



# Defence Committee

## Oral evidence: Future Aviation Capabilities, HC 51

Wednesday 24 January 2024

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Members present: Sir Jeremy Quin (Chair); Sarah Atherton; Richard Drax; Mr Mark Francois; Mr Kevan Jones; Jesse Norman; John Spellar; Derek Twigg.

Questions 45-120

### Witnesses

**I:** Simon Barnes, Group Managing Director Air, BAE Systems, and Herman Claesen, Managing Director, Future Combat Air Systems, BAE Systems.

**II:** Tristan Crawford, CEO, AERALIS, and Nick Laird, Managing Director, European Space and Defence, Spirit AeroSystems.

**III:** Rhys McCarthy, National Officer for Aerospace and Shipbuilding, Unite the Union, and Ian Waddell, General Secretary, Confederation of Shipbuilding and Engineering Unions.

## Examination of witnesses

Witnesses: Simon Barnes and Herman Claesen.

Q45 **Chair:** This is the second session in our programme regarding future aviation capabilities. We have three panels this afternoon. We are kicking off with a panel from BAE Systems, which also brings with it Team Tempest. It is very good to see you both. Perhaps, starting with Herman, you could talk through who you are and where you are from, and then we will go straight into questions.

**Herman Claesen:** Good afternoon. My name is Herman Claesen and I am the Managing Director of the Future Combat Air System business in BAE Systems. I am responsible for the development of all the technologies, capabilities and route maps that will deliver the Future Combat Air System capability to the UK, including the GCAP programme. In my previous role, I was the CEO of Eurofighter GmbH.

**Simon Barnes:** Good afternoon. I am Simon Barnes. I am the Group Managing Director of the air sector for BAE Systems. The air sector comprises all our design, development, manufacturing, support and training. We have roughly 24,000 employees. The majority of those are in the UK. I congratulate the Chair on your appointment and thank you for the opportunity for us both to present at the same time. We are very grateful.

Q46 **Chair:** We have a lot to cover, but this is a timely session. Can we go straight in with an open question about where you are currently on GCAP? You have got the two partners; where are you in terms of all the detail that needs to be put in place—the workshare discussion and the delivery structures? I know, Herman, that you have had a lot of past experience of international collaborations. They are not easy to set up and make work. How is it working here?

**Herman Claesen:** I would like to say that we are making excellent progress. First, we very much welcome the agreement that the three Governments reached at the end of last year. With regard to the treaty, it is very important as part of the delivery set-up that we need for the GCAP. From an industrial point of view, I would say we are about 70% through those negotiations, defining the work share, the work allocation and the work location. It is also good to see that we are converging on the same delivery construct or the same view on how we set ourselves up for the future.

It is important to highlight that we are learning from the past. From a UK and BAE Systems point of view, we have been part of Panavia Tornado, as well as Typhoon and Eurofighter. We are learning the lessons from that and recognising the challenges of delivering this programme with partners. We are building on the lessons learned, and we are building that into the delivery construct for the future. For example, we are looking at providing this new construct with the engineering authority it needs, which was one of the weaknesses in the Typhoon model, but also formally empowering it to make decisions on behalf of the three industries in response to the



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Governments' requirements. We have excellent momentum, and as we speak my team are negotiating with Japan and Italy to make sure that we complete this 70% activity in the first half of this year.

**Q47 Chair:** You mention the concept of making certain that the project can drive forward. Does that mean that it is semi-autonomous—that a lot of the work can be done and orders can be placed without constant reference back to the individual nation states? How will you ensure that you maintain momentum?

**Herman Claesen:** In terms of the nations, they are establishing a governmental international delivery organisation, similar to NETMA for Typhoon. That has been defined and identified in the treaty. It will run the contracts on behalf of the three Governments, which are looking at empowering that organisation. On the industry side, it is exactly as you describe: we are looking at setting up a single entity that is authorised to act on behalf of the three companies—what we call the lead systems integrators, or LSIs. We are doing that through a governance construct, so in effect it becomes almost a company, which we think is a significant evolution of the Eurofighter GmbH scenario where—as you alluded to—the accountability was diluted. We are looking at giving more authority to that single entity, with more people inside that delivery organisation instead of being part of the individual three companies.

**Q48 Chair:** You are not the only sixth-generation project in town, although it sounds like you are one of the most advanced in terms of getting to the final destination. If other projects were to fall by the wayside, is there still room for other nations to join or, with 70% agreed, are you now beyond that point? Is it pretty much cooked—we know what we need to do and we are going to get on and deliver it?

**Herman Claesen:** GCAP is international by design, and that means that we are always open to seeing how the partnership can grow. But you are right in what you have identified there: we are making excellent progress so far with the three core nations. Any introduction of another nation at that level—at the most senior table—must be considered within the context of the programme requirements in terms of timescale.

Does that mean that the door is firmly shut? There is always room to consider any international partners. That can be later down the line, at a different tiering level.

The other thing to take into account is that the FCAS solution is a system—Future Combat Air System—which means it comprises a number of different elements, of which the core platform, the aircraft, is one element. To deliver the future combat air solutions requires other assets and other nodes in the broader system network as well. I think that gives opportunity with other international nations to develop these other elements, apart from the core platform or the aircraft, as we call it.

There is definitely still room for other partners to play a role as the programme progresses, but it always has to be done within the context of



the programme impact, and of course needs to have agreement from all the three nations, considering where we are in the process now.

