SCOTTISH MORTGAGE INVESTMENT TRUST

Why the sky's the limit for Zipline's delivery drones

Keller Rinaudo Cliffton (KRC): Every expert and global public health told us that this idea was stupid and was never going to work. The technology wasn't going to work. Even if the technology worked, we would never get regulatory approval. Even if we could get regulatory approval, there was no chance that a country would actually pay us money to do this.

If Zipline succeeds, then we will be able to move matter as quickly and efficiently as the Internet moves information.

Tom Slater (TS): Their biggest challenge will be scaling fast enough to meet the demand.

Because I think if you can provide this teleportation service with very accurate timings, at an attractive price, demand will be almost infinite.

KRC: I think that over the next ten years, a new global logistics network is going to be built. I think that company is likely to be bigger than UPS and FedEx combined. And I think it's likely that that company is going to have a tremendously important impact on humanity

Claire Shaw (CS): Hello and welcome to Invest in Progress, a podcast brought to you by the Scottish Mortgage team. I'm Claire Shaw, a director and investment specialist. This podcast is designed to give you a behind-the-scenes look at the conversations that take place between our managers and the visionary founders, entrepreneurs and business leaders of the world's most exceptional growth companies.

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The first company we're going to talk about is Zipline, the focus of today's podcast.

Most people think that new technology or advanced technology cannot start in Africa. But you couldn't be more wrong. Founded in 2014, and with Rwanda chosen as its first market, in its simplest form, Zipline is using drones to deliver blood and save lives.

This is a company creating a completely novel way of operating a health service, particularly in low-income countries with poor infrastructure. To discuss Zipline today, Manager Tom Slater joins me. Welcome, Tom.

TS: Thank you.

CS: Tom, Zipline is one of those companies I really think is going to capture people's imaginations. And I know you're recently back from visiting them in the US recently. Can you tell us a little bit about what is it they do and what is it that excites you about the company?

TS: What they do is use autonomous drone aircraft to build a modern, efficient logistics system, starting out in a healthcare setting and expanding into a broader market opportunity. And what really excites me about what they're doing is, first of all, the huge impact that it can have. Because if you can improve access to medical supplies, you can save lives. As simple as that.

But also, beyond that, providing access to economic opportunity for the billions of people who live out with a modern logistics service.

And ultimately, their ability to impact the way we all live our lives and our access to goods and products.

CS: And in a moment, you're going to be speaking with Keller Rinaudo, who is the founder and CEO of Zipline. Can you tell us a little bit about Keller?

TS: Keller is the founder of Zipline. He started the company back in 2013, 2014. He has what will come across as huge enthusiasm for what he's doing. But also, he combines that technical engineering understanding of what is a hugely complicated area with business acumen and a vision of where he's going.

CS: Well I know he’s a fascinating individual so very much looking forward to listening to your conversation.

TS: I was entertained to see you were wearing the Sun Valley coat, because I just got made to take mine off.

KRC: It's a little sad. You would think that adults can clothe themselves, but apparently not these adults.

TS: It's embarrassing that most of my wardrobe is provided by freebies. Not even freebies. Freebies that I pay work for to make sure there's no compliance issue.

Great to have you with us today. Could you start by describing Zipline and what the problem is that you're trying to solve?

KRC: Yes. Thanks for inviting me. Zipline is an automated logistics company. And the problem we're trying to solve is that logistics over the last 1,000 years in different forms has really never served all people equally. It does a good job of serving the

billion people, the golden billion as they're sometimes known, the richest people on Earth. But the vast majority of people on Earth don't have good access or any access to logistics.

And as a result of that, five and a half million kids under the age of five lose their lives every year due to lack of access to basic medical products.

When we started building Zipline in 2013, our backgrounds were in robotics and software and automation. And it felt pretty obvious to us that there was going to be an opportunity to build the first automated logistics system and the first logistics system that would serve all people equally.

We wanted to do so with technology that could be ten times as fast, less expensive, zero emission and just far more accessible.

