

Scottish Affairs Committee

Oral evidence: [Scotland's space sector follow-up: launch - Committees - UK Parliament](#), HC 671

Wednesday 23 April 2025

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Watch the meeting

Members present: Douglas McAllister (Chair); Mr Angus MacDonald; Susan Murray; Elaine Stewart; Kirsteen Sullivan.

UK Engagement with Space Committee members also present: Baroness Ashton of Upholland; Lord Tarassenko; Viscount Stansgate.

Questions 56 - 106

Witnesses

[I](#): Professor Patrick Harkness, University of Glasgow; Professor Malcolm Macdonald, University of Strathclyde; Dr Christie Maddock, University of Strathclyde; and Dr Pamela Smith, Vice-President Future Programmes, AAC Clyde Space.

[II](#): Colin Macleod, Head of the UK Space Regulator, UK Civil Aviation Authority; and Rosie Whitbread, Head of Space Regulation Policy, UK Civil Aviation Authority.

[III](#): Sir Chris Bryant MP, Minister of State for Data Protection and Telecoms, Department for Science, Innovation and Technology; Chris White-Horne, Interim Space Director, Department for Science, Innovation and Technology and Deputy CEO, UK Space Agency; and Matthew Archer, Director of Launch, UK Space Agency.

Examination of witnesses

Witnesses: Professor Patrick Harkness, Professor Malcolm Macdonald, Dr Christie Maddock and Dr Pamela Smith.

Chair: Welcome to this concurrent meeting of the Scottish Affairs Committee and the Lords UK Engagement with Space Committee. We are pleased to be joined this morning by Baroness Ashton of Upholland, Chair of the Lords Committee, and Viscount Stansgate and Lord Tarassenko. I will be chairing this meeting in the absence of Patricia Ferguson, our Chair of the Scottish Affairs Committee. I understand that this is the first concurrent meeting of a Commons and Lords Committee for some time, so we are delighted to have you join us today.

Good morning, Baroness Ashton. Do you wish to add to that?

Baroness Ashton of Upholland: Good morning to everyone on the Committee and to our witnesses who have arrived. Thank you, Chair and the Scottish Affairs Committee, for inviting us. As we do our inquiry into the UK's engagement with space, it is so fantastic to be able to have this series of conversations, so thank you very much for having us here.

Q56 **Chair:** Good morning to all our witnesses. You are all very welcome. Thank you for joining us this morning at our joint sitting. We have three panels of witnesses today, so we shall proceed straight to questioning. Our first panel this morning is made up of academics and sector reps. Joining us are: Professor Patrick Harkness, a professor at the University of Glasgow; Professor Malcolm Macdonald, a professor at the University of Strathclyde; Dr Christie Maddock, senior lecturer in mechanical and aerospace engineering at the University of Strathclyde; and Dr Pamela Smith, vice-president of future programmes, AAC Clyde Space. Good morning to you all.

I will begin with the first question, and it is a question to all of you. What are the key challenges and opportunities for Scotland in achieving end-to-end capability in the launch sector?

Professor Macdonald: Thank you for the question and for the invite to come here. As a Scottish-based sector, global competition is a key challenge we have in making sure that we are competitive, and Government support should be timely and able to support the ambitions of the sector. If we look back at where the sector has come from, we had first-mover advantage in a number of different areas, and that has not necessarily been sustained in the way that it could have been. As we move forward, we want to make sure that, where we have that innovative advantage, we do not lose it again. That is also an opportunity for the sector to capitalise on where we have the innovative lead and the capabilities, making sure that the sector is supported to realise the potential that it has.



Dr Smith: To add to Malcolm's point, there are two primary opportunities and perhaps two secondary opportunities for launch. The primary opportunity is in sovereign delivery of assets to orbit for the UK, so maintaining as much of the supply chain in the UK as we can, along the value chain for small satellites in particular. There are particular applications for security and defence in sovereign capability, and in protecting the UK's access to space. Given the current geopolitical situation, it is important that we have that capability to protect our access to space from a commercial and institutional perspective.

Secondary to that, if we can get things right, the commercial industry could be attracted to use UK launch, but there are several key factors to make that a viable option for industry. That is reliability, flexibility and frequency of launch, but also cost.

The final secondary benefit is in the public engagement and outreach activities. Through launch we have a real opportunity to capture and galvanise public attention in our industry. It could be a really positive story in the end-to-end value chain for Scotland and the UK.

Dr Maddock: I have a few quick points to add. One is that Scotland, and even arguably the UK, is just one part of a global market. You do not have a lot of individual services. If we want to be competitive, we do not have to be competitive at everything. You have to take the resources you have and find which niches you want to invest in, in order to contribute and lead in those areas in the global space market. People launch not from individual countries; they launch to space. Launch is just an enabler of services in space.

The other thing is that, because it is a lot of money to invest, you cannot change direction suddenly two years in. The UK has a unique advantage because we did not do launch up until 2015. The thing to caution—and it may be difficult for Government—is that we need to set a very clear long-term investment goal or strategy. You can have short-term returns, such as vertical launches and things like that, which we do now. If we want to stay competitive in the long term, we have to have a long-term, 10-years-plus plan that has investment, because it is the only way to develop technologies for space and then see returns.

Professor Harkness: I would echo what my fellow panellist said regarding strategic freedom in terms of data, exploration and defence. I would also emphasise this idea of inspiration value as a gateway to engineering. For example, when Europe returns to the moon, the descent engines that will land on the lunar surface will be built in Belfast. This is a hugely inspirational thing that can bring people into engineering and develops high-value jobs in areas that, particularly on the launch side, perhaps struggle with depopulation and providing opportunities for young people.

Part of that providing opportunities for young people is that we need to be careful that we make sure this is a sustainable industry that is



happening organically on the ground here, not something that is imported and happens to be executed here without the economic and skills pipeline really touching the sides in the UK. The whole sector has to exist in the UK, and it has to be—this is an overused word—sustainable in that way.

Q57 Chair: Anyone can answer this question. What is the current demand for small satellite launches, and is that expected to grow in the coming years?

Dr Smith: I will maybe pick that one up from an industry perspective. Over recent years, we have seen an incredible growth in the small satellite sector. That is predicted to continue. If you look at reputable industry market analysis from people such as Novaspace, they are predicting continued growth in the small satellite market, but the market is changing.

We are looking at about 14,000 small sats, so below 500 kg, are predicted to be launched by 2033. We are looking at a lot more vertical integration in the sector. If you think that about a third of that number is from people such as Starlink and large Chinese constellations that are very vertically integrated, that is not to say that it is an open market for small satellite launch. We are also seeing a bit of change in the sector in terms of the mass that is launched to orbit from small satellites. We are seeing increasing mass of satellites towards that 500 kg, so perhaps a slight reduction in number but increasing mass. The sector is definitely changing in that regard, but it is still predicted to grow.

Q58 Chair: On that point, do you think that Scotland's launch sector can adapt towards these changing trends?

Dr Smith: Yes. To Christie's point about a long-term strategy, we have to be looking at servicing the upcoming market and not the current market. That is perhaps a challenge for some of the small launchers that are being developed. Certainly from an industry perspective, we would hope that they are able to cater for a larger platform size in the small sat market.

Professor Harkness: The small sat market is something that is extremely well suited to Scotland and the UK in particular. Geography dictates that we are best suited to launching towards polar orbits. These are orbits that have a great deal of value for Earth observation. That is something that lends itself to smaller spacecraft launched at a higher cadence, built on the back of a significant science economy, which the UK is.

All this sits together really nicely and creates a niche for Scotland and the UK that is a high-cadence, full-spectrum service, from designing and building the small sat to launching it on the kind of smaller launcher that we can develop first into the orbit that we have easiest access to. That is a really natural niche for us to fit into. The commercial benefit of that



arises from the premium that people might be prepared to pay for service as a prime to a specific orbit at a high cadence. I do not think we can compete commercially, in terms of pounds per kilogram, with equatorial orbits, but there is a very natural niche about small sats, high cadence and small launchers to orbits that are well suited for science purposes.

Q59 Mr MacDonald: I want to explore the idea of the support that the Scottish launch sector needs from the UK Government. The launch companies tell us that they need UK support. Do you think that the previous and the current UK Government are stepping forward to give them the support they need?

Professor Macdonald: I, of course, think there could be more support. That support could be better connected. We have to be very careful that we do not think of launch in isolation from the rest of the sector; it is part of the sector. Picking up on Pamela's point, the idea of assured access to space is important, but assured access to space is not just about how we get into space. It is about the skills pipeline. It is about having the launches, the spaceports, multiple suppliers, the spacecraft production, the people who can exploit the data and so on.

We need to think of that as the entirety of the piece that should be supported. We should not be thinking of launch as a goal in and of itself. It has to be part of a broader approach to the sector—that joined-up approach—where we have opportunities for Government to act as an informed customer, perhaps with the support of academia to help get beyond some of the skill gaps that might currently exist within Government. Academia can come in as a friend to support that upskilling to allow Government to procure public services at a lower cost. That is fundamental, because it has to be a commercial activity. It has to be cheaper than the way you are currently doing things.

