



UK Engagement with Space Committee

Uncorrected oral evidence

Monday 16 June 2025

3.35 pm

Watch the meeting

Members present: Lord Clement-Jones (The Chair); Baroness Bonham-Carter of Yarnbury; Baroness Donaghy; Lord Lansley; Baroness Mobarik; Lord Shamash; Lord St John of Bletso; Viscount Stansgate; Baroness Stowell of Beeston; Lord Tarassenko.

In the absence of Baroness Ashton of Upholland, Lord Clement-Jones was called to the Chair.

Evidence Session No. 17

Heard in Public

Questions 147 – 157

Witnesses

I: Dr Joanna Hart, Director, Space Partnership; Professor Martin Barstow, Professor of Astrophysics and Space Science, University of Leicester.

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Examination of witnesses

Dr Joanna Hart and Professor Martin Barstow.

Q147 **The Chair:** Good afternoon and welcome to this session of the UK Engagement with Space Committee. This afternoon we will hear about the role of universities in the space sector from Dr Joanna Hart, who is the director of the Space Partnership, and Professor Martin Barstow, who is a professor of astrophysics and space science at the University of Leicester and director of strategic partnerships at Space Park Leicester. Welcome.

I am going to kick off with a very general question and then we will proceed to unpack that a bit further. We expect this session to last roughly an hour. Broadly speaking, how would you characterise the health of space science in UK universities? What are the key trends we should be aware of?

Dr Joanna Hart: My experience of the trends in academia and space science is through all the work that we have been doing in the Space Partnership. We have brought together industry, academia and government to develop a set of 22 capability road maps that include space science, exploration and earth observation, which are really key areas for academia.

I have had the opportunity to spend time with 72 representatives from across academia and from 40 organisations. All the individuals I have engaged with have been passionate, highly skilled, clearly conducting world-class research, really knowledgeable and have a lot to offer across the piece. It has been clear that they are all operating in a very challenging higher education sector at this point, due to university and funding research issues, which I am sure Professor Barstow will speak to. But, certainly, the health at the ground level is really strong.

The Chair: So, with the right encouragement, you are quite confident about the robustness of our space science sector.

Dr Joanna Hart: Certainly the people within it, which is the core of what you have there.

Professor Martin Barstow: I agree completely with what Dr Hart says. We are in good health as an academic community. We have had more opportunities in recent years for very high-quality science on some very important space missions, such as the James Webb Space Telescope and more recently the European Space Agency's Euclid mission. But we are also vulnerable to the situation in higher education right now. There is no spare capacity that we might have used to bridge people between funding streams in the past. When we have funding gaps, it is very hard to cope with them.

We have not been helped by the relatively recent episode with short-term grants. I understand the reasons for it, with a new Government coming in and a CSR having to be conducted so that they understand where the

funding needs to go. I have a lot of sympathy for that. But the short-termism of the grants and the fact that they have not arrived until six months into the year has been quite challenging. We are dealing with some difficult circumstances, but the community is in good shape otherwise.

The Chair: We will want to unpack that a bit further. Of course, the purpose of this committee is to examine government policy, so that is all very pertinent.

Q148 **Lord Shamash:** We have received evidence which indicated that, in conversations about space policy, universities were not given enough attention relative to industry. Do you believe that is correct? It plays into the earlier question in a way, with that balance between the industry and universities.

Dr Joanna Hart: In terms of the Space Partnership, it is equally representative of industry, academia and government. I report to a board that is equally representative and therefore, certainly over the last couple of years through the Space Partnership, academia has had a really clear voice in policy. The board members at the Space Partnership are drawn from the Space Academic Network, SPAN, which is key. They provide that voice for space-related research in the UK. The other board member is from the Space Universities Network, which provides resources and events to support university teaching staff of space science and engineering in the UK.

