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# Science and Technology Committee

## Oral evidence: UK Space and UK satellite infrastructure, HC 100

Wednesday 1 March 2023

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Members present: Greg Clark (Chair); Aaron Bell; Tracey Crouch; Katherine Fletcher; Rebecca Long Bailey; Stephen Metcalfe; Graham Stringer.

Questions 524-619

### Witnesses

[I](#): Patrick McCall, Non-executive Director, Space Forge, and Joshua Western, CEO, Space Forge.

[II](#): Dan Hart, CEO, Virgin Orbit, and Melissa Quinn, Head of Spaceport Cornwall, Spaceport Cornwall.

[III](#): Sir Stephen Hillier CBE, Chair, Civil Aviation Authority, Tim Johnson, Policy Director, Civil Aviation Authority, and Ian Annett, Deputy CEO, UK Space Agency.



## Examination of witnesses

Witnesses: Patrick McCall and Joshua Western.

**Q524 Chair:** The Science and Technology Committee is in session. This morning we look at some of the implications of the findings in our report on space strategy and UK satellite infrastructure, particularly in the context of the launch attempt in Cornwall a little while ago. We are joined by witnesses from the sector and from the regulator, who will be speaking to us from places ranging from Australia to the west coast of the United States, and of course in person here. We are very grateful to our international witnesses for joining us.

Let me introduce our first pair of witnesses. Joining us from Melbourne is Josh Western, who is the chief executive and co-founder of Space Forge, a space and in-space manufacturing company building the world's first returnable and relaunchable satellite platform. Prior to that, he held roles at the UK Space Agency and Thales Alenia Space. Patrick McCall joins us in person. Mr McCall is a non-executive director of Space Forge and a venture partner at Seraphim Capital, a London-based space technology venture capital company. Prior to that, Mr McCall worked for two decades for Virgin Group, including as chair of Virgin Orbit and Virgin Galactic. He was also previously a board director at OneWeb. Thank you very much indeed for joining us.

Space Forge is a Wales-based company, which is appropriate for St David's Day. Had things gone according to plan, your satellite, ForgeStar-0, would have been the first satellite developed and manufactured in Wales to be launched into space. We are obviously disappointed that it did not work out as you intended. Josh, will you tell us a bit more about what your satellite was going to do and how it came to be put into the Virgin launch?

**Joshua Western:** As you said, ForgeStar-0 is the first satellite designed and built in Wales. It was designed to validate the safety and regulatory case around developing a returnable satellite for the first time ever, specifically so that space vehicles could be returned to the UK and to wider Europe. It is a different re-entry technology. You are probably familiar with something like SpaceX Dragon or the space shuttle from America. The way our re-entry technology works is best described as Mary Poppins from space. It is a large, deployable umbrella that allows us, essentially, to float from space back to orbit. We were developing a demisable version of that platform to demonstrate to the CAA and other European regulators that we were able to do this safely and routinely, ahead of moving up to our full-scale operations on ForgeStar-1 and ForgeStar-2.

**Q525 Chair:** Obviously, you have not been able to do that testing, because the launch did not work. What is your next step? How are you going to perform that required testing?



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**Joshua Western:** We have had to shift the objectives we were looking to achieve from ForgeStar-0 to ForgeStar-1. ForgeStar-1 is a much more capable platform and is launching later this year. It is about 10 times the size of ForgeStar-0. However, because we have not been able to demonstrate some of the safety procedures, it will also not be capable of a full return. We need to be able to demonstrate a worst-case scenario in trying to return something from space to European territory.

Q526 **Chair:** Where are you intending to launch ForgeStar-1 from?

**Joshua Western:** ForgeStar-1 is going to be launching from the States.

Q527 **Chair:** Whereabouts in the States?

**Joshua Western:** As yet, we do not know—either Florida or Vandenberg. It is going up on a SpaceX.

Q528 **Chair:** Obviously, you attempted to launch from Cornwall. Why did you want to do it from Cornwall in the first place? Was that important, or was it symbolic?

**Joshua Western:** We were offered a ride quite late on Virgin Orbit from Cornwall. First and foremost, there was a profound opportunity in being part of an incredibly historic event. At the same time, we were keen to demonstrate a lot of the flexibility with our platform, including late-stage integration and the ability to deploy a returnable platform with a launch via Cornwall, rather than having to go over to America to do that—Cornwall is only a short trip down the M5 and then the A roads. That offered us much greater flexibility with the team and meant that we did not have to staff a team in Florida for an extended period of time.

Q529 **Chair:** Why have you decided that the next launch will be from the United States, given that, as we understand it, this was a technical fault or set of faults? These things happen in space. Is there every intention to launch from Cornwall as soon as possible?

**Joshua Western:** We, unfortunately, do not know when the next launch from Cornwall is going to be. As a start-up, we cannot afford to wait. ForgeStar-0, along with the rest of the Virgin Orbit launch, was originally scheduled for a launch in, I think, July last year. Its being delayed till January this year narrowed the gap between us and our competitors to around six months. The launch then not succeeding means that we are now around six months behind our competitors in deploying this technology. SpaceX and the ForgeStar-1 mission was actually booked prior to ForgeStar-0 being a development pathway. With ForgeStar-0, we were offered the opportunity in January last year. We paused work on ForgeStar-1 to pivot to ForgeStar-0, acknowledging the need to demonstrate some of the safety of operations and other considerations around developing return capability, which ForgeStar-0 afforded us without having to repeat those tests on ForgeStar-1, which we are now having to do.

Q530 **Chair:** I see. When I introduced you, I said you had had roles in other organisations, including in the UK Space Agency, so you are familiar with



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how things could or should optimally be organised. Was it inevitable that the six-month or so delays to which the Cornwall launch was subject should have happened, or were you disappointed and surprised by them?

**Joshua Western:** Yes, we were surprised—especially because our platform was designed, developed and qualified in five months. We pulled out all the stops to be ready for that original July timeline. I cannot speak as to why there were some of those delays—I simply don't know.

What I would say is that, where we have been able to engage with the regulators, the engineering teams have performed admirably. They are excellent to work with. Regarding the gaps between those engagements, I would probably share the view, beyond Space Forge, that others have also suffered from those delays and gaps between engagement, which inevitably have a knock-on impact on the licence.

Q531 **Chair:** Obviously you have done the same with other regulatory jurisdictions. Can I infer that this is not your experience with those other regulators or jurisdictions?

**Joshua Western:** Indeed. The two examples I have are Portugal and Australia, where I am speaking to you from today. In Australia, for example, they quote a six-month timeline from submission of a complete application to licence award, and there is no licensing fee. That is very different from the CAA timeline of 12 months and the at least £5k fee for the application itself, notwithstanding the resource requirement on submitting that licence.

In Portugal, where we are looking to conduct our initial return operations—simply because of its proximity to the Atlantic—we are currently in discussions, but at the moment it looks to be around 12 to 15 times cheaper a day to use their restricted airspace to conduct our business.

Q532 **Chair:** How do you account for that, given that Portugal is, in a sense, competing with the UK to be the first European launch facility, and subject to what one would have thought are similar standards in terms of the safety and regulatory certainty one would aspire to? What are they doing differently in Portugal, to take that example? You might perhaps cite Australia as well. What is your experience there, compared to what you experienced in the UK?

**Joshua Western:** I cannot really speak to the launch side, only the satellite operation and the return capability. In both cases, Australia and Portugal recognise FAA approval from the US, and they have adapted those regulations to fit their own geographies, as ways of stimulating some of their perhaps smaller space economies, compared to the UK.

What I would say is different between Portugal and the UK is the pace and touchpoints with the engagement. We have somebody from their Government or their regulator speaking with us pretty much on a weekly basis to move forward their process to be ready for a return operation towards the end of this year.

Q533 **Chair:** You said it was on a weekly basis in those cases. How frequent was



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the interaction in the UK?

**Joshua Western:** It was highly dependable. Sometimes it was only a couple of weeks; other times we were waiting up to six weeks.

There was a real jarring between the submission of the licence and the licence application via the portal, which could only be submitted once. What that meant was that when the CAA teams had questions, we had to go via email to answer them, which obviously meant there were significant differences in size, detail and so on between the portal submission and what we were actually detailing to the CAA. Quite frankly, it cost us more to licence our satellite for launch than it did to launch it.

Q534 **Chair:** Thank you for that. I will turn to Mr McCall. You obviously heard what your colleague said. Just like Mr Western, you have had a long and illustrious career in the space and satellites sector, not least as chair of Virgin Orbit and Virgin Galactic. Could you perhaps add to your colleague's perspective on this, given your experience of the industry? Why have things been so disappointingly slow here in the UK?

**Patrick McCall:** As Josh has pointed out, this is a global market; there are spaceports already all over the world, and there are more being developed. For those spaceports to survive, they have to be competitive. I think that Grant Shapps had the vision, when he kicked off this process, that the UK should have the most efficient regulatory system in the world.

I think, as Josh has just said, that right now it is a laggard from a timing and expense perspective. Now—I just want to be really clear—that is not saying that the CAA is necessarily wrong; it is taking a different approach to risk. Part of that is probably because the UK is a more difficult geographical place than, for example, the Mojave in California or the Pacific.

Q535 **Chair:** But not Portugal, surely?

**Patrick McCall:** You are going to have Dan Hart speaking later on today—in the middle of his night, on his birthday—and he was having to deal with Ireland, France, Spain and Portugal the night before. I went down to Cornwall the night before. He was having to talk to all those jurisdictions. It is not super simple, launching out of there. Lots of things are really good about the UK, but that is one factor that could make it worse.

However, I think that the big picture is that the CAA is taking a different approach to risk, and a bit to process and timing as well. Of course, it was the first time that they did it, so there are always lessons to be learned and things to be improved next time but, without wanting to be too dramatic, unless there is a seismic change in that approach, the UK will not be competitive from a launch perspective.

Then, if you look at someone like Josh—I sit on his board, and on a few other space companies' boards now—he is doing a great job running his company and launching satellites, but he also has to raise money. He has just raised money. I think it is—Josh, correct me if I'm wrong—about 24



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months of runway. A six-month delay is a quarter of his money gone, so it is real money that is burning every day you are late on launch.

Of course, there are lots of factors that impact that—for Virgin Orbit, in terms of being late, there were the technical issues—but you don't want to overlay more risk on that, to the extent that you can avoid it. Obviously, a better decision is to minimise the risk on the regulatory side. Therefore, if Josh comes back to the board and says, "For the next launch, I want to do it in the UK," he will be given pretty short shrift in terms of whether that is a good idea or not, given all the additional risk.

Q536 **Chair:** By investors.

**Patrick McCall:** By investors. All the investors care about is—well, you can imagine what they care about, but having a successful launch as quickly and as cheaply as possible is obviously vital to them. There is no chance that Josh would win the argument to do the next launch from the UK.

I would go even further than that. Josh just talked about this, but his costs in terms of interacting with the CAA—the regulatory costs—were more than his launch costs. That is a really important point. So even if the UK came back and said, "We'll do the launch for free," I would still say, "Josh, you shouldn't do that because of the time, and, more importantly, the risk around time." Every month is one 24th of Josh's company's life, with his current cash. You can't run the risk of additional delay through regulatory process.

That does not mean that it can't be sorted but, as I say, it needs some kind of big change from a risk-appetite and process perspective, otherwise they are going to go to the US, where you can do it now, or Australia, Portugal, Japan, Brazil or even Luxembourg. They will all be looking at this, asking, "How do we win this global game to become a great place to launch from?" There are lots of factors around that—legal, insurance and all that kind of good stuff—but, fundamentally, if you are not at the same level of risk appetite as those countries, you should not be in that game. As I say, that is not a right or wrong decision; that is just how it is.