Doing that to drive services, the procurement of satellites and the launch sector all goes through to a viable sector that is investable and sustainable. As long as we do it with that kind of joined-up approach and we move beyond the current phase of, "Let's get a launch capability," there is a good opportunity there.

Dr Maddock: One good and bad nature of space is that it is divided between many different Departments, sectors and areas, including everything from military to CAA for licensing. One thing would be a clearer vision of what you want the UK Space Agency to be responsible for, such as whether it is policy-driven, whether it enables, manages and has technical advisers who run research programmes, and how much interaction it has with the CAA and the MoD, especially when you are looking at investment from early TRL projects—things that are trying to bridge research technology or develop software products. That is where it is a bit messy because everybody tends to compete a little bit.

Q60 Mr MacDonald: We have the Minister, Chris Bryant, coming in later, and I think that would be a very good question to take forward with him



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about pulling it all together. There is a second part of that. Since July, basically the election, do you think this current Government have been more involved in and more supportive of the sector as a whole in driving it forward?

Professor Macdonald: We are still waiting for the industrial strategy to clarify that. It is understandable that a new Government will take some time to understand what they want to do. From a sector perspective, it would have perhaps been good if that had happened a little bit quicker. Some of the things I hear, not for on-the-record conversations, are encouraging, and I think we are moving very much in the right direction. They are very receptive to the value of the sector. Once we see movement on the industrial strategy and a multi-year spending plan, that is where we see the delivery of those warm words that we are currently hearing in quiet conversations.

Dr Smith: I would echo Malcolm's point. Some of the communication that we are receiving is very encouraging. To add to the point that was made earlier about being a bit more strategic about our strengths in the UK, we have world-leading capability in things such as small satellites. Launch will be a part of that, but we have that existing capability in the manufacture, design and data delivery. I am encouraged to hear some of the mood music around being a bit more strategic about focusing on what our strengths are, not spreading Government support too thinly, picking winners and backing certain strategic areas. That is really encouraging, but, as Malcolm said, the devil will be in the detail in terms of the industrial strategy.

Q61 **Mr MacDonald:** You are calling for a Minister responsible for the space sector.

Professor Macdonald: Yes. Picking up on Christie's point, if you go back to the space innovation and growth strategy in 2008 or thereabouts, a key recommendation from that was the creation of the UK Space Agency to help integrate space across Government. We have the UK Space Agency, and an element of centralisation came from that.

There have then been a number of landscape reviews that have effectively diffused space across Government again, so we appear to be moving back in a direction of space being across lots of different Departments, but we now also have the UK Space Agency. We have that central co-ordination point, but space is still across lots of Government Departments. How do we better organise that, particularly as space becomes more and more strategically important for the MoD? We have seen policy move out of the UK Space Agency into DSIT. That overall co-ordination is going to be vital if Government are going to be a well-informed customer to the sector, and they need to be.

Dr Maddock: There is a difference between the application of the sector and the underpinning technologies. One thing we would look for from the UK Space Agency or anywhere, even from the research, is that you need



clear technology road maps. They link not only to space but also to hypersonics. They link to a lot of other sectors, but the underpinning technologies are the same. Therefore, it should be technology road maps that you work towards, and then each sector can pull from there as well.

Professor Harkness: Christie makes a good point about a road map and some degree of strategic patience in developing these capabilities, particularly when, speaking as an academic, developing and standing up the capability to hot fire engines is something that takes a lot of time. It is a very energetic activity. There is not really a rule book that tells you how to do this. We have to learn how to do it ourselves, and that can exist in tension with a grant or contract from the UK Space Agency that says, "You will have these deliverables on this date." There is a little bit of conflict between trying to meet your deliverables, looking good to the agency and making all of this work, versus the fact that this is an energetic activity. You are doing it for the first time, and you have students involved. You have to stand this up carefully, and you cannot rush it.

The road map is a good idea in saying that there will be ongoing funding to achieve these goals, recognising that this is difficult and that there might be a conflict between learning how to do it and actually achieving what you are trying to achieve to the dates that the funder expects. That degree of strategic patience to achieve the overall road map is very important.

Q62 **Elaine Stewart:** Malcolm, to back pedal a wee bit to skills, are you worried that we do not have the skills pipeline going forward? How should we be developing that? Should that be through the industrial strategy?

Professor Macdonald: To go back to the idea of assured access to space, we need to make sure we have the skilled workforce. We have a massive skills shortage, not just in the space sector but across the economy. There are a number of different reasons for that. I am not sure that it is unique to the space sector.

The other thing that I note, at least at the University of Strathclyde, is that we are massively oversubscribed in engineering. If we want to create more engineers and scientists, it is not about getting more applications into universities, because we are already rejecting very good students from the courses because we do not have the capacity to take them in. There is also a challenge around retention of students in the sector, both at graduation and as they move through their career.

Some of those issues are unique to the space sector in terms of retaining well-experienced staff. Then there is the broader societal issue of gender imbalance—women leave the workplace and do not find their way back. That is something that, again, is not unique to the space sector, but it would be a great help to the sector if we could find a meaningful resolution.



- Q63 **Susan Murray:** Dr Smith, you were talking about backing strategic areas. Do you think that, within that, it is possible to identify areas that are going to be successful? Professor Harkness talked about the time it takes to develop things, but these things need to be backed during that time. Is there a tolerance for failure within these strategic areas? You are talking about not spreading the investment too thin, but does that mean that the focus then becomes very risk-averse, assuming it is a risky environment in the first place?

Dr Smith: There is a spread in terms of more risky technology areas, as Patrick says, in terms of backing fundamental research, but that is quite different from backing and supporting industry to grow its current capabilities. The two things are quite different. You can still put investment into fundamental research and development to develop that long-term strategic technology road map, while also supporting the key areas of capability that we currently have and helping industry and the sector at large to grow.

Around 90% of the space companies in the UK are SMEs, but that is a huge potential for growth. If you can give the right support at the right time, we can help to grow and scale the industry. That is the key stage that we are at now. To do that, you have to be much more strategic in terms of the areas that you support.

- Q64 **Kirsteen Sullivan:** To go back to this skills gap, it would be remiss of me, given that we have a panel of academics, not to mention that there is something of a crisis within higher education, and further education to some degree, in relation to funding. Do you think there has to be a greater cognisance from both Scottish and UK Governments of the current skills shortages, of how those shortages could be holding back progress and potentially having an impact on any competitive advantage that exists at the moment, and of the role that higher and further education institutions have to play in addressing those skills shortages?

Dr Maddock: I sit on a number of skills gaps sector analyses, including one where we are analysing all of the space sector across Europe, including Scotland and the devolved nations. There are a number of different issues that get lumped together. One is the competitiveness of a skilled workforce. A lot of these skills are there. It is just that they go to other sectors—for example, computer science, engineering, data. It is not that the skills do not exist from a first degree perspective.

I say “first”, meaning the first integrated degree, so master’s degree or bachelor’s degree, but it is easier to be a European. The first degree should train you for general knowledge and not be sector specific. To me, the role of universities in the first degree is to prepare you for a wide remit of jobs, not, “I teach you one software and you can go into this one role only.” If you want any of that sector-specific lingo—and space, unfortunately, is one of the ones in which you potentially need more education—that is done in continuous learning. It is done in training programmes that are mid-career continuous learning. That is also the



barrier for the space sector, because it is a perceived barrier. Electrical or mechanical engineers know oil and gas. For space, they think, "I do not know the lingo. I am not going to go into it."

For the skills gap, the other thing that impacts and is specific to Scotland is geographic mobility. You want people who already have some experience. Everybody wants graduates with at least five years' training, or people with some experience who can start the job running. You have to move to a remote part of north Scotland, say at Orbex, and you potentially have to bring your family. Then there has to be support for the rest of the family. There is that tricky nature within Scotland that is both good and bad. Geographic mobility-wise, the UK and Scotland have the lowest. People tend to stay, good or bad. People in the UK tend to stay in the UK, compared with Europe where 70% or 80% of people move around for university or within the first five years of employment.

Q65 Kirsteen Sullivan: I guess I was really picking up on the point made by you, Professor Macdonald, about having to turn students away. We are hearing across different industries that there are skills shortages. In our other inquiries, we are hearing the exact same thing. There seems to me to potentially be an issue in the pipeline, but if you are having to turn people away at a time when there is a skills shortage, there is an issue there. I would be interested in your comment on that.

Professor Macdonald: Yes, there is an obvious issue there. We get a massive number of very capable students. We hear stories of students with the equivalent of five As at higher being told that might not be enough to get into Strathclyde for engineering. These are the people we need to be bringing through, but we can recruit only so many students into the sector. We have only so many places. As a university, that is just the situation. We are very fortunate to have such high-quality students coming into the university. We can only do so much with that.

Q66 Elaine Stewart: What are the advantages of the Government acting as a customer to support the creation and delivery of the new launch services?

Dr Smith: That one goes back to Malcolm's point around Government as an intelligent customer across the whole supply chain. If we look at a particular example where Government are a customer of data services, for example in Earth observation data, that feeds the demand to build more satellites in our particular industry, and more small satellites. That then feeds the demand for domestic launch capability. It is the full-cycle approach. From fairly small Government investment on the data side, you can feed the pipeline of the full value chain. That of course then stimulates the demand for high-skilled jobs in engineering and data processing.