We are really drawing on the diverse voices across academia because, as mentioned, we have a lot of really good people but with lots of different views, and you need those channels to be able to bring them out. Professor Mark Sims, one of the co-chairs of SPAN, has publicly commented that the Space Partnership enables academic input into strategic planning and joined-up thinking.

There is always more that can be done. My personal experience is that academia and having academic representatives in the room, whether that is on an operational level or a board level, really brings a broader perspective and pragmatism, which is really helpful.

Professor Martin Barstow: I endorse what you have just heard. The situation has improved enormously over the last few years so, to an extent, you may be getting a view that is a little out of date. In the early days of the agency, there was a little frustration about the focus being overly on industry, which is clearly very important, without recognising the importance of academia in providing a pipeline of technology and resources into industry.

The Space Partnership has certainly made a big difference. As an academic, I feel much more engaged. It may be that some people who are not close to that action at the moment have not received the benefit of it. You could be hearing voices that are not so closely connected. We

need to do something about that to ensure that everybody understands that things have moved on.

Q149 **Baroness Mobarik:** We hear that UK universities consistently punch above their weight globally, but the Government have to balance funding fundamental research at universities with strategic investment to support the commercialisation of technology and business development. Do they currently have this balance right and is this the same across the regions?

Dr Joanna Hart: It is not a question that we have discussed directly at the Space Partnership board, so I cannot answer specifically. It is also quite hard to unpack and really understand what that balance is, because there are lots of different funding streams. Some are not space-specific and are much broader. Others are space-specific but, even then, you have direct funding through the UK Space Agency and funding from the UK Space Agency via the European Space Agency. At a recent SPAN town hall, we heard that about 15% of ESA contracts go to academia. That gives you some idea of where the balance is now.

There is also funding through UK Research and Innovation, particularly the Science and Technology Facilities Council and the Natural Environment Research Council. Also, in many cases, industry and academia are working together on projects. Again, unpicking exactly where that balance is is really quite difficult. Clearly, understanding that and working to be clearer on that balance would be a really good thing.

Professor Martin Barstow: As Dr Hart says, this is a really tricky area to understand what is actually happening. It is a complex landscape. By and large, the balance is about right. It is a pipeline, of course: if you do not fund academia, then you do not have the IP coming through the system that industry can take advantage of. Equally, if you do not create schemes that allow industry to upskill—we can talk about that later—but also to take on new ideas and get some support for applying them, then you cannot translate that IP into real impact.

We have tried a lot of things and they are largely working. I also represent the Midlands Space Cluster, which is part of the national cluster network. Those clusters have now been running for a few years. We are showing that they are a great way of connecting the system together and they bring in academics and industry partners. I have spent the last 15 to 20 years of my life trying to join industry and academia together in a more effective way. I like to think that I have succeeded to an extent.

The message really is that we have to keep going. We should not be cutting back on those projects that link things together. There are some great examples such as the connected capability networks, which are funded by Research England, which have done some extraordinary stuff and continue to do so. In some areas, partly through current circumstances around spending reviews, we have seen funding coming through to the clusters drop back quite dramatically. We are in what I would call “keep alive” mode. At least we have some money, but it limits our effectiveness. There is a really clear relationship between how much

money you invest and how much you get out. If you want more out, you really have to make sure that people are adequately funded.

Lord Tarassenko: As a supplementary to that question, it is very interesting to hear a professor of astrophysics talk about intellectual property, so could you say a bit more about that? What kind of intellectual property do you generate at Leicester and beyond that you might wish to see better exploited, or not as the case may be? We have not heard much about that, certainly in the context of astrophysics, which is mostly about, say, the James Webb telescope. What kind of IP are you talking about?

Professor Martin Barstow: It is very diverse and it runs from instrumentation—we build sensors and electronic systems; all that activity has application in the wider world—to a lot of work that we do on data. More and more, we are moving into machine learning and AI, so we are developing expertise in that. We work a lot on earth observation in Leicester. The products that come out of the earth observation satellites are often very valuable and commercialisable in terms of services that can be extended, such as monitoring climate change and aiding agriculture. It is a very large portfolio. It has been a challenge to connect that portfolio with industry partners but we are learning how to do that better.

