HOUSE OF COMMONS

Defence Committee

Oral evidence: Space Defence, HC 271

Tuesday 7 September 2021

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Watch the meeting

Members present: Mr Tobias Ellwood (Chair); Sarah Atherton; Richard Drax; Mr Mark Francois; Mrs Emma Lewell-Buck; John Spellar.

Questions 43-135

Witnesses

I: Nick Shave, Chair, UKspace; Nik Smith, Vice-Chair, Security and Defence Committee, UKspace.

II: Anita Bernie, Strategy and Execution Lead, KISPE Space Systems Ltd; Richard Franklin, Managing Director, Airbus Defence and Space.

Written evidence from witnesses:

- SPDF0010 UKspace
- SPDF0011 Airbus

Examination of witnesses

Witnesses: Nick Shave and Nik Smith.

Q43 **Chair:** Welcome to this Defence Committee hearing on space defence. Space plays an essential role in modern society and in our defence, and it is an ever-crowded and congested environment that we need to learn more about.

We hope to do that today in two panel sessions. The first session will be an opportunity for the Committee to explore the issues covered in our terms of reference. First, we will talk to representatives from the industry, as well as those from the space sector itself.

I am delighted to welcome Nick Shave, who is Chair of UKspace—welcome, Sir—and Nik Smith, who is the vice-chair of the security and defence committee from UKspace. In our second panel, we have two commercial representatives: Anita Bernie, who is the strategy and execution lead from KISPE Space Systems Ltd, and Richard Franklin, who is the managing director of Airbus Defence and Space. You are all very welcome here today; thank you very much indeed for your time.

Nick Shave, perhaps you can begin this session by explaining a little about what UKspace does, saying how it fits in to our wider approach in this important area of defence security.

Nick Shave: Thank you very much, Chairman. UKspace is a trade association for the UK space industry. We have approximately 150 members, ranging from large companies, manufacturers and operators through to mid-size companies—mid-caps, perhaps—and a large and ever-growing sector of small and medium-sized enterprises. So we represent the whole of the space industry.

We work closely with various parts of Government, in particular with the Department for Business, Energy and Industrial Strategy, the UK Space Agency and the MoD, but also with other parts of Government. Also, we work with other international space agencies, such as the European Space Agency. We are really there to represent the interests of our members towards Government.

Chair: Thank you. Sarah, start us off.

Q44 **Sarah Atherton:** I am going to talk briefly about the UK space industry and summarise the very lengthy brief that we have. Please correct me if I am wrong, but the space industry has been identified by the UK as a critical national infrastructure since 2015. It supports 42,000 UK jobs and generates £14.8 billion per annum. There are currently around 4,300 satellites in orbit and 15.5% of those are military or have a dual use. The UK Government have invested in OneWeb, which entails 648 satellites, and there has been a £5 billion investment over 10 years in the Skynet 6 programme, led by Airbus.

Nik Smith first, please—what is your assessment of the health of the UK space industry?

Nik Smith: I think most people would recognise that the industry has been strong for quite some time, and it has continued to grow. The UK Space Agency does a biannual health assessment of the industry, and each year we see some growth. Even during the covid pandemic we have seen continued strong growth in the sector. It is fair to say that it is a strong sector. It has a very high level of productivity—I am sure Nick Shave has those figures to hand—per employee. It has very strong returns from the UK prosperity perspective. However, I would caution against complacency in that growth. I will use a line that was included in one of our members' pieces of evidence. It was submitted by Airbus and it talked about a "fragile space ecosystem", which is quite a good descriptor.

What we have across the sector, in my assessment, is some very strong expertise in particular mission areas. There is a risk, though, that if we do not find a way of continually investing in the sector, we could end up atrophying. I say that because, of course, it is not just a national sector. It is an international global sector, and what we are seeing internationally is that most other nations see the sector in the same way as we do, which is that it is strategic, and they are therefore spending a lot of investment in trying to grow and sustain their own industrial bases. The challenge we have is that if we do not match that, our own domestic space sector will struggle in the face of that global competition.

So I would say there is huge potential for our sector. It has endured incredibly well, but there is still huge potential there that we have an opportunity to tap into.

Nick Shave: I agree very much with what Nik said. I think the figures are slightly higher than you mentioned—£16.4 billion in the last assessment in terms of the industry turnover. I agree that it is quite a fragile industry. Compared with some of our peer nations, we are not spending as much, but significantly less. We spend less on space than Italy does, for example. That includes both the civil and military spend. A very important point is to look at the financial aspects of the sector, but private investment will follow Government investment. We need to really consider that as we consider how strategic space is going forward.

So, yes, it is a growing sector, but it has been impacted by covid. We need to ensure that we consider it and give it the level of importance, strategically, that it has and that other nations take on space.

Q45 **Sarah Atherton:** Do you think the sector has grown stronger or has the potential to grow stronger since the defence Command Paper established a new programme for space? I will quickly outline it: a national space operations centre, a satellite constellation and a supporting military digital backbone, a space academy, and of course R&D, with the prospect of launching our own satellites in 2020? Is that a good or a bad sign? Has it made an impact on the ground?

Nik Smith: I think, again, just reflecting on what has come out from a lot of the submissions from our members, there has been a welcome recognition of the fact that these things have been articulated. Everyone within the industry is very happy to see a clear articulation of some of these programme ambitions. Everyone recognises that, as a Department of Government, the MoD has a key role in being an anchor customer for the sector. These programmes we are talking about have the opportunity to really stimulate some significant growth, and that is incredibly important. However, to paraphrase, what we have seen coming through from our membership is a recognition, with the level of stated ambition that has been put out by Government, not only in economic terms but for some of these programmes, that the investment that is articulated in the IR and Command Paper possibly does not go far enough for us to deliver against some of those very key national ambitions, both economic and from an operational capability perspective.

Q46 **Sarah Atherton:** Do you have concerns, when we look at investment, about foreign involvement?

Nick Shave: We do need to look at the sovereign needs, if you like, for our space sector, where we need to be able to have a level of control and, as MoD phrases it, freedom of action in decision making. Space is like any other domain. We need a certain level of sovereignty. Recently, the MoD has developed an approach called assured capability, which is very welcome in the sector. We have contributed to that, as UKspace, reviewing MoD's proposals. That helps to define that not everything needs to be built in the UK, but we need some core, central parts of the systems to be built and designed in the UK to retain that control over the space system. For example, the communications linked to the space craft—to control that—and the encryption devices need to be built in the UK.

Q47 **Sarah Atherton:** So do you think that the National Security and Investment Act will protect UK investment and the UK space industry?

Nik Smith: Absolutely. I think we would all welcome the need to provide certain safeguards around that. Back to Nick's point, I think there are some key areas of space capability that need to remain sovereign, for the reasons that Nick outlined: for security, and for operational advantage and freedom of action. There are also, quite frankly, other areas where it is important because it is good for prosperity; in other words, that is where the high-value jobs are. Separate to that operational/security need, there is also a requirement to say, "These parts of the space infrastructure are those that deliver the most prosperity and economic return, and we, as a nation, should find a way of trying to protect those as well."

UKspace put together a submission on the NSI directly. One of the things that came out of it was that I think we would welcome it but, equally, back to Nick's point, we have to be very careful that we do not set that bar to a point where it becomes punitive. We have to make sure that the right level of analysis is done to make sure that, when we apply the regulations, we do not diminish some of the opportunity that is there as well to get some inward investment.

Q48 **Chair:** Can I just explore a couple of those areas a little further? You mentioned Italy as being perhaps a yardstick—an interesting comparator—to say that we are falling behind that country in our investments. Can you spell out very quickly who our other peer competitors are? What are Germany and France doing? I think there is an expectation that the United States leads internationally on this, followed probably by Russia, maybe with China moving up very fast indeed. There is then another tier of countries. Where do we sit there?

Nick Shave: It is an interesting debate, which we think about a lot in the space sector. Personally, I would put the UK at tier 3, because Russia, China and the US, as you said, Chair, are really at the top level. Then we have a tier that includes France, Germany and Japan, with Italy on the edge.

Q49 **Chair:** United Arab Emirates?

Nick Shave: They're coming up fast, particularly on the science side. They have a mission to Mars going on at the moment. Then, in terms of spend, there is the next tier, which is where we sit at the moment in terms of overall investment in space.

Q50 **Chair:** So with all the hullabaloo about us launching rockets from Newquay, Scotland and elsewhere, we have to keep in mind where we sit with other countries. We are not doing as much as we could do. Would that be your polite message?

Nick Shave: It would be. I think we have benefited very much over many years from a strong collaboration, particularly with the US, in terms of observation—in the military term, intelligence, surveillance, reconnaissance. We receive a lot of data from the US, so we do not need, or have decided so far not to invest in, our own system in that area. As you mentioned in terms of the defence Command Paper, the sector is very encouraged that we are now looking at committing to an ISR constellation from the MoD. That is an excellent development that can also give back some capability to our allies, like the US.

Chair: We are just about to come on to the leadership of Government in a second, but for the benefit of the Committee could you summarise simply? When we talk about the space industry, can it be broken down into lower orbit, higher orbit, size of satellite and ground capability? Are there some helpful areas that can allow us to understand where we excel and where we need to do better?

