

# insight

## Space Edition

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CONSULTING, TECHNOLOGY & SERVICES



**Insights from industry leaders across  
the space tech sector in Scotland**



Corentin Guillo  
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Bird.i



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Co-Founder & CEO  
STAR-Dundee



Peter Young  
CEO, GSI and Co-Founder  
Scottish Space Leadership Council

## Space Tech Edition

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## THE BENEFITS OF FOUNDING A SPACE TECH START-UP IN SCOTLAND

French-born Corentin Guillo founded his company Bird.i in Glasgow in 2016 with the desire to democratise access to satellite imagery and its potential insights.

The company grew via two investment rounds and was consistently named one of Scotland's top "startups to watch" before pivoting in 2018 towards providing real-time satellite imagery to the construction and infrastructure industries. Bird.i was a finalist for "Startup of the Year" at the 2018 Scottish Tech Startup Awards.

I sat down with Corentin to discuss the benefits of founding his startup in Scotland, the key milestones in Bird.i's development, and what the future holds both for his company and the vibrant Scottish space tech sector.



### Q: What benefits have you seen from locating Bird.i in Scotland?

A: There are many benefits to being located in Scotland, not least how beautiful the country is. However, if I had to sum it up in two main points, they would be:

1. The access to world class talent
2. The support of the Scottish government in laying the foundations for a full end-to-end space technology industry

Before creating Bird.i I worked in France in large space corporations. Then I worked in England in large corporations, in research centres and small companies. Then, just prior to founding the company, I had been working in Scotland for a couple of years.

When I decided to make that leap of faith and start my company, I realised I wouldn't be creating Bird.i as much as I would be creating the team that will create Bird.i. That meant I needed access to the best talent.

“You've got the home-grown talent and you've also got amazing people travelling to Scotland to receive the best training and the best degrees in the world.”

In Scotland you have world class universities, not only in Edinburgh and Glasgow, but also in Stirling and St Andrews. You've got the home-grown talent and you've also got amazing people travelling to Scotland to receive the best training and the best degrees in the world. Once they come, they want to stay. The talent is more affordable than places where I'd worked before in England and France. The people are also much more loyal and committed to the organisation than in places like Silicon Valley, for example.

“Scotland is investing in and developing the end-to-end supply chain to grow the space technology sector.”

At the same time, Scotland is investing in and developing the end-to-end supply chain to grow the space technology sector. There are companies like ours in the “downstream” market that leverage satellite data for imagery, remote sensing, positioning or telecommunications. We’ve got companies manufacturing spacecraft, and soon we will also have companies that can launch these spacecraft.

**“ Being able to do this in Scotland is quite amazing because there are not that many regions – or even countries – in the world that can do this. ”**

The Scottish government has been very supportive of start-ups in this sector. We have received access to finance from the Scottish Investment Bank, access to support for visas and immigration, and access to financial support for research and development.

Right now the country is building the foundations of a much bigger industry that will likely see the country become recognised internationally as a place where you can realise viable commercial research centres and related businesses in the space sector. Being able to do this in Scotland is quite amazing because there are not that many regions – or even countries – in the world that can do this.

**Q: What's the business problem that Bird.i solves? What's your key differentiation?**

A: Our ambition when we started was to aggregate the data from commercial satellite operators and make their imagery and the insights it contains accessible to everyone. In the first couple of years we solved this problem. Anyone could access and view the best of the world’s satellite imagery in real time without needing specialist knowledge, technical skills, or deep pockets.

**“ We realised early on that the market wasn’t mature enough to see the benefits of this data quite yet. We were able to turn this into a competitive advantage. ”**

The next challenge was how to turn this into a commercially viable proposition. Fortunately, we realised early on that the market wasn’t mature enough to see the benefits of this data quite yet. We were able to turn this into a competitive advantage.

**“ We were forced to make our technology commercially viable quickly, and that meant pivoting. ”**

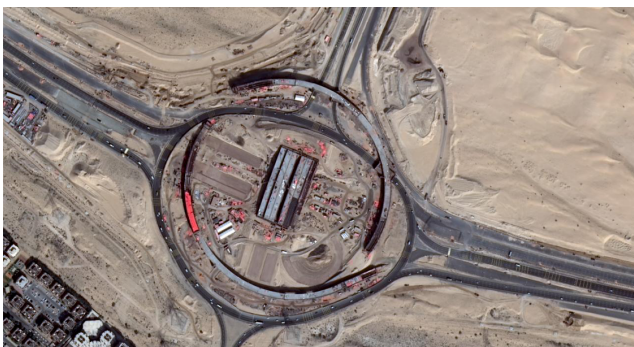
One of the drawbacks of being based in Europe rather than the US has been that we didn’t have access to funding on the same scale. Where we had raised a total of £3 million, one of our US competitors has raised around \$150 million. However, the benefit of this is that we were forced to make our technology commercially viable quickly, and that meant pivoting.

One of our main competitors seems to be stuck in the model of trying to be a generalised big data company, while another has just started to pivot towards selling to defence and security organisations. Because we had to be more careful with our funds and more commercially savvy, we carried out intensive market research to work out which sectors would find our data valuable right away.

We discovered tracking infrastructure, real estate, and construction projects on a regular basis was something that would provide value to many different types of clients. This is where we decided to focus – on leveraging this imagery for the construction market.



From that, we started working with Zonda, the US-based real estate market consultancy. Zonda's main investor shared our passion for leveraging real-time satellite data for the real estate and construction market, but they lacked the technology. We had the technology but needed another round of investment. So I spoke with the Zonda leadership team and its founder Jeff Meyers, and we agreed that they would acquire us, which we announced in April 2020.



