THE STEADY RISE OF A SCOTTISH SPACETECH PIONEER

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

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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 spacetech 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.

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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.

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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.

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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.

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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.
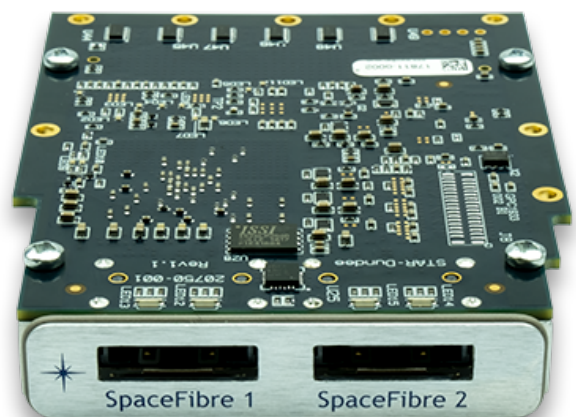
SpaceFibre Interface FMC Board [Preliminary]

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 spacetech 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.