IP is something to be handed on to people rather than protected. After all, a lot of it has already been paid for by the Government through research grants. Mechanisms that encourage people to take up the IP and make use of it through licensing, rather than trying to patent it and keep it as a closed shop, are rather more productive.

Q150 **Lord Tarassenko:** I turn to the question the Chair thought I was going to ask. We have already heard about short-termism in terms of funding, but I want to talk about the fragmentation of the landscape, because we have heard evidence that this is an issue in space funding. Two examples have been brought to our attention. First, there is space weather; ground-based assets are supported by the Natural Environment Research Council and space-based assets are supported by the Science and Technology Facilities Council and the UK Space Agency. Secondly, when you look at instrumentation, the UK Space Agency pays for the construction of the instruments, but the STFC pays for the actual use of those instruments.

Looking at it from the outside, it does not seem a very efficient way of doing it. I have named three or four funders already. We have the UK Space Agency, the Natural Environment Research Council and the Science and Technology Facilities Council—both part of UKRI—and you mentioned Research England. Does this fragmentation work for space, or is it an obstacle to getting joined-up programmes of proper critical mass?

Dr Joanna Hart: It is widely recognised that the UK space sector would benefit from a more joined-up approach to space across government. However, space also underpins so many different areas that if you try to

put it all into one place, you do not have all the links you need into the other areas. It is more of a co-ordination piece rather than a fundamental rejig. What is key is to make sure that those different entities that you have just listed off all agree on what the priorities are and which bits they are going to fund. You are absolutely right: some funding, say, for a big science mission may be through ESA, but before that you had to build up your capability in instrumentation by developing things, possibly through a national programme, and then when it comes to the exploitation it is a different funding pot.

Getting everybody agreed and moving forward on that is important. I know that the Government are working on this, particularly around the capabilities in the Space Industrial Plan. They have been working on these cross-Whitehall strategies. We heard from Minister Sarah Jones last week in a Westminster Hall debate that those plans should be coming out by the end of the year. There has been a lot of work through capabilities and I commend the work that the Department for Science, Innovation and Technology has been doing there, but we have not seen it yet.

Lord Tarassenko: So you are saying that that will not come out in the industrial strategy, which is due by the end of this month, but that it is going to come out later for space.

Dr Joanna Hart: I am not privy to any of that information. However, Minister Jones made the comment that all departments will publish clear delivery plans and set out their priorities for space towards the end of this year. That is where I am picking that up from.

Professor Martin Barstow: That is a really interesting question. It is a big challenge. I have been funded by four different research councils sequentially during my career, which has been quite a long one, as well as by the UK Space Agency. None of them has been perfect. They have all done a really good job, but there are always gaps and complexities associated with these relationships. I agree with Dr Hart that there is a lot of good work going on, but we need to try to join up better than we do.

I would be extremely worried personally, as I am sure lots of my colleagues would be, if there was a very large change in the way things are organised. There are massive opportunity costs associated with that, which would then pile on to the challenges that we have already had around the change in government and things that I mentioned earlier.

I would really prefer to focus on understanding the relationships between the various funders and making sure that we try to get rid of the gaps. Some of that is about UKRI understanding how these things work together. I know that people being funded by the STFC have recently come under a lot of pressure because of challenges within the funding of that individual research council. The delays that have been introduced to things such as the exploitation of space missions are quite eye-watering. Getting things more joined up is absolutely essential.

Q151 Baroness Stowell of Beeston: You have touched on this a little already, but I want to ask specifically about the relationship between academia, the Government and industry. In simple terms, are those relationships as good as they need to be if we are going to be as successful in the space industry as we have the potential to be?