**Bird.i's Broken Ground Detector monitoring infrastructure build progress**

**Q: How will the Zonda acquisition help you grow Bird.i, and how do you see the business developing in the next few years?**

A: By joining forces with Zonda I got immediate access to an established and experienced senior leadership team, a sales team, and access to their customers with our product.

“It was about finding the best way to take Bird.i to the next level, and Zonda and their investors are here to support this growth strategy.”

Right now we are working with Zonda as our major client. They use our technology to automate their survey process to track thousands of construction projects across the US. We're helping them to do this more efficiently and scale up. At the same time, we are proving our technology in the construction sector. Once other

parts of the market become more mature, we will be able to expand our client base into new sectors.

In the end, it was about finding the best way to take Bird.i to the next level, and Zonda and their investors are here to support this growth strategy

**Q: What have been the biggest challenges you faced in getting to where you are now, and what advice would you have for other space tech start-ups?**

A: The two main challenges we faced were, a) choosing just one market to focus on, and b) realising when the wider market was not quite ready for our technology.

When you are a start-up, there are so many directions you can go in. But you need to discard some of those early opportunities to focus deeply on solving one specific problem and get really good at that. This is tough for start-ups to do, but you have to do it.

We found out fairly quickly that the market still hasn't quite matured. When this happens, you need to be prepared to pivot and find commercial applications for your product that will generate revenue consistently.

“Choose the right talent for your business, because without that you will never succeed.”

I would give two final pieces of advice. Choose the right talent for your business, because without that you will never succeed. Work with investors who share your vision and your ambition. That way, you will have a much better chance of experiencing growth.

# HOW PRESTWICK SPACEPORT IS QUIETLY POSITIONING ITSELF TO LEAD UK LAUNCH AMBITIONS



Mick O'Connor

**As the UK's small satellite spaceflight capability comes online, potential market growth will be limited only by our imagination and determination.**

**By Mick O'Connor CEng, CDir,  
Programme Director, Prestwick Spaceport**

Some people question how many spaceports the UK can sustain. However, if the UK can offer a reliable, responsive, and affordable small satellite launch capability, then the world will beat a path to our door.

In this article, I explore some of the potential challenges that lie ahead. I'll also set out why Prestwick Spaceport is well-placed to lead the UK's future spaceflight ambitions, as well as the many potential benefits we offer to investors, partners, and local economy 'beyond launch'.

## How many spaceports can the UK sustain?

Across the UK, six spaceports aim to become operational in 2022, with Prestwick aiming to be ready for first orbital launch in late 2023. The plan is for all of us to be able to launch small satellites into 'low Earth orbit' – though our ambition at Prestwick goes even further.

While there are questions around whether the UK will be able to sustain so many spaceports, the real challenge is about competitiveness and growing the market in Europe and beyond. In many ways, the global market is still immature, but demand for launching satellites – and the data they provide – is growing fast and is currently outstripping supply. Therefore, as the small satellite spaceflight industry starts catching up with demand and launch options appear in Europe for the first time in history, the market can start to find its feet.

With this rising demand, if the UK can offer a world leading capability for delivering payloads into space, then satellite owners and operators will come to us. Likewise, if we are not responsive and safe, or amongst the most sustainable and affordable, then the market will go elsewhere. This is partly where regulation plays a part.

## The regulatory challenge

While technical challenges remain for Prestwick and other spaceports, one major potential hurdle ahead is regulation. No one can launch without a licence, and no one can get a licence without the regulator granting them one. At present, the spaceflight regulatory framework is not in place.

**“The real challenge is about competitiveness and growing the market in Europe and beyond.”**

At the time of writing, the regulation is passing through the UK parliament. While we anticipate this will have been passed by the end of the summer, we will then have a new regulator having to interpret a new piece of legislation. Like anything new, this comes with a learning curve, both for the regulator and for us in the industry.

Even in a best-case scenario, spaceports will not begin to submit licence applications until August or September this year and, depending on complexity, it could take anywhere from nine to eighteen months until an application is granted. In other words, any small delay in submitting applications means spaceports may possibly not receive licences to launch until 2023.

**“Any small delay in submitting applications means spaceports may possibly not receive licences to launch until 2023.”**

For us at Prestwick, the fact we have announced our intention to launch in 2023 shouldn't mean our application gets put to the back of the queue, provided we submit all of the relevant documentation in plenty of time. This is something our team is working together with the Civil Aviation Authority to ensure.

### Prestwick's unique launch capability

There are many aspects to the development of Prestwick Spaceport that make us unique, starting with our launch technology. The other UK spaceports – except for Cornwall – will launch rockets using vertical launch technology from fixed points.

At Prestwick, we will be employing horizontal launch technology. That is, we use a carrier aircraft that takes off from a runway carrying a rocket. Once the plane is airborne and far from Prestwick, the launch vehicle releases, ignites, and autonomously heads into space from an ideal position anywhere in the world depending on the desired orbit and inclination.

**“We would have the technical capability to have multiple launches in a single day if the market required it, which is pretty unique – not just in Scotland or the UK, but anywhere in the world.”**

Because of the launch solution we will be using, we are not constrained by limited carrier aircraft availability, which gives us a level of in-built redundancy. It also means that we would have the technical capability to have multiple launches in a single day if the market required it, which is pretty unique – not just in Scotland or the UK, but anywhere in the world.

This is one reason why we're seeing interest from well-known satellite companies in the industry who are excited by the idea of multiple launches. At the same time, our launch vehicle technology is currently in development in the US and is a variant of an already demonstrated capability, immediately putting Prestwick in a strong and less risky position.

