Q3)

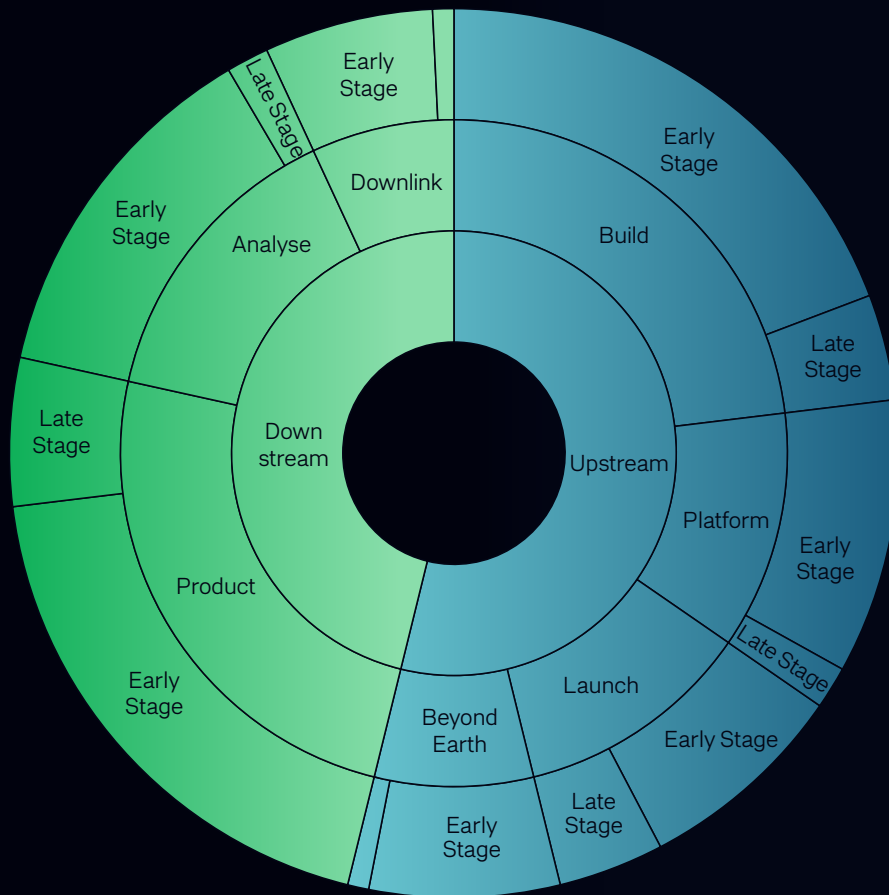
**0**  
space-related SPAC announced (vs 0 in Q3)

## Investment (\$), TTM to Q4 21 vs. Q4 22 (% Change)



The shift from Platforms (i.e. constellations) to Product is likely due to many more downstream data products/services coming online. This follows an explosion in EO data in previous years, as constellations mature. Decline in Beyond Earth is primarily due to comparison effects with a large Sierra Space round in 2021. Comparing to 2020 to avoid comparison with Sierra, Beyond Earth funding is up over 500%. Clearly investors are starting to warm to Beyond Earth investments.

# Q4 2022 DEALS ACTIVITY (# DEALS)



Q4 2022 experienced a record 29 investments in companies in the Build category. Build encompasses companies manufacturing space hardware, robotics, propulsion systems, or software/engineering solutions for space systems.

This increase may indicate that investors now see the space market as sufficiently large to invest in companies that purely service space companies. Interestingly, there was an increase in Product companies (32 versus 23 in previous quarter). This is likely due to a proliferation of companies trying to make sense of the explosion in data produced as EO constellations mature. These companies also have near term revenue opportunities and lower capital requirements versus other sectors in Space.

Overall, the split of transactions in Q4 was roughly equivalent with previous quarters in terms of stage (80% early stage). However, there was a shift in Upstream versus Downstream, with Upstream accounting for only 53% of deals versus 64% previously. This is likely due to many new early stage Downstream companies being formed and raising early stage rounds.

## Q4 2022 Top Deals

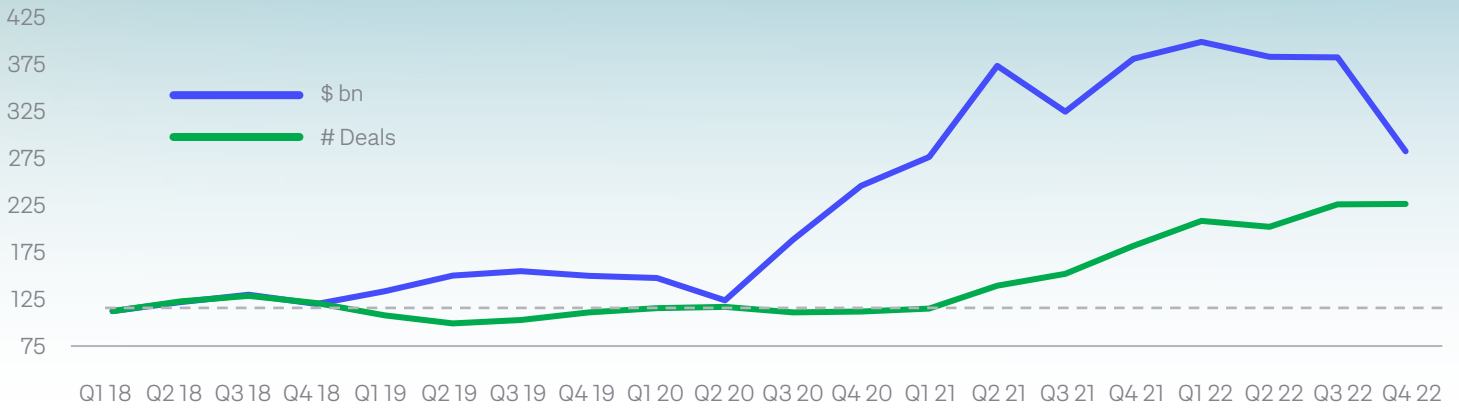
In Q4, the top 10 deals accounted for 54% of the total investment in the sector, a lower capital concentration than has been typically seen in recent quarters. Only two rounds in excess of \$100m were raised this quarter, once again showing the difficulty of raising growth funding rounds in the current economic environment. These rounds were also in drone and location-related companies. Although overall top-10 round sizes were lower, it is notable that downstream Product companies were able to attract relatively large rounds, such as BeZero Carbon. This could be thanks to their climate focus, a key area of investor interest in 2022.