**Simon Barnes:** To build on Herman's answer, we would recognise from an industrial viewpoint that any partnering nation that was to join would want skills development, industrialisation, sovereignty—all the things that the UK wants and the other current partner nations want. There being an ability for them to join and have that is why the programme is designed that way, so that everyone can have a similar level of industrialisation and skills development. That is very much at the forefront of the way that the programme is constructed.

**Chair:** It is going well, but all of this requires funding. Perhaps Derek would like to come in.

Q49 **Derek Twigg:** Just before I ask my main question on funding, obviously I don't build aircraft and I am not an engineer or a software specialist, but in terms of building the aircraft, what comes first? Is it the software development and the aircraft is built around that, or is it that the frame is put in place and then the software develops within that? Help me out—I am not quite sure I understand how that works. What is the priority?

**Herman Claesen:** In the main, the two activities run in parallel. You first go through the design phase, where you create the solution, both physically and also from a software point of view—in the past, on paper, but we now do that in a digital environment.

A good example is what we do today on the demonstrator. We are building a demonstrator to de-risk GCAP. The software has already been written. It is already being tested to a very high standard of maturity, while the aircraft is still in build.

The other important facet to recognise as part of that, compared to previous generation aircraft, is that we are implementing what we call open system architecture, which means that the software is more independent of the hardware, which makes it easier at the start, but also through life, to change the software on the hardware, which was harder to do in previous generations. That disconnect is creating significant opportunities going forward.

Q50 **Derek Twigg:** Is not multi-year funding really important in terms of the success of the programme? Obviously, we are in an election year as well. Could you give us your view on, first, how important it is and secondly, the likelihood of it, given discussions you have had within Governments and elsewhere?

**Herman Claesen:** In my opinion, it is essential. 2024 and 2025 is a key moment for GCAP in particular, when considering the timeline we are going for—2035 in-service date.

We are mobilising heavily. In the UK now, more than 3,000 people are working on the programme, with more than 1,500 inside BAE Systems. As



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an industry, we are making significant investments. We are getting ready to start the design development of the solution from next year onwards.

If you break that momentum, if you stop and start, we will have resourcing challenges. What are we going to do with the people we are mobilising? We need to do long-lead investments now over the next year or year and a half—building facilities, investing in security mechanisms—to underpin and enable the programme going forward. If we can't do that, or if we are stop/starting that, we are building more risk into the programme going forward.

I would also say that the international partners, Japan and Italy—in our tri-national discussions we talk about this; we align our plans—are proceeding now with multi-year funding. They are securing, through their acquisition processes, the necessary funding for the programme going forward. Good momentum is being made there as well.

We are very transparent with our colleagues in the Ministry of Defence. We are currently working through the acquisition process, with the outline business case No. 2, and we really need to make sure that that occurs this year to unlock that multi-year funding and to ensure that we do not build risk into the programme going forward or, in the worst-case scenario, even lose our partners.

**Q51** **Derek Twigg:** To press you, have you been given any indication by the Government in your discussions with the MoD whether that multi-year settlement is likely to be achieved this year, or is it going to be put off because of the election?

**Herman Claesen:** We have not had any formal confirmation yet. All the work—

**Q52** **Derek Twigg:** Do you expect any? I am trying to pin you down so we know exactly where we are up to.

**Herman Claesen:** We expect one to come, for the reasons I mentioned earlier; otherwise, we do not have the assurances in the programme to go forward and contain the risk. All the processes we are running and all the evidence we are gathering for the programme to allow Government to make their decision is in flight and is being worked to support that decision that you outlined.

**Q53** **Richard Drax:** When do you expect capability requirements to be agreed and finalised? How can the need for the aircraft to meet the requirements of the GCAP partners be balanced against a desire for exportability?

**Herman Claesen:** We are in the concept and assessment phase. The three partners—the three Governments, the three air forces—are in joint teams laying down those operational requirements. We as an industry are iterating our response to that. Furthermore, the iteration is also occurring against the operational requirements to make sure that we end up with the right solution, which is affordable, can be delivered and has the right underpinning technology to deliver the right operational effect.



It is worth highlighting that in the UK, through the investments we have made, we have got fantastic infrastructure between Government and industry to iterate that process rapidly. Export is a fundamental part of that. If we go back to the memorandum of co-operation that was signed between the Governments just over a year ago now, export is a key tenet of the programme. Export requirements flow into that process that I described earlier to make sure that when, ultimately, the aircraft is ready there is an export market for it as well. In parallel, as we speak, we are refreshing our market analysis to further underpin that.

**Simon Barnes:** The work has gone on to share a fundamental view of a threat within the 2030, '40, '50 timeframe. That work, I think, is shared by other partners and is therefore how everyone that wants to join the Global Combat Air Programme would have a shared view of that threat. The platform and systems around it are being developed to meet that long-term threat. That is the important conversation to be having now. The progress that has gone on is very positive.

Q54 **Richard Drax:** Derek asked an interesting question, which fascinated me. These aircraft generations are getting better and better. Where do they get better? Is it the materials you use? Is it the speed they go? Is it the less fuel they use, the more kit they can carry, the more up-to-date software, or how much further they can fire the missile? How much better can the basic plane get, flying at 1.4—

**Herman Claesen:** Pretty much all of the above—all you mentioned. If you look at the evolution from Typhoon to F-35 to GCAP now, what do we see? We see the solution, the aircraft, becoming better at low observability, so it is not being detected by enemy radars; it has the ability to carry new weapons at range; and it makes better use of the data and information that is available in the network. So that is not just on the aircraft itself, but exploiting all the sensors, all the data sources that are available in the broader network. It brings that all together, analysing large volumes of data at an incredibly fast speed to equip the operator—we are using the word “operator” more, instead of pilot—to make the right decision to provide a very targeted and very precise effect, and making sure that he or she does not get in harm’s way.