Our development timeline indicates that we will be ready for first operational launch in the last quarter of 2023, after we thoroughly and carefully achieve each milestone. At that stage, we will have the capability



to launch small satellites with payloads of up to 800kg from anywhere in the world. The conversations we are having with satellite operators around the world, have been favourable, so for planning purposes we are looking at a cadence of around one launch per month, from the second year of operation.

The other thing we are looking into – though this is still at the concept stage – is the potential for a crewed spaceflight from Prestwick. When I mention it, people usually give me a funny look, but this is something we have been researching for some time and currently liaising with the Civil Aviation Authority on noise contours.

With human space flight capability, we would be able to replenish the international space station and other space stations as they come online. Certainly, we expect the replenishment of food, provisions, and people to and from space stations to become more in demand in the decades ahead and we feel that this is an area that should be explored in detail rather than dismissed out of hand.

The crewed spaceflight solution would also be able to recover and re-orbit satellites, as well as allowing in-space experimentation, manufacture, and construction. This is an area that is likely to grow, so we are planning for it now – and so far, we are the only European spaceport doing so.

**“The other thing we are looking into is the potential for a crewed spaceflight from Prestwick.”**

**“We are having several interesting conversations with companies who are investigating the benefits of investing and locating here.”**

### Prestwick's unique skillset and heritage

With lofty ambitions like these, you need to have strong foundations. This is the other area where Prestwick really stands out, and what is likely to make us the leading UK spaceport in the years ahead.

Companies such as BAE Systems, Collins Aerospace, GE, Woodward, Spirit Aerosystems, and others, are already based here at the Prestwick. They bring a wealth of talent and skills in aerospace and aviation all in one ecosystem. The spaceport is building on this strong heritage of innovation, engineering expertise, and a reputation as a leading European aerospace hub.

After a period of flying “under the radar”, it is this heritage that we are building our marketing around at the moment and why our new brand tagline is “Beyond Launch”. Prestwick Spaceport is a catalyst to stimulate economic activity around space. Not only are we planning for space launch capability for 2023, but we are also building the commercial infrastructure to support it, as well as manufacturing and significant supply chain capability, all of which will build on Prestwick’s established history within aerospace and aviation.

The idea is to stimulate inward investment from across the UK and further afield. So far, results are encouraging, and we are having several interesting conversations with companies who are investigating the benefits of investing and locating here.

The recently signed £250m Ayrshire Growth Deal, of which £80m is dedicated to aerospace, including space, activity, will provide the funding to sustain and grow such activity, positioning Prestwick as Europe's leading space hub. We are also looking to establish an application centre to assist companies develop their technology and overcome the challenges of transitioning through TRL 5 to 9.

With all of these projects, Prestwick would be uniquely positioned as its own self-contained 'spacetech' cluster, covering everything from technology development to design, manufacture, and launch, as well as having the future potential to put humans in space as well. It is all very exciting, and we have support from the UK government, the Scottish government, and the local councils as demonstrated by the Growth Deal.

### Safe, affordable, and responsive access to space

The space industry is in an exciting place right now, particularly in Scotland. But, as I indicated earlier, there is competition from across Europe and the rest of the world. If our plans – both across the UK, Scotland and here in Prestwick – come to fruition, then we can become one of the world's fastest growing spacetech hubs, attracting the best talent, the best companies, and the most exciting research and development. We have the ambition, the rail, road, sea and air infrastructure, the history, the appetite, and the expertise to do so.

**“There is competition from across Europe and the rest of the world... we must not rest on our laurels.”**

However, we must not rest on our laurels. Other countries are seeking to develop their own space industries and several European nations are also in the race to provide reliable, responsive, and affordable launch capability. In the years ahead, the focus of the industry in the UK must remain:

- Are we safest?
- Are we affordable?
- Are we responsive?
- Are we sustainable?

The signs are positive, the will is here. All we need is to stay focused and respond to the needs of the market, and our dreams for the future of the Scottish space sector can come true. We are only constrained by our imagination; 'dare to dream'.

# "SPACE HAS A MARKETING PROBLEM"

**AstroAgency Founder and space entrepreneur Daniel Smith discusses the huge opportunities for companies and individuals in the Scottish space sector, and why there's plenty more growth on the horizon.**

**By Dan MacNeill, Director – Deep Tech at SH Gillamor Stephens**



**Daniel Smith**

"You don't need a degree in astrophysics or mechanical engineering to have a career in the space sector," says Daniel Smith.

We were speaking just a few days after a major space sector summit attended by Nicola Sturgeon and the new European Space Agency Director, General Josef Aschbacher. Daniel says this shows just how much support there is for this nascent industry at the highest levels.

In this Q&A, Daniel discusses the meteoric rise of his strategic marketing company AstroAgency, and why the industry needed a dedicated company that fully understands and can properly promote, analyse, and connect the sector.

We talk about his award-nominated series of online networking events, and the important work of the Scottish Space Leadership Council – which he co-chairs – in fostering the future growth of the sector both in Scotland and across the UK.

**Q: How did you come to found AstroAgency?**



**A:** I went from the IT world into space technology in 2016, helping to establish and grow companies like Skyrora, a leading European space launch vehicle provider.

I then moved on to set up Responsive Access, which helps small satellite providers to simplify their access to space. I didn't have any previous space sector background. But I think that's the point about the commercial 'newspace' sector: you don't have to have a degree in astrophysics or mechanical engineering to be able to play a role.

Starting my space career at the forefront of UK orbital launch meant I quickly got to know as many people in the sector as I could – partners, suppliers, government contacts and potential customers – all across the global space value chain.