Unusually, compared to previous quarters there were a mix of more capex-heavy business and those with lower capital requirements. On the capital-intensive side we have Volocopter, Axiom Space, and Orbex, while on the more downstream side we have Swift Navigation, Bezero Carbon and Slingshot. While the US remains the primary driver of large SpaceTech rounds, Q4 sees representation from UK, India, Australia and Germany in the top 10. Notably compared to Q3 there were no large rounds in China, although Space is of high strategic importance to China, and significant funding is being deployed to develop these capabilities.

COMPANY	COUNTRY	DATA LIFECYCLE	SUB CATEGORY	STAGE	AMOUNT (\$m)
<b>Volocopter</b>	Germany	Launch	Flight & Delivery	Series E	182
<b>Swift Navigation</b>	US	Product	Location & tracking	Series D	100
<b>Advanced Navigation</b>	Australia	Build	Electronics & robotics	Series B	72
<b>Axiom Space</b>	US	Beyond Earth	Space Infrastructure	Series C	50
<b>BeZero Carbon</b>	UK	Product	Data Platforms	Series B	50
<b>Orbex</b>	UK	Launch	Rockets	Series C	45
<b>Slingshot Aerospace</b>	US	Product	Data Platforms	Series A	41
<b>Bee Flights</b>	India	Launch	Flight & Delivery	Series C	36
<b>Exyn Technologies</b>	US	Collect	Drones & UAV	Series B	35
<b>Reach</b>	US	Build	Materials & Energy	Series B	30



## Seraphim Trailing 12 Months Investment Activity Index (Q1 2018 = 100)



The Seraphim Space index provides the barometer for investment activity within the NewSpace Ecosystem. It shows global volume and value of venture capital deals within the Space sector on a 12 month trailing basis, normalised against Q1 2018.

Q4 maintained the record number of deals at 129, as the deals index reached 214. The amount of \$ investment has also stayed roughly constant in Q4'22 vs Q3'22. This could indicate a plateau in the overall declining trend of Space investment.

The index reached an all-time high of 386 in Q1 2022 and has since fallen to around 270 – levels last seen two years ago. This is consistent with capital deployed shrinking during an economic downturn as we have been experiencing since mid-2022.

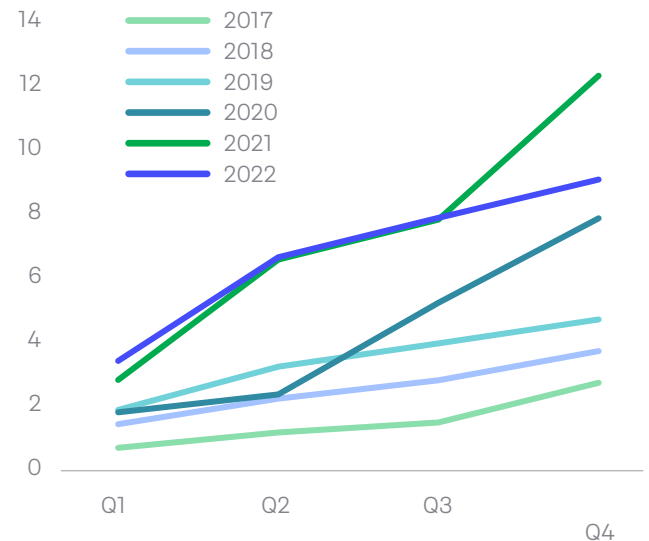
While Series C and Seed deals have risen in both volume and \$ invested, the stages in between have experienced a decline. Investors have been drawn towards lower value early stage deals, as well as companies who are more mature and have made it past the typical stages where failure are seen (A and B). It can also indicate a flight to quality and fundamentals.

## Seraphim Quarterly Investment Tracker (\$bn Invested)



The quarterly investment tracker shows a year of continuous retraction of investment since the highs of Q4 2021. However, the effect seems to be plateauing in terms of quarterly investment, as the decline stabilises.