Mrs Lewell-Buck: May I come in now?

Chair: Is it pertinent?

Mrs Lewell-Buck: Yes, it is.

Chair: Then absolutely.

Q51 **Mrs Lewell-Buck:** Hi Nick. Hi Nik. I am not sure who this is directed at. It is probably for you, Nick Shave. You said that you would have us at tier

3. What would we need to do to move up those tiers—and can we, or are we too far behind to do so?

Nick Shave: We are very much, as you would imagine, looking forward to the national space strategy.

Chair: As are we.

Nick Shave: It is close to publication now, we hear. The paramount thing is to respond to that with a national space programme. We have been very dependent on ESA from the civil side over the last 30 years. That is a decision that was made many years ago, and what we need to do now to start to move up the tiers is build a national space programme. The space Command Paper is a great first move in the MoD space, but we now also need to see that in the civil area. With programmes such as PNT—position, navigation, timing—coming out of Galileo, should we be looking at a national system for that? And the earth observation, with its impact on climate and so on? We need to get the balance right between investment in ESA and a national programme, and that will start to take us up the tier levels.

Q52 **Mrs Lewell-Buck:** Is it realistic? Obviously if we are trying to move up, all those other tiers will be advancing as well, so do you think we will always be trying to play catch-up or is it realistic that we could move forward?

Nick Shave: To answer the Chairman's question as well, we have some strengths in the sector. Telecommunications and satellite communications are very strong. We have some world-leading operators here in the UK, such as Inmarsat, and manufacturers such as Airbus and others—Thales Alenia Space UK—that are all members of UKspace. That is an area we excel in. The decision was made many years ago to invest strategically in telecommunications, and that has borne great fruit. We are now generating significant export revenues through telecommunications, with about 25% of telecommunications payloads built here in the UK. We have proven we can do it, and we now need to look at the next area to invest in to create that world-leading capability.

Q53 **Chair:** Just to clarify the sectoral differences, would it be right to say that, from a British perspective, we specialise in the smaller satellites, rather than huge satellites? Is that where there is a forte?

Nick Shave: Yes, we have been a world leader in small satellites. Others are catching up fast because the technology and capability—how much processing power you can put on to a small satellite, for example—is ever-increasing. Many other countries are now manufacturing smaller satellites, particularly the US and China. We were a world leader, I would say, and we still have good capability. We have a hub up in Glasgow where companies such as AAC Clyde Space and Spire—again, members of UKspace—are building small and even nanosatellites, the size probably of a microwave. That is the sort of size we are good at here in the UK, as well.

Nik Smith: A better way of defining the sector is to talk about upstream and downstream, which is how we would generally delineate between the two, with manufacturing and launching being upstream, which in many ways is the development of the infrastructure—that is, building the satellites then launching them. But the revenue and prosperity come from what you do with them and their application, from an economic perspective. From a military perspective, clearly, it is the operational capability that is delivered, but from an economic perspective it is what you do in the downstream. To be fair, we have some strength, as Nick outlined, in all classes of satellite in the UK, but the real revenue generation will come in trying to stimulate more of that downstream element, because once you create the downstream you create the demand for the upstream.

In terms of the challenge for us, to go back to that question about how we come up through the tiers, what I would say is that it is very easy on tiers to get focused on capabilities, but there are a number of elements and ways of trying to work that out. One thing we would need to look for is a way of building more resilience and capacity into our industrial base. We need to provide more diversity in that industrial base, and the reality is we need a balance. We need the right balance between the upstream and downstream because they become co-existent—you create the ecosystem and they feed off each other. When we build that, that is when we will have the industrial capacity both to respond to the demands of Government but create the jobs and find ourselves climbing those tiers.

Chair: We will explore that a little later, but thank you for raising that. Let's now turn to Government and the leadership we are getting there.

Q54 **John Spellar:** You talked about the engagement of Government, but in a way, surely, that requires a focal point to make those evaluations. Would you say that recent machinery of government changes have clarified where responsibility for space policy and operations now lies in Whitehall and the MoD?

Nick Shave: We are encouraged by the recent developments. Even at the top level, the National Space Council chaired by the PM was an excellent development. To have that decision making, awareness and interest at the top level is really welcome. We have, through the space landscape review, what has been called the space quad, where we have BEIS, the space directorate in the MoD, the UK Space Agency on the civil side, and space command. Those are the four, but space touches 13 other Government Departments in some way or form, so that overarching governance is critical to ensure that we do not get diversification and division, but that we build on the strengths and get the economics of scale to build some of the systems we need. We should try to share capabilities across defence and civil wherever we can, and I think that could be the key basis of our national space programme going forward.

Q55 **John Spellar:** On this policy, where inside Government is the centre of gravity? Who is your main contact—your go-to person or office where you go to resolve issues and to cut through?

Nick Shave: If it is a civil issue, the BEIS space directorate, led by a two-star; if it is an MoD issue, it is primarily the director, space—a two-star level in MoD. There is no person right at the top. Okay, we have the National Space Council, which reports up to the top, but we have been advocating for a Minister for space—a single role—

Chair: A port of call.

Nick Shave: Yes, so that all of the 13 Departments that play into this—Transport, Defra and many others—have a single point there.

Q56 **John Spellar:** That is the orchestra; where should the conductor be?

Nick Shave: At the National Space Council level, so that the PM—

Q57 **Chair:** Or we could be saying that the Whitehall traditional construct is out of date. It does not actually incorporate a register, data and cyber and space as new entities; instead, we are trying to funnel them into an old construct, which is obsolete. Is that fair?

Nick Shave: Yes, in some respects I would argue that we need to think about space in the strategic context that it is. Some other nations do that: for example, Japan has defence and civil bodies, but it has a Cabinet-level position that is responsible for space. I think that is what we should do.

Chair: This is where security is blurring between MoD, defence and security, and the civil as well. The vulnerability is shared.

Q58 **Mr Francois:** If you had a Minister for space, where should that Minister live? In BEIS? In the MoD? In the Cabinet Office? Somewhere else?

Nick Shave: I would argue for the Cabinet Office, so it is overarching. That is where the central point should be, because space touches so many different parts of Government, of society and of our defence.

Nik Smith: From our members' perspective, you have touched on a very significant issue. For most of our members, engagement with Government and understanding who is primus inter pares at which point has always been a challenge. That is partly because of the response to some of the current challenges, with the MoD setting up its directorate and now the decision with BEIS. That has been an ongoing challenge. I back Nick's position. We all recognise the sector and the demands of Government for space are at an inflexion point, and we as a nation need to find a way to respond to that. We have probably a couple of generations ahead of us in which to set in place a strong strategy and policy statement that allows us to capitalise on this, to build and to prepare for what is ahead.

Q59 **Mr Francois:** Let me give you a practical example of the problem. The European Commission kicked us out of the most sensitive parts of Galileo, despite the fact that we invested £1 billion of taxpayers' money in it. Thank you very much to the Commission for that. Then, the UK decides that we may develop a unilateral programme à la Global Britain and all the rest of it. In simple terms, BEIS said that was a great idea if the MoD would pay for it, and the MoD said much the same, and it was

generally costed at somewhere between £3 billion and £5 billion. So everyone pointed at everyone else and said, "This is a great idea, but you're paying for it," didn't they?

Nik Smith: And that is why, where this has happened previously—you have mentioned cyber, and I think the national response to cyber was to put it in the Cabinet Office, at least until it established and created some sort of normalisation. I think many people would suggest there were some benefits in doing that, especially at these early stages, where you need very focused support for the next couple of generations, to see this through. It could be that it normalises. It could be that it becomes business as usual and therefore it sits within a different Department. But I think that, with the challenge ahead of us, some sort of central leadership is important.

Q60 **Mr Francois:** I'll just ask this quickly and then hand back. Some people have said, particularly in the light of the events of the last few weeks, that we need a unilateral system, because we couldn't rely on the Americans to continue to provide us with the GPS signal in a crisis. I think it's fair to say that if they started turning off GPS, we would be the last people they turned it off to, before they turned their own off. So how realistic is it that we will develop, in effect, a UK system for this, or is that really a pipe dream?

Nik Smith: Nick, do you want to take this?

Nick Shave: I don't think it's a pipe dream. We have the capability here to build it. We have done definition work over the last two to four years, and we can do it; we have capability.

Q61 **Mr Francois:** Right, but where is the £3 billion to £5 billion going to come from?

Nick Shave: I think that's a good question.

Mr Francois: Thank you very much.

Nick Shave: Would it really be £3 billion to £5 billion? There are ways we can do it more efficiently, I would argue. There are some capabilities that some of our operators have today that could gradually build up a system that we could also give back to our allies, to give some resilience.

Q62 **Mr Francois:** Do you think we will get a yes or no on this programme, whatever it's called—it doesn't even have a name yet—in the national space strategy when we finally get it?

Nick Shave: I would love to have that answer, but I don't think we will. Government does need to come to a decision, I would argue. There is a PNT strategy that has been built by and endorsed by the Cabinet Office. It explains all the use cases. There are well over 100 use cases. Half of them need a space-based system. So I think it is incumbent on Government to make a decision soon.