Q55 **Chair:** May I link the two questions that Derek and Richard asked? You refer, Herman, to exportability being key. It is, but we have been round this loop before. You have touched on a couple of things: in response to Derek, on how digital is helping you really drive down the costs, and in response to Richard, on how you will hope to ensure that there is a basic platform—how particular nations can then upgrade it via the developers is another thing, but you talked about ensuring there is a basic platform. In combination, you are going to hammer your base costs and you are also going to ensure that what you are producing, while it is sixth generation, is not so super-sophisticated that it is beyond the reach of potential export markets and that it will be open to allies to upgrade in particular directions. Is that a fair summary, and is it going to work?



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**Simon Barnes:** I think it's a fair summary, yes. We are absolutely committed to it; we have put our own money into this and we believe this is absolutely where we should be going—it is where, as an industry, the UK should be going and it is where our partners should be going. We are fully behind this and believe that it will be a successful endeavour.

**Herman Claesen:** The other reason why we believe that is that at the core of the GCAP is freedom of action and freedom of modification. That means that everybody inside a GCAP family needs to have the ability, under certain conditions and constraints perhaps, to modify the solution, enhance the capability, have the knowledge in their respective country to do that. That also makes it easier when we are looking at export because a lot of the countries in the export environment want to have that—to play into that space. The focus on the delivery construct, as I mentioned, also helps us to tackle the efficiency challenges, which we perhaps saw in previous programmes as well, which then affected, ultimately, the export price.

**Simon Barnes:** It is also worth saying that the tools, techniques and technologies we are developing now have direct relevance to the work we are doing now, on existing platforms like Typhoon. It is not just for the Global Combat Air Programme. All the things that our engineers are learning, all the data science we are doing, the way we are transforming some of our day in, day out techniques, have direct utility on current serving platforms.

**Chair:** We have gone through the partnership and the funding. The workforce is the other point to ensure that we actually get this delivered by 2025.

Q56 **John Spellar:** Maintaining a skilled workforce and indeed production capacity is going to be both crucial and a challenge, before you get up to full-scale production. How are you going to meet that challenge?

**Simon Barnes:** It is something we recognise and I think it is one of the driving forces of the 2018 Combat Air Strategy: we in the UK need a talented, high-technology-ready workforce to deliver GCAP and other programmes. So, we have invested. We have invested in young careers—early careers—and experienced hires. We have taken on more early careers starts in the air sector than ever before—500 apprentices and young people last year and 600, probably 700, next year. We are doing that in partnership with the education sector, in terms of how we make sure that the skills that we deliver through BAE Systems are matched with the skills that the education sector can deliver at the same time, to create a situation where we have a long-term, comprehensive workforce plan, and we are doing that in conjunction with trade union colleagues. The key to GCAP, and the key to being in a position where, when we talk about defence procurement, we talk about it through the lens of a national value framework, having a suitably qualified and experienced workforce that is able to deliver on that programme, not just now in terms of its design and development, but all the way through its in-service life and to augment and support it, is at the heart of what we want to try and achieve.



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**Q57 John Spellar:** When you get the final product, what sort of percentage of that will be bought in from supply chain suppliers?

**Simon Barnes:** It's a very large supply chain. Herman will give you the details.

**Herman Claesen:** At least half; probably closer to 60%.

**Q58 John Spellar:** That is very common in the defence industry, and one of the problems that everyone has been finding, during the pandemic and subsequently, is how dependent they are on a very fragile supply chain. What are you doing to ensure that you have a secure and vibrant supply chain, able to supply in to you, who don't necessarily have the access to the capital markets that you do? I don't just mean your tier 1 or tier 2 suppliers; I mean down through that chain, down to 3, 4 and 5.

**Herman Claesen:** Absolutely. Today we are running what we call the technology investment programme in the UK. It is a UK programme. BAE Systems has invested heavily in this, and so has the UK Government. For BAE, that is culminating in the build of an aircraft, which we call the demonstrator, but our colleagues in Rolls-Royce and Leonardo are doing similar activities.

As part of that investment programme, we already have more than 600 organisations in the UK on contract. Those companies are wide-ranging: they are from academia, SMEs—small companies—and larger organisations. That is to do exactly what you just described. There is some fantastic knowledge and capability in the SME base in this country, specifically in digital capabilities. As you outlined, we are testing this space and trying to understand what the challenges are to make sure that we can correct and improve. Indeed, BAE Systems is very forward-leaning in helping those organisations to beef up and step up to reduce risk when the big programme comes along. We have quite a few good examples of where we have done that in the company.

**Q59 John Spellar:** Are you sure that you know who they are further down? It is not just a British problem. The US Department of Defense have found that, when they start to drill down, not only do they have little visibility of the underpinning of their supply chain, but the primes and the tier 1 suppliers also have little visibility. They are doing a major exercise, finding it very worrying and looking at what may not be seen as the high-tech or dramatic suppliers but those who provide many of the basic engineering skills. What are you doing with them, and indeed with your unions—where they are represented elsewhere in the industry—to maintain, sustain and expand that part of the industry?