TS: We first met back in 2018, I think it was, at a dinner in Arizona. We made our first investment for Scottish Mortgage shortly after. I was struck then by this vision of national-scale infrastructure, the ability to look beyond the technical capabilities of drones, which is what the media seemed to be obsessed with at that point in time. But can you take us back to the founding of the company and the trip you took to Tanzania?

Tell us about why that trip and the thesis that you had for improving on medical logistics was so defining.

KRC: I think that we had a sense about how broken logistics was and had a sense for what was possible. But every investor, and particularly every expert and global public health, told us that this idea was stupid and was never going to work. The technology wasn't going to work. Even if the technology worked, we would never get regulatory approval. Even if we could get regulatory approval, there was no chance that a country would actually pay us money to do this.

And we had a sense that it was likely going to be smaller countries, more innovative countries. We were pretty focused in East Africa at the time. Spending time in Tanzania, I got to meet a researcher who had designed this system. It was an early warning text message-based alert system where they could find out when any patient at any primary care facility was having an emergency. If that person was having postpartum haemorrhaging, mum giving birth or bitten by a rabid dog or a wide variety of medical emergencies.

And he showed me this database that he had all these text messages of all these emergencies like, hey, we need X. We need Y. We need Z. And I realised it's just a database of death. Because IT has advanced so quickly, we now have all of this knowledge about what's needed and exactly when it's needed. But there was no other half of the system. It was like, great, thanks for letting us know. And good luck.

And to us, it was so clear that you just had to build the other half of the system. It was like, thanks for letting us know. And help is on the way.

When we saw that, we felt like, you know what? We're going to ignore the experts. We think they don't really know what they're talking about. We're going to focus on working directly with governments that do deeply understand the problem. And that was the path to launching with our first customer in Rwanda.

TS: I think you described that as the perfect environment for Zipline, challenging medical logistics environment, but a government that was open to innovation. How did that Rwanda opportunity come about? What were some of the challenges you encountered in those early months and years in the country?

KRC: We had a sense that Rwanda, by virtue of being a small country, very technology-forward, innovative, willing to try new things, makes decisions quickly. They've modelled themselves off of Singapore. It's a little bit like a city state in Africa. We had a sense that that would probably be a good place to spend some time I remember meeting with the minister of health in Rwanda and saying, hey... We were a team of 15 people at the time, 15 nerds.

And saying, hey, we'll deliver all medical products to every primary care facility and hospital in the country. And I remember she looked at me like I was a total goofball and said, 'Keller, shut up. Just do blood'.

It's a really important product for family health, but it's a total logistics nightmare. And so she basically said, 'Look, here are 21 hospitals. Show that you can deliver blood to 21 hospitals'. And a few weeks later, Zipline signed our first contract with a customer ever, which was a $200,000 contract with the government to deliver to those 21 hospitals. And we were thrilled. We thought, this is going to be great. We have it figured out.

And then for the first nine months, Zipline only served one of those hospitals because we totally didn't have it figured out. Turns out operating an automated national logistics system is way harder than we were expecting. There were a huge number of problems in software and hardware and reliability that we had to solve in real time once we actually started integrating with a full national regulator, once we were integrating with a national healthcare system.

I really think Rwanda was the perfect partner because they were both innovative, but patient. They knew we were trying to do something for the first time in the world. And they were willing to give us the time and space to get it right for that one hospital before we expanded to 20. We then ended up expanding to 450 primary care facilities and hospitals across Rwanda. We expanded to all medical products a year later.

Today, we deliver the vast majority of blood in the country, I think 67 per cent of the blood in the country. We deliver millions of doses of COVID-19 vaccines,

traditional vaccines, infusions, transfusions, cancer products, insulin, everything. And then over the last couple of years, we expanded beyond Rwanda to seven more countries. Today, we serve 7,000 hospitals and health facilities and it's become the largest commercial autonomous system on Earth of any kind.