Q537 **Chair:** So the ambition of the Secretary of State—and I might say, immodestly, of previous Secretaries of State—was to be the first mover in this. We did have the first attempted launch, but the result of that is that you, as an investor in space, are saying that there is no chance of investors supporting another launch from the UK, even with the current regulatory approach.

**Patrick McCall:** Commercial business, unfortunately, is all around wanting certainty in terms of time and budget, because it all leads back to one thing, which is cash and particularly cash burn, if you are a start-up. That is irrespective of whether the Cornwall launch was a success or not. It would have been exactly the same issue. For the UK to be able to launch again using commercial customers, its next one, two or three launch customers need to be Government—people who are happy to take the risk that this could take quite a long time. Then the UK can say, "We



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are announcing in March and we are going to launch in September,” and show that it actually happens. Then, in a year or two’s time, Josh can come back and say, “Look, they have a track record now; we can actually go with these people.” But right now, there is no way that Josh, or any board that I would sit on, would win the argument that they should launch from the UK.

**Q538 Chair:** This is a disaster, isn’t it? We attempted to show what we were capable of, and the result is that things are now toxic for a privately funded launch. We now need to have the Government do it to earn back the confidence of private space investors.

**Patrick McCall:** Yes. As I say, it is not saying that the CAA has the wrong view, but it has a different view. There are other things that have been positive. There are over 200 launch providers in the world. Launch is a really expensive thing to do. Virgin Orbit is public—it spent over \$1 billion building it—so the good news is that the UK has not gone and spent \$1 billion building a launch capability; it has rented it off Virgin Orbit. It is still a lot of money—it would buy a hospital or something like that—but it is nothing like \$1 billion. It is \$10 million or \$20 million. They have taken a much more efficient route to get to space. However, if the UK wants to do launch—and we should probably talk later about why the UK wants to do launch—it needs to change. Otherwise, it should focus on other things that are as exciting and interesting. There are lots of opportunities in space. For me, this is about the opportunity cost of money. You could spend it on launch, or you could spend it elsewhere on space or elsewhere in the UK economy. Maybe you want to talk about that later.

**Chair:** We do want to talk about some of those issues, but let me turn to my colleagues, starting with Aaron Bell and then Tracey Crouch.

**Q539 Aaron Bell:** Thank you, Chair. To clarify what you just said, Mr McCall, the implication is that the failure of the launch was not so bad; it was the delays that were worse for the sector. No one wants a failure, but failures happen in all jurisdictions.

**Patrick McCall:** I will give you an anecdotal example. After the plane took off to launch, we had half an hour together, and I was talking to everybody. It was incredibly exciting—it was amazing—and then it obviously all ended pretty quickly. But I spent that half an hour talking to lots of Government officials, saying, “We have to get round the table and make this licensing process more efficient; otherwise, it is not going to happen again.” That was before launch decided it was success or failure. That is a long way of answering your question; the answer is yes.

**Q540 Aaron Bell:** The last answer you gave to the Chair teed up what I was going to ask. Do you think that the development of a UK launch capability is necessary for the success of the UK space sector? We have a lot of firms that operate—manufacturing satellites and so on. Do we need that launch capability, or is it slightly massaging our own collective national ego?



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**Patrick McCall:** I think it is more profound than that. I work with Virgin Orbit, and I spent a lot of time going to Cornwall. I spent a lot of time with Spaceport Cornwall, which, by the way, did a fantastic job. Melissa, who you are seeing later, and her very small team did an amazing job, and what Cornwall Council has backed is incredible as well. For me, there are two reasons why you want to launch out of the UK. There is the rapid-response military side. I am not the right person to ask about that, albeit that I am seeing the next military satellites not being launched from the UK, which begs a question on that, but there are different satellites at different times.

Then, for me, the most important thing is around how you get the UK to understand the opportunity in space. Space is changing really quickly. What Josh is doing literally would not have been possible even five years ago. Ten years ago, a satellite was the size of this room. It was unbelievably expensive to build—probably \$1 billion—and the payback period was 30 years. The launch cost was absolutely astronomical. Something had to live for 30 years to get your money back. You can now build a satellite for \$100,000 and launch it for \$100,000. The game has totally changed.

I am not technical; my background is as an investment banker—Josh is not technical either, although he is doing a good job at learning it all. What I think this all shows is that there are so many applications for space. The next Kernow Sat, if it does happen from the UK, will look at seaweed development; there is another company involved called Satellite Vu, which can look at this building using infrared technology to work out whether you should be insulating it properly; and there is everything in between. The applications are amazing. I think it is about getting the UK public to understand that you do not need to be an astrophysics PhD. You can be as stupid as me, particularly from a technical perspective, and go, “What is my application? I can look at biomass development in the developing world and work out where the next starvation issue is going to be because crops are not developing, and identify that six months early.” The applications and what is happening are just so amazing.

On the night of the launch, there was excitement in Newquay, but also this was the lead story on the BBC; there was live news. It was a massive feelgood story, massaging the national ego, but, more importantly, everybody was thinking, “What does this mean for me? What could I do with this?” A lot of people would, hopefully, have gone home and said, “I can set up a business around this.” This also applies to kids at school. I have taken schoolkids down to Cornwall, and particularly kids who are struggling at school say, “Wow! This is incredible. I could do everything from establishing a regulatory regime to making tractors drive in a straighter line and spread fertiliser.” For me—it is a bit flippant to say it—this is sort of a marketing exercise, and then it’s about getting people to move to Cornwall, Scotland or Wales, as Josh has done, to build those businesses using very bright people from all parts of society. We are talking about very exciting and well-paid jobs in a sector where there is high growth. It’s an exciting sector and something we are really good at.





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**Q541 Aaron Bell:** The Government obviously have the objective that we become a science superpower; we are investing more money in science generally. We are talking about education and the inspiration that this gives. We have done an inquiry into STEM and inclusion in that as well. If we don't develop launch capabilities, will that have a major effect on our overall ambition? Obviously, we also have the new Department for Science, Innovation and Technology. Do you think it says something about a lack of ambition if we cannot deliver a launch capability?

**Patrick McCall:** I think it really comes back to two things. Can Josh keep building his business outside the UK? Answer: yes. Can the other companies that I'm involved in, from a space perspective, do launch outside the UK? Absolutely they can. And then—without wanting to be too focused on it—this is about money. This is costing money. You could decide tomorrow, "Actually, we're not going to do this anymore." That frees up quite a lot of money. Yesterday, the UKSA, who are doing some fantastic work encouraging companies in the UK, announced over £50 million for lunar-type projects. That could have been £100 million if you didn't do launch.

Yes, I'm just pulling numbers out of space, but there is the opportunity cost of money. You could go and build a hospital. I think that's the way to look at it: is this a good use of money? The conclusion I have reached is that right now it is not a good use of money, because our regulatory framework is not competitive. I will stress again that I am not saying whether that's right or wrong, but it's not competitive with the rest of the world. And it's not like these places are not the US, Australia or Portugal; it's not like companies are just winging it. It's not like Josh and I are saying, "We're going to go somewhere that's a bit off the track." We are going to grown-up countries, with proper regulatory frameworks, where it's cheaper and easier.

**Q542 Aaron Bell:** May I turn back to Mr Western? At the risk of asking you to contradict your NED, what would it take for you to launch again in the UK? What would you personally need to see, as a CEO, to launch again, whether in Cornwall or elsewhere in the UK?

**Joshua Western:** We have publicly said already that we would happily launch again from the UK. What we would need to see is progress in the regulatory environment: a speeding up, and lower barriers to overcoming some of the regulatory hurdles. At the same time, the two things that also matter are, first, confidence in the launch vehicle itself. If anything, apart from the failure it suffered, I almost have more confidence now in a Virgin Orbit launch, because they'll fix the problem and do this again. We always say that we don't want to be anybody's first time. Really, it is about establishing a firm cadence. At Space Forge, we are launching one more mission this year. We are launching three more next year, and one of those is already signed up, again, for a launch from the US. We are looking at launching 12 platforms a year by 2026. At that sort of cadence, even half of them launching from the UK would provide a significant anchor customer for that. But where we need support is in the regulatory environment and on the pricing that UK launch can achieve. It does not



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have to be as cheap as America—there are perks to not having to send a team of five out to Florida for three months—but the closer we can get to that, the better.

I think as well that, as much as we can debate whether we pursue launch—we had that discussion, as a country, after Black Arrow—it really depends on what kind of global partner and science superpower the UK wants to be. That is not a question I can answer, but launch can make us a partner able to work with other countries in a science and space capacity, in a way that we simply cannot achieve without launch.

**Q543 Aaron Bell:** You mentioned that Virgin Orbit will fix it next time. Are you satisfied with the technical explanations you have had of the source of the anomaly and the reason the launch failed?

**Joshua Western:** It is absolutely gutting that a component so small should cause that failure, but it is not without precedent. It has already occurred in other launches. In many ways, I am frankly grateful to have suffered a failure like this so early on in our journey, and not with a much more capable and much larger platform with much more money riding on it. My team took a day to grieve for the loss of that satellite, which was a lot of work, and then they were already heads down on the next mission. We are coming back from it better, and as well as we can, and we still very much hold our heads high for having attempted it.

**Aaron Bell:** That is very good to hear. We all shared in your disappointment, but we look forward to seeing you launch again. Thank you.

**Q544 Chair:** On the point about the money, were you insured, or do your investors have to pay?

**Joshua Western:** No, we took out insurance. I believe we were one of the only companies to do so. Our satellite on that launch was quite small, so it wasn't too onerous—it was maybe somewhere between £10,000 and £20,000, paid for across all the different insurances. Our broker is very good. We have already received about 80% of our money back. However, the insurance only covers the cost of the launch and the cost of the materials. It does not cover the resourcing, the engineering or the time that we have lost from being involved.

**Patrick McCall:** That is a really important point. It is multiples of the actual insured loss. The piece of kit is almost irrelevant from a cost perspective; it is time that is the killer.

**Chair:** Especially in the race against competitors.

**Patrick McCall:** Yes.

**Q545 Tracey Crouch:** Josh, during our inquiry on the UK space sector, we urged the Government to take steps to speed up the licensing process in order to get the launch sector up and running. We have not yet had a response from the Government on those issues, but are you seeing any



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changes that you are content with, or do things still need to be sped up? Is the licensing process fit for purpose?

**Joshua Western:** I think the right questions are being asked, but the pace at which they are being asked is where we are losing. We are going through the licensing process on our ForgeStar-1 platform. We started that in September last year. Again, the engineering and technical teams of the CAA are doing some fantastic engagement, and we have noticed how open and responsive they are to our feedback around certain aspects of the licensing process, but I would have to be honest and say that I would not recommend a company go through their first licence in the UK. It was quite painful at times. It was particularly onerous around company checks.

As a new entity, we understand that the CAA has to be comfortable that we are who we say we are, but the checks reached a level of detail that I haven't previously seen, and I have gone through security vetting. At times, we couldn't understand why that was not a separate process from the licensing of the satellite. Being able to progress those on two separate tracks would be immensely helpful to other small space companies literally looking to get off the ground.

Q546 **Tracey Crouch:** Would you say from your interaction and engagement with the CAA that they are learning lessons from the process that you had to go through?

**Joshua Western:** Yes, absolutely. There has been a real acknowledgement of the level of unneeded oversight of a company of our size. When we started ForgeStar-0's application process, I think we were around 20 or 25 people. By the time that process had concluded, we were 46 people, so we have already massively increased, and the company as a presence has changed significantly from the time when we submitted that original licence.