**“I wondered, why do so many people in Scotland still not realise there's a space sector here when there's so much inspiration and innovation on our doorstep?”**

I also got to experience first-hand what was happening locally around space. A lot of the companies I'd meet were working on cutting edge technology and innovation. I soon wondered, why do so many people in Scotland still not realise there's a space sector here when there's so much inspiration and innovation on our doorstep?



This was true across the rest of the UK too. I'd be down south for engine testing or meeting with potential component suppliers and constantly be feeling inspired, wondering why on Earth I hadn't heard about what they were all doing on the news. It felt like space has a marketing problem.

“ At this point in its evolution, the industry needed a louder voice. ”

I have a background in business development and marketing, so an idea started growing in the back of my mind after a few years: at this point in its evolution, the industry needed a louder voice. It needed a dedicated company that fully understood and could properly promote, analyse and connect the sector, playing an active role in its growth.

In 2019 I set up AstroAgency and immediately brought in space sector people who understood the challenges and opportunities for the industry and also had a passion for promoting the sector's benefits. This foundation of space knowledge and experience is why we're not considered to be a marketing company with an interest in space, but a space company that works to bridge a large gap in the sector around communications, connections, and marketing.

### Q: What does AstroAgency do? What's your proposition?

A: Put simply, we take very technical client propositions and translate them for their target audience.

We're a strategic marketing company working with over 20 global clients that promotes and enables the global space sector. Our services

include brand design, messaging and awareness, industry PR, web development and social media.

To that we add strategy, which is around the business connections and introductions we can give. We have an incredibly strong technical department that map out target audiences for our clients and produce concise and concrete market analysis and intelligence. We work with private or public sector organisations who are looking to grow their business in the industry or identify the best opportunities for them to break into the sector.

“ The space sector gets a lot of interest from angel investors and venture capital. There's also a lot of public funding available. ”

Despite only starting the company 18 months ago during the start of the pandemic, we've grown the team to twenty people. We run events, both physical and digital, and we produce two space podcasts. We also get speaking slots for clients at various third-party events and media productions.

Funding and investment is another big part of what we do. We help companies take advantage of the interest of angel investors and venture capital firms in the space sector, and offer support in acquiring public funding. The UK and Scottish governments are both very supportive of the sector due to the broad range of benefits it delivers to society, the environment, business, and the economy.

We've got a technical department of six people from upstream and downstream disciplines, including PhDs. They support our clients to identify space applications for their technology and to really showcase their products and services, to help them attract investment.

**Q: How have you been received by companies in the space sector? Are there any other agencies like you that focus on this sector?**

**A:** I don't think there's anybody else that focuses solely on space marketing in the world. Our target audience is public and private sector organisations involved in the global space sector – councils, government and its agencies, and of course private companies.

We work with companies throughout the value chain; spaceports, satellite companies, launch vehicles, downstream data companies, ground stations and a variety of suppliers into the sector – we work with them all.

We also help companies that want to move into the sector. For example, there's a company in Edinburgh called Alpha Data who came to us because they felt the electronic components they make for a variety of other industries could be useful for space companies, but weren't sure of all the potential applications. Being part of their journey into the sector and planning a strategy to grow their sales in this industry even further has been just as exciting as working for established or typical 'space' companies.

“ At the beginning, people would often ask whether the space sector was big enough to support a dedicated marketing agency focusing purely on space. ”

At the beginning, people would often ask whether the space sector was big enough to support a dedicated marketing agency focusing purely on space. I figured there was only one way to find out! It's been an

exciting start and we've just signed our 23rd client within 18 months. The business seems to be reflecting the commercial New Space sector that it serves – completely non-stop!

I think it's due to that fact that we have the technological viewpoint and experience of the sector to understand the opportunities, the gaps and the challenges that most space companies experience, whether they be around legislation, funding, licensing, public affairs, or supply chain development.

**Q: What kinds of companies are you working with as clients?**

**A:** We have clients across the whole space sector value chain, large and small. I thought at the start it was just going to be startups, and it was at first.

But then we started to get enquires from people like WL Gore in Dundee, who make Gore-Tex, and global space consulting firm Euroconsult. Suddenly we had bigger companies with thousands of employees around the globe reaching out for some support on market insight or digital marketing.

That made us realise it wasn't just going to be startups, and suddenly we were working with the government agencies, councils, and even the UK Space Agency.

We don't tend to work with Primes as they will all have their own marketing departments. But we have had enquiries from large cross-sector organisations looking to support their in-house marketing teams with space specific messaging and guidance.

**Q: Tell us about your SpaceBar event and what you're trying to achieve through that?**

**A:** SpaceBar is a free fortnightly virtual networking event that came about at the start of

lockdown. We wanted to provide an interactive and inclusive platform for companies to engage, share knowledge, and do business despite the onset of isolation.

SpaceBar promotes the full space value chain, to tell the full story of the benefits that come from accessing space, like using satellite data and imagery to track deforestation or illegal fishing. Some of the downstream activities that our clients like GSI, ConstellIR, Astrosat, Deploy Solutions, Utilis, and Omanos Analytics are doing is amazing, so we wanted to showcase it to inspire others in the way our team were inspired.

We also wanted to help the industry network and make the public aware of the opportunities in the sector, whether it be around employment, new revenue streams and supply chain opportunities in upstream or added insight for businesses through space data in downstream.

**“It’s been incredible, the number of messages we’ve had from people thanking us for helping them make connections during lockdown.”**

It went from 15 – 20 people for the first one to peaking at around 320. Dallas Campbell, the broadcaster, got involved with planetary scientist co-host Dr. Suzie Imber. That really moved it from a slightly disorganised community to a more structured event focused on educational outreach and connections.

The impact has been great. Students have found work placements and startups have found investment. It’s been incredible, the messages we’ve had from people thanking us for setting it up and

helping them make connections during lockdown. At least ten MOUs have been signed from companies meeting at SpaceBar.