TS: It's absolutely phenomenal, the growth of the system. And we'll definitely come on to that. But just sticking with those early days, for listeners who haven't seen a Zipline drone, can you just talk about the physical challenges you were trying to solve and what that first platform actually looked like?

KRC: The way Zipline works is pretty simple. Our product vision is to approximate teleportation. And one important thing to point out, none of our customers give a damn about drones. They have no interest in drones. They don't care that the thing flies. They don't care about the technology behind it, the software, the control algorithms, the ground equipment, the regulatory approvals. They don't want to have anything to do with any of that.

All they want is something that goes from point A to point B, fast enough to save somebody's life. And all of the things that Zipline is building in the background... Actually, I think one of the biggest misconceptions is people look at it and it's like, what a cool drone. And the reality is, the aircraft is 15 per cent of the complexity of this system. And just as important is customer ordering interfaces and regulatory software that we build so that air traffic control can actually monitor the fleet when it's flying at national scale.

Data logging, computer vision-based pre-flight checks, these things are really boring and you don't know they're important until you actually start trying to operate at national scale and then have a rude awakening and realise, wow, you need the full system.

But at the simplest level, the way the system works is that any nurse or logistician or doctor at any primary care facility or hospital that we serve can basically press a button on a phone, order a product. As soon as we get that order, we take that product out of the small fulfilment warehouse that we run and operate. We have it basically in a small electric aircraft. These aircrafts weigh about 22 kg. They can fly 300 km on a single battery charge. We can basically load it into that aircraft, launch it, plane flies autonomously to the GPS coordinates of that facility. We deliver using a really simple paper parachute. Basically, you can just consistently, gently place that thing in a mailbox. The mailbox is just two parking spaces, a rectangle that's the size of about two parking spaces on the ground. And then the vehicle flies back. Once it flies back to the distribution centre, we land. We can then put a new battery in that aircraft and have it launched two minutes later, making another delivery.

The overall system is meant to approximate teleportation and meant to just be fully automated logistics.

It's logistics that works in real-time, based on the customer's schedule, not based on the logistics system's schedule.

TS: And give us a sense of the impact that has had. You talked about the way that you've expanded from that initial hospital that you're serving to a broader range of hospitals. But what's the difference that it's made within the hospitals and the primary care facilities that you serve?

KRC: The interesting thing, that impact question. This is something that I would emphasise again. Almost every expert in global public health that we talked to told us this is a waste of time. It's not going to work. This isn't even the problem. Logistics is actually good. Every possible excuse you could hear. And it's only now, four or five years later, that we're actually starting to see full academic studies of the impact of this system.

Rwanda actually just published an article in The Lancet journal, really prestigious medical journal, showing that they've been able to reduce their national blood waste rate by 67 per cent using Zipline, which is unheard of.

TS: It's absolutely astonishing.

KRC: Yes, pretty astonishing. The Gates Foundation published a study showing that they've been able to reduce missed vaccinations by 42 per cent, while reducing the duration of vaccine stock-outs by 60 per cent, using Zipline. And this was a study done across hundreds of health facilities in Ghana, the second country that we launched in. And then just recently, just a few weeks ago, University of Pennsylvania published a study showing that at the hospitals that Zipline serves, maternal mortality has fallen by 88 per cent.

Which is hundreds of lives of mums who are surviving and able to take care of their families. It's actually hard to take those kinds of numbers and really internalise them, but that's why we do what we do.

TS: It's amazing to me that people have struggled with trying to improve these outcomes. Thrown enormous amounts of money at it.

KRC: Billions of dollars.

TS: And yet, with this one intervention, you've been able to have such a profound impact. There's such leverage into the system with what you're doing.

KRC: I think it's probably the advantage of taking a really orthogonal approach. Zipline is obviously this just completely different idea. I think the global public healthcare is in the business of not taking risk and not losing money.