Q547 **Tracey Crouch:** Do you think they are appropriately resourced to meet the demands of the UK launch industry, given your insight into other authorities and their resources?

**Joshua Western:** I cannot speak for launch, but speaking as a satellite provider, no, they are not. They need more people. My understanding of the licensing process is that our platform, once we get to our second-generation ForgeStar-2 by around 2025, will be fairly standardised, so that element of the application should hopefully become relatively streamlined for us. However, the payload of each of those platforms has the opportunity to be different every time. We would need to file a brand-new licence for the payload each time there was a new one. That could be particularly slow, especially if we were in the usual 12-month offering, around that mission compared with some of the other countries that I mentioned.

**Patrick McCall:** Before you talk about staffing—I think Josh touched on this—the questions should be: what is the inquiry that is needed, and can you lessen that? Then you can work out how many people are needed. I am putting words into Josh's mouth, but having more people doing too



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much work would be unhelpful. This is about reducing the workload, and then resourcing appropriately.

Q548 **Tracey Crouch:** Thank you. That is really helpful. Were the delays in licensing the key reason why the launch did not take place in the summer as planned, or were there other reasons?

**Joshua Western:** There were certainly other reasons, but it was definitely a key element of it.

Q549 **Katherine Fletcher:** Is the CAA taking an approach of, "It'll be fine; let's just identify known risks," such as your throwing radioactive material up in a satellite, which they might need to know about, or are they going from a ground-up perspective, where you have to tell them what it is and they work out that the plastic bits are not dangerous? Can you give us an idea of the mentality?

**Joshua Western:** From my perspective, the CAA have a very sensible initial approach to risk. They go for what is known as an ALARP approach—as low as reasonably possible. I am very pleased to say that, at Space Forge, we do not deal with radioactive material, because that is far too difficult. However, "as low as reasonably possible" is entirely subjective. It could be subjective to the CAA, and it could be subjective to the engineering or technical person in receipt of your licence application. It is different between countries and even between regulators, so the understanding of the level depends on who is reading your application. I hope that makes sense.

**Katherine Fletcher:** So there is an opportunity to provide up-front clarity to speed up the process.

Q550 **Graham Stringer:** Mr McCall, you have given us pretty comprehensive answers, but what I do not have clear in my mind is what you mean by "appetite for risk". What are the risks that are being guarded against?

**Patrick McCall:** At the end of the day, space is difficult and risky. Stuff can crash, blow up and land on people or ships. On the night of the launch, there was a Spanish ship sailing in the launch zone, and it had to be moved with 10 minutes to go. It is probably more of a question for the CAA, because I am a non-exec and not involved intimately in the detail of this, but to put it in layman's terms—my terms—there is a lot more worry about this in the UK than in other countries. I can give you an example from when I chaired Virgin Orbit. When you are a non-exec, you worry about the things that are most important. You can worry about five or 10 things, and then you let the exec team get on with it. Regulatory process was never on my list of things to worry about. It was just, "Okay, here's a report—we don't need to talk about that, so let's move on", whereas for Space Forge, this was issue No. 1.

Q551 **Graham Stringer:** What I am trying to get clear in my mind is this. You often hear at the start of a project—whether it is building a nuclear reactor or whatever—that people are being over-cautious, and it is costing a lot of money. Costs are cut, and several years later, the thing



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blows up. There is an independent inquiry, which finds that the costs should not have been cut. That is one side of it. On the other side of it, jumbo jets and other large aeroplanes take off all the time. They do not land on ships in the ocean, and they rarely blow up on the runway. What is different about this that requires the CAA to take a severe look at the risk involved?

**Patrick McCall:** It is a 25-year-old jumbo jet that Virgin Atlantic flew across the Atlantic for many years, but it is modified; there is a rocket on it, and it has, for want of a better word, ordinance on it; it has explosives on board. There is risk, without a doubt, but you can't take everything to zero. What risks are you willing to take? It has worked in the US, which is not a helpful comment for me to make to the CAA, because it has a legal obligation, set by Parliament, to run a process; it cannot just rely on the US.

It is the kind of question that Josh was getting. Josh, you talked to me a few times about the fact that you were getting questions about your CCTV system in a small building in Cardiff. Is that the right level of detail to go to? You are talking to Dan Hart later; I know that he was frustrated—I'm probably being a bit mean to Dan, in terms of setting it up—about the physical area that was looked at from a risk perspective. It was certainly more than he was used to in the US. That is probably something to ask Dan Hart, the CEO of Virgin Orbit, about. He can compare and contrast what he sees in the US with what he has been asked for in other jurisdictions.

Q552 **Graham Stringer:** You have been very clear that the process should speed up. Josh has been clear that it should be less expensive, looking at the comparators internationally, and that the basis on which we look at risk should change. Are there any other recommendations you would make?

**Patrick McCall:** There is a lack of appreciation of what matters to small companies such as Space Forge. If you work for a big company or in the public sector, it is just accepted that if you turn up for work, you will be paid. If you're a small company, you're thinking, "I'm another day closer to running out of money." To raise money, you have to show a positive view of life. Investors want certainty to budget, and certainty about when things will happen.

It is not a criticism of the CAA or UKSA, but the world has changed. This is not like dealing with Airbus, which is almost like a Government organisation. The new space economy is around small companies—start-ups with limited financial resources and limited numbers of people. I mean, Josh's entire building, including manufacturing, is, I would say, twice the size of this room. The CAA is probably more used to going into an Airbus or something like that, which has multiples of this room all over the world, as opposed to asking, "What does 'new space' involve?"

All the companies I am working with have 20 to 30 employees, with limited financial resources and investors who understand the risks but



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need to understand—the questions that Josh gets from investors at the board are, “When’s the next launch? Is it definitely going to happen? What are you going to show? When can we go and talk to the new lot of investors about raising more money to hire more people and create more jobs in the UK?”

Q553 **Graham Stringer:** This is my final question—I am asking Aaron’s question, really, in a slightly different way. If we don’t get this right for UK-based companies, what are the implications for our international reputation in the world of space?

**Patrick McCall:** I would turn that round slightly and try to be positive. What’s happening in the space world, as I said earlier, is amazing. It is incredible; it will literally change our lives and our children’s lives, where they will work and all that good stuff. I saw Grant Shapps yesterday and talked to him about net zero. Space is a huge enabler of that; it’s incredibly exciting. The UK is one of the leaders on that, and it doesn’t necessarily need a launch to make that happen.

Now, is what happened a bit awkward? Is it a bit difficult, and do I feel very sorry for people in Cornwall and for Cornwall Council, and all the people who have worked unbelievably hard to make that launch happen? It’s very, very difficult. However, the UK space industry can still survive and thrive without a domestic launch. Personally, I think it would be great if we could have a launch, but it is not a must-have. It is a nice-to-have, but it has to be a nice-to-have in an environment in which we are competitive with other spaceports around the world.

Q554 **Stephen Metcalfe:** You mentioned that we might explore why the UK wants to be in space in the first place. I do not think we have put that question directly to you. I would be interested in why you think we should be there.

**Patrick McCall:** In launch, or in the space industry?

Q555 **Stephen Metcalfe:** In both, actually, but more in launch, because I think we know why we want to be in the space industry.

**Patrick McCall:** We should definitely be in the space industry. It is one of the things the UK excels at. What Josh is doing—there are lots of Joshes around the country right now doing similar stuff, although not quite as good as Josh, obviously—is properly amazing. I have gone to his facility and talked to his team. He has assembled 45 people in Cardiff to work on the satellite project, which is amazing, and he is doing it in an old garage in Cardiff. These people are out there. It is a young, diverse team. It is incredibly exciting, and that is happening all over the UK.

We haven’t really talked about what Josh is doing. He is making alloys in space that will be 50% more effective from an electricity usage perspective. He is making things in space and bringing them back to earth. He is talking to British Telecom. We are talking about 1% of the UK’s electricity consumption; he can make a massive difference there. That is just one anecdotal example.



Yes, we should definitely be doing space. Yes, the UK is really good at it. For me, there are three elements: launch, building the kit and the applications. Do we have to do launch? No. Is launch very expensive and risky? Yes. Do we do satellites? Well, we are doing them already. We are actually really good at that; it is happening across the UK. The really interesting bit for me is the applications, and that is where I think the UK needs to make sure it is moving with the rest of the world. Right now, in a lot of places it is ahead of a lot of the world—maybe not America and a couple of other countries, but we are a world leader on this. For the UK to thrive in the future, that is really important. As I keep on saying, launch is a nice-to-have, but not a must-have.

Q556 **Stephen Metcalfe:** Are the other two points you mentioned—satellites and application—not predicated on having launch capacity?

**Patrick McCall:** No. To take the extreme on that, if we had to have launch capability from the UK, Josh should give up now, because it is not going to happen.

Q557 **Stephen Metcalfe:** We have talked about establishing launch capability in the UK for a number of years. Do you think we actually want to do that? Are we making it too difficult for ourselves? Is it in that pile of stuff where we say, "It is a new area to regulate. Actually, it's a bit tricky, so let's make it as difficult as possible for people like Josh, so they go elsewhere; then we don't have to deal with it"?

**Patrick McCall:** I definitely do not think it is deliberate. I think people do want it. People I have met at the CAA are very proud of being involved in it and want to make it happen. Anybody who was in Cornwall—Melissa is here—knows that the atmosphere was amazing. The excitement of making this happen was incredible for the people involved, but it is not working. Either we change that with a seismic shift, or we decide that we will not do it, we save the money, and we spend it on other things that are unbelievably exciting.

Q558 **Stephen Metcalfe:** Finally, do you agree that where we are now just ain't working?

**Patrick McCall:** Yes.

Q559 **Chair:** Thank you, Stephen. I thank Mr Western and Mr McCall. I am sorry, Mr Western, that we didn't get the chance to ask you about your technology in more detail. We are very excited about it, but today we are looking into the regulatory arrangements, and you have both helpfully given us the context we need in order to ask further questions later this morning. Thank you very much indeed, in particular for joining us from Melbourne.

## Examination of witnesses

Witnesses: Dan Hart and Melissa Quinn.

Q560 **Chair:** Joining us from Los Angeles, Dan Hart is the chief executive officer of Virgin Orbit. He previously spent 30 years at Boeing, where he was



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most recently vice president of Government satellite systems. He has also worked on GPS, Wideband Global SATCOM and the X-37 spaceplane. Thank you for joining us, either very late at night or very early in the morning—I think it is about 2am in LA—and it is your birthday, so it is particularly good of you to interrupt it.

Joining us at the table, I am pleased to say, is Melissa Quinn, the chief executive of Spaceport Cornwall, and one of the first female spaceport leaders in the world. It is important that that is recognised by a Committee that wants to improve participation by women. Melissa previously worked for Aerohub Cornwall, which supported aerospace and spacehub businesses.

I am very grateful to you both for coming. Melissa, as you were travelling up, you might have missed some of the praise that was heaped on you and your team for your hard work and commitment to the launch. It must have been a great disappointment. A few weeks on from the launch, could you kick things off by giving your recollections, and any reflections you have?

**Melissa Quinn:** Thank you for having me; it is lovely to see everybody. It has been quite a journey, up until the launch itself. I have been part of it since it started in 2014 at Spaceport Cornwall. It was a roller coaster ride up until the launch, which was just absolutely incredible. It was such a huge moment for my team, Cornwall, the country, and me personally. We put so much energy into it. Anybody who works in the space industry, and specifically with launches, knows the sacrifices that people make in the industry, including our families. A lot culminated in that moment, and obviously it not going how we hoped was really disappointing for everybody. We put all that time, energy, passion and emotion into it. I think you probably saw that on the night; my picture was on the front page of a lot of papers crying, which was not something I expected.