We see that being a customer for data is a critical intervention that the Government could make to provide support across the sector. We have seen a particular example for AAC Clyde Space with the Scottish Government acting as a customer for some of our data. Scottish Forestry



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has worked with us collaboratively on a service to detect pests and disease in trees in Scottish forests. We have been able to develop that capability together with Scottish Forestry and then sell and export that to other customers globally. With fairly small investment, but working collaboratively together with an end user as an educated customer in Government, it allows us to go and export our products globally. It is a really valuable piece of the puzzle.

Q67 **Elaine Stewart:** That would help with the long-term sustainability.

Dr Smith: Absolutely, yes.

Q68 **Susan Murray:** We have heard that Scotland is ahead of its competitors in providing space launch capability. SaxaVord is saying that it will be ready for a launch by July this year. Do you think it is likely that SaxaVord will deliver Europe's first space launch?

Professor Macdonald: Who will get to orbit first? Nobody is going to give you the definitive answer to that. Andøya made the first attempt from western Europe. I would expect at least one orbital attempt from SaxaVord this year, and perhaps two. Nobody knows whether those will make it to orbit, and that is not really the point of what they are seeking to achieve at this stage. They are just trying to move the technology forward. If they get off the pad and do not destroy the pad in that first launch, that is basically a success. Then they go again and try to make it a little bit further next time. That goes to the difference between the Government's approach to risk and the private sector's approach to risk. It is about iterative development and moving faster.

In terms of the competitor sites, there is Andøya, which is moving forward. Esrange in Sweden is looking to do orbital launch, with Firefly looking to launch out of there. Those launches are further down the line, but Firefly has a proven vehicle. Any one of those three sites is likely to be the first to provide an orbital launch from western Europe. Which one will be first is a matter of whichever company gets its technology working correctly first, and that I do not know.

Q69 **Susan Murray:** To follow on from that, do you think it is important to have that first-mover advantage?

Professor Macdonald: I do not think that being first is as important as having a sustained capability.

Dr Maddock: I agree. It is more important to have a flight record. It really does not matter, apart from a publicity point of view, who launches first, as long as you are there.

Q70 **Kirsteen Sullivan:** Following on from the last question, what do you see as the main obstacles that each country faces? How do you think their strategies differ in trying to overcome those obstacles?

Dr Maddock: Do you mean in terms of the skills gap or space launch?



Kirsteen Sullivan: I mean in terms of the first orbital launch.

Professor Harkness: I am not sure about the challenges that face Norway, for example, but we have this combination of the geographical advantage and the industry strength in Scotland that is related to small satellites. This all ties together well with the orbits that we can reach. Where that can leverage the economies of scale that are associated with the UK in terms of funding science missions in terms of potentially a defence market, that gives Scotland something of an advantage with respect to Norway. We have the same geographical advantages, but perhaps we have a larger supply chain that we can leverage.

Q71 **Kirsteen Sullivan:** What obstacles do you think Scotland faces?

Professor Harkness: As we have discussed already, in the context of academia there is this idea of bootstrapping the capability in universities such that we can support the training of the people who will be needed to support and create the industry in the future. That bootstrapping issue is difficult because it is highly energetic and for all the reasons I previously discussed.

That is why it is really good that we have initiatives such as Race2Space, which is based in Westcott. We have R2t2, which is based in Glasgow. These are for people who want to enter the launch industry. They are typically students who have shown their interest in this because they have come through university rocketry societies, which is a great path into the space industry for people who are interested in space propulsion.

Rather than those students having to get involved in energetics in their own time, which is a slightly risky way of doing it, we are able to provide hot fire facilities for them, such that they can learn how to do this in a safe way and then support the industry. One thing that we can do well here is these training programmes that we are standing up to support the industry. I hope that is a strength for us. I am not sure whether something like that exists in Norway, but we can only do what we can do here and do it as well as possible.

Q72 **Lord Tarassenko:** It is very nice to see an all-engineering panel. I should declare that I am an engineer myself. I am a professor of electrical engineering. I want to use worst-case analysis. When you look at the timeline for the last five years or something, we have some delays. We have a major explosion in August 2024. I want to try to test how worried you are about the fact that, for example, Rocket Factory Augsburg has not yet gone beyond a static test. In Norway, they have managed lift-off, but only for 30 seconds.

How critical is that first demonstration, as you said earlier, of getting off the launch pad, not damaging it and having a flight of at least a few seconds? How critical is that to maintaining the profile of SaxaVord? Can we afford another failure? If we have a failure, what is plan B? Is it bringing HyImpulse? Is it bringing Orbex? Is it bringing Skyrora?



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Professor Macdonald: There is the point that SaxaVord is a multi-operator site, so it is not dependent on one operator. The other thing I would say is that it is only a mistake if you do the same thing twice. That is the difference, again, between private sector and Government development. If you look at the Ariane vehicles or how the US Government develop launch vehicles, it takes a huge amount of time but, by the time they launch it, they are fairly sure it is going to work.

The private sector does it differently. You have these incidents, you learn from them and you move on. As long as you do not make the same mistake a second time, you have learned from it and progressed, and that is great. The challenge is that, when you blow up the launch pad, you have a lot of infrastructure to rebuild, so that second attempt at the same thing takes longer, and that is why you are looking to do it.

You mentioned HyImpulse. It may well do a suborbital launch attempt this year. Again, that is part of its progression of stepping through and improving its technology, rather than going from nothing to everything in one step.

Dr Maddock: There is a distinction between a spaceport, which is just a launch pad, and all the support services. Where there is a launch explosion, it is not usually the fault of the launch pad. It would be the launch operator. Especially in the commercial market, all of these things are either getting entangled or separated.

Linking back to the geographic question, geography is a factor only in which orbit you can reach and the regulations, so how fast it will be, how much red tape there is and how much advance notice I need to get my satellites up. Otherwise, launch operators tend to go anywhere that is the easiest and most commercially advantageous for them to go.

Q73 **Baroness Ashton of Upholland:** Hello. It is lovely to see you. Thank you so much for being with us. I think I know the answer you are going to give me to this first part, so I will do two parts together. Is there enough demand to sustain more than one spaceport in Europe, bearing in mind all you have said about how operators will look at orbit and regulation as being the two criteria that will determine what they do?

Whatever answer you give to that, do you think the future demand, bearing in mind what you have said about long-term planning, is going to be driven more by European customers or by international clients to make sure that the spaceports, however many there are, are commercially viable?

Dr Smith: I can take that one from an industry perspective. On the demand, I will go back to the answer to the first question. For UK launch, the demand primarily has to come from a sovereign capability, so that has to be largely driven by defence capability in the UK. The commercial market is supplementary to that for small launch, just simply through the economics. For small satellites, our customers are primarily looking for



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cost-effective solutions that are reliable and have the frequency of launch. Those are the three key factors for commercial launch. The economics of small launch are never going to compete with a ride share on a larger vehicle. That is just the way it works on a cost-per-kilo basis.

You have to look at whether the whole package that we can offer in the UK is favourable for a commercial market to be successful. That goes to regulation and stimulating the rest of the value chain. From a purely commercial standpoint, I do not think the economics stack up for small launch. That is almost a secondary benefit to a domestic, institutional mission capability.

Professor Macdonald: To build on that, though, and look at the broader European situation, we are all aware of what has happened in the world in the last few months. Europe has to work together and ensure it can support multiple spaceports. That is the only way Europe can have assured access to space. If Europe has only one spaceport, we have challenges.

The reality is that the Governments of Europe need to work together to ensure that the different spaceports can survive and provide access to space when Europe needs it. Therefore, yes, SaxaVord has to survive, but so do Andøya, Esrange and probably a few other sites as well. That will go to Government providing that supply in an intelligent way to join up what is required across the European Commission, the European Space Agency and the different Governments of Europe, working together to provide that assured access.

Q74 **Lord Tarassenko:** Do you therefore think that we should be going for the European Launcher Challenge?

Professor Macdonald: I believe that we are. I know there are some UK companies looking at it. I am not aware of the detail, but I think we are looking at it. I would absolutely encourage the use of the European Space Agency. To go back to the comment on the difference between Scotland and Norway, the Norwegian Government have used ESA very well to support not just the launch capability but the spaceports, the production of satellites and the delivery of dual-use services as well. We can make more of ESA there.

Q75 **Mr MacDonald:** I am very encouraged to hear your suggestion that there are SMEs and people moving into this industry. I have a business in Renfrew that does spare parts for the wind industry. We have completely missed that multibillion-pound industry. It is not being built in Scotland, as far as I am aware. Can you elaborate a little on the industry that is developing for space, ideally in Scotland?

Dr Smith: In Scotland, we are largely SME-based. While the UK predominantly has SMEs in the sector, Scotland is even more so. I think that 95% of our space industry in Scotland is SME-based. We have quite a lot of support for start-ups, incubators and accelerators for really early-



stage companies and spin-outs. We have a real opportunity for growth in the sector in Scotland, particularly around the small satellite market and getting that Government support there to help companies grow and scale, export, create jobs and stimulate the skills pipeline. We have a huge opportunity right now to build on the capability. We have been around for a few decades. We have been around for a long time. We have a lot of heritage and expertise in Scotland. With the right support, now is the time to help the industry scale and grow and take advantage of our global opportunity.