So much of the approach has been very incremental. It's been like, can we get a 1 per cent improvement? Can we get a 2 per cent improvement? And if you actually said, actually, forget the 1 per cent improvement. What if we just wanted to fully solve the problem? What would be required

That thinking requires risk, requires transformational change. But it's actually the only way that we can actually solve these problems permanently.

TS: You've talked about Rwanda. You touched on Ghana. You've gone into Nigeria. You've expanded out of blood into, for example, COVID vaccines. Gone into Japan, Ivory Coast, Kenya. Could you talk about what you think the impact that Zipline can have on healthcare inequality?

KRC: Yeah, I mean, a huge part of our mission is just that we think that everybody deserves universal access to healthcare. And one of the interesting things, when the pandemic hit, we saw all of these traditional supply chains basically just stopped working, because there were quarantines. People weren't allowed to leave their homes. You weren't allowed to be driving on the street. And for example, Zipline saw the number of vaccines that we were delivering in one week increase by 10X.

Basically, all of the vaccine came to Zipline because Zipline was the only logistics system that continued to work at scale through the pandemic, because it's the advantage of having an automated robotic system. We still have lots of humans, but working in different ways. And then interestingly, as the pandemic has subsided, that volume never left Zipline. It just stayed. It's as though the medicine found a better way of going.

And it's like, why on Earth would we go back to the old way of doing things? But that also challenged us to start solving new kinds of problems. We started delivering directly to people's homes during that time. There were hundreds of cancer patients who had been travelling to get their medication every month. And they weren't allowed to travel during quarantine. The system that was doing that basically came to Zipline, said, 'Can you just deliver this directly to the patients?' And we said, 'Yes, of course, we'll try'.

And that's becoming a bigger and bigger part of our business. It's actually the main part of our business working with health systems in the US. Zipline has signed up a number of different customers across the US. Big health systems like Intermountain Healthcare, MultiCare in Seattle, Novant Healthcare in North Carolina. All these hospital systems are actually now transitioning their logistics, their home delivery to automated logistics via Zipline.

And all of this together, it's not just expanding into home delivery, it's also all these new use cases are coming out of the woodwork. Zipline last year started delivering animal healthcare products in a lot of the countries that we serve

today. It's actually a pretty substantial percentage. I think it's 20 per cent of the overall deliveries we do. Our animal vaccines, animal healthcare products. We also started delivering artificial insemination products.

The last thing I'll mention on the impact side is that Zipline always hired entirely local teams. I think this was also very controversial.

A lot of our investors didn't really understand this philosophy. I think you did, to your credit, Tom. But Zipline today is about half African, half American. We're 1,000 people. All of our teams that run these distribution centres are these amazing flight engineers and flight operators and fulfilment operators who are doing what some of the richest technology companies on Earth have tried to do and failed.

But here, these teams have succeeded and built these systems that are saving thousands of lives. And I think that this kind of infrastructure has become a pretty big point of national pride in a lot of the countries that we've launched it in. And I do think this assumption that the US will always lead the way in advanced technology and then other countries will follow suit, that is not happening anymore. I think advanced technology is actually, in many cases, starting in smaller, more innovative countries that can move lightning fast.

And then the US is having to be a fast follower. And that's what we've seen with Zipline.

TS: Sticking with this, moving from Africa into the US, maybe the listeners will understand that there are big logistical challenges to solve in parts of Africa. But maybe a bit more surprised that actually, you're now bringing this operational expertise into the US. You've touched on this briefly earlier, but could you just talk about what it is you're doing for these big US healthcare systems or planning to do?

KRC: Yeah, this year, Zipline was awarded our Part 135. It's how the FAA certifies airlines in the US. There's no way Zipline would have been able to get that regulatory permission if we didn't have 35 million commercial autonomous miles under our belts.

We were able to provide this massive database of safe flight hours to the FAA to help them get comfortable with the technology, the scale, the safety mitigations, etc.