Of course, it was disappointing. I shared some time with Dan and his team, because they are just as passionate about what they do. They are absolutely incredible with what they do in bringing launch to the UK.

Since then, there has been a lot of time to reflect. The first reflection was that we got to space for the first time ever from UK soil. That was huge. Remembering that we made history happen from Cornwall, from a small regional airport after a pandemic and all the things that have happened, was really inspirational still. I should have brought them today; I have thousands of letters from schoolchildren all across the country and the world saying how inspirational it was. Most of them do not even realise that the satellites did not get to where they needed to be—they just absolutely loved it.

We are building back the momentum from a lot of those positives, with steps like today, and looking at getting that second launch. That is hugely important to us as a spaceport. We are licensed and ready. We have the licence, and that is something we want to use. We want to ensure that the UK uses it, and that companies like Virgin Orbit want to use it. For us, it is about how we get to that point, so that we can be a spaceport. We are





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just at the beginning of this, and I would not want to lose it before it really gets started.

**Q561 Chair:** Thank you; that was very clear. Turning to Mr Hart, we have obviously got the facts of what went wrong with the launch itself—I think it was a dislodged fuel filter. Can you say something about that and update us on the latest thinking? You may have heard from our previous session that we have been advised not to get too hung up on what tripped up the launch, but to try to learn lessons from some of the aspects of licensing and regulation that led to delays and to where we are at the moment, which is that we do not have a future pipeline. Could you reflect on both those things: the immediate problem and what led up to the launch?

**Dan Hart:** Certainly. We will get into the issue that we had—a lot of things went right, as Melissa just mentioned. The issue we had was that a fuel filter apparently become dislodged and affected the fuel pump of our second stage. That was after the first stage had flown; we were going 1,000 mph when the second stage ignited. The fuel filter affecting the pump affected the operation of the second-stage engine, which actually operated for quite a while but eventually had a failure because of heat build-up. That caused the system to turn off, and continue along a trajectory that was planned, in case of an issue, to be a safe trajectory. It eventually fell into the ocean.

**Q562 Chair:** Have you concluded those investigations, or is there some way to go before you definitively close the book on that?

**Dan Hart:** We are well along the way. We are doing some experiments. We are doing a very formal investigation, as you would expect, with independent experts as well as Government oversight. We are in the middle of doing some experiments to make sure we can relate flight telemetry and data to ground test results and clinch it. In parallel, we are finishing the build of our next rocket, which has that filter designed out of it. We want to make sure that we have our finger on exactly the issue, and we can share that.

On your other question about the build-up, No. 1 is that this was an enormous undertaking. We are a fairly small aerospace company, as aerospace companies go. It was an honour to be in a position to attempt this first launch, and I thank Melissa and her team at Spaceport Cornwall, Ian Annett at UKSA, Tim Johnson and the team at CAA, the RAF, Air Vice Marshal Godfrey and others who supported us. It was a hugely complex undertaking.

The logistics aspect of performing the mission was quite an undertaking, and then there were the safety aspects of carefully planning and going through the regulatory process. In terms of the regulatory environment, the first surprise we got was, as Mr Western alluded to, the ALARP process. We had anticipated that the FAA process would start off as the founding portion, and we could then use that documentation and analysis. We found relatively early on that we would need to reformulate that in a



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unique UK regulatory set of documentation and analyses. That was somewhat unexpected, and it would be helpful if the two were more compatible. That is No. 1 that I would point out.

No. 2 is that the CAA was involved, but many organisations had an interest or a statutory requirement to have an interest in the launch, including maritime, environmental, health and safety, nuclear and lots of other organisations. We found that we needed to rehash information many times, and sometimes the asks would change in terms of the level of depth or the kinds of information we needed. There was not what I would call a central clearing house, where you put your information in and then the system is satisfied. Things changed along the way, and our expectations changed. We all plotted forward, but that was difficult.

We were all taking a fair amount of risk in whether we were actually going to be able to do this or whether the rules would change in such a way that we would not be able to. Perhaps the largest example of that was to do with the hazard area that needed to be established at the airport. In a pretty late-breaking development in the fall of last year, it was determined that the hazard area we had proposed was not adequate, and we needed a larger one. That caused quite a burden on the airport to accommodate it by closing roads, businesses and so forth.

The last part I will mention at this point is that there was airspace to negotiate and range that needed to be evaluated, and there is perhaps a rethinking of what a company is capable of doing. We mustered through it. We usually asked for help, and often we eventually got it, and I am grateful for that, but we can probably think forward for the next time about, for example, the fact that if Virgin Orbit asks a ship to leave an area, it is probably not going to be as effective as if the coastguard does. Maybe we can set up those interfaces right from the get-go. Again, it was a huge undertaking. My team had their heart and soul in this. We were tremendously disappointed that we did not get to orbit. Most of all, I apologise to the spacecraft that we did not deliver.

**Q563 Chair:** Thank you very much. To follow up on the approach to regulation, was it the case that, for example, the aircraft—the 747—needed to be licensed by the CAA? This is a pretty familiar aircraft. Was the FAA approval sufficient or did it need to be specifically licensed?

**Dan Hart:** It had to be specifically licensed. There was interchange on both sides. We have an experimental certificate because it has a special pylon, a rocket holder, under the wing, so the aircraft is under an experimental licence. There was work to do there. That probably was not the hardest part of it, although it was a risk working through the agencies and making sure everything would work out, and we got there.

**Q564 Chair:** Would you have expected a mutual recognition of the standards of a regulator with the depth and experience of the FAA? Would you have expected a passport system to apply? If you were approved in that jurisdiction, it could apply here.



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**Dan Hart:** That was our expectation, and we would perhaps take that as the foundation. We did expect that we would need to have lots of technical interchange. When we work with the FAA, we spend hours and hours discussing and talking with the engineers, and good questions come up. With the CAA people, the engineers and the team, lots of good questions came up. There was lots of good interchange. When the engineers get together, answers happen quickly. There might be methodologies associated with that that might improve things. It might improve things to have more of that interchange so that when the documentation comes out it is crystal clear to everybody what everything is. That is one way to be more efficient.

Q565 **Chair:** There were multiple delays to the intended launch date. At one point, on 9 December 2022, Virgin Orbit put out a statement that the launch itself had to be put off because the licences were outstanding both for the launch itself and for the satellites within the payload. Do you recall the decision to postpone these launches being connected with the lack of regulatory licences having been issued?

**Dan Hart:** I remember the delay. The reason also included needing to ensure the health of the rocket. We had an issue. We were working on a technical issue and working really hard to get it in before the end of December. We looked at the windows that were allotted to us. I believe there were two days that were approved for launch windows in December and we did not have our licence yet. When you stacked all that together, it was not practical that we could pull a rabbit out of the hat, get all our work done and all our certifications, and have a window available to us when we needed it. I would not put that all on licensing, although licensing played a part.

Q566 **Chair:** You were clear in your statement that it was some technical work that was required and the licensing. The Committee was surprised that when you made that statement there was a very swift and robust response from the CAA—the regulator—saying that the delay in no way related to the timing of the licence being issued by the CAA. What you have just told the Committee is that it was two things: a technical thing and a licence issue. Were you surprised that you would have a public tit-for-tat from a regulator like that?

**Dan Hart:** I would defer to the CAA there. There was a lot of focus and desire to clarify.

I would just say that we are used to operating in an environment where we have several days, and we have back-up days, to launch. We are used to taking our time; we have to ensure everything is right, and we always do, before we go forwards. Looking forwards and having a couple of days approved—and maybe one or two more that might get approved, but we do not know if they will—was not a comfortable place for us to be in. Honestly, that is one aspect we would need to re-look at going forwards.

**Chair:** Thank you very much indeed. I will turn to my colleagues, Aaron Bell, Stephen Metcalfe and then Rebecca Long-Bailey.



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**Q567 Aaron Bell:** Thank you, Chair. I want to turn to you, Ms Quinn, on the impact on Spaceport Cornwall. We saw the impact it had on you, and you have described the impact it had on your staff. What about the wider area and the people of Newquay and so on? Has the failure of the launch affected the area?

**Melissa Quinn:** I would say that, if anything, it has had a more positive impact, especially from—as I said earlier—the inspiration side of things. We have been out in the community a lot talking about picking yourself up and going again—“This stuff happens in life”. That strong messaging, especially for young people, has been really important, and it has brought a lot more interest to what we are doing.

There have been questions—obviously, with the major council investment in this—about its future, what it means and if it was good value for money for Cornwall. I would say 100%, if anything, from that inspiration side, but also from the fact that we were in newspapers all around the world. We have been inundated with space companies wanting to come and locate in Cornwall because of the launch.

From our perspective, I have just seen the positives. Of course, local media have the headlines—“It has failed”, “What a waste of money”—and they are not seeing the wider picture of what we have achieved over the last eight to nine years, leading up the launch and since the launch. We are about to open a brand-new building for satellite manufacturing and satellite data companies; it is full, and we have not even opened it yet, because of the interest on the back of the launch with Virgin.

Looking at it beyond just the fact that, yes, the satellites unfortunately did not get to orbit, it created this catalytic effect and interest from the media, schoolchildren and businesses.

**Q568 Aaron Bell:** Obviously, from what you have just said, you have engaged with the local community, speaking to schools and so on and so forth. Do you think the people in the area understand the benefits it can bring to the area, as well the excitement—the commercial benefits and the benefits for the economy of the area as a whole?

**Melissa Quinn:** We have done such a lot of work over the last few years on community engagement. It has been fundamental. I was over in America last week at the Global Spaceport Alliance, where all the spaceports in the world get together once a year. I was asked to speak and tell our story.

The one thing I said that I think all spaceports anywhere have to do is properly engage with their community. The community, local politicians and local media have the ability to shut these projects down, and you can see cases of that all around the world. What has been successful for us is that engagement with the community—going out and understanding what their concerns are, but also where the opportunities are.

When it came to launch, on the night, we were allowed 2,500 people on site; Eventbrite said that the interest they had in one day was 10,000



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people from the local area. Again, we were inundated with local communities wanting to be part of it, and local businesses that have nothing to do with space being part of and benefiting from it. The general consensus across the board in the community is definitely, "Yes, this was really exciting. When are you going again and how can we get involved?"

Q569 **Aaron Bell:** That is good to hear. I know colleagues want to ask about the future activities of Spaceport Cornwall, so I will not tread on their toes, but what joint lessons-learned activities have you carried out together with Virgin Orbit—I will come to you in a minute with the same question, Mr Hart—and the UK Space Agency and the Civil Aviation Authority? What joint lessons-learned activities have you had since the failed launch?

**Melissa Quinn:** We have had a few different ones. The CAA came down to speak just with us and our ops team at the airport, which was really useful—a more unofficial, "How should we move forward with this?" Dan's team only left properly a couple of weeks ago, so we had them still on site for a long period—again, working more unofficially than anything official. This afternoon, we sit down with the UK Space Agency and the Government to discuss more formal lessons learned, and I imagine that will continue going forward. However, we have yet to have a wide, joined-up lessons learned with the Virgin Group, the CAA, the UK Space Agency and us. I would definitely appreciate having something like that in the near future.

Q570 **Aaron Bell:** Mr Hart, obviously you have had to do the technical investigation yourselves, but what joint working have you done on lessons learned, and what lessons have you learned so far?

**Dan Hart:** As Melissa just mentioned, there is a meeting this afternoon that I think is the start of lessons learned. There has not been a lot of interaction yet. As Patrick McCall said, there is a bit of a seismic shift that we ought to think about on what the core is, what is being protected, what is the most efficient way to get there and what are the risk levels. I am anxious to get into some of that discussion, which could be very fruitful.