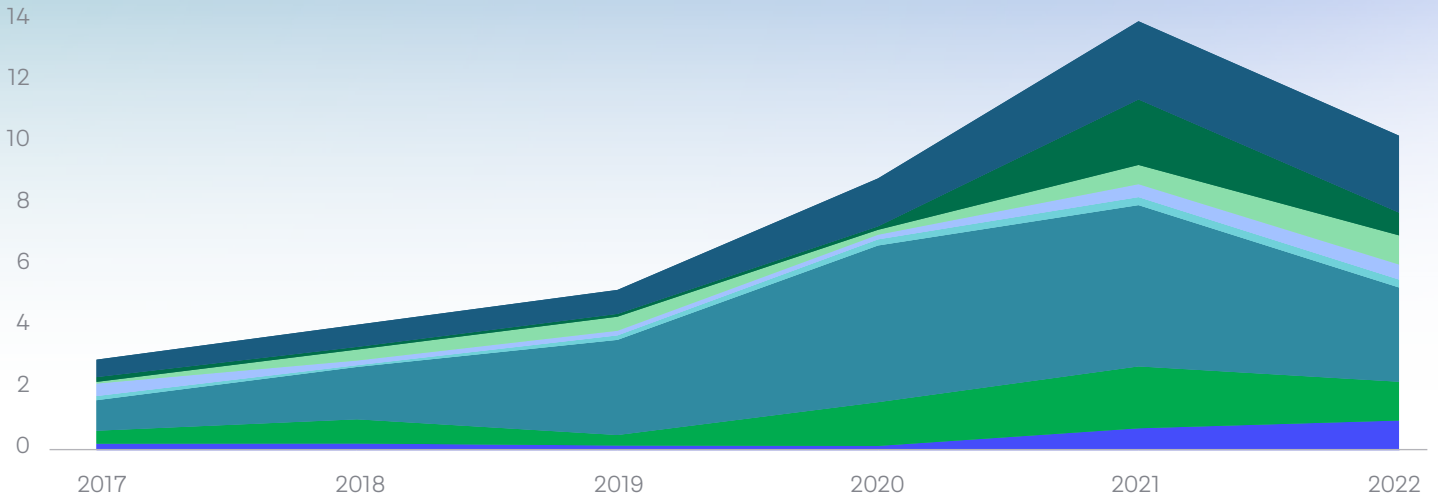
## Seraphim Annual Investment Tracker (\$bn Invested)



Cumulative investment through 2022 remained at the highest levels recorded, and appeared to be tracking 2021 levels, until the most recent quarter. However, this is likely due to Sierra Space's large \$1.4bn round in Q4 2021 which was deemed an outlier. It is promising that despite falling compared to an outlier year in 2021, space investment continues to grow compared to previous years.



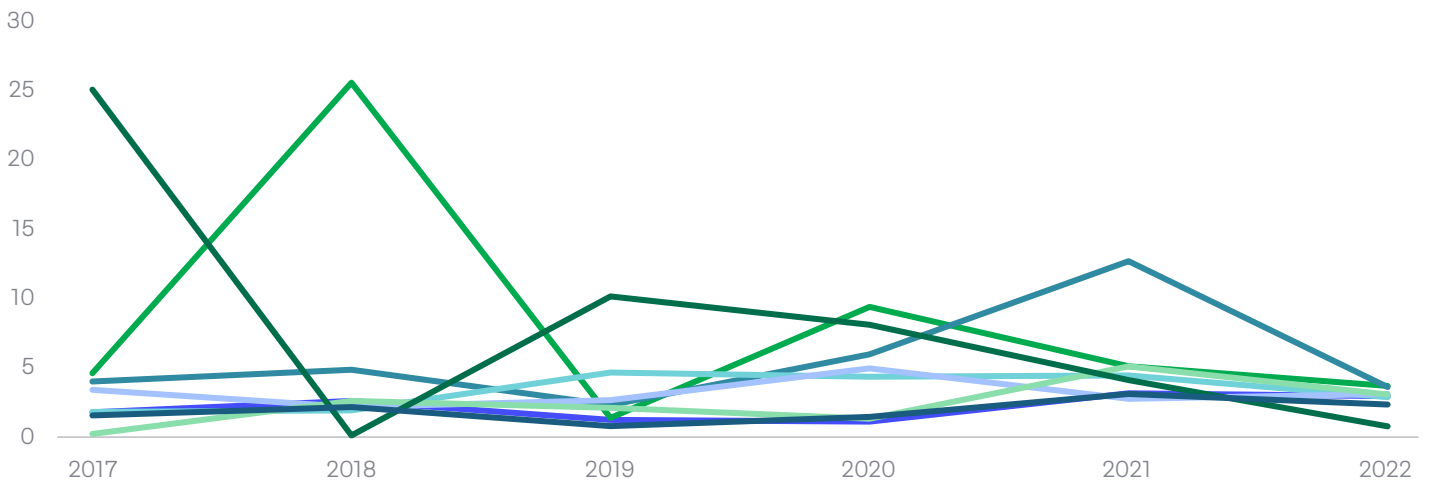
## Annual Investment (\$bn)



Space investment is down by ~25% compared to 2021. The Constellation (Platform) sector has been most affected: it is down 40%. In 2021, \$4.6bn invested in constellations: \$3.3bn of this was for OneWeb and Space X, the remaining \$1.3bn other constellations. 2022 saw no funding raised by OneWeb, and while SpaceX raised \$2bn, other constellations only raised \$0.69bn. Notably, the proportion of investment going to Product and Build companies

is growing while the Downlink and Analyse segments have seen approximately constant proportion of investment over the past few years.