At our one-year anniversary we had Tim Peake and Kevin Fong drop in, and we’ve had people like Max Alexander drop by, who trains astronauts to take photographs on the space station. We’ve had some big US investment funds coming on and giving advice to startups, as well as the UK and European Space Agencies.

**“At our one-year anniversary we had Tim Peake and Kevin Fong drop in.”**

Usually it’s the format of two or three themed panel discussions. It’s not about just sitting and listening to presentations – we don’t allow slides in the ‘bar’! It’s about interacting and asking questions.

We try to make it as interactive as possible because again, you can’t get that anywhere else during lockdown. It’s been nominated for awards now as well, including a Sir Arthur Clarke award, which I never would have imagined when we started it.

**Q: You’re heavily involved in the Scottish Space Leadership Council, and recently became co-chair. What’s your ambition for the council and where do you see its biggest impact and benefit for the Scottish space sector going forward?**

**A:** I’ve been part of the SSLC for a few years, and the Council has come to represent the sector with a single voice. What’s so good about the SSLC is that it helps all of us to think about promoting the sector as a whole.

I’ve got really high hopes for its future role in the UK space landscape. It can promote and enable the



sector in Scotland and beyond, both to act as a gateway for enquiries coming into Scotland and to showcase the good work being done here internationally, as part of the wider UK space sector proposition.

**“What’s so good about the SSLC is that it helps all of us to think about promoting the sector as a whole.”**

The UK Space Agency, Satellite Applications Catapult and the Scottish government join meetings alongside representatives from academia, and it’s great to see so much interest from across the UK. It also makes it easier if you’re trying to do things on a UK level. Instead of going to individual Scottish organisations and groups, you can get a collective and representative viewpoint in a faster and more organised manner.

Some of the real achievements in the last year or so have been the formation of the UK Spaceports Alliance to foster cooperation and to make sure launch happens from the UK.

There have also been a number of other working groups, including New Voices in Space which promotes inclusivity and diversity in the sector. They’re doing some great work!

In June we hosted a summit on Sustainable Space Challenges to discuss the findings of our 2021 campaign, to bring together environmental groups and the space sector on how the sector can be more environmentally conscious. The First Minister was at the summit, as was the head of the European Space Agency, the UK Space Agency, and Dallas and Suzie. It had 420 registered visitors.

It was an incredible event. Since then, my inbox has been full of requests from people about the next

steps. “How can we get involved to help make sure that space is more environmentally conscious? How can we take this initial work and grow the space sector to be more sustainable?” Questions like that.

These are all initiatives that are coming out of the SSLC. And that’s only some of it. This is a completely voluntary group that is working collaboratively with the aim of addressing important issues and bringing about real change.

My ambition is for it to keep doing those things, keep leading by example and showing thought leadership. With the First Minister and ESA Director General there, the summit demonstrated the SSLC’s ability to lead on key issues and focus on tangible outcomes.

**“With the First Minister and ESA Director General there, the summit demonstrated the SSLC’s ability to lead on key issues and focus on tangible outcomes.”**

**Q: As the new space sector continues to grow, what do you see as the big opportunities and challenges for new Scottish startup businesses trying to break into the sector?**

**A:** The challenge is knowing and understanding the landscape and how to navigate it. Once you know what all the various governmental, public, and industry bodies do – who provides funding, who provides lobbying, who provides supply chain support, business development opportunities, standards or legislation support and so on – you’re good to go.

After that, the support for startups in the space sector really is there. That’s a testament to the sector, as well as to the UK and Scottish governments for seeing the sector’s potential and

getting behind it.

**“The support for startups in the space sector really is there.”**

We do need to enable cross-sector companies to get involved and be part of the space supply chain. They can help the sector grow while also finding some additional revenue in a difficult economic climate.

Scotland, and the wider UK, is home to a burgeoning space sector full of innovation, advanced manufacturing, and technology. There are orbital launch vehicles, multiple spaceports, high-tech payloads, and testing facilities being built, for example.

One of the challenges for such an emerging industry though is being able to find suppliers – it’s won’t be a surprise to know that space specific suppliers aren’t exactly a thing here like they are in the States, for example. So it’s crucial for space companies to be able to connect with partners from different sectors. Oil and gas, construction or renewables, and many other industries have the transferable skills or experience to be able to support the growing space sector.

We need to let those companies know “ey, space is here, and it’s definitely not an exclusive club. In fact, we need your help!” Any company from any industry can support the space sector, in the same way that any company from any sector can benefit from the data that comes from space. It’s still relatively unknown that every single day we all rely on space enabled services in our work and in our daily lives.

Alpha Data, in Edinburgh, is again a good example of the supply chain opportunities. It’s a components company working in other industries who spotted the potential in the space sector and have added it to their target markets, enabling them to sell into the

sector. The more companies we make aware of the opportunities, the more we find have products or services that are crucial for the sector to find if we are to hit the UK Space Agency target of securing 10% of the global space market by 2030.

**Q: How do you see AstroAgency growing in the next five years and beyond?**

**A:** For us it’s about continuing to strengthen our position in the UK whilst building more of a global presence. At the moment, the majority of our clients are either based in the UK or looking to break into the UK space market.

Yes, we’re working with companies in Canada, the US, Germany, and Austria and half our team is based outside the UK. But I would like AstroAgency to be known in places like Australia or Luxemburg – emerging new space countries that are in a similar boat to Scotland – in the way we are known here.

That way, we can support companies in different emerging regions and continue to act as a bridge for our UK clients to overseas markets. For us, it’s all about the connections – bringing together companies, ideas, and people from around the world to help the commercial space sector reach its full potential.