**Simon Barnes:** Security of supply is something that we are absolutely focused on. All partners are focused on that. What does that mean in reality? It means getting very close to your supply chain—from where we are right the way to the source of manufacture—and understanding where those parts of the chain break down. Is it a funding issue or a capability issue? Is it something that is not growing at the pace that is needed? Our role, as a prime contractor, is to look all the way through that chain and to





invest where it is required—whether that is financially, through expertise or through time—to help the SMES and small businesses that will be part of the Global Combat Air Programme flourish. We are definitely doing that and, as you say, others are, too. That is really important to us.

**Q60 John Spellar:** In the context of maintaining capacity at all levels before you get to the production phase of this, how significant is the Germans' apparent reversal of their position on Typhoon exports to Saudi Arabia?

**Simon Barnes:** We welcome the public news of Germany's change in stance. I think it benefits the Eurofighter consortium. Obviously, a significant part of Typhoon is manufactured in the UK. Therefore, the steps that take us towards further exports of Typhoon are very welcome from our perspective. We see it as a really positive step forward.

**Q61 John Spellar:** Okay. I have one final point on maintaining that industrial capacity. Do you now think that it was basically a mistake, given the huge fleet of Hawk trainer aircraft around the world, for BAE to walk away from involvement in the trainer aircraft sector?

**Simon Barnes:** We definitely have not walked away. We are very proud of the role that Hawk fulfils in the UKMFTS contract. It gives us a great viewpoint into what current training looks like and what future sixth-generation training needs to look like. We are certainly putting our efforts into working with the RAF and the Department on how we can envisage being able to train pilots of the future—not just pilots, but the maintainers and the people who go around the platform to make it successful. How can we be in a situation where that is done with value for money at its heart and ultimately using the data and synthetics that will be part of the platform? What we have seen is a complete transformation in flying training in terms of the balance between live and synthetic. Hawk is definitely fulfilling a really important role at the moment, but we are throwing our mind forward to how we train the people of the future.

**Q62 John Spellar:** You do not have an actual successor platform to Hawk, as far as I am aware. At the same time, you and maybe some of the senior brass in the RAF may think that this is all going to be done through virtual training, but that does not seem to be a view shared in air forces around the world. Have we not missed out on a major opportunity for the UK, given how strong we were in that field, but also, at the same time, an ability to maintain production capacity and a stronger supply chain?

**Simon Barnes:** I think the Hawks that are currently in service have a lot of life left in them. They are going to be great assets to provide the service they are currently providing. The balance between live and synthetic is something that is going to be in everyone's minds. The synthetic environment gives you a great ability to protect information and repeat things at low cost. There will always be a flying component of training; that is absolutely critical. So what that mix is will be really important.

**Q63 John Spellar:** But we're not going to be part of that, are we?

**Simon Barnes:** We'll be part of a training solution—absolutely.



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Q64 **John Spellar:** But you won't be part of the actual, physical aircraft solution for that part of the training.

**Simon Barnes:** We may be. Hawk at the moment is our platform—

Q65 **John Spellar:** But that will be becoming redundant.

**Simon Barnes:** It has a lot of life left at the moment—lots of life left.

**Derek Twigg:** How long?

**Mr Jones:** This is a bull answer.

**Derek Twigg:** How long?

**Chair:** We probably won't solve this one. I think, John, you have made your point.

**John Spellar:** No, no. I think this is rather important.

Q66 **Mr Jones:** Can I come in? Sorry, Simon, but your answer is bull. You have taken a decision to get out of training in terms of the traditional flying with Hawk, as a company. Okay, you might be involved in the synthetic side, but you have made that decision, haven't you?

**Simon Barnes:** No—

**Mr Jones:** You have!

**Simon Barnes:** We have people at Valley all day, every day, supporting the RAF in terms of flying training. Hawk is—

Q67 **Mr Jones:** Well, what's the successor to Hawk, in terms of a fixed-wing capability? You haven't got one, because you have made that decision to come out of it. Just say that.

**Simon Barnes:** We haven't made that decision—

**Mr Jones:** You have!

**Simon Barnes:** We have a fast jet trainer, which we are invested in—

Q68 **Mr Jones:** You have, but you're not putting investment in. If you look at the competition, they are actually putting investment into their trainer. You have tried to skirt round the answer to John's question by saying that you'll be involved in training, so technically, legally, you're not telling us porkies. Yes, you might be involved in the synthetic world, but you're not going to be in actually producing an aircraft, as otherwise you would be putting some effort into thinking about what's coming after Hawk, wouldn't you?

**Simon Barnes:** As I say, from our perspective, Hawk has a lot of life left in it and is delivering in a great way—

Q69 **Mr Jones:** You're repeating that, but you're not going to replace Hawk, are you?



**Simon Barnes:** At the moment—

Q70 **Chair:** I will ask the question another way, if I may, and then we must move on. This is just to—hopefully—help Kevan and John. Are you saying, Simon, that you believe that in the time it will take between now and Hawk leaving service, there is still the opportunity for you to develop a new platform, to be used for training purposes, or do you think that bus has gone?

**Mr Jones:** Hang on. Be careful what you say about a “platform”, because he’ll go on to the—

**Chair:** I mean a physical plane that people can actually train on and get airborne, rather than the synthetics. Do you still think there is an opportunity there or has a decision been taken—“No, we’re not going to try to present an alternative or a successor to Hawk”?

**Simon Barnes:** No, we haven’t taken a decision. What we want to do is work collaboratively as to what a sixth-generation training system looks like and play our role in that, as we have done here; we’ve done that in other countries. There are various models that work. We want to play our role in that model. We have taken no decisions. Hawk is providing the backbone of the RAF’s training today. There’s lots of life in those assets, and it’s doing—

Q71 **Chair:** If you want to write to us to absolutely crystallise exactly what you mean on that, that would be very helpful.