Nik Smith: One thing I would say—it came up very clearly in all the evidence from our members—is that it is that kind of programme and that scale of programme that is required for the national programme that Nick talked about. If we want to try to deliver the industrial base and the economic growth we are talking about, I'm afraid it is that scale of programme we need. We talk about moving up the tiers; they are the levels of ambition we should be aiming for.

Q63 **Mr Francois:** If you had to bet your last 10 quid that this was going to happen or not, where would you bet it?

Nik Smith: Are you putting a time limit on that—is it going to happen in the next five or 10 years—or just asking in general?

Q64 **Mr Francois:** Ten years—yes or no?

Nik Smith: I think there will be some level of capability the UK will look to invest in. Whether it's of the scale that I think the industry is demanding is a different question.

Chair: John, were there any more questions on the Government side or are you okay?

Q65 **John Spellar:** Well, Nik Smith just mentioned the role of the Cabinet Office. Do you assess that they have either the capacity or the appetite for that?

Nik Smith: I wouldn't know for sure. I will make a statement as to what we are seeing across our membership. I think there is a recognition that, across Government, there possibly isn't the level of expertise in this sector that is required. So I would imagine that if they were going to do it, they would need to grow some of that expertise.

Nick Shave: It is important that Government needs to grow the expertise. I mentioned the outsourcing, if you like, to ESA that we have done for the last 30 years. That has meant that there are some good pockets of capability inside Government, in different areas, or in Government agencies like UKRI. But to run a big space programme as we have just discussed—to technically define it, to acquire it from the different places and to then follow it through to mission, with all the testing required and so on—is quite an important capability. ESA has 1,000 people in Holland doing exactly this. I am not saying we need that, but we need some capability on that scale, that level.

Q66 **Chair:** We are getting the picture that there could be better co-ordination in Government and stronger leadership. With that would perhaps come more of a drive to get the finances that we need to invest. Would you agree with that thesis?

Nick Shave: Yes.

Q67 **Chair:** Okay. Were that to come, you would then of course need the skillsets. We touched on this earlier. Are there skills gaps in this very fast-changing area of technology? From a commercial and military

perspective, what should we be doing to fill those gaps?

Nick Shave: Yes, there are gaps in the skills arrangement. The industrial funding over the last few years—we had a lot of money going into Galileo, as was mentioned. It was about £200 million a year. That was coming back into the UK. We want more work, actually, because we are very good at what we do in some areas of that. For industry to maintain that capability, it needs more noble work. That is one angle.

In terms of building skills, Space Command stands up on the defence side. We start to develop capability together. Cross-posting could be a good way to develop skills—people from the MoD could move over to industry, and vice versa. That is something that we in the industry would welcome and support. A national space academy has been a proposal as well, in order to support Government, industrial and academic development of skills. That is a really important one. At the lower levels, it is about getting space more into the national curriculum, so that we start early and build that through. It is already an important inspirational aspect inside schools, but we can start to build the engineering side early as well. So there are moves to improve the skills gap.

Q68 **Chair:** Looking at universities and so forth, are we encouraging enough potential engineers to sign up to space-related courses?

Nick Shave: I think that, in general, we are doing so, to a degree. But based on the ambition that we are going to see in the national space strategy that we hope to see, we need to be planning in the medium term—the next few years—to invest further in that. That is where we will need some sustained strategic actions, like a proper national space academy, in order to build those skills.

Q69 **Chair:** Which universities are pioneering this the best, or the most effectively, at the moment?

Nick Shave: Leicester is very strong; there is a new space park being developed in Leicester. Guildford and Southampton are strong in certain areas. There is Strathclyde in Glasgow. There are different specialisations in different parts of the sector.

Q70 **Chair:** Are they getting Government support for the programmes there, or is it very much left to the universities?

Nick Shave: They are getting Government support. I have heard about lots of stresses and strains around the one-year funding cycle, which has really hit universities in a difficult way.

Q71 **Chair:** Thank you. Can we now turn to threats? This really comes more into the domain of what we are looking at. Space is now proving to be the ultimate high ground. If you dominate space, you can effectively control things—you can control activities underneath. Can you summarise what the biggest threats are and how vulnerable we are in the UK space sector, given the threats that are emerging from other countries?

Nik Smith: You can characterise it in a number of ways. Clearly, there is increasing talk about threats to the systems themselves in orbit and in space, and we are seeing that well articulated through a number of open source reports. What is interesting is that it is becoming far more part of an open messaging and narrative about the potential direct threats from other nations to our space assets because of the dependency that we have on those systems. In fact, if you look through the evidence coming through our members, there are a number of really good examples of what those look like. We need to find a way of being cognisant of those. In general, the feeling among most of the members is that the way you respond to that is through burden sharing with allies. You build up far more comprehensive enterprise responses to these threats, and you work with allies to put in place a strong deterrent posture, which is then your mitigation against some of these threats. I think that comes through.

If you are going to characterise the likelihood of the threat, I think everyone recognises that there is a lot of focus, clearly, on the space systems themselves, be that through any kind of soft or hard attack on those systems—lasing or electromagnetic attack, or even direct ascent weapons. That is part of it, but the biggest likelihood is always going to be on the ground. The thing to remember about space systems is that you have to make sure that you build in a high degree of protection or resilience throughout the entire system. To protect the system, you need a system-wide view of it, which again takes a certain amount of industrial skillset to be able to respond at that level. That is one characterisation of the threats. There are lots of open source articulations that are very accurate about where those threats are.

Equally, there are hazards. We need to remember that space systems can be at threat not only from adversaries but from the natural hazards of operating in that environment. Solar activity is a classic example.

That is one part of it, but you also mentioned the threat to the sector overall. I would say that we clearly have a need to respond to those threats from a national interest perspective and to find a way to offer a deterrent posture to our adversaries. Equally, we need to be mindful of the fact that, if we want to have a level of industrial base that will be here for a long time, so that in 10, 15 or 20 years' time we have that industrial capacity here to be able to deliver the systems that will be fit for the future, we need to find a way of having a strong national programme to underpin that, as we said before.

One of my concerns is that that is an area that we possibly have not focused on yet—the threat that our industrial base over the years atrophies. We have seen it in other critical mission areas for MoD where, over time, the skills capabilities have atrophied and when we have come to try to replace the systems, we have not had the industrial base. That is a key threat and, as we have said before, we are seeing other nations investing heavily and subsidising their sectors to ensure that they are there for the long term. That is how I would characterise it. Nick?

Nick Shave: To pick up on that last point about other countries subsidising, one of the biggest issues at play is geopolitical. China is building up a strong military, civil and now more commercial space programme. It is very advanced. The threat is increasing from the Chinese. I would even phrase it as a potential Huawei-type situation, if the Chinese continue to invest, particularly commercially. They are building a 13,000-satellite mega-constellation funded by their Government. We need to be careful not to fall into the situation that we had with Huawei. We need a co-ordinated Western response on this, working closely with our allies.

Q72 **Mr Francois:** Which taxes should we raise to subsidise that?

Nick Shave: Good question.

Chair: I think that is probably beyond—

Mr Francois: I am only being half-flippant, because if you mean subsidy, you mean taxpayers' money. This week, we are about to have some very lively debate about raising taxes—let us not go down that rabbit hole now, but you appreciate the point: when you say "subsidy", you mean raising taxes to subsidise an industry, don't you?

Nik Smith: These are standard policies. From a membership perspective, what we are seeing is a level of policy ambition laid out by Government, while we in industry stand here ready to respond to that policy ambition. I understand what you are saying, but we are here ready to inwardly invest and match that. That is what we are seeing from a lot of our membership. The question is, is that the level of ambition that the Government have? That is a policy decision that has to be made. I would say that the view is that, if we realise the level of potential within the sector, we start to deliver prosperity in the longer term. That is one of the decisions that needs to be made: do we invest now for that prosperity benefit in the longer term? When we look at the strategic sectors and the strategic industrial opportunities, I think we recognise that space really has the possibility for us to be one of the key, long-term, strategic-delivery industrial bases. That is a policy decision that needs to be made.

Mr Francois: I was just making the point that every industry would like to be subsidised.

Nik Smith: Absolutely.

Q73 **Chair:** Just to finish on the threats, because this is important from an MoD perspective, you touched on the kinetic and the non-kinetic. There is an expectation that, were there to be some form of large-scale attack, it would start in space, because that would blind your opponent, in the same way that we see cyber-attacks taking place at the start of conflict—Georgia was a great example. First, how much has our industry been affected in some way or other by attacks? For example, we hear of hacking taking place regularly here on terrestrial earth. In your view, how much of the satellite industry is affected by interference of some form that you cannot identify? Problems have happened; you can't put your

finger on it; it potentially could be interference by a hostile state.

Nick Shave: We have seen a number of satellite operators that own satellites—not manufacturers here in the UK—being affected by intentional interference. We have worked with the MoD to co-ordinate how we respond to that. We have ways and mechanisms now.

Q74 **Chair:** But we are not hearing about it as much as we would with, say, a cyber-attack on a business. We don't hear so much about it. Should we be reporting more openly when these attacks take place in space?