Q571 **Aaron Bell:** On the specific source of failure—the fuel filter—there is a long tradition, which is probably not the right word, or history in the space industry that it is often about the little things that people had not thought would happen. What extra measures will you take in future to ensure that all those little components are fit for purpose at launch?

**Dan Hart:** A very involved process is already in place for many hundreds and thousands of components. We are looking at filters, as well as any kind of installation or practices that may need to be changed. We are not sure whether that was the installation aspect, or something associated with a fluid-dynamics situation. We are doing experiments right now. It is a little early for me to put a pin on all of it, but we will look very broadly at the causes—the contributors—and then we will attack every single one.

**Katherine Fletcher:** It sounds like rocket science.



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Q572 **Aaron Bell:** Finally on that point, should the checks that you did do before the launch have picked up that failing? Or is it a case of there needing to be further checks? Or are you not able to say yet?

**Dan Hart:** They would not have picked that up—there were significant checks. There are some things on the ground that you do not quite replicate from flight—the G-force, some of the vibrational effects or aerodynamics. You do test, and we did test, this area for leaks and lots of things, but the robustness of the design and installation needs to be there, and that is what we are going to make sure of.

Q573 **Stephen Metcalfe:** I have a quick question. For absolute clarity, will you be pursuing another launch from Cornwall? If so, when do you think that will be?

**Dan Hart:** Yes, we have had some discussions. It is unclear at this point. The launch starts with the payload in the satellite, so there are options there. As Mr McCall mentioned, there are Government satellites and commercial satellites that are candidates, and there are some ideas about university satellites to spur education. A lot can be done there, but it starts there. The regulatory framework needs to be looked at, and hopefully we can work together to improve the process. Those are the two key pieces. Then my team looks at me and says, “When are we going to finish this?”—in other words, let’s get to work.

Q574 **Stephen Metcalfe:** Great. But what about the timescales? I recognise all those things—you need to get a payload and the licences in place—but when do you think the next attempt will be?

**Dan Hart:** We could do it before the end of the year. I don’t have confidence that the other pieces will be ready by then. I think it is a great question, but it really has to get to, first, a payload, and secondly, how long it takes to look at the regulatory side, to find another mission.

Q575 **Stephen Metcalfe:** Okay, so it is an aspiration, not a plan?

**Dan Hart:** Yes, sir.

Q576 **Rebecca Long Bailey:** Happy birthday, Dan. You mentioned that the regulatory framework needs to be looked at. Briefly, can you let us know what the advantages and the disadvantages of Virgin Orbit launching from the UK are, compared to its other launch options?

**Dan Hart:** The advantages for us have to do with engagement and participation in a growing UK space sector. That sector really spans commercial, civil and national security. So the advantage for us is to be a partner and a trusted provider of space launch.

The technology we have developed is unique in that we can take a slab of cement at an airport, and the next thing you know, a week later there is a space port there—with a lot of help from Spaceport Cornwall, mind you. That is unique.

The other aspect is that we can fly out and put the rocket where it wants to be before it ignites. Obviously, there are a lot of neighbours and a lot of



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airspace around the UK, but we have that flexibility. We can fly north and do northerly trajectories, or we can fly further out and do various trajectories from the south. That's quite a bit different from sitting on the ground at one launchpad.

The last part is that we got off on a blustery, rainy night in Cornwall, of which there are many. There happens to be one here in California tonight, too. A ground-launched rocket would not have launched that day, so I am very proud of the team, and of the technology we developed and our pilots, for being able to navigate that and, at the first opportunity, getting off in a new spaceport and a new place.

For us, it's about being part of the community, and part of the industry, the economy and the national security requirements. I think we are uniquely capable of doing it.

**Chair:** I should point out that the Member of Parliament for Newquay was in the Committee Room earlier, and he would hotly deny that there are many blustery nights in Cornwall. I think they are exceedingly rare.

**Q577 Rebecca Long Bailey:** On the issue of the regulatory framework, what do you think needs to be looked at? What changes would you like to see the UK Government make?

**Dan Hart:** Let me start with the symptom; then, the question is what drives it. We found ourselves in a position where, as I mentioned, the hazard area of the airport was very high, and impactful to the airport and to Spaceport Cornwall. It cost a lot of money there, and it reduced our flexibility.

The other thing is the amount of airspace that was determined to be hazard areas—much more than we were used to when we were flying past San Diego and flying past Mexico. The hazard areas are more attuned to where there are events like a staging event on a rocket or something like that.

Why is that? It would be useful to look at what the requirements are. On the hazard area at the airport, I am not a safety analyst by trade, but I know it was developed assuming 100% of the fuel and oxygen could instantly combine and ignite. That's an enormously conservative assumption. Usually, what I have seen is that less than 20% is assumed in hazard analyses and on ranges. So I think some of those things would be important.

The other important things are just roles and responsibilities in having a central clearing house where there is a central regulatory framework, so we don't have to negotiate with individual agencies. It took an enormous amount of work to get everybody together.

**Q578 Rebecca Long Bailey:** Thanks, Dan. Melissa, is work under way at the moment to secure further launch partners?



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**Melissa Quinn:** Yes. Obviously, our anchor tenant is Virgin Orbit, but we have always been very clear that we want to be a multi-user spaceport. The beauty of our spaceport is that we are an active civilian airport at the same time, so we are integrating into the activities of the airport. That means that we are not just about launch on the site. That makes the whole business model a bit more sustainable, in the sense that not all our eggs are in one basket.

For us, it is about the quality over the quantity of launches at Spaceport Cornwall, to make the business model work. That is why attracting other businesses, whether they are space or aerospace, to the site off the back of the launch is really important. When Virgin is not here, we want to be using the facilities and making sure that we are making good on all the investment that has gone into the site.

We have announced a partnership with another launch operator called Sierra Space, with Dream Chaser. It takes off vertically, likely in the States, and to land they need a long runway. We are working on a concept of operations with it. We have Space Engine Systems, a Canadian launch company that just relocated over from Canada—it just set up about a month ago—and a couple of other launch operators. That said, with horizontal launch, there are not a lot of players in the game. The fact that our anchor tenant is Virgin Orbit, which is the main launch operator globally for horizontal launch, is a huge coup for the UK.

As I said, I was just over at Cape Canaveral, and US Space Force was talking to the conference about using allied spaceports around the world for national security. The only non-US spaceport it put up on its map was Spaceport Cornwall.

It is important to maintain this capability for the UK. I understand what Patrick was getting at earlier when he said that we don't need launch, but given the way the world is going, if we do not have our own access to space from the UK, we will be building these incredible satellites for national security but we might not be able to replace them, and that leaves us out in the cold.

I know the regulations have been difficult—believe me, from a Spaceport perspective we understand that—but they have been difficult for everybody. This is our chance to get it right. Saying that we don't need a launch capability would be the wrong decision, not just for creating market opportunity for the UK and making sure these satellites can launch from home soil, but also from a national security perspective. For me, that is fundamental. We should of course be supporting companies like Virgin Orbit to launch, but also future companies too. We should back the one spaceport that we have licensed already. It is a national asset—it is not just Cornwall Council and Virgin Orbit—that I hope the UK wants to use for all those reasons that I just mentioned.

Q579 **Rebecca Long Bailey:** Thank you. Very briefly—I understand that you might not be able to disclose too much information on this point because it might be commercially sensitive—you mentioned that Virgin Orbit is





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your anchor tenant; are there any potential restrictions that would prevent you from securing future arrangements with future operators?

**Melissa Quinn:** No. The decision by Cornwall Council to invest in a spaceport back in 2019 supported a pathfinder launch with Virgin Orbit. That is why you saw the investment going into the site and into Virgin Orbit: we wanted to create that capability because we did not have it here. For us, that initial pot of funding was important. It was crucial that we proved that capability.

Sorry—remind me of the question.

**Rebecca Long Bailey:** Is there anything that would restrict you from securing future partners?

**Melissa Quinn:** No, as long as we know that when Virgin are coming back to launch, they have access to the facilities when they need them. They will of course have a priority over the next few years—definitely—but there is nothing contractually saying that we can't work with other people.

**Rebecca Long Bailey:** Thank you.

Q580 **Chair:** On that point, would any payments to Virgin be triggered if you hosted a launch from another company?

**Melissa Quinn:** Our commercial agreement is for the first launch only, and we will be negotiating what the future agreement looks like after that first launch.

Q581 **Chair:** So in the case of Virgin, the anchor tenancy was for that launch.

**Melissa Quinn:** For that launch, yes.

Q582 **Chair:** And that is expired now.

**Melissa Quinn:** Yes, it expired at the end of February.

Q583 **Chair:** At the end of February, so there is no anchor tenant at the moment. It is—if you will excuse the expression—a virgin site.

**Melissa Quinn:** No, we have other people coming in now to use the facilities.

Q584 **Chair:** But it is back entirely in your control. You have no contractual commitments—or, to put it another way, no contractual engagements from any other launch company.

**Melissa Quinn:** Nothing contractual, just MOUs.

**Chair:** I see. Katherine Fletcher wanted to come in with a supplementary.

Q585 **Katherine Fletcher:** Mr Hart, I noticed you raised your hand at the end of that question. Do you want to come back in before I go off?

**Chair:** Sorry, I missed that.



**Dan Hart:** Yes, if I could. I thought Melissa brought up a very important point and I just want to emphasise it. It is to do with the importance of space launch in the future. Space assets have become—and will be more so—part of the fundamental infrastructure that is supporting the UK's economy and our understanding of the environment and national security. If you play it back 20 years and see how space was used, and you play it to now, you see tremendous changes. We know what is going on in Ukraine because of space assets. We look at it in the evening news every day—we look at imagery. We weren't doing that 20 years ago.

We communicate with space and we are going to manufacture in space, as Josh Western mentioned, so it really is, and will be more and more so, part of the infrastructure supporting us. That is why it is a really important piece. If you play it forward 10 years, if something blanks out or there is a disaster or situation that requires a space asset, it will become more and more important to get something in the right place at the right time. I think that is the point, and I wanted to agree with Melissa. I couldn't agree with her more.

Q586 **Katherine Fletcher:** That is beautifully put, and probably brings me back to where I am coming from. Let us say that I 100% agree with you, although I reserve my right to change my mind. If that is the case, let's get this right. You mentioned the idea of maybe having a central regulatory framework to prevent dealing with multiple agencies. At the risk of testing your memory, could you give us a flavour of who they are? You have the CAA and the FAA. I presume you have local council planning. Have you got the Environment Agency? Could you just give us an idea of what the UK local and national Government regulatory framework looks like, as a user of it?

**Dan Hart:** I can somewhat, but I could get you a better list. You rattled off some of them there. Yes, there is the CAA on the space side and on the aircraft side. I think there are a couple of different communities—there is the maritime community and the environmental community—and health and safety both at the federal and local level. Then there is airspace and international airspace. There are well over a dozen—maybe a couple of dozen—different communities that we had to brief and get comfortable. Eventually, the statutory review required nuclear and other communities to also—

**Katherine Fletcher:** I tell you what: it would be wonderful to get the long list on the record, but I am conscious of the time. If you could write to the Committee, I would be very grateful.

Q587 **Chair:** Thank you for leaving it there, Katherine. I have one final question, if I may. You are a global company. You have agreements or arrangements in place not just with the UK, but with Japan, Poland, Brazil, Australia, Luxembourg and obviously the US. We have heard from our evidence today how attractive it is for countries to host launch—partly to help their own space and satellite industry and partly to generate some public excitement around it. You are pretty footloose, are you not? Are you not going to increasingly expect to go to places whose



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local jurisdictions—national and local Governments—make it worth your while? In other words, where they pay your costs.