Once we had regulatory permission to operate in the US, actually working with these health systems has been relatively straightforward. All of them are coming out of COVID. They've seen telepresence explode in terms of the use cases and usage of telepresence has gone up 100X in the case of a lot of these health systems. And we really just talk about teleportation as being the other half of telepresence.

If someone can now stay at home and hop on a Zoom call with a doctor and either get a diagnosis for themselves or get a diagnosis for their kid. And the doctor can tell you, hey, I know what's going wrong. Here's your prescription. Now it's like, hey, stay at home. We're going to have what you need delivered to your doorstep in five minutes.

There's also this big trend happening in the US, which is the consumerisation of healthcare or the 'Amazonification' of healthcare, I've heard it called. And the reality is people are starting to expect good service and convenient service. And healthcare has never been that. But there's a huge transformation happening in healthcare toward that.

TS: And I think back in 2020, you announced a contract with Walmart to provide on-demand deliveries of healthcare and medical products. And the launch of that initiative started last year, I think. Talk about how you're thinking about the evolution of the company beyond healthcare.

KRC: Yeah so, Walmart is one of our largest partners in the US. We started really with this vision around prescriptions, health and wellness products. It quickly became clear that customers wanted everything. And we went from delivering a small number of SKUs, to 3,000 SKUs, to 12,000 SKUs. Now we deliver 27,000 SKUs of the 30,000 total SKUs in the store that we're attached to. The first distribution centre we built is in Arkansas.

It's near Bentonville. And that distribution centre basically enables teleportation of essentially any product in that store to any home within 50 miles. And I don't think I can share too much data quite yet. But suffice it to say the data is really shocking and really exciting. The customers really, really, really love this service. And they are using it way more than we expected, way more than people use most ecommerce services.

You can imagine there are people who are literally ordering things on this system every single day. People are ordering birthday cakes and rotisserie chickens and you can get anything.

And turns out if you make a service that's super convenient, aka teleportation, press a button on your phone and get it delivered to you ten minutes later, people will use that service a lot.

TS: And has that led to you redefining your opportunity set, the addressable market, to now think about delivering much more broadly competing with the likes of UPS or Amazon or whoever that might be?

KRC: I think that it's pretty natural. I think it's smart. If you look at FedEx, FedEx started delivering just coast-to-coast document delivery overnight. It was a very, very narrow... That was the thing that they did and they really nailed that. Obviously, over time, it's become this full global logistics network.

I think that over the next ten years, a new global logistics network is going to be built. And that network is going to be automated, it's going to be zero emission and it's going to be ten times faster than any delivery we've ever seen. And I don't think it's going to be the traditional logistics companies that build that. But I do you think whoever successfully builds that company, I think that company is likely to be bigger than UPS and FedEx combined. And I think it's likely that that company is going to have a tremendously important impact on humanity, both in terms of assuring universal access to healthcare products, but also universal access to everything else.

TS: It's just a huge opportunity. Could you talk about what the remaining challenges are to getting to the point where we're seeing your aircraft in the skies in developed markets, that scale?

KRC: It's funny, I was actually just talking to a really good friend who lives in Bentonville. And he's a big mountain bike enthusiast. And he was leading a group of 50 people on this bike ride and they headed out of Bentonville. And as they were coming back at 6 PM, they came past the distribution centre. And he stopped and looked up and he was like, there were aircraft delivery. You could see aircraft over a couple of miles.

Because at night, we have running lights. We're easier to see. It looks a little bit like UFOs. And he said, holy crap, that was my Zipline aha moment. The reality is, depending on where you live, we're basically already there already.

TS: It's happened already.

KRC: Yes, it’s happening already. And the funny thing is, whenever we get started, people are always... The idea of having an autonomous aircraft deliver something to you in five- or ten-minutes sounds so bonkers. It sounds so weird. People don't really believe that it's possible.

Also, everybody's like, Amazon said they were going to do this ten years ago and then didn't. It must be vapourware. And there's seven days of sci-fi magic of people being like, ‘wow, I cannot believe that I'm having things delivered this way’. And then on day eight, people totally don't care. They find it completely boring. But they're also completely entitled. I've had doctors look at their watch and then look at me and say, it's 30 seconds late.