Nick Shave: I think yes. We need to raise awareness and correctly co-ordinate the response. You need to attribute first, and that is a function in itself, and you need proper space-domain awareness to do that. Through the defence Command Paper, we have seen plans for a good space-domain awareness programme. That is really important, so that we can work out who is the aggressor, or whether it is unintentional interference. That is really important to move forward.

We should be talking about this more. It was good to see Air Vice Marshal Harvey Smyth, Director Space, talking about some nefarious activities that Russia did last year, when he publicly announced that and called it out, and co-ordinated closely with our US allies.

Q75 **Chair:** To end on this, the ability of China, for example, to launch satellites that can orbit other satellites—is that something that you as an industry are now very conscious and aware of? Or is this still something that is simply speculation in the military papers?

Nick Shave: We are very aware of that.

Q76 **Chair:** You are aware of that. You see that in your daily activities in what you are doing?

Nick Shave: It is certainly a threat that we need to address.

Chair: That is very helpful. Sarah, did you want to come in?

Q77 **Sarah Atherton:** The Chief of Defence Staff has said that you need "to dominate the domain of space" in order to fight a modern battle. Is the UK dominating, or at least protecting, our interest in space quickly enough, if there were a modern battle soon?

Nik Smith: Again, I will do my best to reflect our members' views. The general perception across members, from those who have got experience in space, is that they are probably not doing enough right now. I think that probably comes through in what we have seen in the IR and the Command Paper. There is a recognition that the UK is probably going to have to invest in some of its capabilities to respond to that threat.

Equally, of course, there is also a recognition that the way to do that is not unilaterally but as part of a coalition. There are investments. I think of the MoD submission into this evidence call. What they are doing, through the coalition space operations framework and that initiative, and what they are doing through Operation Olympic Defender, is a way of putting in place a

strong coalition that allows them to operate in the domain, as they need to.

Q78 **Sarah Atherton:** How far do you think China is from having some sort of anti-satellite missile that could take out a classified military satellite in geostationary orbit?

Nick Shave: It is probably very close, if not having the capability now.

Q79 **Chair:** They took out their own satellite, didn't they? They have already proved that from the ground.

Nick Shave: At low Earth orbit, yes.

Q80 **Chair:** And the Russians are now developing their MiG fighters to fire from altitude to take out satellites as well.

Nik Smith: Some of that technology was demonstrated in the '80s, some time ago. This is not new technology. I am sure in classified areas there is a better answer for you but, from our industrial perspective, we would imagine that is capable—not easy, but possible.

Q81 **Chair:** Do you see a situation in which we would be sending up satellites whose only job is to monitor other satellites, from a neutral perspective, to be able to recognise what activity is taking place up there?

Nik Smith: I represent our security and defence committee. Many of our members clearly are suppliers to different defences across the world. When you take a mission view, as many of those companies do, what they recognise is that if you want to protect one high-value asset then you put a protection layer around it. Sometimes that is an ISR group and sometimes that is some sort of sentry view. An analogy I use—this might be in one of the MoD papers—is that if you think about a very high-grade satellite doing a strategic mission like it is an aircraft carrier, it is a high-value asset, and therefore you build a carrier group around it. If you are going to put in place the level of layered defence that you need for some of these assets, then that is the mindset you should be taking forward. I would say that is the mindset that we are seeing from a number of nations.

Chair: Interesting.

Q82 **Mrs Lewell-Buck:** You will know that the Government plan to invest in—this is a tongue twister—space situational awareness in intelligence, surveillance and reconnaissance. For both, we currently rely on allies in the commercial sector. Can the Government actually do both, and can they do both well? If not, what should they be prioritising?

Nick Shave: Space situational awareness and ISR—that is the question? Should we invest in both?

Mrs Lewell-Buck: Yes, or what should come first—what should we prioritise?

Nick Shave: As I mentioned earlier, the space domain awareness or space situational awareness—what is going on in space—should come first, I would argue, because you need to be able to know what is going on and attribute any problems first. However, I would not say that it is a question of which one do we take first or second; I think they both need to come pretty much at the same time. We can invest in those two programmes. That is what the Command Paper has proposed: a specific observation constellation that provides support to MoD, and also provides support to our allies, because we have built some niche capabilities that they do not have at the moment. That would be the sweet spot for that programme.

Nik Smith: The UK does currently have both capabilities. Airbus's submission talks about their involvement with SSTL, which is bringing the Artemis programme: the delivery of an early-stage ISR system, allowing the MoD to become a more intelligent customer. That is the way they are investing at the moment. That is a really important way of investing, as you build up some of that capability and expertise. Then through Fylingdales—a capability in which Serco is a key partner in delivering—there is some space situational awareness capability provided. We already have some nascent skillsets.

The question is: how much more do we invest to grow those? Where do we want to get to? More than that—and this is Nick's point and comes out in much of the evidence—how do we work with our allies to make sure that we deliver the piece of capability that either they cannot deliver or we are better placed to deliver, and therefore we become a crucial partner? There are a number of mission areas that the MoD currently have where we do that, and we do it incredibly effectively—we work incredibly effectively as an alliance. Space has to be the same way. The question is: which part of SSA do we do within that alliance? It is the same with ISR.

Q83 **John Spellar:** The MoD have said that they intend to use "flexible and innovative procurement" to increase the speed at which new capabilities can be delivered. Have you seen any evidence of this?

Nick Shave: I would say that in the R&D area we have certainly seen some positive movement. I think DSTL is doing a good job trying to get capability and early prototype testing-type missions moving. We have even seen procurement actions where they have given contracts on that day—very small contracts—when a number of SME's have presented. That is really encouraging. On the other hand, the larger MoD programmes in the space domain are still subject to the CADMID lifecycle, which does not feel appropriate sometimes given the fast-moving nature of space technology. We look forward to some improvements, and we are hearing that there could be some improvements coming.

Q84 **John Spellar:** What would you suggest that they do? This is nudge theory.

Nick Shave: It is important to build up capability, and to do some technology demonstration earlier, so that we can de-risk some of the key aspects of space programmes faster. The MoD, and the Government in

general, need to take a few more risks on some of those things and not just wait for the next level of approval—which seems to take so long within the MoD

Q85 **John Spellar:** Are there lessons to be learned from other countries, the competitors and sometimes collaborators that you have mentioned, for example the "constructive disruptor" approach of the US Space Development Agency?

Nik Smith: The challenge that we face in space is the same across a number of different capability areas. The MoD, like a lot of Government Departments, has been challenged by, for anything that is high technology, how to put in place an acquisition or procurement process that keeps up with that change.

When it comes to large-scale capital programmes, we would all like to see some improvement but recognise that it has to be a very protracted approach to that for the scale that we are talking about. The question is: how do you find a new way of applying sourcing and procurement for some of these smaller fast-spin opportunities? That is really where the Space Development Agency comes in.

The way they have done that, as far as I can tell, is by taking that procurement out of the standard procurement agencies, putting it under a pure R&D bubble and then laying out a very clear strategy of what they are going to do over the next 10 years. They have said, "This is our plan for the next 10 years, and that is the national space development architecture." They have identified some key mission areas that they want to see technological development in, and they are prioritising schedule above programme and cost. That means that every two years they have a new tranche done. That is quite a mindset shift: a move away from cost and programme performance as your main drivers and putting it on to schedule. That is how you start getting this incremental development of both expertise and capability.

There is something to be learned from that approach, but of course you need to accept that you are taking a risk in some sort of cost drivers. However, for the speed of how they want to get this development done, and at the scale—because this is the R&D stuff—I think that there is a lot to learn from there.

Q86 **Mrs Lewell-Buck:** A final question from me. Has the delay in the national space strategy impacted much on industry?

Nick Shave: I think we have been waiting for it for some time. The most direct impact, I would say, is that investment decisions by industry have been delayed. We need to see where the ambition is and where the priority areas are from a Government perspective, so that we can invest our own R&D in the right areas, so that we are meeting the capability need and creating the economic benefit going forwards. Lots of the things that the Government have invested in have generated significant returns later on, in terms of multiples of investment. As Nik said earlier, we are very good at that end-to-end service delivery of space systems, where we

really see the export benefit coming in later. Coming back to the question, I think the delay has not been helpful, and it is mainly on those investment decisions.

Q87 **Mrs Lewell-Buck:** Have the Government engaged with you throughout the development of the strategy? I note that you said that you are not clear on what the priorities are, so that would indicate that they perhaps have not engaged as well as they should have done. Is that a fair assumption to make?

Nick Shave: No, I would say that they have engaged with us, through UKspace and other organisations such as ADS, which we work closely with, and techUK, for example—trade bodies. We have had good engagement with both MoD and BEIS on space strategy. We gave input and we saw early drafts, but we haven't seen the final outcome. We are looking forward to seeing that, so we can really see where the priorities are.

Mrs Lewell-Buck: You have seen the early drafts. Can you give us some highlights? We haven't, Chair. Do you fancy sharing?

Chair: Thank you, Emma. My final question is to do with the—

Mrs Lewell-Buck: That's a no, then.