**Dan Hart:** Yes. We're a business, so we survive only through the economic value that we can bring to our shareholders.

**Chair:** Thank you both very much indeed for your evidence today. It is extremely helpful to have. We are now going to ask the UK regulators to join us.

### Examination of witnesses

Witnesses: Sir Stephen Hillier, Tim Johnson and Ian Annett.

Q588 **Chair:** We have Sir Stephen Hillier, who is the chair of the Civil Aviation Authority, having taken over in August 2020. Sir Stephen had an illustrious career in the Royal Air Force before that, becoming Chief of the Air Staff. He has extensive military flying experience, as you would expect, and we are very grateful to him for coming today. We welcome back Tim Johnson, who is the policy director for the CAA and helped us with the inquiry to which this is a follow-on response. We also have Ian Annett, who is from the UK Space Agency. He joined the agency in 2020 as deputy CEO for programme delivery, and he is responsible for the delivery of all national space programmes across the agency, including the Spaceflight programme.

You have been kind enough to sit through the evidence we heard from other witnesses, so the questions we have will not surprise you, because they are, in effect, the ones that they have put to us. I guess it amounts to this. We have recognised in this country through the Government and other agencies an opportunity we want to take to have satellite launch and space launch in this country. We have a very strong satellite industry. We wanted to have a first mover advantage in this, at least in Europe, and we had that through the Cornwall space launch, but what we heard, especially from the first panel, is that we have thrown that away, and the assessment is that commercial investors are unlikely to invest in the UK and the whole thing needs to be rebooted with public sector customers to re-establish our reputation, because of the regulatory approach that has been taken. Sir Stephen, what is your response to that?

**Sir Stephen Hillier:** Thank you for this opportunity. From a Civil Aviation Authority perspective, we have two roles. We are the regulator. We also see that we have a role to play in enabling successful aerospace enterprise, both aviation and in space. Clearly, we have a statutory duty in relation to regulation, but in terms of enablement, we are very active in trying to play our part in enabling a thriving aerospace and, in this case, space environment. We play both those roles.

In terms of what we have heard today and the situation that we are in, there were lots of positive comments, and there is lots of emphasis on lessons identified. We are absolutely a learning organisation, and we want to play our part to the full in that, so we are participating in that process



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at the moment. We have a key role to play, and there is work to do even over the next couple of days as we start to bring all of that together. Lots of great points have come out there.

But what I need to come back to is that the core role that the CAA is performing is to enact the legislation that was given to us, and our primary duty is to ensure that space activity in the UK is conducted safely and conducted within the ALARP principle, which is "as low as reasonably practicable". One of the earlier witnesses said "possible", and there is a really significant difference between "possible" and "practicable". It relies on things like safety cases. That is the foundation of the work we have been doing.

To be honest, I do not think there has been enough balance so far on technical readiness. That was very much the focus of the CAA, certainly in the second period of last year. The previous Virgin Orbit launch was on 2 July 2022 in the Mojave desert. The average for Virgin Orbit is about six months between launches, so it was always going to take a period of time for them to reconstitute, certainly in another country and a new operation, and then actually deliver the mission. In terms of how the sequencing worked, the CAA licensed. From our perspective, we are confident that we license in advance of technical readiness. You mentioned the exchange of correspondence last year. It is very unusual for the CAA to go public and make a regulatory statement to the stock exchange to say, "It's not the licensing. It's not down to us." It is a very unusual step, and we would not take that sort of step lightly. As far as we are concerned, we licensed in December, and the launch happened in January, and there were technical issues running through there. Perhaps I will pause there.

**Q589 Chair:** Indeed. You say there were some positive things said. Your engineers were singled out for particular praise, which certainly needs to be acknowledged. But, net, the evidence that we have heard, not just from Space Forge but Virgin Orbit, is the most devastating evidence I have heard in a commercial regulatory context since I have chaired this Committee. This was something that was a strategic priority for this country to be ahead of the world. We have heard evidence from investors and operators to say that their experience of regulation here has put us behind the rest of the world.

I do not think one can hide behind the excellence of the engineers that you employ. There is clearly a big problem with the approach to regulation in the eyes of those who deal with jurisdictions right across the world, and who are going to go to them in future rather than the UK, and are publicly warning others not to come to the UK. As the chair of the regulator, that is not something you can be comfortable with, I would submit.

**Sir Stephen Hillier:** Where people have criticised us for our engagement, absolutely. We recognise what they say, but I would look at it from the perspective of the Civil Aviation Authority taking on this role in July 2021. It ran through from the CAA board perspective.



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In that period, from then until now, we have had 18 board meetings. At a dozen of those board meetings, space and our progress with space was a substantive matter for discussion and debate, including an extraordinary board meeting in advance of the Virgin Orbital launch. I have to say that is greater than the application that we have applied to virtually any other area of our business.

In terms of engagement—I know that Tim Johnson will cover this shortly—there were six separate visits to Virgin Orbital in the Mojave desert, and countless other engagements that we have done across the process. In terms of the wider sector, yes, there was the licensing associated with Virgin Orbital, but not getting as much publicity as it should, frankly, is that the CAA has issued so far, in the past 18 months or so, 285 space licences.

Twelve of those were related to the Virgin Orbital licence, but the other 273 were more widely. The CAA absolutely shares the disappointment that this launch was not success. We have a key role to play and feel this, as well. But on that day 40 other CAA-licensed satellites went into orbit.

In terms of the focus that we give this, absolutely. I know that the Committee at its previous meeting looked at the size of our space team, which was 35 at the time. It is nearly 50 now and is growing all the time. The reason it is growing is because we are investing the resources from a CAA perspective, to ensure we match the capacity needed as the industry continues to develop in the UK.

From a personal perspective, I have engaged at least twice with every constituency MP in potential spaceports around the UK. I have written to them as well. I have engaged with the sector myself, and clearly know a lot of the players from my previous roles. Proportionately, this has been a huge investment from the CAA. We have got it here, and I feel that we are playing our part.

**Q590 Chair:** You take us back to the inquiry that the Committee conducted, which was before the launch. We took a lot of evidence, including from Mr Johnson. We take our evidence either from witnesses appearing in person or many more who write to us. One conclusion that we came to was to be worried about whether the CAA was the right body to be entrusted with this regulation. Previously, space had been under the UK Space Agency.

We heard from others, including some of the Scottish spaceports, that they were concerned about delays and uncertainty in regulation. We heard worries about the numerical capacity of the team. We heard worries about the duplication or creation of different standards. We reported all that, in terms of recommendations, which weren't taken up by either the CAA or the Government, frankly. What we have had in the context of the failed launch in Cornwall, which, I think it is clear, is not about the technical fault, is the opportunity to look back. I cannot see that any one of those recommendations was off beam, and yet, Mr Johnson, you rebutted them at the time. When we were forming them, you said that you had the right number of people, that you were the right



organisation and that you were operating in an agile way. Do you reflect back that that was actually the wrong steer to give the Committee?

**Tim Johnson:** As Stephen has outlined, we increased the size of the team during the year to reflect the workload. We heard what you said and reflected on it. Throughout the year, we made substantive progress, but we also learned lessons along the way. I can think of a number of areas where, working with some of the operators, we adjusted our engagement plan and upped the frequency. We were talking to Virgin Spaceport Cornwall in a number of different guises at least two to three times a week. For example, we amended our approach to the environmental assessment, having had some initial feedback from Spaceport Cornwall and Virgin on the approach there. As Stephen said, we are a learning organisation. There is a lessons-learned process across all the parties going on at the moment. We have already identified a number of aspects of something called our regulator's rules, which deal with some of the points that Space Forge made at the outset. Some of the other changes that we might want to think about relate to legislation, whether that be set out in secondary or primary legislation.

Q591 **Chair:** When it comes to some of the detail of the approaches, Sir Stephen, you have had a brilliant career in the RAF, and you will have been used to dealing with the armed forces—particularly the air forces—of other countries. Military-to-military co-operation is something, I am sure, you practised every day at the height of your military career. Why is it the case, as we have heard repeatedly today, that the standards and licensing of an organisation as respected as the Federal Aviation Administration—the FAA—is not passported and respected here, and that you at the CAA are taking the approach to revisit it all and start from a blank sheet of paper? Surely you could bring from your previous career the recognition of the good work that is done by trusted allies.

**Sir Stephen Hillier:** Just referring to that previous career, then, it is the case that we sometimes do mutual recognition, as we would call it, and other times we don't. The UK has its own specific requirements—that exists in defence as much as it does in civil aerospace.

In terms of our relationship with the FAA, it is excellent at all levels. As you may be aware, we even have an FAA secondee in our space team to ensure that we transfer as many of those lessons as possible. We have enormous respect for what the US system has achieved over six-plus decades of space launch capability. Why don't we just passport it in? To be honest, that is not what the legislation says. The legislation says that the UK has its approach, which includes things such as the ALARP principle and the building of safety cases. The whole emphasis in the UK system is that it is not for us, as the regulator, to tell the entity how to be safe; it is for them to build the safety case and say why they think it is safe, and then we describe the regulatory framework and we do the assurance within that. It is a different approach to regulation. Whether that's right or wrong, our duty as the Civil Aviation Authority is to enact the legislation that requires us to do these things.



**Q592 Chair:** Clearly we have heard that things have gone wrong, in the sense that we have fallen behind other countries. We heard evidence that Australia and Portugal, for example, are taking an approach that is more accommodating of work that has been done by the FAA in particular. So are you saying that you are prevented by the legislation from doing that? Is it right that this Committee should take a recommendation from you that the legislation needs to change because you are being hemmed in by it?

**Sir Stephen Hillier:** I don't think the statutes need to change. We are working, as I say, very closely with the FAA, and I do believe there are areas where we can do mutual recognition at a particular level, consistent with the legislation that we have in the UK, but we have to respect things like the geography. The CAA's primary role is to ensure the safety of this activity, and that's the safety of the general public on the ground who might be affected by launch activity. There is an obvious difference between launching from the Mojave desert and going out over the Pacific, over a single nation's airspace, or launching from Australia, where, again, you are dealing with a single nation's airspace and a sparsely populated area—there is a world of difference between that and somewhere like Newquay in Cornwall, where there is clearly a lot of population around. We previously heard from Spaceport Cornwall that 2,500 people were there, watching this launch activity actually happening. That doesn't happen in the Mojave desert. And then you would be going out into international airspace and having to negotiate with a whole range of other nations for this launch activity. So we have very specific things from a UK perspective. There is a UK approach, which is, "We are responsible for the safety philosophy within our national boundaries, and this is the approach that we have decided to take."

**Q593 Chair:** I understand that. Clearly, the Mojave desert and, indeed, Australia are different environments, but what about Portugal and Luxembourg? These places have comparable challenges. Surely it's concerning to hear that the jurisdictions in Portugal and Luxembourg, for heaven's sake, in a landlocked country—they are both quite small—are able to adopt more of the licensing arrangements from the FAA and that we are losing out to them and we are taking an exceptionalist approach even compared with those two European Union countries.

**Sir Stephen Hillier:** I am not familiar with the Luxembourg approach, but what I would say is that they have not done a launch, so we will need to wait and see how they work that through the EASA, or European Union Aviation Safety Agency, system and with the geography. We will need to see. And in terms of Portugal, that is not, as was covered, a launch capability; that is a recovery from a satellite that is coming in over the Atlantic ocean. You can imagine the difficulty of landing something in a part of the seaspace around the United Kingdom—the challenges that that would bring.