**Simon Barnes:** We will put that in writing—*[Interruption.]*

**Chair:** Derek, is it on this? I’m conscious this is on GCAP.

Q72 **Derek Twigg:** I will be very quick. Sorry, but I had only got part of the question out. What is your estimate now of the lifespan left of the Hawk?

**Simon Barnes:** It will support all the way to its current anticipated out-of-service date.

Q73 **Derek Twigg:** Well, that’s the question: when is that? When do you anticipate—

**Simon Barnes:** At least 2040.

**Chair:** Jesse, I think you wanted to come in, and then Mark.

Q74 **Jesse Norman:** Yes, and my question does bear on this very gently. I just want to talk about integrating uncrewed combat aircraft into the mix in relation to Team Tempest. Can you just talk about how you see crewed versus uncrewed? Obviously, the mock-up we see at the moment is crewed. If we take evidence we have been given separately, the superforecast is suggesting we will see artificial general intelligence towards the end of this decade. We have obviously seen AlphaDogfight-type situations in which they have proven superior to human pilots, and there will be many other examples of that. Isn’t this putting some pressure on an entry service date view of 2035? Why should it be crewed



at all?

**Herman Claesen:** There are two approaches to this. First, as part of the current contract that BAE Systems has with the Ministry of Defence, which is referred to as the acquisition programme, we are running scenarios and doing concept analysis that includes force mix as you described it there, including unmanned assets. We are able to experiment and understand, including by making assumptions about what level of AI we will be seeing in the future to really understand what kind of unmanned system you will want to see in the force mix going forward. That is informing us what it needs to be. In parallel to that—

Q75 **Jesse Norman:** Just to be clear, this could potentially be a Wingman-type solution that looks like the current aircraft or a non-Wingman central platform that is uncrewed. There are options there.

**Herman Claesen:** Absolutely. It is a spectrum. We should not just home in on something that sits on the side of the manned aircraft. There are other spaces and other opportunities for unmanned systems to play a role.

The second part of the answer is that BAE Systems recognise that and are investing heavily at the moment in the development of unmanned system. We are looking at building a demonstrator to ensure BAE Systems stay at the forefront of this space. We are continuing to work very closely with the Royal Air Force and the MoD to shape what that final solution feels and looks like.

Q76 **Jesse Norman:** This is my final supplementary question. What implications would those force decisions have on exports? You wouldn't necessarily want to be exporting the unmanned vehicle.

**Herman Claesen:** As you may know, the unmanned systems are subject to the missile technology control regime. In principle, that means that, as the UK is part of the MTCR, we can currently export only to those who are part of it. We always need to adhere to the international policies, rules and regulations in that space.

**Jesse Norman:** So it is part of the commercial versus industrial/military decision.

**Chair:** Okay. I think we will come back to that theme with the next panel.

Q77 **Mr Francois:** On Hawk, if you want to do something really positive, sort out the engine availability, because it is crippling our air pilot training. Someone has to fix that.

Mr Claesen, in terms of building Tempest, the international situation is becoming more perilous. You are going to want to build it at a steady drumbeat in order to maintain good work at factories. We understand that, but given that, as they told me once at Warton, it takes four years to build a Typhoon from scratch—three years if you really hurry up—is one of the things you have looked up in the design of Tempest how you could build that aircraft much more quickly, leaving aside the industrial considerations for a moment, in the event of a national emergency? Have you looked at a



plan for how you could build it faster if we had to go to war?

**Herman Claesen:** We haven't looked at it in the context of a national emergency—we could absolutely do that—but what we have looked at—

Q78 **Mr Francois:** I think the Committee would encourage you to at least consider it.

**Herman Claesen:** Yes, we can absolutely do that. We have part of the answer, I would say. We have looked at reducing the lead times that you highlighted—you cited Typhoon. We are driven by costs and time to get it into service, so we have been looking at investing in new manufacturing techniques. We are looking both at the way we build components, recognising the lead times and how long it takes to machine certain components, and at novel techniques. Indeed, the demonstrator we are building has some of those new technologies.

A second area we have invested in is the assembly space. The use of automation gives you more agility on the factory floor, working alongside people to ensure you achieve the right level of accuracy. That enables you to do it faster. We are seeing encouraging and positive signs. It is clearly in our sights to improve on the lead times that you referred to for Typhoon, and we can absolutely look at whether we can improve it all the way to a national emergency scenario.

**Mr Francois:** Thank you very much.

**Chair:** Sarah, are you happy? No other questions?

**Sarah Atherton:** I am fine, thank you.

**Chair:** Perfect. Thank you both very much indeed for your evidence, and good luck.

## Examination of witnesses

Witnesses: Tristan Crawford and Nick Laird.

Q79 **Chair:** Nick and Tristan, could you tell us, for the benefit of people watching, who you are and where you are from, please?

**Nick Laird:** I am Nick Laird, Managing Director for European Space and Defence at Spirit AeroSystems. Spirit is one of the UK's largest aerospace manufacturers. We have 4,600 people working for the company in the UK: 3,500 in and around the Belfast area and 1,100 in Prestwick. We were pleased to host the Committee last year and give it an insight into some of the work we are doing in support of defence. When your diary allows, Chair, we would welcome a visit in due course.

We have leadership in engineering technology and advanced materials, and specifically in ultra-lightweighting of materials. In that area, the work is about advanced composite capabilities, which some Committee members have already seen.