It's like, wow. We went from science fiction to entitlement in about seven days. And that is, I think, one of the magical things about building new kinds of technology. It's like humans are very good at adapting. And once you realise, you can press a button on your phone and have something delivered to you ten minutes later, people are not going to go back to the old way of doing things. It becomes boring.

It fades into the background. It's just infrastructure. People don't care. The vehicles are silent. They're totally unobtrusive, way less obtrusive than trying to make deliveries on sidewalks or roads. And you can't really tell the difference between these aircrafts and birds. Generally, the neighbourhoods that we serve love the service. It's pretty cool to see the way that the technology, again, goes from sci-fi to just totally boring.

And boring is where we want to be. Boring is it's just normal infrastructure that you use day in and day out and you never even have to think twice about.

TS: And you touched on it there, but there have been several high-profile attempts to launch a service like the one you're talking about. Why can a start-up like Zipline succeed when others have failed at this so far?

KRC: It's a little bit of a tricky question for me to answer because I only know what we do. I can't really speak to why tens of billions of dollars that have been spent in this space haven't been able to really produce results. But I think the reality is when we were starting Zipline in 2013, we were not the biggest team. We were definitely not the best-funded team. And we never even thought of ourselves as being the smartest team.

But I do think that we were by far the most practical. And that is really what is in Zipline's DNA. We are very scrappy, frugal problem-solvers. You've been to our office, Tom. You've looked around. We're not a fancy...

TS: I've launched a drone.

KRC: Yes, you've launched aircraft yourself. You've been to our distribution centres. The reality is we assumed that we were dumb. And in fact, that assumption was correct. We had a lot of the original design assumptions wrong and original product didn't work as well as we thought it was going to. But I think that we were really good at moving fast and getting something into the real world and then learning by doing.

And learning by doing, although it sounds extremely unfancy and obvious, the vast majority of companies, at least in our industry, have not done a good job of that over the last decade. I think there's been huge amounts of money raised and a lot of people sitting in R&D labs building cool technology, but not a lot of people rolling around in the dirt trying to make stuff work in the real world in unfancy places.

TS: I think the recent announcement by Zipline that you've managed to hire Deepak Ahuja, who previously served as the CFO at Tesla, is a huge endorsement for the company. How does attracting leaders of that calibre help Zipline?

KRC: I think that's a pretty easy question to answer. There's definitely a point now where we are realising the scope of the opportunity ahead of us is far larger than we first appreciated.

And the only way that we're going to be able to really scale into that opportunity is to have a combination of younger, ambitious, but also stupid leaders, like me, with people who have at least seen it once or twice. And we try to balance. We need people who... We don't want to have to reinvent every wheel is what we talk about. We do a lot of innovating and a lot of solving problems from scratch at Zipline. But if we don't have to solve a problem from scratch, let's not so we could focus our effort on just the problems we actually have to solve.

And having folks... Zipline has learnt a lot from Tesla. Specifically, substantial portion of engineering team comes from Tesla, a substantial portion of the leadership team comes from Tesla. But I think the way that we have been able to attract people who have already done extraordinary things in their career is that Zipline's mission is our secret weapon. I think there are a lot of people who are sick of this paradigm of technology companies being evil and destroying democracy or whatever it is.

And I think Zipline has been really focused on trying to show that, hey, there are humanity-level problems that are not going to be solved, but for new technology and entrepreneurship and innovation. And we should be getting the smartest engineers graduating from the best universities in the world focused on those kinds of humanity-level problems that would make the world a more equal or better place.

And it's a good business model to do so. You can make money. It could be profitable serving these kinds of markets. I think if we can prove that, it will have a massive impact on the $4 trillion of foreign direct investment that happens every year, almost none of which goes into solving the problems I'm talking about.

A lot of people want to work on those kinds of problems. And I think a lot of people want to be part of something that they can tell their grandkids that they created from scratch.