But I don't want to come across as saying, "We have the perfect solution"—not at all. We are a learning organisation. This was the first UK space launch. We have colleagues in the US who have over 60 years of



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experience. This was our first one. We are learning and improving all the time.

In terms of timescales and how long this will take, we identified and we publish that, for a first licence, it should take between nine and 18 months for that to work through. That is not just taking a swag; that is calculated on the experience of other safety-critical industries—oil, gas and the like—plus our own experience as the CAA. We publish that, and that was published in, I think, 2019, before the CAA even took on this responsibility.

**Q594 Chair:** What about the approach for implementing that? We heard that you can make one application only and then that's it, rather than being able to iterate it and work it up, as it were.

**Sir Stephen Hillier:** I will pass that to Tim in a moment, but I will just say that the Virgin Orbit licence, within that nine to 18-month window, was done in 10 months, so we did it right at the left-hand end of what we said we would do. That doesn't mean that every subsequent licence or application is dealt with in nine to 18 months. We build on the experience that we have already got, and it will depend—if there were another application, if we were notified of another launch out of Spaceport Cornwall, we would say, "If it's the same as you did before, it's going to be a relatively straightforward process. If it's markedly different, there is more work to be done."

It is not necessarily a nine to 18-month process for every satellite. Again, we use proportional regulation here. We do not just say, "Here is a template that applies in every circumstance." We analyse risk, look at the mitigations and work with those that we are licensing.

**Q595 Chair:** On that point, obviously there are lessons to be learned. We have heard that a single application needing to be made without the ability to iterate it has been constraining. Is that something that you can change?

**Tim Johnson:** The spaceport and the launch licences that we have issued are not just for one launch; they are for Virgin and for Spaceport Cornwall. They allow two launches a year. They are in place. If either Spaceport Cornwall or Virgin want to fly a slightly different trajectory, there would be a process involved in amending the licence, but it is certainly not going back to first principles and applying for a whole new licence. That is one of the advantages of the UK regime for launches at spaceport.

**Q596 Chair:** The point we heard was that on the way to getting the first licence, there was a sense that they had to submit everything and then wait and hope for the best, rather than working up the content to be able to get to an approval and have that iterative relationship.

**Tim Johnson:** From our perspective, we have a very iterative relationship with Virgin Orbit and Spaceport Cornwall. We went regularly to see them and had multiple meetings most weeks of the year, where they submitted evidence. We were assessing it, asking questions, and testing and probing. As Stephen said, we are a learning organisation, and I think we adapted a





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lot of our engagement throughout the course of last year in how we went about that. In preparation for this Committee hearing, I went back and looked at the amount of engagement we did with all the applicants, and it was very considerable.

**Chair:** Let me turn to my colleagues. Stephen Metcalfe wants to come in with a supplementary.

Q597 **Stephen Metcalfe:** Good morning, everyone. Stephen, you talked about the regulatory framework being laid down in statute. Do you have any degree of flexibility in the way you interpret that statute? The second part of that question is: when deciding how to interpret it, what process do you go through? Obviously, everything cannot be covered through legislation—you have to decide what to do.

**Sir Stephen Hillier:** Absolutely. It is not a case—and we would never want it to be—that statute describes everything that you must do. Ultimately, if we could write a formula or algorithm, and just put in the variables and then out comes the answer, we would not need people involved. There have to be judgments in there.

Probably the primary judgment is around “as low as reasonably practicable”. The approach to that from my perspective is that you make every effort to gather the evidence and the data that you are reasonably able to access, you examine every risk, and you work it through to a reasonable conclusion. At the end of all of that, you can be satisfied that you have got all of the data inputs, and then you apply the judgment. The risk is that you apply the judgment too early in the process, and you say, “I am sure this is going to be okay”. A lot of times that might be fine, but when it is not fine you will subsequently go back and regret it.

As was covered by previous witnesses, this space launch is a complex and demanding activity. There are multiple factors that you need to look at. It takes time to go through that exercise. We need to take it to a reasonable conclusion; if we just waited until the point where we had absolute certainty, we would not be doing it as low as reasonably practical. That is the way we approach it.

How that works through in practice is that we have an excellent space team in the CAA. They build up all the evidence and come to their judgments, and then we have additional layers that oversee their work. Ultimately, there is a single accountable individual in the CAA who is responsible for signing off and saying, “I am satisfied the evidence is there. Here are the judgments I have made.” Ultimately, within the CAA as a whole, the board does not make that safety-based decision, because it rests with accountable individuals, but the board makes sure that the CAA’s work has been done well and that the decisions that have been made appear reasonable to them. That is how we work it through.

Q598 **Stephen Metcalfe:** Thank you; that is very clear. We heard mention earlier of a CCTV camera in a factory needing to be assessed as part of this process, but you are saying that there must be a reason for that. Can



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you speculate as to what that reason would be? Do you think that is an overburdensome regulation, or that there is a good, sensible reason for it that we don't know?

**Sir Stephen Hillier:** I think the point was made in relation to national security clearances. That is part of the process that is set down. I know there was a question about all the agencies that have to be involved; we have that list, if you want to go through it.

In those sorts of areas, this is where we need to do lessons identified and say, "Is what is being done in the security risk assessment proportional?" I am not making a judgment about what the outcome would be, but we need to analyse that. In those sorts of areas, consultation is a significant part of the timelines involved. We can work on how and with whom we can consult, and on a number of other areas.

I would be reluctant to say that we start to compromise on the safety-based issues, because these things go wrong. Across space operators and space launch overall, the success rate, particularly in the early stages, is quite low. Things do go wrong. We are accountable, as the CAA, for making sure that when they go wrong, they go wrong in a safe way that does not affect people on the ground and cause risk to life. That is the core, if you like, but there is much work to be done around the outer. That is why I am really looking forward to the lessons-identified process.

Q599 **Katherine Fletcher:** Sir Stephen, I don't have your bravery or your background in terms of your military career and history, but what I was doing before I came into this place was trying to change businesses and processes and improve things. There are a number of things I have heard that give me some concern. I have almost heard, "It's not our fault; it's the law." I have heard language and mentality that perhaps misses the strategic importance and intent of the companies that have been giving evidence to us.

Highlighting as a positive thing the number of meetings you have had with an individual around judgment and proportionality—for these commercial businesses to want to sit in the UK, time is money. If they are having a meeting with the CAA, they want to know that it is fact-based, that they understand the process and that they can provide evidence and have a dialogue. If I am candid, I almost get a sense that you don't think it is in the right place. It should be in the Mojave desert, you don't really like it, it is a very busy airspace, you have got a lot to do and we are going to allow two launches a year. Is that the right strategic intent from the leadership in the CAA to support a burgeoning industry? I will start with you, Sir Stephen, but this is all in the detail, Tim, as we both know.

**Sir Stephen Hillier:** If I have created the impression that we have somehow been reluctantly doing that, then that is the wrong impression. As I said at the start, the CAA has those two roles: a core regulatory role, in accordance with the statute, and a role to enable a successful, thriving aerospace enterprise, in which we have invested significantly over the last



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three years or so. It goes beyond space, into wider innovation areas and advanced air mobility. We absolutely want to play our part.

I am not leaning into the legislation and saying, “Well, it’s because the legislation tells us to and therefore...” but what I am saying is that as the Civil Aviation Authority, our authority comes from the legislation. That is where we are accountable, and so I need to make sure that the Civil Aviation Authority is working within the legislation—

**Q600 Katherine Fletcher:** Could you give us a “for instance” of a tweak that could be made to that that would speed up the process? For example, we heard about hazard areas in the sky, and that we take a 100% approach whereas others will only designate a hazard area where a piece of rocket could potentially land. Is that in the legislation?

**Sir Stephen Hillier:** I will ask Tim. I think the particular hazard area that Mr Hart was talking about was a ground-based hazard area based on the size of the rocket. As I say, I will ask Tim for the detail, but my understanding is that the figure that we worked on was given to us by Virgin Orbit.

**Q601 Katherine Fletcher:** What would you have us change legally to make this process faster, if we accept that we want it to be faster?

**Sir Stephen Hillier:** It is a really difficult question in advance of doing the lessons identified process. I think it ties into the answer I gave earlier. I would not go at the core safety part of this, because I think that is absolutely vital, but it is that wider consultative issue—the other checkpoints that every applicant has to deal with. I think there may be flexibility in that area.

**Q602 Katherine Fletcher:** I am genuinely going to press you; you are a very articulate man. Could you give us an example of where we could change the law to speed this process up, not in terms of implementation, proportionality or an assumption or definition on the ground of what is practicable? Is there anything that stops us doing it faster in law?

**Sir Stephen Hillier:** I think it is the consultation process. I am not saying that we should not do a consultation process, but I need to point out that that takes a significant chunk of the time.

**Q603 Katherine Fletcher:** And the steps in the consultation process are in law.

**Sir Stephen Hillier:** I believe so. I will just check with Tim.

**Tim Johnson:** Yes, the requirement to consult, particularly on the environmental assessment, and then consult the Secretary of State.

**Q604 Katherine Fletcher:** Okay, there are requirements to consult, but what about the steps of the consultation? I could consult the Chair by having a quick word with him in a corridor or doing a six-month, 200-page process. Is what consultation looks like mandated in law?



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**Tim Johnson:** I think the requirement to consult or seek consent from the Secretary of State is in law. As I think we demonstrated last year, we were very proportionate in terms of the length of time of those consultations.

Q605 **Katherine Fletcher:** Last year, we had a bunch of people saying, “We’re worried about regulation stymieing an industry,” and this year we find ourselves receiving the same evidence, so you will forgive me for being robust. Perhaps another way of putting it is this: what are you doing to review your existing licensing process to make sure that it is fit for purpose? What have you removed from that process since December?

**Tim Johnson:** Since December, we have undertaken some initial lessons-learned conversations with the applicants. We are reviewing our regulator’s rules at the moment, which is the detailed operational level.

Q606 **Katherine Fletcher:** So the answer is nothing.

**Tim Johnson:** We have a list and we are happy to share our lessons learned with you.

Q607 **Katherine Fletcher:** On things that have actually been removed to make it better, the answer is nothing.

**Tim Johnson:** We have adjusted some parts of our process. We particularly want to look at security and finance as we go forward. As part of the lessons-learned process, we are very happy to—

Q608 **Katherine Fletcher:** Okay. Let’s do this a slightly different way. What are you doing to look at other countries that perhaps have a different interpretation of “reasonably practicable,” “proportional” or all these words that are incredibly difficult for engineers and your staff to define in a meeting room in Cornwall? No wonder it has taken ages; how on earth are they supposed to be able to define that? What are you doing to speak to international partners to improve—and to steal their ideas, if they are quicker and better?

**Tim Johnson:** First, the main relationship we have at the moment is with the FAA, which has a track record, and we have been working with it throughout the whole process. We have been supporting each other through the licensing processes. We have an ongoing dialogue with the FAA, which I think the Government are helping to facilitate, about whether there are some areas where we could put greater reliance on each other’s licensing processes, recognising, as Stephen said earlier—

Q609 **Katherine Fletcher:** So, conversations and dialogue, but no recommendations adopted or practical actions changed as yet.

**Tim Johnson:** At a practical level, we have done lots of lessons learned and we have been able to take—

**Katherine Fletcher:** You will forgive me—as a former businesswoman, this does sound very civil servicey. Consultations have been had, chats have been had and nothing has been delivered. I will pause there, Chair.

**Chair:** Thank you, Katherine. Tracey, I think you wanted to come in.



Q610 **Tracey Crouch:** Katherine sort of asked the question at the end. Sir Stephen, what recommendations would you like us to make as a consequence of this inquiry? What recommendations would make it easier for you to be able to deliver on what you are being asked to do?