Professor Macdonald: The growth of the sector in Scotland has not been to the detriment of elsewhere in the UK. It has actually grown the UK sector. We have done something different, so the opportunity in Scotland is complementary to activity in the rest of the UK. It is not about taking a bit of the pie; it is about making the pie bigger.

Chair: Thank you very much to our first panel of academics and a sector rep. Thank you for travelling down and joining us this morning, and for giving your time. It was absolutely fascinating, so thank you.

Examination of witnesses

Witnesses: Colin Macleod and Rosie Whitbread.

Q76 **Chair:** Thank you very much for joining us. You are very welcome. Thank you for joining our concurrent meeting this morning of the Scottish Affairs Committee and the Lords UK Engagement with Space Committee. We have Colin Macleod, who is head of the UK Space Regulator at the Civil Aviation Authority, and Rosie Whitbread, who is head of space regulation policy at the Civil Aviation Authority. Good morning to you both. Can you both explain what systems and processes you have had to change to adapt to the rapidly developing nature of the UK space launch sector?

Colin Macleod: Thank you for the invite to come along today. To put that question in context, we became the independent regulatory authority in 2021 and we have seen quite a lot of change already. We have granted licences for more than 385 different activities, which we now regulate and monitor. Quite uniquely in the world, I think, we have the only end-to-end licensing process that covers launch, spaceports, satellites and orbit activities, et cetera.

It is very important for us that we have the opportunity of the outcome-focused regulation, which is very modern. It has been looked at in many other parts of the world as a model they can use. That outcome-focused system allows us to regulate effectively and protect public safety, which is our primary concern in space, because it handles innovation extremely well. If you have a criteria-based standards system, it makes it very difficult. Innovation needs this outcome approach. It is similar to what we use in the UK for things like nuclear and oil and gas.



Finally, in terms of what we have learned over the last few years, engagement with the sector is really important. While our primary concern in the legislation is public safety, we also have a requirement to support and make the sector effective. It is really important to draw the distinction between those two things. In terms of supporting the sector, for us, engagement is key. We have a space launch and orbit group, which is a continuous engagement with the sector where we can get feedback on what we are doing and how we operate.

We have developed some products, as well as processes, that we have changed. We have developed products, including things such as safety case workshops and environment assessment workshops, to try to help these new companies as they work with us on these new regulations. I will hand over in a moment to Rosie, who leads a lot of the work on continuous improvement, to set out some things we have been doing to encourage and support growth through the Regulatory Innovation Office and the Government regulatory reviews.

Rosie Whitbread: The process has transformed from where we started a few years ago. That has been through a constant process of listening to the industry that we are regulating and taking their feedback. The key things that we have done are all around proportionality, being transparent and being risk-based in our approach. We have looked to reduce the burden of the amount of information that has to be provided at the point of licensing. What are we going to do with that information? Is it of value? Do we need to see it now? Is it something we can pick up during monitoring?

We try increasingly to make sure that the information that we are asking for is information that companies are producing anyway, so we are using their existing material for us to be able to assess against. We have updated and transformed what we call the technical question set for orbital applicants to provide real clarity on why we are asking that question and what kind of information we need to see, so that they know what it is that they are trying to demonstrate to us and we can then clearly see that they have demonstrated it to us.

We have transformed our guidance. We have transformed our pre-application process, engaging more, as Colin said, with the workshops that we have introduced for safety and environment. We have dramatically altered how we assess the environmental effects of it, reducing considerably the number of criteria that we look at, again to ensure that it is proportionate and that we are actually looking at the topics that matter and taking advantage of the experts who are writing those assessments.

Q77 **Chair:** Scotland's space launch sector is developing quite rapidly. How confident are you at the Civil Aviation Authority that you have adapted to meet that transformation and that you are providing the support required?



Colin Macleod: I certainly think that we are adapting as quickly as needed. Some of the evidence for that is that the spaceport licence for SaxaVord was issued in 2024. We issued the launch licence for Rocket Factory Augsburg in January. It is part of continuing to build on what Rosie said. We are aiming to be able to authorise activities through the granting of licences as early as is sensible and as early as us being confident that we can protect public and property, as required in our mandate, and then allowing us to monitor and act as a regulatory authority through conditions of the licences.

That has a number of benefits. It helps remove regulatory approval from the critical path to launch. Launching rockets into space is an incredibly difficult and technical operation. We want to be giving authority for companies ahead of their technical readiness. We can see that that is what we have achieved in this particular case. In fact, through our entire time in the last few years, we do not think that we have ever stopped a mission operating that is technically ready. We want to get that balance right of being able to protect the public through an authority for operation as early as possible, moving to monitoring, then allowing the company to focus on its technology development and mission, and for us to monitor its ongoing progress to make sure it is doing what it says it is meant to be doing.

Q78 **Elaine Stewart:** Skyrora has told us that it has experienced delays in obtaining a launch operator licence from the CAA. Can you explain the main reasons why air launch companies are experiencing these delays and what steps you are taking to expedite this?

Colin Macleod: We are not in a position to talk about individual cases. We cannot talk about the specifics of Skyrora's assertions. I can say that, following on from what I mentioned in my last answer, we work very closely with companies. We try to understand what their positions are. When we are comfortable that the operators have met all the tests set out in legislation and primarily, of course, the one in terms of protecting public safety, we are in a position to be able to grant a licence, which we can then go on and monitor.

We are shown to be internationally competitive. We work with partners around the world. We have two other licence applications in progress, apart from Skyrora. We also have HyImpulse and RFA. Again, from my perspective, the evidence from the engagement I have with rocket companies from around the world is that they are encouraged to come to the UK, in large part because of our regulatory system and the opportunities afforded to them by the SaxaVord spaceport and the whole UK space ecosystem.

Q79 **Viscount Stansgate:** Welcome to both of you. After this session, we are going to be hearing from the Minister at DSIT and the UK Space Agency. I wanted to ask whether you think you have enough support from central Government to enable the CAA to do the work that you do and improve the regulatory processes to better support the launch sector.



Colin Macleod: The support that we get from Government is very good. I can possibly pre-empt a future question, which is whether we have enough funding. The answer is yes. We are funded by Department for Transport, and we get a small income from satellite licensing, but it is relatively negligible. In terms of the support financially and in the work that we do from an overall perspective, that is very positive.

The one thing I would say is that we have had recent reviews of what we do from the Virgin Orbit lessons-learned report through the regulatory reviews being run by DSIT. A common theme through a lot of these is the complicated landscape, which was touched on by the previous panel. The landscape and the number of parties and Government Departments involved is quite complicated. There are lots of reasons for that. These reports and reviews have suggested that we need more clarity, particularly in roles and responsibilities.

I am not suggesting that things need to change necessarily between Departments. That is a political and Government decision, but more clarity in the specific roles and responsibilities could help the sector. That in turn helps us, because we are responsible solely for the licensing and regulation of these activities. We are not responsible for policy and the Government cannot grant a licence, but sometimes some of those lines still get a bit blurred. Improving that roles and responsibilities piece would be really helpful, but we are working with Government, the regulatory reviews and the Regulatory Innovation Office to support growth and find ways where we can help them to deliver their mandates as well.

Rosie Whitbread: I would add one bit to that. We are currently going through the post-implementation review of the space industry regulations. We are doing an internal piece of work within the CAA, and we will report back to DfT at the end of July. This is based on our experience of operating as a regulator for the last few years and the industry feedback.

We are coming up with some fairly ambitious suggestions of where we could change and amend some of the secondary legislation to remove some of the administrative burdens to streamline things in some places to embrace the goal-setting nature of it and allow it to be flexible. We are putting those forward, and they will go into all the other discussions that DfT is having in looking at that reg review. If those are picked up, that will require parliamentary time to make the changes.

Q80 **Viscount Stansgate:** Reading between the lines, it would not be unfair to say that, if it turned out that there was greater clarity and certainty about how space policy was handled by the UK Government, that would help you.

Colin Macleod: That would help, but, as Rosie said, there are further opportunities that we can see. Although we have, as I said earlier, modern legislation that is outcome-focused and very supportive of



innovative activities, space moves very fast. I do not agree with statements that say that the regulations cannot keep up with technology because, by their nature, we are always going to be able to deal with it.

We have learned that the technology is changing. Some of the impacts on policy and the things that we are learning about how companies are starting to structure themselves or their new missions mean that we can continue to adapt. In a small number of cases, some of the existing regulations, which were thought to be great in July 2021, might need a bit of amending. Then it comes down to a prioritisation or a cost-benefit analysis of how great an improvement it will be. At the moment, there is nothing that has come to us so far or that we see in the pipeline that we cannot regulate, but there might be better ways of doing it. Is it worth changing it for that one thing, or are there other things that we could change that would help the whole sector?

Q81 Kirsteen Sullivan: This is for you, Rosie, and you touched on it in an earlier answer where you mentioned the need for flexibility. How do you think regulation could be further shaped to enhance the UK's attractiveness to international space launch customers?