And I think our mission has been our secret weapon in terms of competing against much bigger companies that can offer NBA-level salaries. No normal start-up can compete with Facebook or Google on salary, but you can compete on mission. And I think that's been Zipline's competitive advantage.

TS: You recently became a father. Your wife's obviously very successful in her own right as well. How do the challenges of dealing with sleepless nights and new-born babies compare to the sleepless nights you've had dealing with the challenges at Zipline?

KRC: I think we're pretty darn lucky. Our daughter is, I think, as chill as babies come. I think we got really lucky on that one. I do think it makes me think a little differently about how I spend my time. Our daughter, Zoe, is already over one year old. And wow, that went by like that.

She's about to be walking and talking and it's like we hardly even got to enjoy her as a baby. And whereas before, if I was on work travel, maybe I'd spend the weekend there. I'm trying to be home every night. It just constantly remind myself, what would I give when I'm 80 years old for one more day with Zoe at this age? And I think, for the answer, it's probably just about anything. I guess the last thought is it definitely makes me more determined to hand her a world that we're super proud of.

And a world that's better and more equal than the one that we were given. I feel like we've done an amazing job over the last 20 years of innovating in digital things that are bytes. But we've done very little when it comes to bits. Our grandparents landed on the moon. We don't have that capability. Our grandparents could fly in supersonic aircraft. We can't do that. Our grandparents built the infrastructure for us that's now crumbling around us.

One of my big hopes is that we can get back to a really optimistic vision for the future that is actually based on us making the world better around us, like building more infrastructure, not less. And building it faster, not slower. And building it so that it's available to all humans equally. That's the world that I am super excited to hand to Zoe.

TS: And maybe just to push you on that a little bit further as the last question, what does the world look like if Zipline succeeds in its mission?

KRC: If Zipline succeeds, then we will be able to move matter as quickly and efficiently as the internet moves information. That's a profound idea. Not only will that save millions and millions of lives every year, but that will also enable a transition for instant last-mile delivery to fully zero emission, which is a super important thing. And it will mean that all humans have equal access to or at least far more equal access to economic opportunity.

And if we can create a world where logistics serves all people equally... Logistics, it's like running water. You don't think that much about how cool running water is. But you would really notice it if you didn't have it. And it's a pretty big part of our quality of lives that we take for granted.

And I think that if we have an opportunity to transform logistics, to make it ten times faster, zero emission, less expensive and universally available to every human on Earth, that's going to be an incredibly important transformational change that's going to happen over the next ten years. It will make the world

look different. The world may look different from space. That's why this transition that's going to happen over the next ten years is pretty darn exciting.

TS: I think that's a great note to end on so thank you very much Keller for joining us.

KRC: Thanks for having me.

CS: It's hard not to be impressed and humbled, I think, in equal measure in terms of what they have achieved. And I think maybe just starting with one of the comments that Keller mentioned about every expert, I think in public health, told them they were stupid and it wasn't going to work. But Tom, you first met him, you said, at this dinner in 2018. What was it that he said that you didn't think it was stupid?

TS: I think that the first thing that captured my attention was the vision of where this was going. This wasn't an ambition to create a device. It was to create a system, a nationwide system at that, for instant logistics. Second, they'd solved a lot of the really difficult technical challenges of doing this. And there are many. In my view, the initial technological risk had largely been worked through and then you're on this trajectory of continuous improvement. A significant part of these systems are software. And we know how software systems can improve dramatically over time.

And then there was Keller himself and just that X factor, that entrepreneurial drive and ability to get things done and really understand where you're going. And I think it was a combination of all of those factors.

CS: It's interesting you mention this X Factor, because I loved his comment about Zipline's mission is their secret weapon. And it's interesting, we talk a lot about competitive advantage, but we often don't hear someone talking about their mission being their competitive advantage, do we?