**Sir Stephen Hillier:** I think that probably the key one is the one that has been mentioned by Mr Hart, because it has been obvious to us as well: the multifarious agencies that licence applicants or launch aspirants have to engage with. That point about some sort of central gateway to help manage the process is really important. If it is difficult for us as a Civil Aviation Authority to make all of those connections with other aviation authorities around the launch area and if it is difficult for us to engage with a range of Government Departments, it is even more so for commercial entities, and it is very much so for small and medium-sized enterprises, and it might put them off the process. That would be the one that might strike me—more of a portal approach.

We need to be careful. Again, I come back to our accountability for safety. We need to make sure that it doesn't become a negotiation around safety. The authority is given to us to look after that aspect. I think that is the one that most strikes me.

The encouragement to move faster—yes, absolutely. We want to move as fast as possible as well, but we are, first, dependent on the evidence that is given to us, so there is a responsibility on industry. Then we need to make sure that we have the right level of engagement throughout the process, and reassure, but these things will take time if we are to get this done properly, which is a vital part of this.

We want it to happen quickly, but having a stable, predictable regulatory environment that allows successful launches is an attractive thing in itself. We know it works in aviation. Countries look to the UK as a benchmark nation when it comes to aviation regulation, and they want to do business here as a consequence. We need to create that environment for space as well.

I come back to the fact that we have issued 285 licences so far. This is a thriving area of activity and we are growing it constantly, in line with how the sector grows.

Q611 **Stephen Metcalfe:** Good morning. I want to turn to the UK Space Agency. What role does the UK Space Agency play in supporting the UK launch sector and how long have you been involved in that?

**Ian Annett:** In terms of launch itself, it is responsible for delivering LaunchUK's programme, which brings together the regulatory elements and what we call the delivery aspects, as well as brokering the international agreements that have been required, both technical and otherwise, outside of the airspace ones, which have been run by DFT.

I am the senior responsible owner for that as a programme. I have a strong dependency on colleagues in the CAA for the regulatory approach and it has been a very good and strong relationship. I would highlight,



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though, that in terms of going through this exercise—the first launch—there are a lot of lessons that will have to be learned. We are at the start of that process today—starting to collate the lessons that the likes of the CAA has conducted, and bringing them together. I agree that one of those early lessons is likely to be the co-ordination and engagement across different Government Departments that customers have to face.

More broadly, in terms of launch and the role of the UK Space Agency, we are there really to do three things. The first is to catalyse the investment into the sector. I would not necessarily agree with Patrick McCall in saying that, having had this one event, people are then rushing away. I look at other launch providers when we are talking about vertical launch, in Scotland. We are still seeing inward investment into UK companies. Orbex, who are building rockets in Forres in Scotland, have just closed on a significant investment round of £40 million and they are taking on the operation of the spaceport, and they have 50 people. That would not happen if we had not generated the opportunity and capability to launch in the UK. Similarly, we are seeing that with SaxaVord in Shetland as well. We are seeing a number of other European countries coming to the UK because of the regulations that we have and because of launch. HyImpulse and RFA are German companies. These are people who have chosen to come to the UK to do their launch activities.

**Q612 Chair:** Just on that, if I may, Stephen—because this is pertinent to the evidence we have heard—you say that they come because of our regulations. Does that reflect conversations that you have had? Are they positively attracted to our regulations compared with other jurisdictions’?

**Ian Annett:** If I look at it from another jurisdiction’s perspective, in Europe there are no others that have regulations in force to enable launch at the moment. Whether it is the most likely competitors—Norway, Sweden and Portugal—none of them has primary or secondary legislation or regulations in place at the moment that enable them to launch.

**Q613 Chair:** So they are attracted by the fact that we have passed the Space Industry Act and we have got the statute there. But we heard evidence in our inquiry, as you will remember, from multiple companies that were concerned about the regulatory approach. Are you saying that there are companies that will give evidence to us that they think it is the right approach?

**Ian Annett:** There are companies that will give a different version, because the only regulatory environment that they are aware of is the UK’s, as opposed to translating from a US regulatory environment into a UK regulatory environment.

**Chair:** Sorry, Stephen, I interrupted your question.

**Q614 Stephen Metcalfe:** No, that’s fine. What I wanted to explore a bit more were the comments that Mr McCall made earlier about the damage to the UK space launch sector following the events in January. Had the mission been a huge success—I am now asking you to put words in his mouth—would he have said that this was a great leap forward for the UK Space



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Agency because it failed? Or is he trying to conflate the two issues of the failure of the mission—non-success is perhaps a fairer way of describing it—and the challenges that the regulatory framework presented?

**Ian Annett:** You're right; I wouldn't want to put words into his mouth. However, I would observe that, while the outcome was obviously not what we or anybody else would have wanted, it has continued to demonstrate that we do have primary and secondary legislation that works. We do have regulations and guidance that work. Again, it is the very first time that we have done this; so yes, there are lessons, but we have proved the system. We have a working spaceport and working regulations. We can broker for the airspace that is required for launch with our international colleagues as well. It can be done. That is not to say it can't be done better and more efficiently, but it can be done. There is nobody else in Europe that can do that at the moment.

Q615 **Stephen Metcalfe:** So you must be working on how we can do it better. Presumably, there will be a process in place. What can the Government do—this is my final question—to improve the situation from where we are now? We have this working system. It's happened, but surely the Government could do more.

**Ian Annett:** What I am working on is reinforcing the success that we have already had. That is where we need to focus our efforts, whether it is supporting small companies that want to set up around these spaceports and generate income, or whether it is access operating on a global market. Again as a slight aside, if you look at the number of small satellites, which is what we are focusing on here—small satellite launch—back in 2012 there were 50 small satellites launched into space globally. Last year there were 1,700. It is a rapidly growing market. While the overall space economy is worth around \$360 billion globally, about \$20 billion of that is in launch. There is a part of that that is an addressable part for the UK. It has economic value to the UK if you can attract international players to come and launch in the UK.

As well as the points that Melissa was making, there is an element across security and across knowledge, whether that is through inspiration or increasing skills—our space workers in the UK have over two and a half times productivity, so that is an economic output as well—or whether it is through the prosperity agenda. We should be focusing on catalysing that investment by helping these companies to get off the ground and operate in the UK.

**Tim Johnson:** Let me just add a really quick factual point. We have 38 companies across the space sector—the launch and spaceport range and satellite companies—that are either in an application process formally or are in pre-application discussions with us. The evidence is that there is a range of companies today looking at the UK and the regulatory framework, and saying, "We want to engage with that."

**Stephen Metcalfe:** Thank you.

Q616 **Rebecca Long Bailey:** Ian, I have a few very brief questions to you. You



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mentioned that your focus now needs to be on helping companies get off the ground within the wider space ecosystem around launch sites. How, specifically, will the UK Space Agency ensure that it attracts future launch missions to Cornwall and other UK spaceports?

**Ian Annett:** Part of that is generating clusters of activity around the UK. Over this spending review period, we are planning to invest over £70 million in that, whether that is about attracting very small activities or some of the larger aspects that were announced yesterday, in terms of British companies being able to compete into Moonlight, which is the ability to provide communications around the moon. A number of activities that we are doing have specific funding attached to them. We will be managing those projects and programmes from within the agency.

**Q617 Rebecca Long Bailey:** We have already heard today that it is far cheaper in certain parts of the world to operate launch missions. Do you think the UK needs to offer subsidies in these early stages of the emerging market?

**Ian Annett:** It is important to look at the broader context of that. Josh Western from Space Forge alluded to that. If he is going to launch from the US, he has to send his staff to the US. Virgin Orbit had 50 people over here in the UK at one point. That is a cost to the company. If you don't have to do that—if you can do it from the UK—that is an immediate saving to companies.

It is not just about regulations or the cost of launching. You come to the UK because you have a stable democracy and a stable legal framework. More satellites are insured in the UK than anywhere else across the globe. You come to the UK for all those aspects that create the environment in which you would want to launch from the UK.

**Q618 Rebecca Long Bailey:** In an ideal world, if you could ask the Government to achieve anything, what would you be asking them to do to support the space industry and future launch sites?

**Ian Annett:** That is, in part, a policy question for the Department for Science, Innovation and Technology, rather than the agency, so I would probably duck that one. Our role is to deliver. Of course, we want to generate people with more skills so we can draw on that. One of the challenges that we have across the sector—not just within the agency—is bringing in the right number of people with the right level of skills, so we should do anything we can to improve that. We are also doing that within the agency. We will of course continue to feed in at the bottom, whether it be through inspiration or technical training.

**Rebecca Long Bailey:** Thanks.

**Q619 Chair:** Thank you, Rebecca. We have a new Secretary of State for Science, Innovation and Technology, and we hope that she will come soon to give evidence to the Committee. We will no doubt ask about space.

Finally from me, we have two witnesses from the Civil Aviation Authority. As the name implies, it is principally concerned with civil aviation, which





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is a huge and very important sector—and quite a mature one. I am conscious that, during the pandemic and subsequently, there have been major challenges there. On reflection, do you think the CAA is the right host for this very different character of activity? If the Government were to look again at the statutes, might it be better to have a separate, focused space regulatory agency?

**Sir Stephen Hillier:** I am not just saying this because of the role that I am in at the moment, but I believe it is actually essential that space activity is within the Civil Aviation Authority. When I was doing my preparation three years ago for this role, one of the things in my mind was, “Why isn’t the CAA doing space as well?”, and then I came across the fact that this was working its way through in legislation.

Why is it important that it is joined up in that way? Nothing gets to space, and nothing comes back from space, without going through air. So, you have all of the co-ordination issues in relation to airspace control and so on, working with other international authorities. In a more practical sense, the skills and capabilities you need in relation to risk management in space are exactly the same as the ones on the air side.

When I talk about 50 people in the CAA space team, virtually the whole of the CAA was involved in this space activity in some way or other, with lots of reach into the aviation side. Mr Hart mentioned that his 747 is an experimental 747. It has to be certified by the CAA as an aircraft, and the rocket is done in another part of the CAA. All of the organisational synergies are clear.

I am absolutely convinced that this is the right place for it. I say again: we are not saying that we are perfect, but we have got a good framework and we need to keep building on that. The point about pace applies across the sector. I am sure the Committee is hearing from innovators in relation to advanced air mobility, air taxis and so on. It is exactly the same issue, and we are working on that right now.

On the touchpoints to Government, we clearly speak more broadly, but our sponsoring Department is the Department for Transport. I want to say that we had great support from them throughout the Virgin Orbit process, including support for us doing what was necessary within the timelines that were advertised, to ensure that this was a safe launch. We were not working in isolation; we were working very closely with our sponsoring Department and across Government, and they were satisfied with what we were doing.

**Chair:** Thank you for that; that is very clear. Clearly, the context for today’s hearing is that we were very disappointed to hear from some of the stakeholders in the industry about some of their frustrations with the regulatory process. It is quite right to put on record that you have an important safety responsibility. It is easier in some ways to have this kind of discussion than a much more difficult discussion, if people’s lives had been put at risk, or worse. You do have an important job to do.



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Clearly, in such a fast-paced industry as space, we need to keep pace with the competition. It has been our strategic ambition to be a leading space nation, and that does impose some requirements on the pace of change and innovation in regulators. We are grateful for your assurance that you are up for that change. The Committee will reflect on the evidence that we have heard, and make some suggestions to the Government, the agency and other stakeholders. Thank you for your evidence today, and for coming in person. Thanks also to the other witnesses who gave evidence this morning.