Q88 **Chair:** We are more than happy to receive anything that you have, and we are happy to publicise it as well. That would encourage the Government to move forward.

My final question, from a legislative perspective, is whether there is anything holding business back. I understand that both Elon Musk and Richard Branson are keen to start launching their vehicles from the UK but are prevented at the moment because there is some insurance legislation that is yet to go through its cycle. Is this ringing any bells? Are you familiar with this?

Nik Smith: On the launch regulations, I think a lot of work has been done. We have a number of members in UKspace who are involved in some of those grants for launching, and actually outside of the grants, as well, they are going to set up private space ports or launching operations.

Regulation was always a concern. I think we have seen huge progress in that recently, with the agreement of the legislation. We have also now approved the CAA as the regulator, so I think that is moving at pace. I think that regulation will be available in time for when people want to launch.

Q89 **Chair:** It is not holding them back at the moment? Sir David Morris, who leads one of our space APPGs here, made the case, very fervently, that we need to hurry up and get the SIs through Government, because otherwise we will lose business.

Normally, when we speak of the Navy, it is Belgium that we are compared to—I would hate to think that our space industry is now compared with Italy, from that perspective. I would want us to move up a

couple of gears. I would hate to see us not have the legislation in place preventing launches from UK soil.

Nik Smith: Looking across our members, I would think that the one that is closest to launching would be Virgin Orbit, out of Cornwall. I would imagine that they are the ones that are probably on the critical path to getting their regulation through, so I can imagine that they are keen to ensure that there is no delay in the availability of that licensing regulation so that they can license and launch. I would imagine that they do have some concerns. For the others that are looking at this, as long as they meet the timelines that are laid out, we should be okay to have those licences in place.

Chair: Thank you. If there is nothing further at this point, I will say thank you very much indeed to Nick Shave and Nik Smith, representing the trade sector for space. We are very appreciative of your time this afternoon. I would invite you to take a step back, but please stay in the room to hear our next two panellists.

Examination of witnesses

Witnesses: Anita Bernie and Richard Franklin.

Q90 **Chair:** I am pleased to welcome Anita Bernie, from KISPE Space Systems, who is from one extreme of the space industry, from a smaller business, and Richard Franklin, who is representing Airbus. I am very grateful for your time this afternoon.

Anita, I will start with you. You have just heard that first session. Do you have any reflections on the initial discussion? Would you agree with the representations from the trade side in where Britain is in competing in the very competitive environment of space?

Anita Bernie: I would echo a lot of what both Nicks talked about. On our position globally, if you look at a table of the top 20 space spending nations, we are definitely in the bottom half of that table. I know we have ambitions to be mid-tier, and the integrated review certainly didn't claim that we were anywhere near the top. We are not a dominant player, but we have ambitions to go further.

Q91 **Chair:** Could you elaborate on what you do in this wider sector? I will invite Airbus to do the same, bearing in mind that they have also taken a lot of their goodies across to France to continue work over there, so what actually happens in the UK compared to elsewhere? Anita, could you go first?

Anita Bernie: I work for a company called KISPE Space. We are a systems engineering, technology, development and programme execution company. We are a start-up with a dozen or so people, based in Farnborough. We work with start-ups, scale-ups and established organisations across the commercial, industrial and Government sectors, supporting them to execute and implement their business plans. A

majority of the staff at KISPE have come from Surrey Satellite Technology Ltd, which is one of the jewels in the crown of the UK. We brought with us that vision and that impetus to continue to change the economics of space.

We work with a lot of commercial customers, and customers from other sectors, who have quite challenging constraints, so we work and partner with teams across the industry to bring together those capabilities. Rather than reinvent the wheel, we would rather collaborate and team with others, then blend those capabilities together to create a best-breed solution for our customers.

Q92 **Chair:** Thank you. I—and I think, some others—have visited the campus town in Guildford. It is very impressive. How much of that effort, down there, has been thanks to Government, and could Government be doing more to advance this even further?

Anita Bernie: I would like to expand it further than just SSTL in Guildford, but I will take that first. Martin Sweeting recently did a study that found that the return on Government investment in some of the programmes there was in the region of 40:1. The Nicks talked collectively—I am talking globally here—about the ESA investment, and I know that on some of the ARTES programmes through the ESA we were seeing returns of at least 7:1, which is far in excess of the general returns, the GVA we are seeing, which is about 2.6 in terms of productivity in the space industry. I think the Government could definitely do more. Coming back to your point, Mr Francois, about who is going to pay for it and where the taxes will come from, it really is about how we invest to generate that prosperity down the line, and that comes back in taxes.

Q93 **Chair:** And it is a growing industry, isn't it? It is clearly advancing and we are getting better at it, so Britain certainly wants to thrive and be a global leader in this area.

Richard, welcome. Airbus is obviously a big organisation, with a UK enterprise and other assets across Europe. I am afraid that there is a cloud over Airbus, from the perspective of Galileo. Surrey Satellite Technology has been mentioned, and the capabilities, efforts and resources, but somehow Britain has ended up being excluded from Galileo, for different reasons. Can you shape what you are doing here in the UK, and how does that work with what is happening on the continent?

Richard Franklin: Thank you, Chair, for the opportunity to speak to the Committee today. As you have said, it is a very exciting moment for space in the UK, and a lot is happening. To put Airbus in context, we are the largest space operator and the third largest defence prime in the UK. To put the space industry in context, the next largest company is SSTL, which we own, and that is one tenth of the size. We have about 3,500 people in space in the UK, and a further 8,000 in aerospace overall, so we are a large player.

Scale is important in space, as it gives us the opportunity to tackle those most difficult problems. There are some of the ESA exploration

programmes and the military programmes. We are the operator of Skynet, and we have done that successfully in partnership with the MoD for 18 years—a number of you have come down to Hawthorn to see that capability. Scale helps in space. Building on the points from the Nicks, we see that Airbus and the UK have world-class capability. Yes, overall there are elements that are missing in the UK, but we manufacture and sell over a third of the world's telecoms satellites in the UK, so we are world-class. Skynet remains a world-class military capability. That is proven each year in tests with the US, through exercises and war games. We do have areas of world-class capability.

Our strategy is all about maintaining that capability, taking that long-term vision to push forward and grow that, and, building on the comments we have just heard, see that investment return. We do see multiples. It is a large ecosystem and over half of Airbus's revenue is spent in the supply chain. That is the same in SSTL. The end of Galileo has had a major impact on SSTL, so we are reshaping that plan, working very much with the MoD and for the export market to see how we reshape and push forward that business.

Chair: We were very grateful for our visit to Skynet. It was fascinating to get a better understanding of what is happening down there. We are very grateful to have both extremes from the space industry represented here today, from the very large to the smaller but very important companies coming through. Let us now turn to the direction of travel and your experience of leadership from the Government.

Q94 **John Spellar:** You will have heard this question when I put it to the previous witnesses. Have recent machinery of Government changes clarified where responsibility for space policy and operations now lies within Whitehall and the MoD?

Richard Franklin: Speaking for myself, it was very positive to see the creation of the space directorate the year before last, and Space Command was formally launched just a month or so ago. That has added a real sense of clarity from the defence perspective. I believe that an overarching position in the Cabinet Office would be good. The space council focus has added a new clarity. Certainly, we have seen a real focus on driving enthusiasm for space, so bringing that focus would make sense.

Q95 **John Spellar:** Is that clarity of policy or clarity of execution?

Richard Franklin: On the military side, I think that we have had that clarity of execution. Have we wanted to do more if budgets were more? Absolutely, and many have. But on the programme that we have been acting, they have been executed well.

Q96 **John Spellar:** What about the civil side?

Richard Franklin: On the civil side, there are fewer programmes. We are a supplier to many customers from the UK. The UK is the heart of much of what we do from a manufacturing perspective. There is a lot of support

from ESA into some of the ARTES-type funding for our science missions, so there has been good dialogue and actually very good progress.

Q97 **John Spellar:** Should that enable us to move from tier 3 to tier 2, or do you even accept the analysis of which tier we are in?

Richard Franklin: In some areas, we have world-class expertise. There are a number of areas. You mentioned ISR—that is an area we are not in at scale. We have the capabilities here in the UK to do it, but we do not have national programmes. A focus on those national programmes would create a larger ecosystem of spin-offs from that and in particular would drive export opportunities.

Q98 **Chair:** So a space strategy would be quite helpful, then, wouldn't it?

Richard Franklin: We await it with interest.

Q99 **John Spellar:** Do you have any indication as to its estimated time of arrival?

Richard Franklin: I think you are as close to that as we are.

Mr Francois: Soon.

Richard Franklin: Hopefully in the coming weeks.

Q100 **Chair:** As you are international—Italy has been mentioned; it is now scored on my mind—can you give us an indication of how we compare from an Airbus perspective with France, Germany and Italy?

Richard Franklin: We are a multinational company—a European company. We have Portsmouth, Stevenage and SSTL as the core sites and then the operational military sites. In France, we have Toulouse. We have processors—one of the key areas at the very heart of our satellites—which are made here in the UK. Our payloads are again here in the UK, so within the Airbus family, we have some of the core parts of manufacture here in the UK and we are really proud of that.