Rosie Whitbread: The nature of the regulation we have is that it is focused on the key things that we are concerned about when it comes to securing public safety, so issues around safety, security, to some extent, and environmental impact as well. In terms of changing the regulations, there are bits of the regulations where we could perhaps make it more goal-setting and remove some of the limited amount of prescription that is in there. The real benefit of the regulation is that it does not preclude us from working with industry to develop good practice guidelines on how to be compliant with that legislation and demonstrate that you are secure, safe and sustainable.

That is an area where there are some real opportunities, and we are doing some of that work at the moment. We are engaged in the DSIT-funded sandbox for rendezvous proximity operations, where we identified in the first stage that the legislation sets out a certain level of framework but, to have more clarity for those sectors of what it is that we need to do, there is an opportunity to develop guidelines and good practice to enable people to comply with that legislation.

We have other work that has just got to the first draft, working on the environmental assessment requirements, where industry has led a project. People who have been involved in developing the assessments of environmental effects are producing a how-to toolkit so that they can share that learning. That is working in partnership with us, so we can endorse it and say, "Yes, that is a good way of doing it." That is how we build in that flexibility without always having to go back and amend legislation. That is a real strength of having a goal-setting Act such as the Space Industry Act.

Q82 Kirsteen Sullivan: To some extent, you have co-production with



industry that allows you to better understand their needs, but it will also hopefully build in the flexibility and responsiveness that is required.

Rosie Whitbread: Yes, absolutely. That is essential. You see that across the whole range of major hazard regulators, so in the oil and gas sector, the chemical sector and the nuclear sector. “Partnership” might be too strong a word, but as a regulator we are holding public safety as the primary responsibility. We have to work with industry to come to a shared understanding. When you are regulating for safety, it is about: What’s the worst that could happen? What are the credible worst-case scenarios? What is the best way of mitigating and controlling them?

You need to have a shared understanding between the regulator and industry of what those credible scenarios are and how we can go forward. Then our monitoring is the really important part, and it says, “This is what you said you would do during licensing, and now we are monitoring you. Is what you said you were going to do actually happening? Are you maintaining those levels of safety as you continue to operate?”

Q83 **Kirsteen Sullivan:** Following on from that, what legislative changes might enable you to offer better support to companies?

Rosie Whitbread: I am not sure we need legislative changes to offer better support to companies. Legislative changes are really around the fact that there are some curious bits of prescription within the regulations as they stand at the moment that we could look to amend, which would allow us to continue on this process of working collaboratively with industry to get that shared understanding of what good looks like, and then holding them to account through our monitoring.

Q84 **Kirsteen Sullivan:** Finally, has the CAA’s approach contributed to Scotland having a competitive edge in attracting European launch providers such as Rocket Factory Augsburg for their first launches?

Colin Macleod: That is absolutely correct. As I mentioned earlier, we are one of the few countries that have this end-to-end regulation. In fact, in Germany, there is no current space legislation, and it is not possible to launch from Germany anyway, for safety reasons, at this current technology level. Certainly, my experience for the last five years or so, from speaking to companies, is that they appreciate the regulations.

It is a bit of a challenge for a lot of the companies, principally because they are generally brand new, they are entrepreneurial, they are engineers and they do not think, necessarily, about what the regulatory requirements might be until they are quite far down the line. You mentioned the support we give them, but we have developed these workshops, which we have learned about and adapted from our experience of working with the companies.

As Rosie said, the majority of the engineering information we need, for example, is good engineering practice that they would and should have anyway. The problems I have seen would be companies who have not



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been following good engineering practice. They then find it hard to explain why they are safe, and that in turn makes it harder for us to work with them in terms of public safety.

Finally, we are also developing at the CAA some more commercial courses to offer the sector for the UK and more globally. We work with international partners to learn good practice and share experience, because public safety, as we see in aviation, oil and gas or wherever else, is not really a competitive advantage. Public safety is public safety, wherever it is, but we are developing some other courses, for example around cyber and some other safety aspects, which we are piloting now and hope to be able to offer more widely to the community at the end of this year or early next year.

Q85 Lord Tarassenko: With the previous panel, we heard that the business plan for SaxaVord is not just commercial applications, but also the development of a sovereign launch capability for military applications. I am very mindful when I ask this question that the “C” in Civil Aviation Authority stands for “civil,” but do you talk to the MoD in thinking about launching military hardware into space and so on? Where is the interface between the CAA and the MoD when such a launch might take place?

Colin Macleod: Yes, absolutely. It is a very good question. We work very closely with the MoD and the safety authorities in defence. In fact, last month or the month before, a statutory instrument passed through Parliament allowing a military exemption for some activities.

In effect, we also regulate military activities. It is not a secret. We regulate the Skynet satellites, and we continue and expect to regulate a lot more military activity, because we have the deep expertise and skills to do so. If we did not do it, defence would have to replicate a lot of that activity, as they do in aviation, to show how they can meet the same public standards as the civilian operations as a minimum. We work closely with partners in defence and hope to continue to do so.

Q86 Lord Tarassenko: Do you report back to the MoD rather than DfT on that activity?

Colin Macleod: We are an independent regulator, so we grant the licences, and we have the enforcement powers to deal with the activities that we have. We work with all Departments, but it goes back to one of the original questions around roles and responsibilities. A very large number of Government Departments have an interest in space for their particular responsibilities, from DEFRA to the Department for Business and Trade, et cetera. We work with a lot of Government Departments.

Chair: That concludes our second panel. My thanks to both of you from the Civil Aviation Authority for joining us this morning. Thank you for your time and your evidence.

Examination of witnesses

Witnesses: Sir Chris Bryant, Chris White-Horne and Matthew Archer.

Q87 Chair: We will now move on to the third and final panel. Joining us today is Sir Chris Bryant, who is the Minister of State for Data Protection and Telecoms in the Department for Science, Innovation and Technology. Also we have Matthew Archer, director of launch at the UK Space Agency, and Chris White-Horne, interim space director at the Department for Science, Innovation and Technology.

To our Minister and our experts, good morning to all three of you. You are very welcome. Thank you for joining both the Scottish Affairs Committee and the Lords UK Engagement with Space Committee. It is a concurrent meeting this morning.

If I may ask the first question to all of you, how are the UK Government currently supporting Scotland to achieve a successful end-to-end launch capability?

Sir Chris Bryant: It is great to be here. I am a Macleod as well really. My grandmother was a Macleod by birth, and her father was the minister in Avoch. In fact, my grandfather played for Glasgow Rangers. That has probably put off half the Committee, if not all of the Committee—I did not do that research beforehand.

I might just set this within the context of what we are trying to do overall in terms of space policy, because it is not that space is a “nice to have” now. We know that, for national security reasons, geopolitical reasons and economic reasons, space is a vital part of what we have to have at the core of our industrial strategy. Since we came into power last July, I have tried to change our posture a little bit, for two reasons. First, because those elements have come into sharper focus than they did previously.

Secondly, I got the impression when people were briefing me, including these wonderful people on either side of me, that we had got to a place where, every time there was a new space Minister, they came in with a new idea of a new thing that we ought to be doing in the space territory in the UK. That meant that we were trying to do an awful lot of things, all at the same time, rather than focusing on the things that really contribute to our national security, our geopolitical strength, our alliances with close neighbours or economic growth. I have tried to get everybody to focus a bit more on the things where we can make a real difference.

The second element is that, in the past, there was a bit of a view, in relation to space policy in the UK, that if you tickled it a little bit, the private sector would deliver the goods. Actually, if you look around the world, there is no space industry in any country that has flourished simply because of the private sector. If you look at SpaceX, the numbers vary. One version I have seen is that there has been \$38 billion of investment, grants or whatever from the US Government. We know that investment from Government and political drive is a really important part



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of making the space sector flourish in the UK, which we are determined to do. I want us to be as ambitious in this area as resources allow.

I said that I wanted us to focus, and one of our focuses is on launch, because there is a very specific advantage that we have over anybody else in Europe, which is that we are not space-locked. I met my German counterpart, and I said, "Oh dear, you are space-locked. Maybe we should work more closely together." Nearly every other country in Europe faces exactly the same problem, which is that they have to fly over people, heavily populated areas and other countries to achieve orbit. That is why we have a unique advantage in Scotland, and particularly in Shetland. That is why we have invested.

I am really proud. It is not just this Government but the previous Government as well. Over the last seven years, I think we have invested £96 million. The largest proportion of that, more than 70%, has gone to Scotland. As you know, we put £20 million into Orbex. We are very keen to make sure that launch happens in Shetland, hopefully later this year. It is not for me to determine exactly the dates, before anybody asks me that question, but we are ambitious, and we want to make sure that flourishes.

Q88 Chair: What I am taking from that is that your change is a sharper focus and that you are very ambitious. Is there a twin aim in relation to the commercial sector and national security? Are they complementing each other?

Sir Chris Bryant: Yes, very much so, but I would put it slightly differently. The two key aims are national security and economic growth. This is a very significant part of where Scotland can play a vital role in the wider space sector across the whole of the United Kingdom. We talk about launch, and you think, "Is that just about a rocket?" or, "Is that just about a spaceport?" No, it is about a whole series of different elements that go into making a successful launch and a satellite going up into space. All those different elements are where we need to make sure that we have an effective pipeline. I or any of the others can draw out more of that if you want.