**Tristan Crawford:** I am Tristan Crawford, founder and CEO of AERALIS. My background is originally with BAE Systems; I then went into Airbus on the commercial aircraft sector side, where I grew up and developed my career. That drove a lot of the thinking that ultimately grew into the concept of the company AERALIS.

**Chair:** Thank you both very much. Jesse, you kicked off on crewed and uncrewed in the last session; do you want to take that forward?

Q80 **Jesse Norman:** Yes—thank you, Chairman. May I revisit the issues we were discussing in the previous session and ask you, Nick, to talk a bit about how you see the mix of uncrewed versus crewed in relation to Tempest, how they should be developed, and how you deal with the point about hitting intersecting technologies, particularly AI technologies, that may not exist at the moment?

**Nick Laird:** Looking at the uncrewed element in the future force mix, I think that in the higher-end unmanned platforms—the MoD classifies them as autonomous collaborative platforms—there is huge utility in order to provide additional combat mass at a cost point to defence in the future. We were involved in the Mosquito programme, for example, which was the demonstrator programme for the lightweight affordable novel combat aircraft—LANCA—which was due to aim to come into service round about 2035. We started the programme at the beginning of 2020, and within a couple of months we were all in national lockdown under covid. That brought challenges for collaboration, which I might come back to later. The programme was to identify how we could take considerable cost out of such platforms compared with a manned platform, and to compress the development time of the platform. The programme provided an opportunity and even acted as a catalyst for Spirit for additional defence programmes, including our work in Team Tempest. Key to the whole programme was knowledge capture and exploitation.

I will give the Committee a few examples of how we could take cost and time out of future programmes, which has been identified and is now information that the MoD has, and how the MoD can exploit it not just on air platforms but on other platforms. We talked about the digital toolset that is now used in developing programmes. We leveraged our very sophisticated and mature commercial aerospace digital toolset into the programme, and we saw that we were conducting in six months what the MoD would expect in 18 months of developing time. We were rapidly going through configuration adjustments to optimise a platform and, in less than two years, we had the platform optimised for the mission set.

In addition, we leveraged our advanced composite technology, which we use on the Airbus A220 wing—it is proprietary to our company and lightweight. We took that technology, projected it forward and took it to another generation. We ended up developing a one-cure, single-shot, one-part wing for ACPs. Part of the success of that was the ability to take huge amounts of cost out of the structure, to manufacture it quickly and to provide it not just for the class of unmanned platforms we were looking at, but across the whole suite.



We also provided a novel tooling. In the aerospace industry, tooling represents some of the high costs on the non-recurring side of the business. We developed multi-part tooling so that we could manufacture components out of one tool, which has taken a huge amount of cost out of that non-recurring side. We were looking at trying to future-proof the platform, so we provided novel harnessing in the back of the aircraft so that, during the development, we could have placed four different in-production engines into the platform—and we could potentially do so for future platforms—without huge changes to the platform.

All those knowledge points were pulled together in the programme: demonstrating how we could take cost out of future programmes compared with manned programmes and, more importantly, compressing the development time considerably.

**Q81 Jesse Norman:** So even though Mosquito was cancelled, you took away a great deal of learning from the experience.

**Nick Laird:** Hugely. From our perspective and the MoD's perspective, Mosquito was a success. The programme was brought to a managed close. Again, context—what was happening in the world at the time—is everything. The data that we provided to the MoD allowed them to decide to take a slightly different direction in the near term in order to focus on smaller aircraft that were nevertheless capable and highly effective.

**Q82 Jesse Norman:** That is very interesting; thank you. There are two questions that come out of that. First, why would you stick to 2025 as the entry-into-service date for Tempest if you could be developing some of these other Tempest-related platform technologies much faster, potentially introducing them along the lines that you described? Secondly, why regard them as subordinate to some manned platform when there are in fact lots of reasons for thinking that the AI technology may allow them to supplant the manned platform?

**Nick Laird:** We still have very good relationships with the MoD and with the Rapid Capabilities Office, which ran this programme. You are absolutely right: there very much is an opportunity to exploit that and to do so quicker, especially in times of national crisis. As a company, we are very keen to support that and to provide that pipeline.

With regards to your question on its role compared with a manned aircraft, I think that both have huge benefits. Ultimately, an unmanned platform can have a number of operational benefits. First, an operational commander can take the view, "I will operate this platform in a highly contested environment and therefore protect resources." Secondly, future unmanned platforms of the higher capability give political choice, and I think that is really important.

Interestingly, the analysis and the data that we pulled together and provided to the MoD clearly showed that we could forward deploy these capabilities with a much smaller manpower footprint and a smaller engineering footprint—so a reduction in the cost of a forward deployment. If you look at our sovereign capabilities and areas around the world, you



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could have those platforms forward based as a level of deterrence that could be brought into action very quickly. Only in the past couple of weeks, we have seen some of the activity that has been happening around the world. Ultimately, if we had unmanned platforms, there would be some roles for which I think the MoD would use them.

**Q83 Sarah Atherton:** Nick, you spoke about force mix and unmanned-manned teaming, and we look at what is being termed the swarm picture—an orchestra in the air. Is enough thought being given to who is going to conduct that orchestra around air traffic control? All this is going on, but who is actually going to organise it from the ground?

**Nick Laird:** On the work that we were involved in, I am conscious that this is an open forum and Mosquito is a classified programme, so there is only so much detail I can give, although I am more than happy to come back to the Committee in a different forum to provide a bit more detail, because we pushed this through various scenarios as part of the Mosquito programme.