Q101 **Chair:** It is a little bit of an awkward question, but I was trying to lead to asking what France is doing that perhaps we could learn from. Maybe I will politely put it that way.

Richard Franklin: In the larger investments, they are, particularly from an ISR perspective, investing in Earth observation and they have very strong capabilities and a long heritage in that. If you look to Germany, they committed many years ago to say laser was a key area of focus and have supported very significant investments in laser technology, which we here in the UK see as a core part of that future space strategy because it adds a mesh dimension, gives resilience, higher throughput and so on. We mention the space strategy choosing some national programmes and capabilities.

Chair: That we then drive through and push forward.

Richard Franklin: That is what the other nations have done, and the UK needs to follow.

Chair: We look forward to the strategy.

Q102 **Sarah Atherton:** The global space sector is proposed to double over the next few years or so. Have you got any concerns about recruiting the right skill mix of personnel?

Anita Bernie: I think that we all have challenges. We are all feeling the pain of not having sufficient trained and skilled expertise, and I think that was really amplified by Brexit. Before that point, I think we were all accustomed to accessing a European talent pool, and we lost a lot of skilled experts in space back to their home countries. Now we are in this position, at least from an SME perspective, where we seem to be competing for an ever-dwindling supply of skilled and experienced talent.

There is this gap in the talent pipeline that we are trying to fill, and I think the indications are that we need around 30,000 more space experts within the industry. That really needs to happen as well on the military side, on the defence side—particularly because space is a new domain for most. It is unfamiliar for many. We do not have that inherent expertise and knowledge of the domain and the particular characteristics that are quite unique to space.

We need to have that mirrored on the defence side, so that they are intelligent customers, intelligent procurers and know how to define or at least articulate the problems that they want to solve. That can then feed quite well into national programmes because you are starting with, "What is the threat? What is the need?" and then asking industry to be part of solving the problem.

Q103 **Sarah Atherton:** Do you have any suggestions on how to improve recruitment and get the academic establishments on board, and what can the MoD do?

Anita Bernie: It is a difficult one because the pipeline needs to be filled from the bottom. It really does start early. Socialisation is a big factor. STEM has not always been up there as a subject area for young children to be excited by. However, space is cool—that is one of the things that always gets young children excited. It is about building on that enthusiasm for the wonders of space and turning it into capability.

The other thing I would add is that on the defence side in the RAF, for example, you were either going to be a pilot or you were nothing. Until 18 months ago, space was not really seen as a valid career path within the forces. Now that is starting to change. We will start to see a lot more interest from within the armed services; we are seeing that, for example, with the stand-up of Space Command, which is a joint command. We will see the interests and needs of all the domains represented and that will help to drive through some of the demand signal for the types of skills that we need.

Q104 **Chair:** You said that we are missing 30,000 experts. What is the average age of an expert? In other words, how long would it take for us to home-grow these experts ourselves?

Anita Bernie: Gosh—ideally we would like five years of experience. If you bring someone relatively inexperienced into SMEs, you lose your talent density. It takes a lot of effort to bring someone up to the level where they can work and perform independently. Ideally, they would have five years' experience.

On the civil side, the UK Space Agency initiated the SPIN programme. We have seen that as absolutely critical. We want to make sure that KISPE is part of raising the talent bar within the UK, bringing in undergraduates and early-career students—even GCSE students—and giving them some exposure to what it means to work on a space project. They take that back and it augments the academic learning that they are doing in universities. It ensures that they are a bit more ready to perform when they go out into industry after they have graduated.

There is no magic answer to this, unfortunately. It is going to take time.

Q105 **John Spellar:** As in so many other industries, isn't the fundamental paradox that if all the companies keep saying, "We want two years' lab experience to work in the biology industry and five years' experience to work in the space industry", people will not come through into the industry? Then you complain that you have a shortfall.

Anita Bernie: Exactly. That is why we have been supporting and providing paid internships, even though we are only a very small company. We see it as absolutely crucial for the industry and the ecosystem. We are investing.

Q106 **John Spellar:** What do they do in America, France, Germany and other countries?

Anita Bernie: They fund. They have a lot more Government support and investment into training and education than we do here. They just have a much longer-term view—they have been doing this for longer than we have.

Richard Franklin: I just want to add a different perspective as a larger employer. We have apprentice training of people fresh from college and we take part in college training; we have just started with Leicester University an actual degree and college programme. We have graduate programmes as well, taking fresh graduates. We have the scale to allow us to do that, but an SME does not have that luxury.

As we have seen the growth in space, particularly in the last 18 months or two years, Airbus has seen a higher attrition as we lose those experts to the smaller businesses—the start-ups. Because of that requirement for four to five years' experience, we are seeing that increased drain as a need for us to increase our recruitment and training. That is a negative, but also good for the industry. It is a privilege to be able to do that in many ways.

As you mentioned, STEM is key. We have a very large STEM permanent centre in Stevenage, with North Hertfordshire College. It is a mixed approach. It needs to be cool to be in space and it needs to be seen as a credible long-term career—not just here for now, but a long-term career.

Q107 **Sarah Atherton:** As a north-east Wales MP, I know how sought-after your apprenticeships are at the Broughton site. Do you have plans to extend your apprenticeship schemes? You talk about people leaving. What plans does Airbus have to retain your workforce, if you are concerned that they are going to leave? At either end of the Airbus career, what is Airbus going to do?

Richard Franklin: I will talk about the defensive space rather than the commercial at Broughton, if I may, because I am more familiar with that.

A certain level of attrition is good, because people want to advance; otherwise, you end up in a stale organisation. There is a delicate balance. To get the right people takes years of training, as we have said, so you want to retain them. It is about having an exciting work culture and interesting projects. For us, the balance between military, space programmes, in terms of the science exploration, Solar Orbiter and Mars, and the commercial projects allows people to have a full career. For us, that is really the advantage and the need for the UK to have a large prime. We only have one. We have limited budgets, and it is that attraction that allows people to come in and have a long-term career. Without it, people will just dip in and dip out. There are some skills that people can dip it and dip out of, and we need to get better at that.

Colleagues mentioned the partnerships with MoD. As part of the Skynet programme, we have been pushing for many years for co-location, job sharing and job role sharing, so that we increase that SQEP so that it becomes a career. Many of our employees are ex-forces, so there is a long-term career from MoD into Airbus. A full range is required to solve this problem.

Q108 **Mr Francois:** Richard, you mentioned partnership with the MoD. As you know, each year the Government's Infrastructure and Projects Authority audits all the top MoD procurement programmes, and they produce their annual reports in July. They grade them on a traffic-light system—some of them are yours. Of the 36 programmes that they audited, how many were green—in other words, how many were successfully on track for time and cost?

Richard Franklin: I have not looked at the full list, but I assume that you are suggesting not many.

Q109 **Mr Francois:** Literally none—not one. Some of them are yours. The A400M is yours, and it has a tortuous history. But we are doing space today, so we will leave that for another day. What was formerly called Future Beyond Line of Sight is the Skynet replacement—the next generation of satellites—which is yours. How was that rated?

Richard Franklin: I can say that the Skynet 6A—that is the part you are referring to—is on time and on budget under our contract. I don't know about the overall model—that is a separate project.

Q110 **Mr Francois:** It is the same programme. According to the Infrastructure and Projects Authority, they rated it red/amber. Do you know what the definition of red/amber is?

Richard Franklin: I do not.

Q111 **Mr Francois:** Okay, I will read it to you: "Successful delivery of the project is in doubt, with major risks or issues apparent in a number of key areas. Urgent action is needed to address these problems and/or assess whether resolution is feasible." Why is the next-generation Skynet in that mess? For the avoidance of doubt, this is not the Committee's assessment. This is the Government's Infrastructure and Projects Authority. They rated the programme, not us.

Richard Franklin: I understand that. Our contract with Defence Digital for Skynet 6A is on track and on budget.

Q112 **Mr Francois:** Then how do you explain the rating?

Richard Franklin: Because it is a wider programme, which is part of enduring capability and all the other aspects that need taking into account, some of which have not yet come to competition.

Q113 **Mr Francois:** So which of the bits of the wider programme are going wrong?

Richard Franklin: I am not familiar with all of those aspects. I am familiar only with the aspects that are contracted.

Q114 **Mr Francois:** The reason I am dwelling on this is that Ajax was graded red. It is a disaster. We had General Dynamics in here the other week, and we gave them some fairly tough questioning. That is £4 billion of British taxpayers' money probably down the tube. This is a programme worth hundreds and hundreds of millions of pounds. Are you telling the Committee that there is nothing wrong with it? The IPA are saying something different.

Richard Franklin: The Skynet 5 programme today is very successful operationally, with world-class capability and long-term relationships, and it has performed well. The PFI contract comes to an end next August. The constellation itself has capability long beyond the PFI contract life. The MoD has been working to ascertain when you need to replace those assets to maintain the capability. Skynet 6A is a continuation of that capability, and the MoD determined that it needs to be ready for launch by the end of 2025—that is what our contract has. It is on time and on schedule; the manufacturing—the actual metal-cutting—will start in the next couple of weeks. We had Harv Smyth and Space Command all at Stevenage yesterday looking at all those plans and capabilities. Enduring Capability itself, the follow-on programme after 6A—the future after full Skynet—is in discussion and specification. That is what we are strongly recommending a

partnership approach to, so we can maintain UK capability. We believe that fits with the DSIS recommendations on national capability and will allow us to assure that there are no gaps in capability and that it is best value for money.