I’d like us to have more of a foothold in some of these emerging territories and build the same reputation there that we’ve established here in the UK. I’d also like us to build more of a presence in North America and in Asia in the coming years, so we can capitalise on these other markets too.

That said, we’ve grown so fast. I never would have thought we’d have over 20 clients, or that we’d be working with government, or that Nicola Sturgeon would contribute to an event we’d organised. Things have moved so fast in 18 months and the sector is growing at an incredible rate, so it’s hard to even imagine where we’ll be in five years at the pace we’re growing, and that’s exciting.

# THE STEADY RISE OF A SCOTTISH SPACETECH PIONEER

## Q&A with Stuart Mills, co-founder and CEO of STAR-Dundee



Stuart Mills

Founded by three University of Dundee PhD students and their supervisor in 2002, STAR-Dundee was one of Scotland's first purely space-focused tech companies. With their pioneering work on SpaceWire onboard networking technology for spacecraft, the company soon found itself in great demand amongst major spacecraft manufacturers and space agencies on four continents.

Here, Stuart tells us about STAR-Dundee's growth, which has seen it open a location in Barcelona alongside its Dundee headquarters. What does the future hold for the company, its pioneering space technology, and the Scottish spacetechnology sector as a whole?

### What's the STAR-Dundee proposition that you're taking to market?

We sell test and development products for SpaceWire, an onboard networking technology. We do the same for SpaceFibre – the next generation of SpaceWire – which allows for higher speeds and offers more capabilities.

We're the experts in SpaceWire and SpaceFibre. We wrote the initial standards with input from the international space community and contributed massively to their development. We also wrote the latest revision of the SpaceWire standard which was published two years ago.

“We support our users through all their development efforts, providing lots of documentation and comprehensive APIs to enable them to develop their own software and devices.”

Customers don't just buy a product from us. They buy access to our team of experts. We support our users through all their development

efforts, providing lots of documentation and comprehensive APIs to allow them to develop their own software and devices.

We also licence our IP which is used in lots of spacecraft. We don't just send over some code and leave you to it. It's a partnership where we share our expertise with our users. We have developed lots of good partnerships as a result.

### STAR-Dundee was one of Scotland's first space companies – can you tell us a little about your company history?

When we started in 2002, we were a spin out of the Space Technology Centre at the University of Dundee – me, two other PhD students, and our supervisor Steve Parkes. We led the technical work on the SpaceWire standard, which was published in 2003.

We didn't have grand ambitions for the company. We were doing research into SpaceWire and developing devices and software as part of that research. Then SpaceWire grew as a technology and was adopted on lots of spacecraft across the world. It was a European standard and NASA quickly adopted it too.



**“ People started coming to us because they saw us as the experts on the technology. ”**

Because Steve was the one who wrote the standard on behalf of the ECSS, that meant people started coming to us because they saw us as the experts in the technology. We grew quickly because of the interest in our products and the technology that we were developing.

From there, demand for our products increased and we started hiring staff, to the point where we now have 25 employees. In 2017, Steve stepped down as CEO and became Chief Technology Officer. We changed the business structure to an employee ownership model, and I became CEO.

I'd been gradually taking on more and more responsibility as we had grown, so it wasn't too much of a leap for me to make. It's challenging and tough sometimes, but exciting to be at the forefront of such a cool industry.

#### **Who are your main customers now and in the future?**

Any payload data handling network could potentially use SpaceWire. That means all the Prime spacecraft developers, space agencies, and companies making instruments, processors, storage devices, or anything that handles data onboard a spacecraft could potentially have a SpaceWire interface.

With SpaceFibre, although it was designed with payload data handling in mind, it can also be used for command and control. That means we can open it up to a lot more organisations. We're now at the stage of being able to work with anyone who develops a device for use on a spacecraft.

We speak to all the space agencies, the research institutes, all the Primes, then all the smaller companies that make unique instruments or devices. It gives us a really broad outlook on the industry and a wide potential customer base both now and in the future.

#### **Do you have any direct competitors with similar technology?**

There's another company that develops SpaceWire technology who, like us, have been around for a long time. There are other companies who develop ground support equipment. In SpaceFibre there is a new company that's a spin out of a university who've developed their own IP.

**“ The space industry is very collaborative, and you see competitors working together frequently. ”**

However, the space industry is very collaborative, and you see competitors working together frequently. For example, the SpaceWire and SpaceFibre standards are open standards where we've worked with all the big Primes in Europe, the US, Japan, and Russia. Everyone is involved in contributing to the standards.

The European Space Agency allows companies to licence our core SpaceWire IP for use in European missions. NASA also developed their own SpaceWire IP which is used in some US missions. So although it's unfair to describe them as competitors, we do lose business to the space agencies. That's the trade-off for developing a common open standard to benefit the wider industry, which also benefits us in the long run.

## What are the biggest challenges you've faced to get to where you are today?

As well as recruiting the best engineers from a technical standpoint, we also need them to be a good fit for our culture. We want our users to work with our employees, so our engineers have to be good at communicating. We've found it difficult to recruit people who fulfil all these criteria.

**“ We are now in the position of having a very talented and dedicated team, and it has served us well. ”**

That said, we are now in the position of having a very talented and dedicated team and it has served us well. The most recent challenge of course has been Covid, and we've done well through that because we've got a great bunch of people we can rely upon. They've all stepped up and managed to cope with home working and all the other challenges Covid's thrown up.

We've been putting a lot of effort into marketing SpaceFibre, and that's starting to pay off now. It's a new technology and the space industry is relatively conservative, especially for the larger spacecraft. Getting them to adopt a new technology can be tough.