Q89 Chair: Does anyone wish to add to the Minister's very comprehensive response?

Chris White-Horne: Good morning. Thank you for having us along. The constituents of the system are really important to understand here. There is a good analogy, which is about air travel. You need the airport, or the spaceport; you need the airliner, or the rocket; and you need the passenger, or the payload. If you think about it like that, you need to have all those things. There is no point having an airport with no passengers or aeroplanes to fly from it.

This is where Scotland has such a great advantage because, as you heard from the academic panel earlier, we have the small and medium-sized



companies—we are trying to help them grow—the rocket builders, with Orbex and Skyrora being two examples, and the site at SaxaVord has the unique geographic advantage that the Minister mentioned. That is why we have invested so much. That 70%-plus of our investment on launch has landed in Scotland. It is for good reasons, because the opportunity is so great.

Sir Chris Bryant: Just before Matthew comes in, the one other thing I would say, just in terms of economic growth, is that we know it is projected that satellite demand by 2035 will add up to something like \$50 billion. If we only had 2% of that, that is \$1 billion coming into the UK economy. Of course, this is an area where we want to exploit our unique geographical, geopolitical advantage for economic gain as well.

Matthew Archer: Briefly, all I was going to add to what the Minister said is that that sharper focus has been really important. When we started the UK launch programme back in 2015, it was very much with an industrial strategy that was, “How can we encourage the private sector to enter this market?” It was about reducing early hurdles. A very different world unfolded both during and then post covid, where investment was not in such strong supply. Government have to play a role in being a stronger customer of launch, but equally providing that investment to get things working. Those are the steps we have been taking with SaxaVord and Orbex investments, to make sure that we are making progress towards building that capability that we so desperately need.

Mr MacDonald: This is a different question than I normally ask you, Minister.

Sir Chris Bryant: It is not a telecoms question then.

Q90 **Mr MacDonald:** When we listened to the academics, they were very clear that it would be useful to have a Minister whose sole job was space. I am sure this is above your pay grade, but can you appoint a Minister for the space sector, who would pull the different Departments together and perhaps make things move a bit quicker and seamlessly?

Sir Chris Bryant: I am not going to take it personally that everybody keeps on saying we need a better Minister for space or whatever. In fact, there are people also clamouring for a Minister for tourism who should be in the Cabinet. Over the years, I have heard these suggestions. Everybody always wants a Minister for this, that and the other in the Cabinet. I fully understand the pressure for that, but the single most important thing is making sure that we have a cross-Government approach to space.

Lord Tarassenko referred earlier to the issues with MoD. MoD is a big player in this field. One of the first things I did when I took on this portfolio was meet with Minister Maria Eagle to talk about how MoD and DSIT could work more closely together. Actually, within DSIT we need to work more closely together between UKRI and my responsibilities in



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space. That is Lord Vallance and myself working more closely. You have already heard from the CAA. That reports to the DfT. Sorry, all the acronyms are growing now.

Also, as you know, we are developing an industrial strategy, and that is the responsibility of the Department for Business and Trade. Yesterday, I was really glad that we had our first junior ministerial meeting with all the relevant Ministers in the room. We are absolutely committed to making sure that we deliver this cross-governmental approach.

I know you often ask me questions about telecoms, as do many others. Actually, there is an interplay between my telecoms responsibilities and my space responsibilities. If you tried to spend a day without any engagement with anything that had anything to do with space, your day would be pretty empty. That is why, as I say, the most important thing is to try to garner together this single Government approach. That is what I am very focused on doing. I hope that, by the time you produce your report, you will say, "There is no need for anybody other than the present Minister for space." Chris will now agree.

Chris White-Horne: Yes, Minister. This is really important to us as we deliver the Government's plan for space: that idea of focusing and of having cross-Government plans. We have categorised the different areas of space. We have strategies for those looking at what the ends are, and the ways and means to achieve them. Doing that in a way that gets more bang for your buck, or that is mutually dependent upon each other, is where the real win comes here. It is really welcome for us, as we try to deliver this programme, to have this focus. I was at yesterday's meeting, to which the Minister referred. It was a really engaged and really engaging group driving it forward. I am very optimistic about that.

Sir Chris Bryant: We did not have the meeting yesterday because we were coming today, by the way. It had been planned for a while.

Q91 **Kirsteen Sullivan:** Thank you, Minister, for that full answer. Just for absolute clarity, because this is a question that has been raised time and again, the responsibility for cross-departmental co-ordination lies with yourself. Would that be correct?

Sir Chris Bryant: I am the space tsar. I am the space commander, although it is not actually my title.

Q92 **Kirsteen Sullivan:** Everything stops at your door?

Sir Chris Bryant: Obviously, MoD has a very specific role to play. We also had the FCDO there yesterday because, as I referred to earlier—Baroness Ashton will know this from her previous job in the European Commission—there are very significant issues in relation to space that apply not only to the UK, but also to our overseas territories where debris has fallen, for instance, recently. There are other potential economic opportunities for us from space that might apply to our overseas territories. Then, of course, there are relations with, for instance, Ukraine



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and other places where the interconnectivity of all the different Departments is really important. I am the person who has the responsibility for making sure that we bind all of that together.

Q93 Kirsteen Sullivan: That is fantastic. Just to be clear, is the Department for Education involved in that as well, because we heard earlier about the skills shortage?

Sir Chris Bryant: It was one of the things we talked about yesterday. Education was not there yesterday, but it is a key thing that we need to make sure of. It is about the pipeline into these skills. I read the evidence session that you had in February. Some of those points were made about Northumbria University, which I visited back in September or October last year, making sure there is that skills pipeline is important. Yes, we probably ought to be bringing the Department for Education into our future meetings as well.

Q94 Lord Tarassenko: You mentioned the industrial strategy. Now, in previous meetings of this Committee, it was mentioned that there is a disappointment that space is not highlighted as one of the growth sectors. Do you think it ought to be the ninth sector, because there are eight at the moment, or should it feature in advanced manufacturing, digital technologies or even life sciences, because we have heard about microgravity manufacture of antibodies? Do you want to see it spread across these growth sectors, or would you like to see your own growth sector?

Sir Chris Bryant: You make it sound like I want to take over the universe. It is part of the advanced manufacturing sector. A draft report is being produced at the moment. I am not sure quite when DBT will choose to publish all of the industrial strategy. That is in the process at the moment, and space is a key part of it, and should be. Whether, subsequent to that and subsequent to the spending review, we may want to produce something else, I do not know yet.

Q95 Baroness Ashton of Upholland: Thank you, Minister, for being with us. We look forward to having you before our Committee at some point in the future, before the inquiry is finished. Can I drill down a bit more on this investment and funding aspect? In my humble experience, cross-Government is often code for, "How do we engage the Treasury?" In working cross-governmentally, it is really important that you start to see the investment and funding strategy coming to the fore, not least because so many companies that we have already met talk about the need to be able to grow from the classic SME to something bigger. The approaches that they get tend to be from elsewhere, particularly from the US but also from other countries. They have opportunities that they describe fending off, because they want to stay part of the UK sector. That is one of the challenges that is going to be on your desk. If it is not already, it certainly will be in the future.

Looking specifically, first of all, at Scotland, is the level of UK Government



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investment commensurate with the scale of the opportunity that the sector presents? One figure that I am always being told by those engaged in the space sector is that way back in the Apollo era, which is my favourite era of space travel, the rough return was 10:1. Being able to invest in the space sector in terms of economic growth has, at some level, a degree of opportunity. I just wondered how, as the space commander, you are going to approach that. How do you feel you can get the level of investment, which brings me back to my point about the Treasury?

Sir Chris Bryant: I am regretting the "space commander" line already, not least because there is a space commander, who will probably have a word with me later.

If I could just make one prefatory remark, and then both of my colleagues will probably come in, we also know that we will have to have a sovereign capability. We cannot simply rely on others in this sphere. It is perfectly sensible for us to co-operate with others, with other allies, not least because, as has already been referred to, you have the airport, you have the aeroplane and you have the passengers. Not all of those passengers might be UK-based. They might be from different Departments. Some of them might be MoD payload. There was MoD payload in the Cornwall launch, for instance, which unfortunately was not successful.

That will undoubtedly have to be part of the whole process of making sure that all of this has economic viability, growth potential and so on. That means we will have to be rather more interventionist than had previously been thought in the wider space sector.

Is this all driven by wanting to persuade the Treasury that we should have more money? No, it is not. We are in a spending review process at the moment, and we are making our arguments on these two key elements around national security and economic growth. Later this year, we will have a European ministerial commitments meeting in November. By then, we will have to have shaped a view as to what our financial resources are for the future. No, it is more that, if we are going to be more interventionist and more focused, I need the whole of Government to be doing that in the same way, at the same time; otherwise, we are, first, wasting taxpayers' money and, secondly, wasting all our time and energy.

Is it commensurate with the opportunity that is available? Probably every Government Minister that you could have in front of you would say, "We would be able to do more if we had more."