Q115 **Mr Francois:** So you are mystified at this rating? To paraphrase, it is not cool, so you are mystified by the red/amber rating?

Richard Franklin: Those are your words. For the elements we are involved in—

Q116 **Chair:** Richard, you have heard what Mark said: there is a concern about the rating itself. Maybe we can invite you to read the report itself, place into context your reaction to it, and write back to the Committee with a response.

Richard Franklin: I am happy to do that.

Chair: We will move on. I don't think we are going to gain anything further by discussing it; we are not going to get the details we need today. Is that fair?

Mr Francois: I think having read the report would have been helpful.

Chair: Mark, your points are on the record. Sarah, was there anything else from your side?

Sarah Atherton: No thank you, Chair.

Q117 **Chair:** We will now turn, in the time we have available, to threats. We touched on them before, but from your perspective, have you been subject to any form of threats from adversaries and so forth interested in your technology or capability, or your intellectual property? How have you been affected by the scale of threats that we are conscious exist in space today?

Anita Bernie: On threats to space, there are the natural hazards and a whole range of threats that can impact the entire space domain—spacecraft, launchers, the ground segment and the links in between. They are all vulnerable because we are so reliant on space capability, so they are all subject to threats. As our previous colleagues were saying, they are all vulnerable and there are a number of different ways in which they can be impacted or our access to them can be impacted. I am aware anecdotally of situations that we would rather had not happened, but they did not happen to us, as far as I am aware, at KISPE. Maybe Richard has a different perspective on that.

To come back to the conversation on threats you had earlier, in general the actors who are the riskiest for us to think about are also the ones who want to avoid attribution. As much as there are a lot of overt signals and threats that are opposed and signalled in orbit, I think it is the non-kinetic threats that we need to worry about. Jamming, spoofing and cyber-attacks on the ground are probably the ones we should worry about most. However, they are very difficult to attribute, and that ties in with what the

Nicks were saying about being able to detect those threats when they happen, to deter them and to have resiliency within the system.

Chair: Thank you for that. From Airbus's perspective?

Richard Franklin: You referred to two aspects of threats—the systems and the IP or intellectual property in the businesses. At Airbus, we take security, particularly cyber-security, as one of the highest threats to the business and our business value. There would be nothing worse for us than either losing designs or having our systems hacked, so we have our own cyber-capabilities and that is our highest priority. It is always a threat for any business or entity.

For the space assets themselves, we are working with our customers all the time and many of the commercial advances, which probably happen as rapidly as—if not more rapidly than—in the military domain because of the frequency of change, flow down into the different domains. The ability to resist jamming, beamforming, complexity of processing on the satellites helps us to be more resilient against many of those threats. It is something we are continually evolving and spending R&D to counter.

Q118 **Chair:** Looking at things from a NATO perspective, it seems—from my perspective, certainly, although the Committee may have different views—given what has happened in Afghanistan, there is some head scratching about how we move forward from a collective responsibility, leadership-wise, where the United States intends to go. How can we work together from an international security perspective?

You represent a company that straddles the channel. I touched on Galileo, which was brought up earlier as well. Our adversaries—China and Russia—have only benefited from the absence of Britain participating in this programme, from us not working together, and from the west continually being divided in providing greater security in our telecommunications. Has it been a frustration, from your perspective, that we have been excluded from a project—the Galileo project—that was actually a British entity? It came from Surrey Satellite Technology, and you then took over Surrey Satellite Technology. It has now moved to France, who have excluded Britain from participating in the advancement of that programme. We can buy into it, but we can't be part of that project.

Richard Franklin: It has certainly had a business impact for SSTL. It is not just SSTL; we also had skillsets in our Portsmouth capabilities. I know that some of our competitors, peers and the supply chain have had to lay off or reduce some of those skillsets because there is not the business need for them. To be involved in Galileo now, it is the Europe-based teams. Airbus in France has been successful in being part of future Galileo, in terms of the manufacture of some of the future satellites.

Q119 **Chair:** Did you move some human assets across?

Richard Franklin: No. Very few. Were there some from France and Germany over here already? I couldn't answer specifically. But, on the whole, no, the capabilities were all—

Q120 **Mr Francois:** To follow the Chairman's point, we did invest in it. We invested over £1 billion of British taxpayers' money, and then they kicked us out and they won't give us our money back. That's about right, isn't it?

Richard Franklin: That wasn't my question. The question was on manufacturing—

Mr Francois: No, but I am asking you. That's my question.

Richard Franklin: Did we withdraw? Are we out of Galileo? Yes, that's correct.

Mr Francois: Do you think that is fair?

Richard Franklin: It is really a question for—

Chair: It is a political question. Airbus had to go with the flow.

Q121 **Mr Francois:** No, with respect, Chairman, it is also a taxpayers' question. £1 billion is a phenomenal amount of taxpayers' money. You could do a lot of hip operations or cataracts with £1 billion. You are our major space manufacturer, and you are saying you have no view on that.

Richard Franklin: I am saying that I would love to have carried on manufacturing here in the UK. I would love to do so again on a UK PNT programme.

Q122 **Mr Francois:** But you don't think the decision to kick us out was wrong?

Richard Franklin: A lot of decisions were made around Brexit. It is a complex scenario.

Q123 **Chair:** From the perspective of the GPS capability, when the 7/7 attacks took place here in the UK, the GPS was removed. That was a security perspective. I think for 9/11 we also saw it being closed down. For different reasons, sometimes it is shut down. We don't have our own capability; we lean on another constellation of satellites. The question I have for you from a security perspective is: would it make sense for Skynet, for example, to have one single satellite, in the same way that India does? They have a regional capability that just looks after their country. Would you advocate, from a security perspective, Britain having a regional GPS capability that just looked after the UK in the worst-case scenario that we couldn't have access either to Galileo or to the Americans?

Richard Franklin: The Nicks described a lot of different scenarios for PNT use cases. Clearly, for supporting the UK, PNT is used for many, many systems. It is critical in the timing of networks and for the operation of so many things that we do in our everyday lives, as well as Government and military. The military operate globally, so if you need assurance from a military perspective, you need more of a global capability. If we are more

focused on a UK domestic point, a regional or national coverage capability could be the answer. Again, it comes back to this decision on which problem we are trying to solve and whether it is spaced based. We do need resilience, absolutely.

Q124 **Chair:** My concern is the sort of grey zone of threat. If you take out GPS today for whatever reason—the 24 or 36 satellites—or even if a few of them break, we couldn't even buy a cup of coffee. No transactions could take place, and we would have to suddenly adapt. The economy would collapse for a number of days, I think. Certainly, traffic light systems and other infrastructure would be affected. To have our own capability may be in Britain's interests—to have a satellite that was secure and that looked after UK plc as a back-up.

Richard Franklin: I am a strong believer in resilience. We are becoming ever more reliant on PNT, GPS, Galileo and other timing and precision navigation. As we move forward with automation, it will become even more critical, so from a national infrastructure perspective we have to look at resilience. There are a number of options for how we achieve that, whether it is from the UK or more globally. We can help. We have the skills and the capabilities needed for a space-based capability, and we would like to be actively involved in that.

Q125 **Mr Francois:** I am sure you would love to build it if we could find the £3 billion to £5 billion to pay for it. We have just wasted £4 billion on Ajax. The Committee sometimes gets rather frustrated at all the waste in MoD procurement, because you cannot spend the same pound twice. There is over £100 billion in the report I mentioned, which I humbly suggest bears study, sir, and there are so many cock-ups that we do not have the £3 billion to £5 billion to build your satellite, have we?

Richard Franklin: From a space perspective, as we mentioned, we believe there is a force multiplier on every pound spent, through the system, and what happens in the economy through the supply chain. It is money well invested, from our perspective, but we understand that there are always constraints on Government spending.

Mr Francois: It is only well invested if the kit works, right?

Chair: We need to make progress. Talking of constellations, we move across to Richard Drax.

Q126 **Richard Drax:** It is nice to see you both. My memory sometimes fails me, but seem to remember that when you were last here representing your company, the point you made, either before or after our meeting, was that Skynet had control of all the stuff in the sky, but was trying to control all the bit making on the ground, and that the groundwork was not being co-ordinated with the satellites in the sky in the UK. You had manufacturers elsewhere and you were trying to bring it all back under one roof. Does that ring any bells? Is the whole system now being built in the UK?

Richard Franklin: For Skynet 6A, for the first time. Skynet 5s started their manufacture in Stevenage, the second stage was in Portsmouth and then they went to Toulouse, where there was a UK enclave created for the test and integration. For Skynet 6A, we are working with RAL at the Harwell Space Cluster, where they are creating a new test and integration capability, so it will be completely built in the UK on this occasion.

Q127 **Richard Drax:** Everything?