Dr Joanna Hart: Relationships can always be improved. There is a huge willingness—

Baroness Stowell of Beeston: If they can be, how?

Dr Joanna Hart: There is a huge willingness from all parties and all people across the piece to work together better. If you want to get people to work together, just getting people in a room and presenting show and tell does not quite work. What they need to be doing is working together on some things, in the same way that this committee is doing.

When we have been developing the road maps, I have had industry, academia and government together in a room, working together to try to get to an end goal. The key thing that they have found in doing that is being able to understand the other stakeholders' objectives—for academia to have a better understanding of what is important for government and for government to have a better understanding of the challenges for academia. It is that key piece of understanding and giving people the opportunity to spend time thinking about it that really makes a difference.

My recommendation would be to enable those opportunities. That is what I have been trying to do through the Space Partnership, at a working level and at the board.

Baroness Stowell of Beeston: If a purpose is required in order to make these relationships work better, which I can understand, who is setting the goal? Where does the goal come from?

Dr Joanna Hart: In terms of the goal, you have heard a lot across all these committee sessions about the importance of prioritisation and how, with the current levels of space investment in the UK, we really require focus. If we are going to do that, it is very hard for one group of stakeholders to say: "That's the priority. Let's all work towards delivering that". If that is the Government, for example, they need to know how much it is going to cost from an industrial perspective and whether we have the skills and the people already from academia.

Some of these things are iterative conversations. There are clearly some constraints from each side. The goal should be for the Space Partnership board or the different stakeholders to say: "These are the key pieces of information we need from the other side to be able to proceed". At the moment, there is too much expectation on government to just provide the answer and there needs to be more input from industry and academia.

Lord Shamash: If you had a magic wand, who would you see ought to

be giving that leadership?

Dr Joanna Hart: In terms of the magic wand, the Department for Science, Innovation and Technology is the lead for space so I would ask it to take that. It works closely with the Space Partnership, which provides the platform to bring everybody together at both an operational and a more senior level. It is those discussions that need to move forward.

Baroness Stowell of Beeston: Do you feel that one of the things you are lacking is prioritisation from the Government to inform strategic and national priorities? Or is there something else that you think the Government should be doing that they are not doing that might help?

Dr Joanna Hart: There is a large expectation on the Government to provide those priorities, but that conversation between industry, academia and government needs to happen to be able to make some of those choices. The 22 road maps that we brought together cover everything going on across the space sector. There is a huge number of interdependencies between each of those. You cannot do in-orbit servicing and manufacturing unless you have space domain awareness. You cannot do launch unless you are thinking about manufacturing of satellites. What is that satellite going to do? Is it SATCOM, PNT or EO?

There is a lot of join-up and interdependence here, similarly for space science work. The work that was done five, 10 years ago is now coming through today. This is a really complex system of systems and expecting any one person or stakeholder group to be able to work through all of that is really tough. My view is that there is no right answer. We cannot analyse absolutely everything. What we need to do is get the best choices, which means it is more of a conversation. I would obviously argue the Space Partnership is the place for that, but others are available.

Professor Martin Barstow: I would support that view very much. Prioritisation is always a challenge when resources are limited. It is much better done as a conversation rather than as a direction. One of the real strengths of the UK space ecosystem is actually its breadth and the range of things that we do, so that we can move into different areas that seem to become more important as time goes on. It is a very fluid set of circumstances. Things are changing quite rapidly these days and we need to be able to move and be fleet of foot. That has been a challenge. Getting legislation through for things such as space launch has slowed things down enormously. We could be a lot further ahead than we are. It is about being alert to the opportunities as much as about setting priorities.

Q152 **Lord St John of Bletso:** Dr Hart, you spoke about interdependence. What scope is there to set up more innovation hubs or clusters where industry professionals and academia can collaborate more seamlessly?