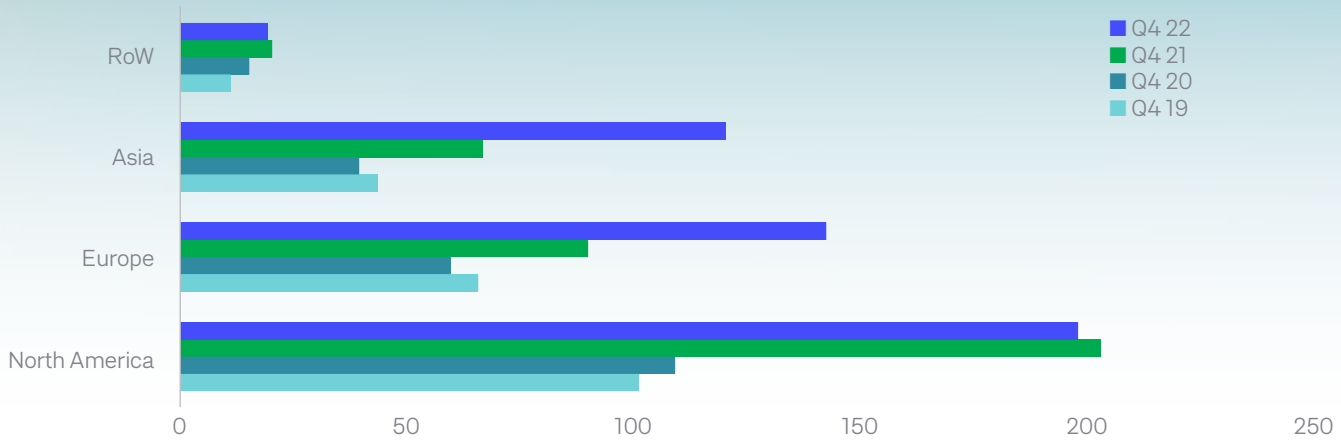
## Median Deal Size (\$m)



This quarter we have changed our approach to look at median deal size rather than average, given some significant outlier rounds especially in the Beyond Earth category. The median deal size versus 2021 is down in almost all categories except for a small uptick in Analyse. Across the board we have seen generally smaller deal sizes this year given greater economic uncertainty. The top performer in Analyse for the quarter was Ororatech, providing wildfire intelligence from space, which highlights the potential of 'Space for Earth' technologies.

Although median deal sizes have fallen, the actual number of deals continues to rise, with higher deal volumes versus the previous year in Build, Analyse, Product, Beyond Earth and Drones. Though raising smaller rounds, space startups are continuing to grow in number.

## No. Deals Last 12 Months Investment



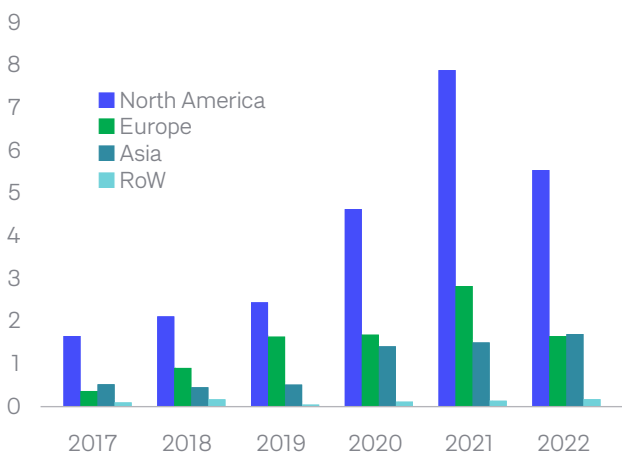
While 2021 was the year of massive rounds, 2022 has been the year for seed and early stage businesses. Despite overall investment being down in 2022, deal numbers grew by 58% in Europe and 80% in Asia. Growth in Asia was primarily driven by China, particularly at the early stages where deal number grew from 46 to 86 in 2022. China has a mature space programme, which appears to be spinning out a new wave of startups.

European deals by number were essentially flat at the later stages, however there has been an explosion of early stage deals, growing

from growing from 67 to 117 in 2022. There are a few factors that can explain this - increased non-dilutive funding available for European start ups, talent leaving the larger tech companies to found startups, and the relationship of space to climate, which is attracting many impact-driven founders.

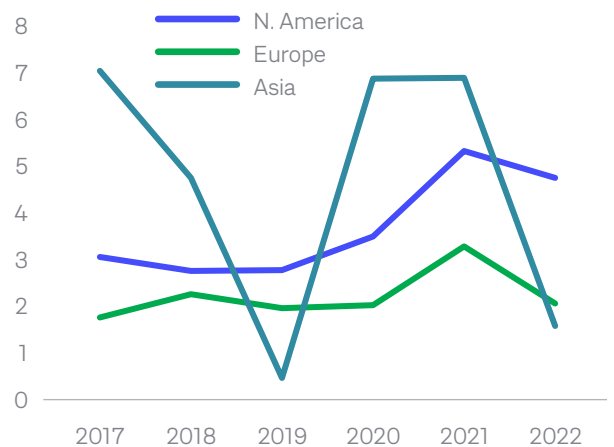
Founders are clearly still keen to found space businesses in 2022, and there has been no shortage of investors at these early stages.