But the technology is very good for what it's designed for, so we're now seeing more and more organisations adopting it in the US and Europe. We seem to have reached that tipping point where it's well on the way to being something people think of as a trusted and viable technology.

## What do you see the next five years looking like for STAR-Dundee?

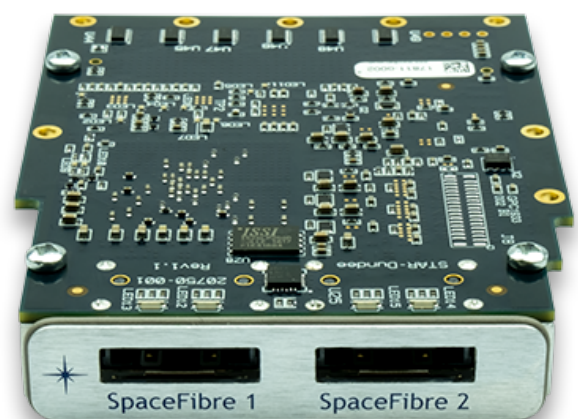
We have a broad range of world-leading SpaceWire products and technologies. We're steadily growing a similar range of SpaceFibre

products. We're also pushing the commercial technologies used in those products.

SpaceFibre can run at 6.25 gigabits per second per lane, and you can have up to 16 lanes running as a single link which means you can potentially have 100 gigabits per second. When we get up to that kind of data rate, we need very capable PCs – and interfaces from the PC to the SpaceFibre network – to demonstrate these 100 gigabit-per-second speeds.

**“ That's where a lot of our effort is at the moment – in developing new products to support SpaceFibre technology. ”**

We're starting to push what's possible from commercial on-the-ground technology for our test and development products. That's where a lot of our effort is at the moment – in developing new products to support SpaceFibre technology and to really extend the art of the possible. If PCs and the technology that goes into them are capable of these higher speeds, then that really drives what we can achieve.



**SpaceFibre Interface FMC Board [Preliminary]**

## How do you see the company growing in the next few years?

We have a market that wants our products, and that market's going to keep growing – especially as SpaceFibre grows. We want to grow in Dundee and Barcelona, but it will be steady growth based on having the best expertise and service, in keeping with our ethos. If the right commercial opportunity came along then we might branch off into something new. Otherwise, we're staying focused on steady, organic growth.

## How has the landscape of the Scottish space industry changed in the years since you started?

When we started, we were the only Scottish company that focused purely on space technology. Apart from Clyde Space, there weren't any others that came along that were purely spacetechnology companies – it was big companies that had space as part of a broader portfolio.

Since then, we've gone from just a few big companies and the likes of us to a real mix of lots of smaller software companies, people building nanosats, etc. And then there's still all the big companies, and they're investing more in Scotland. Gore have recently opened their new Space Centre of Excellence in Dundee, for example.

**“The Scottish and UK governments are so supportive of the space industry that it can only continue to grow in the immediate future and do great things.”**

There's a real buzz about the Scottish space industry and it's much easier to get into now, both if you're starting up a company or if you're interested in working for a company. People are

beginning to see that there are real career opportunities. I would never have considered a career in space when I was at university. It was only when I was offered the chance to do a PhD that I thought it was possible. Even then I didn't know if I would ever get a job out of it.

In the UK in general there's been a lot more interest in space – the likes of Tim Peake have had a great impact. You can see there's a lot more interest in the news.

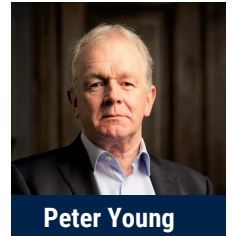
Scotland is punching well above its weight and the industry here is continuing to grow. The Scottish and UK governments are so supportive of the space industry that it can only continue to grow in the immediate future and do great things.



# THE FUTURE OF THE SCOTTISH SPACE INDUSTRY

## How Scotland can make the most of growing demand in the New Space sector

By Peter Young, CEO of GSI and co-founder of the Scottish Space Leadership Council



There's huge interest in the space sector, from academics doing research, to governments looking to foster its development, to investors looking for growth, to companies seeking more business opportunity. While Scotland is well positioned to take advantage of this interest, we can't rest on our laurels.

This article outlines the growth in the sector, why it's important to focus on the wider benefits it offers, and why the work of organisations like the Scottish Space Leadership Council will continue to be so vital in the years ahead.



### To boldly grow...

Having worked in the space sector over the last 25 years, it is perhaps ironic that almost all of my career was spent outside of Scotland. Yet I had been aware of the growth of interest in Scotland as a potential hub for the space sector for some time before I returned. When I did come back to Scotland in 2017, part of my motivation was to see how I could help the Scottish sector to realise this potential.

It's really impressive just how far we've come in such a short time. When I helped set up the Scottish Space Leadership Council with the likes of Richard Tipper at Ecometrica, Craig Clark at Clydespace, Peter Platzner at Spire, and John Innes at Leonardo, there were only six or seven of us. My co-founders represented perhaps the biggest companies in the sector at the time, which was still relatively small. On top of that, all our contributions were pro bono and had to fit around our busy day jobs.

Fast forward to today, and the picture is very different. Membership of the SSLC has grown from half a dozen to over 60, with many more knocking on the door asking to join. There are also many more companies in the sector.

Just before Covid, the Scottish minister responsible for space – Ivan McKee – attended a meeting, and he has been at every quarterly meeting since. Space is one of the Scottish government's nominated sectors for economic growth. And we're on the cusp of Scottish spaceports becoming a reality in locations as far apart as Prestwick, Sutherland, the Shetland Isles, the Western Isles, and Machrihanish near Campbelltown.