You are absolutely right. It is a complex solution. First, I think there is a lot of interesting technology out there that is very close to making that a reality. Secondly, from an operational point of view, the managing and interlinking of assets—where they are and how they are operating, either by themselves, independently, or in co-operation with manned platforms—is something that the Tempest team very much have at the forefront. As I said earlier, we joined Team Tempest in July 2020 and are providing, not the software side of it, but more on the detailed design, manufacturing and testing of the platform.

**Q84 Sarah Atherton:** You have both had collaborative projects with the MoD and the Rapid Capabilities Office. The Combat Air Strategy 2018 suggests that the MoD will work more collaboratively with industry. Are you seeing signs of that, or are there any areas where you think the MoD could improve?

**Tristan Crawford:** First, I thank the Committee for inviting AERALIS to provide evidence. We are very grateful for that. While we are not a member of GCAP or the Future Combat Air System, the Combat Air Strategy invited wider industry and the Government to work together to change behaviour, to introduce new ways of thinking and to be self-starting. That is why AERALIS is here.

Certainly in some areas, MoD has been extraordinarily collaborative, particularly on the digital enterprise side, where we have a contract with the MoD to support knowledge and know-how in that area. In other areas, when it comes to novel ways, looking at new models and understanding the air system as a whole, where we have a different model, that is where we propose that there is a gap in the ability of the MoD to invest prosperity funding into opportunities. The main reason for that is that, in our experience with the MoD providing that kind of support—we saw it a little with the Rapid Capabilities Office—it attracted a huge leverage effect on third-party market funding, sovereign wealth funding, into our





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programme. It was a massive multiplier on UK taxpayer money, which allowed us to get to where we are today. We believe that the MoD should be leveraging that a lot more.

In our case, where we have a new model, which is looking at a different approach to how you crack the problem of affordability, where some targeted defence prosperity funding into a new model can attract multipliers of 10 or 20 times that amount of money to give you a new way of understanding an air system, that is a massive opportunity for the UK.

**Q85 Sarah Atherton:** I noticed that your face lit up when we were talking to BAE about the Hawk. You have the new trainer Hawk programme. Do you want to share any feelings about your work with that? How is it getting on?

**Tristan Crawford:** Absolutely. We are all fantastically passionate about the Hawk, the history of that programme and what it has done for the UK. But from our perspective, we believe it is time to move on; it is time to be investing in a new approach. Really, it comes down to affordability, and it is about seeing a new way of understanding how you generate an affordable solution so that we can move this on.

The problem with advanced jet trainers is that, economically, they are very difficult to justify. They require a lot of investment and a lot of up-front cost, into marginal markets, so the business case is quite tough. There is a way of cracking that problem, and it is not just us who are looking at this. The Secretary-General of NATO, Jens Stoltenberg, was recently quoted as saying, "We have a kind of joint responsibility as governments, as industry to look into how we can increase supply without unacceptable high increases in prices and costs." We need to move away from replacing a frigate with a frigate, a tank with a tank and an aircraft with an aircraft, and that is exactly why we started this company.

We believe there is a methodology for cracking that affordability question and moving away from replacing like for like. Really, the difference is about bringing a very strong commercial approach into the equation. Technology is fantastic, and defence industrial capability is fantastic, but it is missing really strong commercial principles. We know this works, because—certainly in my experience in the commercial aerospace industry—that model is alive, well and prospering. Looking at the commercial aircraft sector, you will all probably travel on an aircraft system called the A320. It has multiple variants and has sold massively across the market, solving many different requirements. We all go to Malaga for 60 quid, and those aeroplanes typically leave on time, by and large.

That model is alive and well in the commercial sector, but let me bring that closer to home. If we look at the defence sector, it is not just airlines that are doing this. When you look at the rotary wing and helicopter part of the military flying training system, that part of the system is already using a family of helicopters. We estimate that it is only taking a third of the manpower per aircraft to guarantee very high levels of availability for



that fleet day in, day out, so it is already working in the defence sector. The challenge we now have around advanced jet training is that the legacy platform has been conceived to meet a niche capability need, and there needs to be a much broader approach to the problem.

There are really five principles that I want to get across about how you break this problem. While, as I say, we are not in GCAP and FCAS—

**Chair:** Give us the five, but we have quite a pitch. We will hear the five, but do it succinctly. We will then hear Nick's answer to Sarah's question, and I know John will be keen to come back at you, Tristan.

**Tristan Crawford:** I will definitely keep it brief. We should aggregate the need. Don't just look at AJT; look at neighbouring needs as well.

When you have an aggregated need, just take existing technology—it is already very good—and modularise it, so that your technology risk is low and you are using it much more broadly across a bigger need.

Thirdly, let industry run the aircraft fleet that features that aggregated existing modular technology. The industry will be able to achieve a much lower cost per flying hour, which will free up availability and funding to pay for instructors and international defence training.

Fourthly, private investment is absolutely doable—there is a very near-term market, in the next five years, around the world for this kind of aircraft—but it needs a little bit of Government catalysing support. That goes to the point I made earlier about a little bit of investment in prosperity funding that leverages that private money.

Fifthly, sovereignty. The national value framework is pivotal for balancing prosperity, capability, international influence and budget. If we keep that here, the regions around the UK can all be part of the programme. If it is a modular programme, it is very easy for them to participate. You have soft power for supporting the export process, which we lack today. STEM is obviously massively important: how do you train young people in whole aircraft if you do not have a programme? Lastly, there is the capability: I do not need to say that keeping it here in the UK is obviously highly critical.