Richard Franklin: Everything. For clarity—so there is nothing unexpected—there are supplied parts that are from abroad. I can give a breakdown of that in a separate submission—I do not have it to hand. But we are trying to use the UK supply chain as much as possible, hence the work with MoD, RAL and the Departments that helped to finance that business plan to change the manufacturing process in this instance to create that capability. That is very much what we would like to do for Enduring Capability—the next phase—as well.

Q128 **Richard Drax:** I ask because, bearing in mind that we left the EU and the US is becoming more isolationist, we—the United Kingdom—have to become more resilient, for our own defence and so that we can take part in commitments around the world.

To come back to my question, what opportunities might small satellite constellations in LEO offer for the development of future defence space capabilities?

Anita Bernie: Before I talk about constellations, I will talk about the benefits of small sats in general. They are smaller and quicker to deploy. Programmatically, you can kick off the development and have it launched in a standard spending cycle of three or four years, so you get from the idea and move away from concept and analysis paralysis to implementation straightaway. That is one of the key benefits.

There are three main areas for small sats: technology, development and experimentation; ISR or sensors; and communications. Each could be sovereign capabilities, or we could use them as contributions into our coalitions' interests.

Taking ISR first, what we are looking for is situational awareness on the ground. For that you need coverage, timeliness and a diversity of different sensors so that you can all acquire a range of different signals that can give you the intelligence you need to make decisions. You really need a disaggregated system to be able to deliver those and to have them launched in orbits that are over your area of interest. Having that proliferated architecture also builds in resiliency as well. If you lose one spacecraft, you still have others, which may not pass over at quite the same rate, but you will still get some useful data down over time.

On communications, again, it will depend on what you want. For requirements to do with latency, for example, timeliness is not such an issue. Maybe we could look at the internet of things or machine-to-machine constellations for asset tracking or monitoring. Or, heaven forbid,

if the comms system goes down and you need a way of doing low bandwidth messaging, that kind of low-cost system could be quite easily deployed. But if you are looking at high bandwidth, it is GEO for the sorts of satellites that Airbus produces. There is Iridium in LEO and then there are the mega constellations, many of which are in development right now.

Richard Drax: Richard, do you want to add anything to that?

Richard Franklin: OneWeb is an example of the LEO constellations. We make that, and we hope to make generation two in the UK. We see it very much as our meshed approach for the future if you want to really focus on that resilience. It is about having a number of the layers. We start from our perspective with what we call Zephyr, the HAPS capability flying at a height of 60,000 or 70,000 feet with small payloads. Then you have the LEO constellations and that next layer, MEO and GEO. In the future it is about having assets in those different areas and being able to seamlessly work across them. That is very much where our focus is.

Q129 **Richard Drax:** I think you have answered my next question, but I will ask it and if there is anything else you want to add, please do. If not, say you feel you have answered it. I think you have. Is the Government doing enough to encourage innovation and to support new entrants and SMEs in the defence space sector? You did talk about new entrants. Is there anything else you want to add, Anita?

Anita Bernie: There are a couple of things that I would like to add. I know that the MoD has set a requirement for, I think, 25% of its spend to go to SMEs. Most of that I believe goes through the key strategic suppliers, some of whom are represented here today. There is very little of that spend that goes directly to SMEs. Most of our engagement with MoD is through those strategic suppliers, and there are not many routes in where we can have the face-to-face conversations with the end users and be part of developing the solution.

There is a lot of talent and problem-solving capability within the SME community. Generally, people come to us with a problem statement. They do not come to us with defined requirements, which I think is one of the hurdles in working with defence, because if all the requirements are frozen, it is very hard to come up with an alternative, innovative solution. I would ask the MoD to come to us with a problem statement. Let us think about what the driving requirement should be before we think about the solution. Stipulate more SME engagement and more SME spend and, as Richard said, more buy UK within those procurements.

Q130 **Mr Francois:** With respect, often the opposite is true. One of the reasons so many of these problems get into terrible trouble is because the MoD keep changing the requirement.

Anita Bernie: Yes.

Q131 **Mr Francois:** Endlessly changing the requirement often gets you into terrible difficulty.

Anita Bernie: Absolutely. Also, expecting one system to do everything. Trying to build a lot of complexity into any one system is just asking for trouble. With lots of competing requirements, it is really important to focus on the driving mission need, the purpose, and to focus on that and try to eliminate as many of the nice-to-haves as possible. I know we have limited resources and there is this great tendency to try to do everything, but we need to be a lot more focused and think about how we can have a hybrid solution.

Richard Drax: As we say in the Army: order, counter-order, disorder.

Richard Franklin: I have just one thing to add. I see that there can be criticism of the big primes stifling innovation, but I also see the advantage of the big primes having that community of SME networks. If I looked at Skynet 6A, there are 45 SMEs involved in that from around the country, so take that role of having the network and be able to help those companies survive and prosper, and support and be that interface to the large customer who can change the mind a lot. There is a positive role.

Anita Bernie: I would question that a little. The devil is in the detail. How much of that is window dressing, and how much is true SME space expertise contributing and how much is ancillary support? It would be really good to understand how many of those SMEs are pure space and how many could be anything, and are just suppliers rather than real experts. The devil is in the detail.

Richard Drax: Thank you.

Q132 **Mrs Lewell-Buck:** Good afternoon Anita and Richard. A final question from me, although I think you touched on some of it, Anita, in your answer to Richard. How can the MoD use industry expertise more effectively in developing our future space defence programmes and policies?

Anita Bernie: I think it comes back to the question we are all asking ourselves: when are those policy documents going to come out? When is the national space strategy going to come out? When is the defence space strategy going to come out? It will be good for us to understand what are the threats and the scenarios that we perceive for the future. Therefore, what capabilities do we want to develop, whether sovereign, partnered or acquired commercially? Most importantly, what is the spend attached to that? How much is being committed? It is only once we have that clarity and transparency and the demand signals for where the interests are in the Government and the MoD, that we can formulate our plans, as SMEs always establish organisations within the ecosystem as well. I am worried that the documents will come out and there will be no budget attached to them, in which case they are just marketing, they are not really plans. We need to make sure that there is clarity about the plan and about money.

Mr Francois: Welcome to our world.

Anita Bernie: Yes. We are looking for that clarity of direction and what the real intention is to invest in certain programmes and capabilities.

Q133 **Mr Francois:** Just remind the Committee: how long have we been waiting for the national space strategy?

Anita Bernie: Gosh, I think it was supposed to come out a year ago, initially. But there have been a lot of changes since then; on the MoD side and in BEIS there have been a number of structural changes, which have led to the quad that Nick and Nik described. That needed to be in place. There have been a lot of interactions at Cabinet level and across the Departments. It is important to spend time underlining how important space capability is across all Government Departments and for the economy. I would not necessarily say that it is time wasted; I think it has generally been time well spent to make sure there is a coherent position across the national defence sides, which feed into industry and academia as well.

Mr Francois: Very roughly, it is about a year overdue.

Anita Bernie: Yes, I think so.

Q134 **Mrs Lewell-Buck:** Going back to my question, did Richard want to come in? You don't have to.

Richard Franklin: A strategy without a commitment behind it is not a strategy; it is an empty vessel. There will be nothing more important than the spending review to see the commitment behind the strategy. Whatever the strategy says it needs to be, we need the commitment behind it. Otherwise, we will be waiting.

Space is a long-term game. The investment and technical research take time. The more direction and partnership we can get from Government Departments, particularly from a defence and MoD perspective, to help us steer where we invest our R&D and do those joint programmes, the more we can support. For me, that long-term vision and sense of partnership so we can work together is critical.

Mrs Lewell-Buck: As Mark alluded to, this place is full of unclear and underfunded strategies. Fingers crossed and we will keep the pressure on.

Mr Francois: The fundamental problem is that they cannot even spend what they've got properly. They have an equipment plan of £180 billion.

Chair: Let's—

Mr Francois: Hang on. But they can't even spend that properly. Of 36 programmes, none is successfully on track. Not one.

Chair: Richard.

Q135 **Richard Drax:** To be fair to the space industry, presumably the cost of that kit is so enormous, but the moment you do something and say "Hurrah!", you hear the Chinese or the Russians have something else that takes out your bit of kit. Although you can produce another telephone or a car at a reasonable cost, the levels of expenditure in your business are in the multi millions and billions. The race for space is a hugely expensive

venture.

Richard Franklin: It is an expensive venture. "NewSpace" has allowed some reductions in that and is speeding up. If you look at the OneWeb-style satellites, they are 36 a month, and at a much lower cost. Large military satellites are expensive. We tackle that by leveraging it off commercial, which is evolving just like your computer or mobile phone—extraordinarily fast. Then, when the MoD need the next capability, leverage off that to make sure we are always at the forefront. But yes, it is a technical race.

Chair: Thank you very much indeed for your time this afternoon. That great line, "Space is cool." We need to take that forward. It is exciting, and it certainly is growing, but it is also daunting and very competitive. The space domain awareness we are seeing from Russia and China is now integrated into their military doctrine, which is why this Committee is taking an interest in it. This session has been extremely informative and constructive. I thank Anita and Richard, and Nick Shave and Nik Smith, for your time.