## Investment By Region (\$bn)



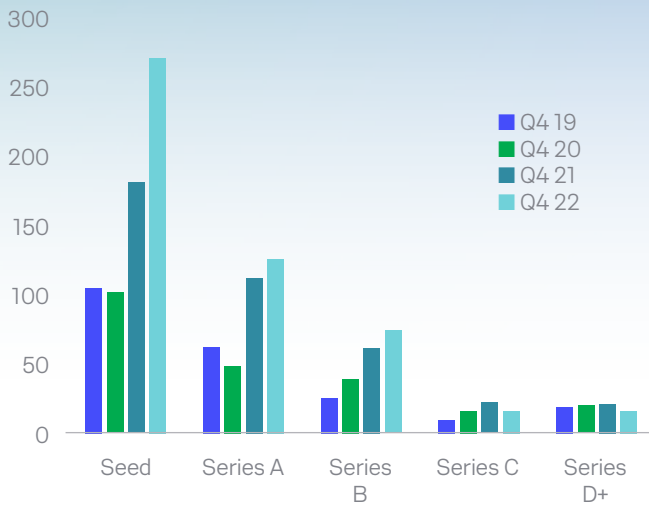
The amount of capital investment is down in North America and Europe, but up in Asia and ROW, albeit at much lower quantum. This is in line with the number of deals funded having grown, as investors are drawn towards smaller and perhaps lower valuation deals, searching for quality and value during an economic downturn. The large drop in US is evident, as 2021 saw record levels of capital deployed, typically attracted to more risky businesses set up in more mature regions.

## Median Deal Size By Region (\$m)



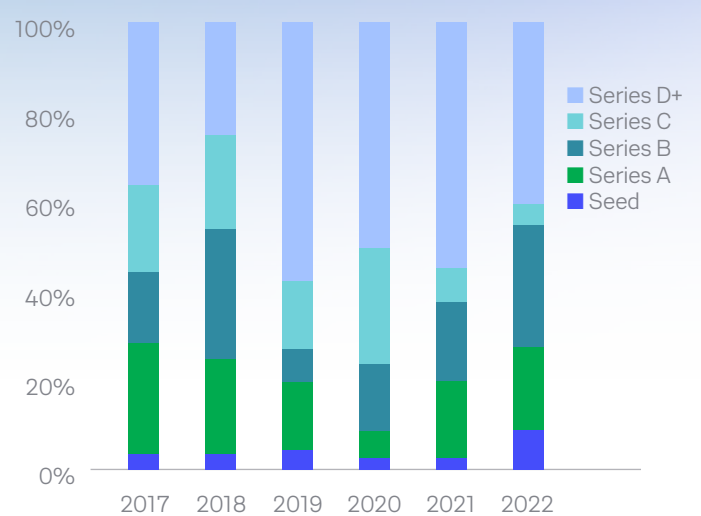
Median deal size is down across the board. This may be driven by 2 factors: 1) Given the harsher funding conditions, companies through 2022 have been avoiding raising funding unless absolutely necessary. Many are raising smaller extension rounds to extend runways to Q4 2023/Q1 2024, when conditions may once again be more favourable to raise large growth rounds. 2) The reduction in megarounds which were seen through 2021 for constellations such as OneWeb and Starlink, as well as for Beyond Earth companies.

## No. Deals TTM (Q4 2022)



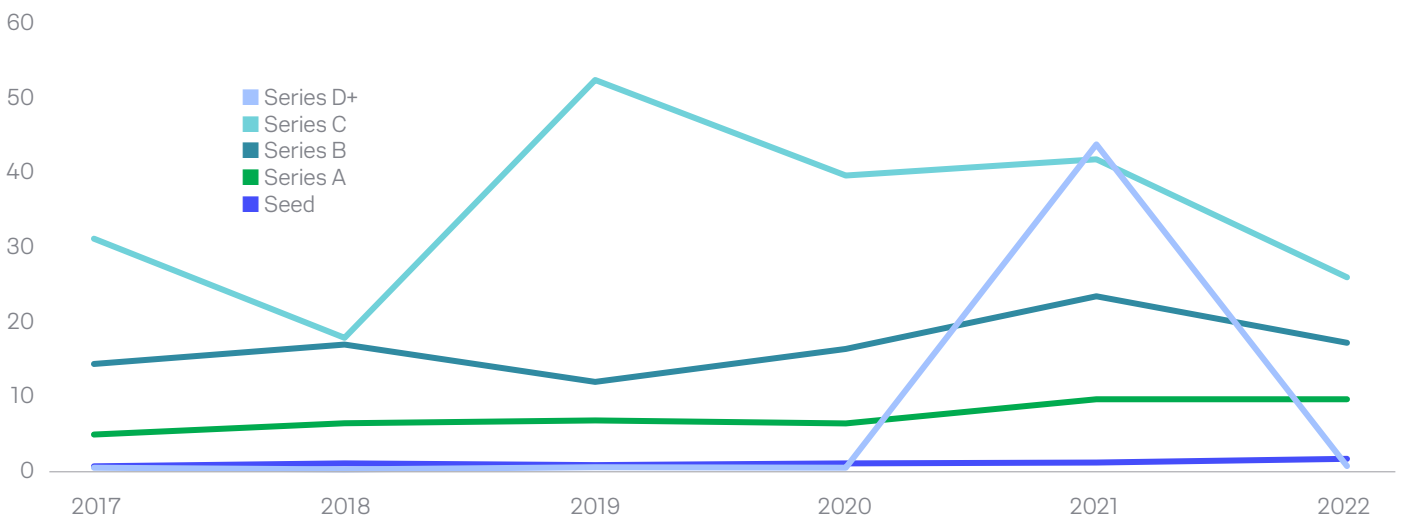
Early stage deal numbers continue to grow, while at the later stages investors have diminishing appetite in the current economic environment. Clearly, seed deals have more than doubled in the past few years, indicating record levels of new space startups being founded.