Dr Joanna Hart: There are already 14 clusters across the UK. There are lots of opportunities for people to come together. The challenge is finding

things for them to work on so that they are doing something productive. Particularly noting the funding challenges within the higher education sector, the availability of resource—particularly from the academic side—is not always there at the moment to enable them to lean into some things as much as they could.

Adding more places that bring people together is probably not the right thing. The question is what we are all trying to do; let us be really clear on where we are trying to go. We know that we want to deliver on the ambition in the National Space Strategy, but we need to ask: what does that mean? What is the next step? What is the agreed piece?

Professor Martin Barstow: That also relates to the previous question; I will say a few things that I did not get round to saying on that. We need to learn how to work better between academia and industry. We are on a journey and we are doing much better than we did a number of years ago. Things such as the space clusters are a vehicle for that; they are not the only way of doing it. When we built Space Park Leicester, which has now been open for three years, we built it with the intent of trying to do a better job of working with industry, bringing academics and industry partners together. That is going very well, but it is in an early stage and there is more to do.

The mechanisms we already have are probably the right ones, but we just need to get behind them and ensure that the resources flow through. As Dr Hart mentioned, one of the big challenges is for academics to find time to do this. They all have other jobs doing research and teaching students, which are pretty much full-time occupations in their own right. The additional piece of working with industry can be a bit challenging for an individual academic. We have piloted a number of schemes that have provided resources for academics to do that. If we could keep those going, that would be really helpful.

Q153 **Lord Lansley:** Thank you very much to our witnesses for being with us this afternoon. What are your feelings on what the priorities should be in relation to our international partnerships as seen from the academic or universities sector?

Professor Martin Barstow: Thank you very much for that question, because I am passionate about our international partnerships. I have been working internationally pretty much throughout my career and international opportunities have been an important driving mechanism that has helped us maintain the quality of activity in the UK. It is very difficult to do things on your own if you are a medium-sized country. We do not have the resources of the United States, for example, or of other large space agencies, and we never will. Creating partnerships such as that with ESA, which allows us to operate on a similar scale with our partners across Europe, has been enormously effective.

Where we did not have balance until relatively recently was that almost everything we did was focused on ESA. That disadvantaged us a little in the wider world and within ESA, because we were not driving our own

space industry with homegrown projects that would give it experience and would have allowed it to bid into ESA competitions and feed back some resources that we were handing over.

We are in quite a good place now. The recent implementation of the strands of international bilateral programmes in the agency and the science bilateral programme have given us some very welcome opportunities to operate on a somewhat smaller scale with our partners, but in ways that actually help our industry grow. As an example, until recently when the grant ended, I had a project working with an international team drawn from across Europe—not in the ESA context but including two industry companies from the UK that were helping devise the mission. They came in at an early stage, so they were developing their technologies alongside the technologies that were available in the universities.

We are doing quite well now. We have some mechanisms in place. Again, if we keep those going and—I am not asking for more—if we keep the funding at the levels that we were receiving before the recent complexities, we actually have a good platform to support our industry and our academics and balance all our potential international interests worldwide.

Lord Lansley: Without dwelling on some of the evidence we have received, we have tended to have if not conflicting evidence then certainly not consistent evidence telling us that we should do more in ESA, that we should do more by way of national programmes and that we should do more by way of international partnerships with countries outside Europe. In so far as we may not have the resources to do all these things, where does the priority lie?

Professor Martin Barstow: I am probably going to disappoint you by saying we should do all those things because they all have different benefits and they are all very closely related. If you invested more in ESA without investment within the UK to complement that, you would not be able to benefit as well from that investment. There is always more we can do and I always hesitate to ask for more money when I am in meetings such as this because there is a finite cake. There are lots of other priorities across government; we have to get the balance across all the other priorities right and make sure that space plays its role in that. If you spend more then you get more out, but is that necessarily the priority for the UK?

Space is a good investment because it has high commercial impact and high societal impact, so it is well worth making the investment. It is probably for others to decide the balance between space and other areas within government. Those of us who work in it have vested interests there.