Matthew Archer: I would say exactly the same thing, which is that we could always do more. That is part of the long-term funding that the agency tries to put into the sector. It is about not just short-term growth but long-term development of technology and applications that have long-term spillover benefits.



In terms of the 10:1 figure you mentioned, we often see similar returns in many of our programmes in the agency. They are good economic programmes to invest in. Likewise, they often underpin future national security technology. There are good investments for us to make, while being more coherent across Government and having more impact. Yes, we could do more with more.

The agency has also had learnings as we and the sector have matured. We traditionally engage in research and development grants. That has been the predominant leverage we use with the sector, but it is not great at crowding in private sector investment. We are looking at alternative, more interventionist options. That is clearly how we can get more out of the sector and leverage long-term growth. It is going to be about choosing a different type of intervention with the money we have, which is what we have started to do with launch.

Chris White-Horne: The companies tell us loud and clear that they want more actual contracts rather than grants. We have this vision—we call them the flywheels of growth. You have to keep these wheels spinning. We are very good at the R&D investment grant, as Matt has said. We need to get better at being more interventionist and actually buying services. We can do that with our partners. The European Space Agency is a good institutional partner, potentially, for us there. That is the second flywheel. The third flywheel we talk about is direct investment, so what we have done, for example, in SaxaVord and Orbex. Actually, you need all three of these flywheels spinning.

The reason the flywheel analogy works well for me is that this has a continuity. It has a momentum to it. What companies want to see is consistency, a long-term vision and focus. If you get that, they are in a position both to pull in investment themselves and work with other funders. That is where the real power is. Why do we talk about numbers like 10:1? It is because we are getting other people's money in because of the role Government play. We have a unique institutional role. Bringing Government money to the table matters. It matters more, potentially, than other people's money. You have to make the whole system work, but we are also looking at the other flywheels to make them work.

Sir Chris Bryant: We went through pretty rigorous due diligence before putting our £20 million into Orbex. You have already heard from Orbex, so you know the specific niche into which they are seeking to insert themselves. I would say that they are doing so pretty effectively.

Q96 **Baroness Ashton of Upholland:** My last additional thing is about when we compare the funding of civil projects with European counterparts. Your point, Minister, about needing a sovereign capability is absolutely right. In this pulling together of Government, I absolutely endorse your description of what that means, what it can do and the energy that you are clearly putting into doing it. How much do you think you are going to be able to succeed against what could inevitably be better-funded



competitors? How is that going to work in terms of trying to make sure that we have that capability, but also an international capability?

Sir Chris Bryant: We at DSIT are arguing for our best-resourced set of outcomes from the spending review. I am conscious that sometimes the UK has an advantage even though it may not have a financial advantage in terms of having as much money to put on the table. As you will again know, sometimes what we are better at doing is managing to be the glue that binds everybody else together. It may be that launch is such a specific advantage that we have over anybody else in Europe that it will play well for us, even if we do not have the same amount of money to put on the table as everybody else.

In addition to that, we have very strong working relationships with our Italian counterparts, Germany, France and others. There will be complicated discussions later this year. I cannot remember the precise term, so Chris will remind me, but we put money into the European Space Agency, and we hope that most of that will get spent back in the UK, to put it bluntly. We were at 93%, and we have managed to get to 99% of the money that we are putting in being spent in the UK, only in the last year. That is a very significant achievement. That is where we can make an even stronger argument, to the Treasury and others, about how this is a good investment to make.

Chris, did I get that wrong?

Chris White-Horne: No, you got that spot on. It is called geo-return. It is the just return you get from your investment. Actually, in the last quarter of the last calendar year, the UK received nearly €100 million of contracts. It is the largest amount any country has received since 2015 in a quarter. We have done a huge amount of work in the UK Space Agency to address this geo-return challenge. There is more to come as well.

Just coming back to the point about cross-Whitehall and the level of investment, the prize here is one of becoming mutually dependent, either within Government, so we get the most bang for our buck, or with our partners, and being really clear-eyed about where we have advantages and where we want to collaborate, and how we can maximise the benefit. The geography in Shetland for launch is a good example, but there are others in the technology base where the UK has really world-class and world-leading technology. Often, what we fail to do is to scale that. We often come up with a good idea but are unable to turn it into a commercial success. We are really working hard on that.

By coming across Government and thinking back to that notion of the flywheels of contracting, grants and making it all work together better, there is such a big opportunity here.

Q97 **Kirsteen Sullivan:** Continuing that theme, Matthew, could you tell me how the Government plan to address the potential need for additional Government funding? We have heard from companies such as Lockheed



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Martin, who have stated that they and their partners have already doubled their contributions to the original match-funded grant for their launch operation projects, while the grant value from the UK Space Agency has remained the same. We have touched a bit on this, but I wonder if you could give a bit more clarity on how you plan to address the potential need for additional Government funding.

Matthew Archer: I will answer this in two parts. I will talk specifically about the nature of the grant, without going into commercial specifics, and then more broadly on funding for launch going forward.

On the nature of the grant, it was one of our early grants for launch. In this case, we had two with Lockheed Martin. When we issue a grant, we conduct a value-for-money assessment, as we do for all grant awards. In essence, part of that is always balancing the risk to the taxpayer, in terms of how much we are willing to spend on achieving a set of outcomes that we know carry risk. In this case, it is unsurprising that there have been additional costs to Lockheed Martin. Some of that is driven from some of its choices in the way it has selected providers to conduct the launch. Others have been unforeseen costs in the development of technology. That is part of the nature of the risk we share and the burden we share. In some cases, Government may decide they are so unexpected that we might make a contribution, but ultimately that is part of a value-for-money assessment, and one that is ongoing in relation to that particular grant.

In terms of broader launch sector funding, we have obviously talked during this session about the investments we made in Orbex and SaxaVord. One of the key things that is coming up this year is the European Space Agency's Launcher Challenge. It is a really big focus for how we might secure commercial custom from ESA for future missions over a long period. We have heard in this session about the need for the security of a pipeline. That is where we get it from. That is about making sure that we are securing launch custom from Europe and a number of institutional missions. That is a key part of what we have put into our SR spending proposals. Ultimately, that is what we are pushing to achieve. That is a key part of providing the certainty and the income that companies need to develop the technology and reach the heritage point.

Ultimately, launching once is not success. It is about doing it three, four, five or 30 times. Once you have done that, you know you have a sustainable business and a technology that works. That is the investment road map that we have to follow. We are focusing on that to make sure that we achieve it.

Sir Chris Bryant: I know you have previously asked questions about the move to Shetland. It is key not to have just the idea of getting a launch happening this year—or maybe two this year, or one this year and one early next year, or whatever. You need to get to a commercialised situation where you have enough payloads to be able to make this commercially viable, and then you need to be able to increase capacity.



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That is where Sutherland might come back into play. Certainly, that is very much the plan.

Q98 **Kirsteen Sullivan:** Matthew, what steps will be taken to confirm the level of additional funding that is required, and how will that be managed? Sorry, you are getting all the difficult questions.

Matthew Archer: That is why I am here.

Sir Chris Bryant: It is very useful.

Matthew Archer: For that particular grant, I will not go into the decision.

Q99 **Kirsteen Sullivan:** What about in general?

Matthew Archer: In general, we will go through a process called a grant change notice. Lockheed Martin will submit a proposal, and it has done so. The agency is currently considering its response and whether any additional funding should be provided, or what the next steps will be with that grant. I cannot say that we definitely will, but ultimately that is a consideration of how we achieve the outcome. That might well be how we achieve the outcome of that grant and the benefits it was designed to deliver, or we say that best value for taxpayers might be to stop. There are various outcomes that could come from that process.

Sir Chris Bryant: Just generally on finance, there is not a lot of it around. We may have lots of ambitions, but we may not be able to meet all of them. We will have to work within the resources that are available to us.

Q100 **Kirsteen Sullivan:** In this Committee's visit to Norway fairly recently, and speaking to a number of companies, it was clear that the Norwegian Government perhaps have a greater appetite for risk. We heard earlier that failure in this area, in the space sector, is not what we would traditionally perceive failure to be. It is not a catastrophe. It is a learning opportunity and can afford you the ability to move on and progress, and ultimately give more certainty. Do the Government have greater appetite for risk in this area?

Sir Chris Bryant: I cannot judge whether we have greater appetite for risk than Norway, but it is a very well-made point, which again was made by one of your previous witnesses. They referred to what some people would call a failure as an anomaly. The key issue is whether all the protocols worked, whether there was a threat or danger to life, and whether they were able to learn from what went wrong to be able to improve what happens next. SpaceX and every single organisation that has operated in this sphere has ended up having to learn from things that did not go quite as people originally intended. I have plenty of appetite for that.

Q101 **Viscount Stansgate:** We have heard a great deal about how important it is for the Government to be a domestic customer of launch services. In



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view of what you said earlier about needing to be more interventionist in future, could you tell us in what way you are trying to position the Government as a sustainable customer in Scotland?