## \$ Invested By Stage (\$bn)



An interesting trend can be seen in the graph above, of reducing proportion of early stage investment up to 2020, following which we've seen a return to a greater proportion of investment going to early stage companies (seed and Series A). This means a lower proportion of year on year investment is going into later stage deals, with investor interest turning away from these typically expensive deals.

## Median Deal Size (\$m)



Median deal size across all stages has fallen, which is unsurprising given the general decline in capital deployed this year. What's clear is that at the early stages median deal values have maintained relatively stable values while later stage (C and D+) have fluctuated quite a lot more. 2021's spike in Series D+ can largely be attributed to the bumper number of deals seen into late-stage, highly capital-intensive

companies such as Sierra Space, SpaceX, OneWeb, and Relativity Space. This sentiment has largely dried up in 2022 as investors flock towards better valued deals. Series C deals have mostly maintained the highest median deal value over the years, an indication that once companies are generating meaningful revenues (as largely seen at Series C) they are able to attract capital more easily.



## Announced & Completed Space SPAC Deals

SPAC valuations are very suppressed, trading significantly under their listing EV. We have seen that a lot of space SPACs have been struggling since listing, especially Astra which has received a delisting warning. Market Cap for all companies with the exception of Blacksky are down from end of Q3. Of all the SPACs, EVE has held its value best in Drones,

and Planet among the SPACS. One new SPAC announced after year-end is World View but it remains to be seen whether this transaction closes, given the relative hesitancy towards public space companies seen in the past 12 months.

ANNOUNCED	COMPLETION	COMPANY	REGION	SPAC SPONSOR/ EXCHANGE	DATA LIFECYCLE / SUB CATEGORY	AMOUNT	PRO FORMA EV	MARKET CAP CAP 30/9/22
Oct-20	13-Aug-21	<b>Momentum</b>	US	\$SRAC / Nasdaq	Launch / Space Tugs	\$247m	\$567m	\$65.6m
Dec-20	07-Mar-21	<b>AST&amp;Science</b>	US	\$NPA / Nasdaq	Platform / Satcoms	\$462m	\$1400m	\$343.2m
Dec-20	10-May-21	<b>Blade Urban Air Mobility</b>	US	\$EXPC / Nasdaq	Launch / Flight & Delivery	\$365m	\$825m	\$256.5m
Feb-21	01-Jul-21	<b>Astra</b>	US	\$HOL / Nasdaq	Launch / Rockets	\$500m	\$2100m	\$116.0m
Feb-21	17-Aug-21	<b>Spire</b>	US	\$NSH / NYSE	Platform / Earth Observation	\$265m	\$1600m	\$134.4m
Feb-21	17-Sep-21	<b>Archer Aviation</b>	US	\$ACIC / NYSE	Launch / Flight & Delivery	\$857m	\$1700m	\$455.0m
Feb-21	11-Aug-21	<b>Joby Aviation</b>	US	\$RTP / NYSE	Launch / Flight & Delivery	\$1600m	\$4500m	\$2082.8m
Mar-21	10-Sep-21	<b>BlackSky</b>	US	\$SFTW / NYSE	Platform / Earth Observation	\$283m	\$1100m	\$186.9m
Mar-21	25-Aug-21	<b>Rocket Lab</b>	US	\$VACQ / Nasdaq	Launch / Rockets	\$777m	\$4800m	\$1784.2m
Mar-21	03-Sep-21	<b>Redwire</b>	US	\$GNPK / NYSE	Beyond Earth / Space Infrastructure	\$170m	\$620m	\$126.4m
Mar-21	15-Sep-21	<b>Lilium</b>	Europe	\$OELL / Nasdaq	Launch / Flight & Delivery	\$584m	\$2600m	\$447.4m
May-21	07-Sep-21	<b>ArQit</b>	UK	\$CENH / Nasdaq	Platform / Satcoms	\$115m	\$1100m	\$442.9m
Jun-21	16-Dec-21	<b>Vertical</b>	UK	\$BSN / NYSE	Launch / Flight & Delivery	\$300m	\$2100m	\$713.2m
Jul-21	08-Dec-21	<b>Planet</b>	US	\$DMYQ / NYSE	Platform / Earth Observation	\$590m	\$2400m	\$1183.7m
Jul-21	26-Jan-22	<b>Satellogic</b>	S. America	\$CFV / Nasdaq	Platform / Earth Observation	\$262m	\$780m	\$271.4m
Aug-21	30-Dec-21	<b>Virgin Orbit</b>	UK	\$NGCA.O / Nasdaq	Launch / Rockets	\$228m	\$3200m	\$623.5m
Oct-21	28-Mar-22	<b>Terran Orbital</b>	US	\$TWNT / NYSE	Build / Satellite Manufacturers	\$255m	\$1600m	\$225.0m
Dec-21	Cancelled	<b>Tomorrow.io</b>	US	\$PTOC / Nasdaq	Product / Data Platforms	\$420m	\$1200m	-
Dec-21	10-May-22	<b>Eve</b>	S. America	\$ZNTE / Nasdaq	Launch / Flight & Delivery	\$377m	\$2400m	\$1917.9m
Jan-22	Cancelled	<b>D-Orbit</b>	Europe	\$BREZ / Nasdaq	Launch / Space Tugs	\$185m	\$1300m	-
Mar-22	28-Oct-22	<b>SatixFy</b>	Europe	\$EDNC / Nasdaq	Build / Space Hardware	\$229m	\$365m	\$626.8m
Sep-22	Q1 23	<b>Intuitive Machines</b>	US	\$IPAXU / Nasdaq	Beyond Earth / Space Exploration	\$330m	\$815m	-
Jan-23	Q2 23	<b>World View</b>	US	\$LHC / Nasdaq	Beyond Earth / Space Exploration	\$121m	\$350m	-