Lord Lansley: Dr Hart, is there anything you want to add to that? Also, on the question of how the universities sector in this country is interacting and partnering with the universities sector in other countries,

how is that being created and exploited?

Dr Joanna Hart: I will probably defer on the latter question to Professor Barstow, because I cannot say—when it gets down to a university-by-university level, that is not my level of expertise. If we are to figure out what that mix is between ESA’s bilateral national programmes, there are two key actions. One is for the UK Space Agency and UK Research and Innovation to agree what the key science questions and key related technology questions are. That was the real struggle we had when we were developing the road maps around this. Everybody wants to do everything, as Professor Barstow said, but if you knew the questions you were trying to answer, you might tweak which way you go. I know that the new chief scientist at the UK Space Agency has started work on this with UKRI, but more encouragement would be great.

The other piece is to clarify the roles between the UK Space Agency and UKRI, including RAL Space and the Satellite Applications Catapult, as well as the funders. In doing that, it will become much clearer how you prioritise some of these things and understand that, given that there is not enough money to do everything, if one piece of the chain cannot fund something then it puts the decision and that conversation in the right place. At the moment, we have not seen those roles and responsibilities articulated as clearly as they could be.

Professor Martin Barstow: The university international collaborations are very healthy. The example mission I was talking about is a mission of university partners across Europe. Similarly, we work with universities in the US and further afield. We have had long-standing relationships with universities in Japan going back decades, which have been brokered by mutual interest in space. It took a bit of a hit when we went out of Horizon for a while. It has been quite hard to climb back into that because it is only now that new calls for activity are coming out that the UK can participate in, but it is pretty healthy.

One thing I would add to Dr Hart’s comments on prioritisation is that a lot of prioritisation goes on within the European space community, particularly through ESA. ESA has its mechanisms for looking at the landscape over 20 or 30 years and at least choosing the science priorities that we are all going to get behind and making selections of key strategic targets that it would like to work on.

There is an element of that going on already. Maybe where it does not quite join up is in some of the technology priorities. One of the weaknesses where there are gaps between the agency and the STFC—and, dare I say, the EPSRC, which has not been called into this discussion—is that developing those technologies sometimes falls between the cracks. Without the new space technologies for your instruments, you cannot deliver on some of these ambitious plans. We need to make sure that those things are linked in properly.

Q154 **Baroness Donaghy:** My question to you both is about competition, rather than collaboration. Are UK universities and research institutions

competitive in training and retaining world-class space scientists? Would you say that the warnings we have of a brain drain are true, or is there likely to be a reverse brain drain, from the USA for example?

Dr Joanna Hart: At the moment, the Space Partnership is facilitating the Space Skills Advisory Panel, which brings together industry, academia and government to discuss some of these topics and really highlight them. There has not been much discussion about a brain drain within universities recently. Clearly, there were in the past. Where we have a regular challenge is at the mid-career level. The reason is that there just are not enough people who have five years of experience, whom you can drop straight in and they can get on and start working straight away.

The only way we are going to resolve this is to train up more early-career people. In my view, the number of early-career opportunities across the space sector is not high enough. Therefore, I would encourage using every lever in the space sector to try to increase that number. The universities are doing a fantastic job in training up these graduates and beyond, but they are then really struggling to find jobs. You are finding ratios of 50 applicants for each job that is going. I have heard of even higher ones for apprenticeships. If that is the case, it is not that there is a lack of interest or capability, it is just the number that are available. The only way we are going to change things for the future is if we train more of those people up today.

Probably the same is true for academia. We need to make sure that it has that pipeline coming through and that young people have those opportunities to work on, say, smaller-scale missions, so that they can get those principal investigator roles on bigger missions as part of international pieces later on. It is about thinking about this chain, not just looking at one piece but looking at the whole system, which is really important in the space sector.