“Membership of the SSLC has grown from half a dozen to over 60, with many more knocking on the door asking to join.”



### What makes Scotland such a great investment?

When the spaceports come online, we'll have all the elements needed for a complete end-to-end space supply chain. We have the likes of AAC Clyde Space and Spire who manufacture satellites. We have the academic backbone in the universities of Strathclyde, Edinburgh, Glasgow, and Heriot Watt, amongst others. We'll soon have that launch capability. And with companies such as GSI and Astrosat we have the downstream companies that can monetize the satellite data.

This combination is pretty much unique in any country outside of the US. From an investment point of view, it's great, since we'll be able to build the satellites, launch the satellites, gather the data, and analyse it – all in one closely-connected eco-system in a relatively small geographic location.



The SSLC has had a huge part to play in all of this. When we started, the whole idea was to showcase Scotland's potential to the rest of the world. We were aware back in 2016 that something very special was happening, but it was uncoordinated. The SSLC was a way to bring the industry together in one voice, to present Scotland's nascent sector to the world, and to harness the support of the Scottish and UK governments to support it.

“ The SSLC was a way to bring the industry together in one voice, to present Scotland's nascent sector to the world, and to harness the support of the Scottish and UK governments to support it. ”

From the very beginning we had support from Scottish Enterprise and Scottish Development International – the trade and inward investment agency. We're very much looking to build on this relationship going forward, and help the SDI attract more and more of that inward investment.

Now the SSLC is getting a new chair, and the fulltime capability to help spot opportunities and really make the most of them in the new Scottish Space Group that's about to launch. This SSG will have a fulltime delivery arm and can work with us at the SSLC to coordinate our efforts, as well as those of the Scottish government.

This feels like the next step in terms of maturity, and it's happened at just the right time. The SSLC has written a Scottish space strategy. The Scottish government is drafting theirs. Soon we'll be able to put these strategies together and build a joint proposal for the future of Scottish space that will be fed by industry, academia, and government.

### Why New Space offers the biggest opportunity for the Scottish space sector going forward?

It's important, when looking at the future, to focus on the biggest opportunity, as well as where Scotland can punch above its weight. This is why New Space is the key. This is the name given to the launch and operation of smaller satellites, and it's where the Scottish sector excels.

The reason is simple. The big operators like Airbus and Thales Alenia are building huge satellites for the likes of NASA and the European Space Agency. This takes a significant amount of resource, money, and time. It also doesn't allow for much flexibility. Any company involved in planning, manufacturing, or launch for one of these big headline-grabbing space launches knows that you're talking five – maybe even ten – years from concept to design through to launch.

By contrast, building and launching a small satellite into orbit can be turned around in less than a year – maybe even as little as six months in some cases. Within Scotland, we'll soon have the capability to cover every part of that supply chain for smaller launches.

Imagine being able to design, build and launch in Scotland. For any company, you'd have the agility and the proximity all in one relatively small area – and with a very supportive Scottish and UK government environment. The ability to coordinate all these various pieces of the value chain is Scotland's real opportunity to excel. It is what makes us such a good location for inward investment.

I picture Scottish Development International on a trade mission being able to say: "Come to Scotland, and we can introduce you to people



who can do all of that for you from beginning through to launch, into orbit, and then the downstream." That's the vision.

### What is the purpose of the space sector?

One key message about the space sector is to keep in mind the reason for this spectacular growth, and the reason why this growth is set to continue. Although the space sector can bring a lot of high value jobs and inward investment to Scotland, this will only happen if the Scottish sector remembers the ultimate value of the sector.

The question we must always keep in mind is: what is the value of the space sector to citizens and to other industries? It's about the value the sector delivers – as well as the potential value it delivers in the future. After all, while launching satellites is exciting, and a great challenge for talented minds and innovative companies, we're not just launching satellites for the fun of it. Those satellites serve a purpose.

This is the where the downstream part of the industry comes in, including Global Surface Intelligence (GSI), the company I became the CEO of earlier this year.

“Come to Scotland, and we can introduce you to people who can do all of that for you from beginning through to launch, into orbit, and then the downstream.” That's the vision.

“What sets us apart is our technology – our software engineers, coders, and data scientists.”

We are a space company in that we take satellite data, clean it up and apply machine learning and AI to it to sell to our clients, most of whom currently are in the forestry sector.

Effectively, we support commercial forestry operations in the US and Canada to monitor the trees within ranches covering hundreds of millions of acres. We analyse the tree species, their height, their density, and their circumference. This allows our clients to know the value of their forests. Without us, they would be forced to use a mixture of drones and boots on the ground to do it manually, methods which are much more time consuming and more expensive.

To some extent, it's quite remarkable that an SME like ours based in Scotland has won so much business in North America. In the end, this is down to the accuracy of the data we provide, which we've perfected to a level others can't match.

However, the raw satellite data we use is available for competitors. What sets us apart is our technology – our software engineers, coders, and data scientists. So whilst we are a space company, we are just as much a technology company. Given our current focus on forestry,

you could also classify us as a forestry company. We are a huge beneficiary of space assets and services. But, as a company based in Scotland using space assets, the main beneficiary of our work up to now is forestry clients based in North America.

The real benefit of space, in other words, comes from how we apply those assets to other industries. This will be key to Scotland's future success. What can space do for other industries and other sectors? What challenges can it solve? How can it help governments develop practical policies around decarbonisation? How can it help city planners improve our quality of life?

These are the important questions going forward. If we engage with citizens, businesses, and the public sector in terms of how space can help solve their challenges – not just in Scotland but all over the world – that's how the industry will really grow.

### Tree species and metric maps



GSI's ForestNow Data Map