## ANGEL PLATFORM + ACCELERATOR + VC FUNDS + RESEARCH

**Our Model:** Inception to exit support powered by smart capital

Seraphim is the world's leading specialist investor in SpaceTech.

Powered by smart capital from leading Space companies and government agencies, we have a unique model combining investment funds, accelerators, and an angel investor platform.

We use our panoptic view of the SpaceTech ecosystem to provide inception to exit support to the sector's most ambitious and fearless entrepreneurs as they aspire to harness the infinite potential of Space to help push the boundaries of what is currently possible by turning science fiction into science fact.

Seraphim Space Investment Trust Plc is listed on the London Stock Exchange (Ticker: SSIT)

**Our focus:** Businesses collecting & communicating data from above

We are focused exclusively on the multi \$trillion SpaceTech investment market.

We believe SpaceTech is at the nexus of mega-trends that will define societal change over forthcoming decades and has a unique role to play in addressing the world's most pressing problems.

Radical advances in the Space sector mean a data and connectivity tsunami is about to transform the world as we know it, driving the next major paradigm shift in the global economy.

We invest in companies that are enabling, generating and exploiting data being collected and communicated from above.



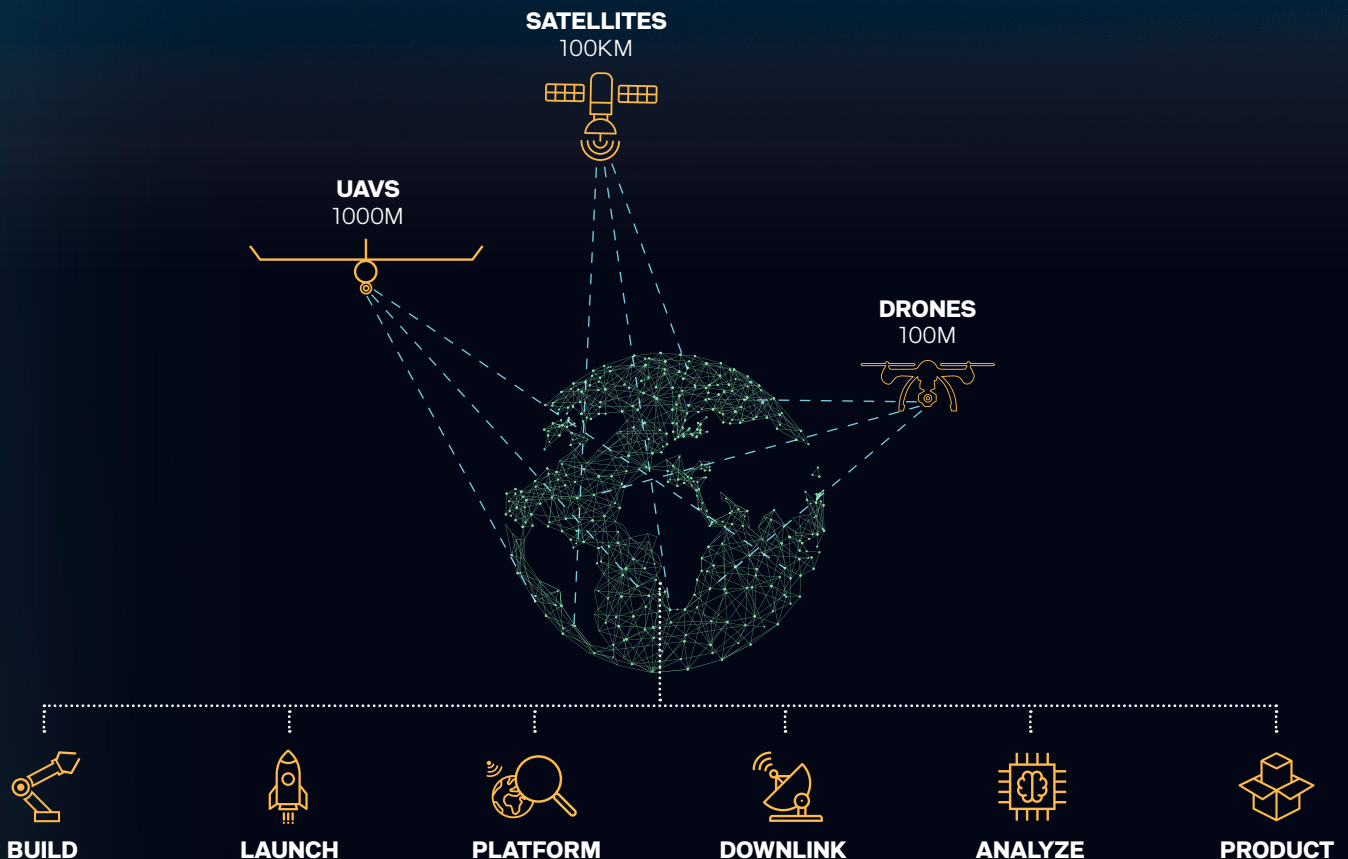
**Mark Boggett**  
CEO



**James Bruegger**  
CIO



**Rob Desborough**  
Accelerator &  
Early Stage



**Current Portfolio**

We are the most prolific investor in SpaceTech globally. Across our different activities, we currently have a portfolio of more than 70 of the world's leading SpaceTech start-ups.