TS: I think that a significant part of that is competition for talent is intense. You need advanced software engineers. They also need people with aerospace expertise, hardware designers. And when you have these large online network platforms competing with you for talent, that's a really difficult environment to be in. But actually, what you can compete on is doing something that people want to be a part of, that people really think they can have an impact at Zipline.

And it makes it possible to recruit individuals that you couldn't compete for on money alone as a start-up business.

CS: And I think that it's clear that the culture that he's fostered within the organisation, you can see there's a real sense of purpose. I'm intrigued, just from your perspective, you meet so many of these phenomenal visionary founders and entrepreneurs. What lessons or takeaways have you learnt from Keller over the years?

TS: I think that one of the reasons he has succeeded where others have fallen down is not allowing access to capital to go to his head. They've only invested in what they've needed to invest in. Those Novant projects, when I was out seeing them in 2019, they were running the business from shipping containers. It's this mentality that the vision comes first. It's not about making money in the short run. That's an outcome of achieving the mission. And I think it's that mentality which has really been impressive at Zipline.

CS: And I think what you often talk about is we need to see ourselves as being partners to our companies, as opposed to just be seen to be renting shares, if you like, in inverted commas. And I think when you're listening to Keller talking about some of the challenges that they've gone through, particularly in those early days, what support have you given Keller during some of the more challenging periods?

TS: I think what we can offer is a patient, long-term approach. If you are a business that's dealing simultaneously with really difficult technological challenges, but also an evolving business environment, negotiating contracts, that is not going to all go smoothly. There are going to be setbacks. And what you don't need to be worrying about in that environment is, have I got shareholders breathing down my neck, demanding why I didn't meet the last quarter's numbers?

You don't want to be worrying about fundraising and where I'm going to get the next cheque from. And we make no claim to having any useful operational input. But I think a shared vision and trying to engage and do our part and helping that become a reality is the crucial point.

CS: And looking back, we initially invested early 2018 and we made follow-on investments, 2019, 2021. Do you think Zipline's a good example of Scottish Mortgage's approach? We scale up our investments as we build more conviction in the business model. Is that what's happened with Zipline?

TS: And I think it's tied to the way we invest for Scottish Mortgage generally. Which is, you cast the net widely looking for great growth opportunities. You accept that you won't be right about all of them. And in the ones that are able to deliver, being there and continuing to support them and building the position and building conviction. And that's why we have such a high degree of stock ranking in the portfolio at the end of that process.

CS: What do you think the biggest challenge is then to the company achieving the potential that Keller talked about?

TS: I think the first part is the bureaucracy. And you've seen very differing paces of acceptance and adoption from different countries. And whilst the company can move very fast, they are held back by the environment in which they're operating in. And then I actually think if they're in there and they can get pricing to an

attractive selling point, actually, their biggest challenge will be scaling fast enough to meet the demand.

Because I think if you can provide this teleportation service with very accurate timings, at an attractive price, demand will be almost infinite.

CS: I think the scale of the opportunity is just immense from here. And maybe just one last question from me, Tom, I have to ask, what was it like to launch a drone?

TS: I think what underlies that question is this point that Keller made about the drones being 15 per cent of the process. Actually, it's getting the workflows around it, making the operations efficient. And if you're actually going to build scale, that's what you need. Actually, launching one of these things is dead simple. Push the button. That belies the fact that how complicated it is to have this 20 kg object accelerate from naught to 100 miles an hour over the space of 2m to become airborne.

It's a really impressive thing to see, but I'm not sure my input was of any particular note.

CS: Maybe a better question for next time is, what's the strangest thing that will be transported in a Zipline drone, given the things that was mentioning that they are now delivering? Which was news to me, I think.

TS: I thought the rotisserie chicken was rather noteworthy myself.

CS: A big thanks to our guest today, Keller Rinaudo of Zipline, and to our investment manager, Tom Slater.

Next time, we're exploring the commercial future of a completely different continent by talking to the Chief Financial Ofiicer of MercadoLibre, a company often called the Amazon of Latin America.

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