Professor Martin Barstow: There is not much risk of a brain drain from the UK into other countries, if that is the angle from which you are approaching it. You are quite right to point out there may be jobs coming the other way. Recently some of my colleagues in NASA have been saying: "Are there any jobs going in the UK?" They are having a really challenging time right now, which obviously we hope comes to an end some point soon.

Dr Hart has put her finger on the problem. It is more a case of drain from the pipeline. We have some fantastic university degree courses; we have spent a lot of time over decades trying to address issues around the STEM pipeline in schools so that we have graduates coming through. That remains a challenge. We have some amazing places such as the National Space Centre, the Science Museum and other organisations around the UK, which do a great job of trying to encourage people into STEM subjects. That does not mean that they are the most important things, but they are essential from an economic perspective.

The problem is how that pipeline functions. In a way, the problem is much larger than the space sector. It is about how these organisations work with the Department for Education. That is often quite siloed and we find it very hard to break into it and get some of our good ideas, which we think deliver good results from an education point of view, into the wider system.

There are a number of steps that need to be taken all the way along this pipeline to stop that draining of talent as it comes through. More jobs for young people is one of them. Opportunities for people to translate across different sectors is another. The space industry as a sector has a challenge finding enough people, but that goes for all our high-tech industry. It is a growing problem that we as a country need to address, which we cannot just address in one sector like the space sector. We have to do it across the whole piece.

Baroness Donaghy: We heard at Harwell that there were certain non-traditional, if you like, skills that were taken on board in the space industry, for instance weaving and craft skills training. Therefore, there needed to be a broader set of thinking in the education world to attract those people into the industries.

Professor Martin Barstow: You are absolutely right. The skills required by space are widening all the time and go well beyond STEM these days, such as law and economics. We have just been very fortunate to receive an award from the Leverhulme Trust in Leicester for a centre for humanity and space, which is designed to address just these issues—to try to see space as something that is for us all, not just for a small group of people who happen to be interested in rockets and other toys. It is about the benefit to our entire society and there is a lot to win from that.

Q155 **Baroness Bonham-Carter of Yarnbury:** Picking up on what my colleague has just said, I get a bit upset by the obsession with STEM. I come from a creative industries background and STEAM is what we should be thinking about. I had forgotten about the weaving, but that is a good example.

Baroness Stowell was asking whether the UK space strategy from the government perspective was on the right track. I am going to ask about it from the academic perspective. Are you being imaginative enough? I thought it was interesting what you said, Professor Barstow, about not really having enough time to go out and deal with businesses because of all the things you have to do as a teacher. Are you being imaginative enough in pursuing the way forward for this particular area?

Professor Martin Barstow: The answer to that is probably not. But I would like to think that we are trying our best to be as imaginative as we can be. I am sure there are things that I miss that I could be doing. The example I just alluded to—the Leverhulme centre—is something that I would like to think is us being really imaginative, by seeing how the importance of space can be spread more widely and looking at these other aspects. I absolutely agree with you about STEAM. Scientists are

also creative and our imaginations come into play when we are trying to think of the future. I am engaged in things like looking for life on other planets, which to me is one of the most imaginative things we can do.

We are trying very hard to be imaginative and there are a lot of good things going on. Things such as the Leverhulme Trust and non-traditional funders are important from that perspective because we can ask for money that we would not get from a research council to do something that we would like to do but otherwise could not get funded.

Dr Joanna Hart: The key thing for me is diversity of thought. Bringing in different views and perspectives in everything we do across the space sector is really key. As noted, it is a complex system, so we have to make sure that we are really challenging things in different ways. Perhaps sometimes things get set top-down just by the funding and it does not create that room for that creativity and challenge. That is maybe the key thing that could do with changing: how do we accept that you cannot just analyse absolutely everything in a very financial or scientific way and that we have to get the best choices that will stand the rigour of challenge from diversity of thought? Enabling that is actually quite difficult.