**Fund**



**Accelerator**



**Seraphim Space Accelerator Mission 10 Cohort**



**Seraphim News**

- [Seraphim Space Accelerator, Mission 11 Launched](#)
- [Generation Space Podcast is now live](#)
- [Altitude Angel Announces \\$5 million Deal with BT to Accelerate Plans for Skyway Corridor](#)
- [Seraphim Space featured in Sifted's SpaceTech Report](#)
- [Seraphim In-Space Ecosystem Map 2023](#)
- [Rocket Lab's first launch from Virginia deploying three satellites for Hawkeye 360](#)
- [Seraphim Space Sector Predictions 2023](#)
- [The First SpaceX launch of 2023 Included Satellites from Portfolio Companies D-Orbit, ICEYE & Spire](#)



## Methodology & Taxonomy

We use a wide range of different data sources to compile our investment tracker. This includes proprietary, off-market information from our deal flow and network, deal databases such as Crunchbase, industry news sources such as SpaceNews and TechCrunch, and public announcements from companies themselves. We only include third party capital invested on an arm's length basis and therefore do not include personal investment that the likes of Jeff Bezos may make in their own space initiatives.

## Further Research

We routinely publish our own research and insights on our website with a view to helping other investors share our excitement for the multi-decade transformational potential of Spacetech. Key periodic research we publish includes our widely recognised SpaceTech Ecosystem and Smallsat Constellation market maps.



### BUILD

- Building & selling satellites, drones, autonomous systems. Components, sub-systems, complete systems
- Hardware (sensors), software (i.e. control system), hybrid (i.e. machine vision)



### LAUNCH

- Building & launching rockets
- Launch-related services
- Deliver (i.e. air taxis, drone delivery)



### PLATFORM

- Any data collection / space platform (i.e. smallsat, drone, HAPs)
- Multi-modal: look, listen, communicate



### DOWNLINK

- Facilitate transmission of data from space / aerial platform back down to earth
- Satcoms & terrestrial comms networks
- Data storage, processing, security



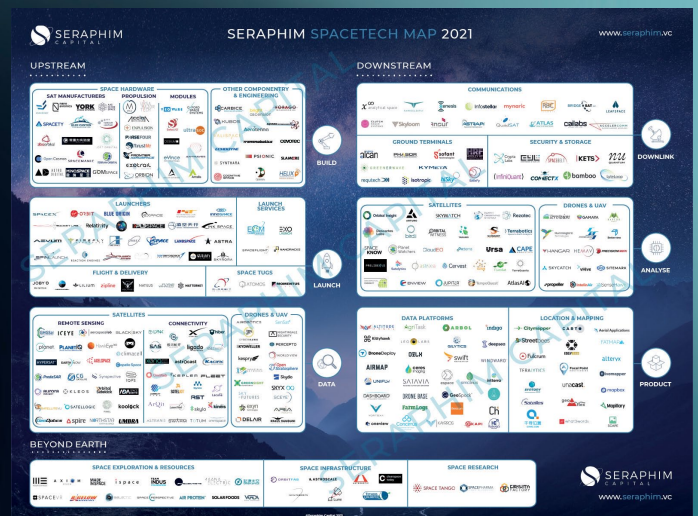
### ANALYZE

- Analysis of data from space / aerial platforms
- A.I / machine learning enabled analytics



### PRODUCT

- Packaging of different data streams (space & non space)
- Tailored to specific use cases in specific verticals
- Location, monitoring, insight, mapping

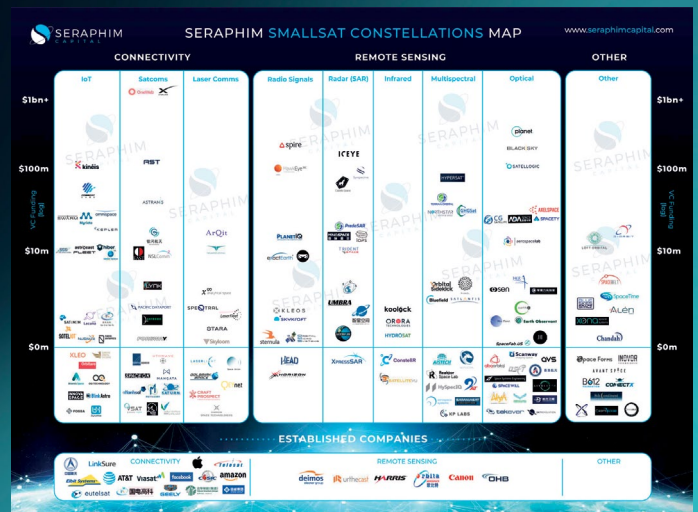


## SPACE TECH MAP

Global VC backed emerging leaders per category



[DOWNLOAD](#)



## SMALLSAT CONSTELLATION MAP

Global VC backed companies across categories



[DOWNLOAD](#)