Sir Chris Bryant: I will defer to Chris in a moment but, to use the analogy that he uses regularly, about the airport, the aeroplane and the passengers, of course Government will need to be a passenger. There will be a series of different things that we need to roll out, and that is part of what we are looking at in terms of our industrial strategy. I may not have made it clear enough earlier that, when the industrial strategy is produced with its eight subsectors, the advanced manufacturing space will be part of that. We will be able to say a bit more when that comes out.

It is a fair point. As I said earlier, SpaceX has had lots of Government contracts, which has enabled it to thrive. That will have to be a part of the equation for us as well.

Chris White-Horne: The Minister mentioned how a day without space would be an empty day. One of the challenges we have, going back to the question about where space should sit in the industrial strategy, is that it touches everything the Government do.

I will use DEFRA as an example. Very often, Departments are great consumers of data that is sourced from space. Their analysts frankly do not care where it comes from. They want to see images, data, Earth analysis and so on. It is the same for climate change and other things. Part of what we have been trying to do through the UK Space Agency is what we call unlocking space for Government. Part of that is just simple education: "Did you realise where this comes from?"

Then you move into things like aggregating demand. For things like Earth observation, you can use that in DEFRA. What about Network Rail? You could use space data to warn of landslips that might disrupt a railway line, for example. It would be topical for Scotland, of course. There are lots of parts of Government that are consumers of space without realising it. Then you have, of course, the core customers, so defence and other parts of the security infrastructure that use space day-to-day.

The challenge is bringing all of that together, working out where we focus our investment. Is it in the passengers—the payloads? Do we buy that through the commercial market? Do we do that directly? Do we invest in developing the launchers and the sites? It is quite a complex situation. We do not want to focus on just one element of it, but we are doing a lot through the UK Space Agency to try to unlock this across Government. That is in the UK. Even with the best will in the world, the UK on its own is not going to support a thriving launch sector in Scotland. We have to go elsewhere, so through the European Space Agency and the European Launcher Challenge, which we mentioned earlier. There is a tremendous opportunity there to use Scotland as the base for those institutional, often science research type of missions.



There is the work that the EU is doing. Of course, there are challenges with that. There is work with our close defence and security allies as well. America has already said that it is struggling with capacity to launch the number of rockets that it wants to launch. We can offer additional capacity and that unique geographic advantage, where we can launch into what is called polar orbit. If you launch a rocket north, your satellite is going across the north pole. In an era where the Arctic, Greenland, the north-west passage and everything are going to be increasingly important in the decades ahead. This polar and Arctic access is tomorrow's world of space. Scotland is uniquely qualified to do that for us.

Sir Chris Bryant: I have one tiny point. We need to do more co-ordination with the devolved Administrations in looking at that.

Q102 **Viscount Stansgate:** Our Committee has heard a great deal about the benefits of space that people do not realise. If we lost our access to global positioning systems for seven days, we were told that it would cost £8 billion in a week, which is staggering.

I just have a quick follow-up, because the change from grant funding to Government contracts was briefly mentioned. Could you tell us a bit more about your thinking? Do you not think this is a better way to develop commercially viable, scalable and investable services?

Sir Chris Bryant: Sorry, I do not quite understand the thrust of that.

Viscount Stansgate: I am talking about changing from grant funding to Government contracts as a way of delivering and developing.

Sir Chris Bryant: It is going to have to be a mixed economy, so it is not a wholesale switch from one to the other.

Q103 **Viscount Stansgate:** Are we moving from a previous era to a different way of expressing Government support?

Matthew Archer: It is an adaptation, recognising that developing technology through research and development grants can be a very effective tool and helps develop a range of things. We have done that for a long time. What we have recognised, particularly in some sectors like launch and others like telecoms and Earth observation, the impact and getting better value from our investments is achieved through more novel interventions, whether that is through an equity-type intervention or a commercial contract.

What we will see is a mixed model. We will use more of that in the times ahead, but it will still be a mixed economy for the UK Space Agency. Our skillset is still primarily in grant delivery, but it is important that we recognise that how we get best value for money for taxpayers is about engaging industry in a way that it can then generate further revenues and investment. The best way to do that is often through contracts.

Q104 **Susan Murray:** This is another question aimed at you, Matthew. It is a



question about space debris, which we hear is going to cause a significant challenge going forward. Are there any specific measures being implemented to mitigate the risk? Will it be the responsibility of the commercial sector or the UK Government? Who will be responsible for moving the debris?

Matthew Archer: We could have a whole day answering some of those questions.

Susan Murray: There must be an international market for debris.

Matthew Archer: There are a range of activities taking place. I am happy to give more evidence on it in future, if that would be useful. Certainly, the UK plays a leading role internationally, through the UN and other international forums, both in setting guidelines and encouraging good international best practice, in terms of the lifetime of a mission, how we might deorbit satellites at the end of their life or make sure they are in a safe graveyard orbit, as we call it. All of that is good internationally.

On a domestic level, we are developing technology that will help us to remove satellites that have been both prepared and not prepared for removal. Often, what we find is that legacy technology causes a risk of fragmenting and causing further issues and further debris in space. We have invested in a number of missions through the European Space Agency, and working through domestic partners, to say, "How can we develop technology to allow us to go up and remove those satellites?"

There is a lot of work going on across the UK Space Agency to tackle that and create a more sustainable future. We are very much setting the tone internationally. Very much, it has to be a global effort. There is a real challenge in the long term around how we maintain the sustainability of the orbital environment.

Sir Chris Bryant: Sorry to interrupt, but it speaks to our two key themes of national security and economic growth. For economic growth it is an area where we have a degree of expertise and commitment that others do not necessarily have, and we want to exploit that. Secondly, it is a key aspect of future security, because if you have things bumping into each other or things being exploded or whatever it may be, that is a significant problem for all of us. If one of our key satellites, as was referred to earlier, were taken out, there would be significant financial implications for all of us.

There is one other tiny thing I would refer to, because I have the telecoms responsibility. One of the things that space also affords us is the opportunity to use telecoms data far more effectively, so that we could end up using spectrum more effectively. That could have an economic advantage for us as well.

Chris White-Horne: On the debris point, time and pace matter here. The number of things being launched into space is growing exponentially. Tens of thousands of satellites will be in orbit. It is a bit like the climate



emergency. We have a chance to address this problem in space before it is too late. The challenge is that, if we end up with lots of debris, it becomes too late and there is nothing we can do about it at that point.

Q105 Susan Murray: That leads me to the point I was going to make as a secondary point. If we are talking about retrieving the satellites and deorbiting them, we are also talking, as I understand it, about a location on the Earth's surface where they can fall. Therefore, we are likely to have a pile of space debris on the seabed. What is the plan to deal with things when they have left their space orbit?

Matthew Archer: One thing that has changed over the past 10 years or so is the invention of mega-constellations, particularly Starlink and OneWeb. The one advantage they have over previous technologies is that they generally all have what we call the ability to actively remove themselves from orbit at the end of life. They have a clear plan to say, "We will deal with ourselves." Often, they burn up in the Earth's atmosphere. There are not necessarily huge numbers of objects coming back to Earth, or any risk to human life. That is not what we are expecting. In future, we know we have seen NASA contract for the end of the ISS. That will be brought back using Starship. Some aspects in future will involve recovery.

For things that are at the bottom of the ocean having been through Earth's atmosphere, it is very unlikely there is a commercial incentive to go and retain them. Often, that is a small part of anything that is coming back to Earth. Given the way we are dispersed across the planet, there is very little risk to human life from space debris. It is one thing that we continue to watch, but the main bit is understanding how we protect that environment for long-term use. Absolutely, it is about future national security and economic benefit. If we cannot use space, we all suffer as a result. It is one that we are looking at carefully.

Sir Chris Bryant: We have had some debris come down on Turks and Caicos, one of our overseas territories. We have had to do that negotiation with them, and that is not necessarily simple.

Q106 Lord Tarassenko: We started with football, so maybe we can finish with football. As I am sure you and everybody here will remember, Scotland and Norway were drawn in the same group at the Euro qualifiers. The home game was drawn, but Scotland beat Norway 2-1 in Norway.

You have said a couple of times that Scotland and Shetland are uniquely qualified in western Europe. I would probably slightly disagree with you, because Norway is also not space-locked. It is also close to the north pole. In fact, there is a 9° of latitude advantage between Andøya and SaxaVord. Therefore, there is an alternative within western Europe. Is it a competition between Scotland and Norway? If it is, they are 1-0 ahead because they have had a lift-off and a flight for 30 seconds from Andøya last month. Or is it a partnership? Where are you at in discussions or involvement with Norway and its space development?



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Sir Chris Bryant: It is a competitive co-operation. Inevitably, everybody in the space sector, whether they are commercial operators or not, wants to gain advantage over their rivals for economic reasons. At the same time, they need to learn from each other. I know it says in my notes that Norway keeps its cards very close to its chest. That was bred of a time before the present geopolitical situation. If I were to insert a third line alongside economic growth and national security, it would be international co-operation where we can.

I would like to see more. I hope that, in the run-up to the ESA ministerial commitments in November, we would want to be enhancing that element of co-operation, but in the end I want us to win.

Chair: That is a very good point to conclude matters. I thank the Minister and our two directors for your time and your attendance this morning. That brings the evidence session to an end.