Q156 **Baroness Bonham-Carter of Yarnbury:** I like the fact you have brought in the word creativity, as well as diversity, because of course that is another potential problem. It is quite a male world, is it not? Furthermore, do we need a new, updated National Space Strategy?

Dr Joanna Hart: The current National Space Strategy is absolutely adequate. It sets the ambition and the direction. The piece we really have to figure out is about bringing that diversity of thought from lots of different people. We need to figure out where the bits are where the UK can make the best choice and take the best direction to optimise its opportunity, both globally and nationally, so that we are bringing people through and making a difference.

Professor Martin Barstow: The strategy is great. I would hesitate to try to reinvent it at this stage. It took a long time to get it. What we need to do is actually deliver on it. We could keep revising our strategy and keep talking and then we would not do much. We are on the cusp of really getting something out of it. We have been working on things for a long time and we are seeing some funding that is associated with some of those goals starting to flow through. We just need to keep on going and we will start getting an impact and delivering some of those goals and aspirations, which can be only a good thing.

The Chair: Are we really saying that we need to get the Space Industrial Plan right at this stage?

Professor Martin Barstow: All the plans have to be right, the academic plans and the industrial plans, and they have to work together.

Q157 **The Chair:** There is a final question from me. We have heard from those further downstream of universities that the grant culture is not always helpful and they would have preferred to have contracts in many cases.

Does that apply to universities? Is there any similarity there?

Dr Joanna Hart: Professor Barstow is probably the best one to answer that.

Professor Martin Barstow: First, I will say that we will take any money from wherever it comes. To be more serious, we take research grants and we take contracts. What we have to do is make sure that whatever mechanism that we operate under pays the bills, so that the funding we get is actually paying enough for the work that we have to do. As long as we get that balance right—and that has been challenging—then it does not really matter what the funding mechanism is. They both have advantages and disadvantages. I am saying that we should have a mixed economy.

The Chair: That is interesting. Did you want to come in, Dr Hart?

Dr Joanna Hart: I will just add very quickly that the reason for contracts is that, if you are looking for investment or co-investment, you really want to have long-term, clear revenue streams because then you can borrow against them. That is much more important from an industrial perspective. That is why that call keeps coming through, because then they can attract equity investors or debt investors—whatever it may be—to bring that through.

The Chair: You would be as relaxed as Professor Barstow about this in terms of saying, “Wherever it comes from, it does not have huge advantages one way or another”.

Dr Joanna Hart: No, as long as the economic costs are covered. There are lots of grant terms when you go into the weeds, which sometimes means you need match funding and all those pieces. As long as the terms are right for whatever it is that is trying to be achieved, it makes sense.

The Chair: Yes, it is covering the overheads, which are sometimes not covered by grants.

Lord Tarassenko: Obviously we are looking forward, but sometimes it is worth looking back. Dr Hart, you have been at Harwell for just over 10 years now, leading development of the STFC skills factory. What is the one thing that you have done that has really improved the skills shortage?

Dr Joanna Hart: Frustratingly, regarding the comment I made earlier about increasing the number of early-career opportunities, I stood on a podium and said that five or six years ago and it has not happened. While I was at the STFC, it increased the number of apprenticeships and it doubled the number of graduates. I do not know whether that has continued or not, but I made a difference for at least a short time.

The more we can get the sector as a whole to invest in those early careers, the better. It is expensive and it costs; you still have to pay and train them and the supervision cost is high. This is not an easy thing to

do, particularly if you have short-term contracts, because an apprenticeship takes generally four years and a graduate scheme takes two years, plus there is your recruitment and everything else. You need that visibility of your future revenue streams to be able to justify that investment. That is my key thing that I keep pushing. I am also a returner, so I push that too. I made a small difference at the STFC, but clearly through everything else I am doing on skills, I am still trying to make a big difference.

The Chair: Thank you very much, Dr Hart and Professor Barstow. It has been a very interesting and enlightening session. The public evidence session is now concluded.