Q86 **Chair:** You can now pause for breath, Tristan. I think John will want to come back to that, but can we hear Nick's answer?

**Nick Laird:** Collaboration with the MoD and the rapid capabilities office was a very positive experience, despite all the challenges of covid; we adapted, changed and tried to overcome them, but in reality I think we all found that very difficult with new working practices. In other parts of the MoD, there was our relationship with the Defence Equipment Sales Authority, with parallel support from UK Export Finance. That was first class—it was incredibly helpful in linking embassies' DAs in support of opportunities abroad. There was also the MoD Defence Equipment and Support down in Abbey Wood. Our company produced the Short Tucano trainer, which was the advanced turbo-prop trainer; it was in service for



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31 years in the Air Force. We managed that programme. As it came to its OSD, we did additional fatigue work to ensure that the platform could make its out-of-service date, and again that was excellent.

In the near term, over the last three years we have been putting secondees in the MoD's UK Defence Solutions Centre, and we have been very careful about putting very high-quality people in there to work on defence work strands that help to shape policy and capability decisions in the centre of the MoD. The senior leadership in the DSC must be commended for their work. It will come as no surprise that we got one of our senior engineers from the Mosquito programme to lead a certain work strand that it then fed into, so that collaboration with industry is absolutely essential. There are areas for improvement, from an MoD perspective, in continuity of staff and access to specialist staff, whether that is in the MoD or DSTL. I fully understand the challenges that defence puts on moving people and promotions and so on, but at the beginning of a complex programme such as Mosquito, the continuity of people throughout the whole programme is absolutely essential for a successful outcome.

**Q87 Sarah Atherton:** Can I ask you about levelling up and the social value? When we visited you in Belfast, the regional spend for Northern Ireland was very low, followed closely by that for Wales.

**Nick Laird:** That is a very good point. I know that the MoD's figures for defence spend are due out on 8 February, so I can only quote 2021-22. However, in that period, defence expenditure was £21.1 billion, and Northern Ireland received 0.5% of that spend. The region with the most had 29%. What does that mean in real terms? That is £60 per head of population; across all regions in the UK, it is about £310. There is a disparity across the regions. If defence is looking to build resilience into the industrial landscape, it needs to look at how it can provide funding across the defence spend. This is not a plea for a handout; we are looking for parity of opportunity, because we certainly have a huge amount of technologies that can be leveraged into the defence space that are not being fully exploited.

You will recall that we launched a RUSI paper last year in Parliament, "The Defence Industry in Northern Ireland: Leveraging Untapped Potential". Again, it is not just about Spirit; it is about the OEMs, the primes and the SMEs. The MoD needs to look at how it leverages potential. One way in which it could do that, and have what I would classify as an early warning capability, is to have regional programme hubs. What we are looking at is a central place; we are not looking to create an office, or even to put more personnel into Northern Ireland, Scotland or Wales, as such, but to regrade some of those staff to be programme-focused. That is what is missing.

This is really about the tyranny of distance, in many ways. SMEs find it hard to come to MoD. There is a cost, et cetera. Having that focal point would be very useful. It is something that I think the MoD should consider. Other countries have regional hubs that do this very well.



**Q88 Chair:** You mentioned continuity. There is another cultural issue with the Rapid Capabilities Office. Do you think there is an attitude of mind inside the MoD of being prepared to experiment—to put money into projects and see what we learn? The experiment might not go the full course; we might do an organised rundown and say, “That’s fine. We’ve learned a lot.” Was your experience with LANCA positive? Were you saying, “I am glad it isn’t a situation where we’ve got to keep this going because we have launched it, and have to permanently throw money at this”? There was a willingness there to say, “We have worked with you. We have discovered a lot. Let’s capture that, and then redeploy the cash.” Is that what you were saying? Is there a cultural change?

**Nick Laird:** That managed close was exactly the right decision, because that knowledge capture can be shared across other defence programmes. In Northern Ireland and Scotland, from a defence perspective, what we look for from Spirit AeroSystems is a pipeline of activity, so that we can build skills and generate high-skilled jobs. I know there is a huge amount of focus on high-skilled jobs, but our industry and defence need semi-skilled as well. People tend to focus on high skills, but semi-skilled is very important. Those who went round the factory will have seen that we have a lot of high-quality engineers, but we also need semi-skilled individuals. That is what will move the dial on social benefits to a region.

**Q89 John Spellar:** That is what I was touching on in the earlier questions, which you will have heard. I was talking to BAE about having workforce capacity and manufacturing capacity. Coming back to Tristan, yes, you have an innovative approach to a new trainer, but how are you going to make the AERALIS?

**Tristan Crawford:** Again, through developing the enterprise. We are taking an enterprise approach, which is typical of many OEMs. You have very high skillsets and a tight integration team in your company, but obviously our supply chains and the industrial capability throughout the market is very strong. Certainly commercial aerospace works in a sector where you federate out with your industrial partners the ability to industrialise, and we are no different. We are basically mimicking the same model with AERALIS. We are not pretending in any way that you could create a new aircraft company out of thin air and have it up and running in a couple of years. That is not our objective.

When you have digital enterprise and the right commercial construct—that is, you have a hard market ahead of you, it is not too far away and you can raise private investment—you can start to create the business case for significant industrial partners to start to take an interest, a stake, even when sharing partnerships in your programme. With the digital enterprise approach, the ability to share data much more freely in a fully integrated way across those partners really does allow you to create and emulate a large company, even though you are a small one. That is absolutely doable, and we are doing it now.

Our core team is already 180 people in the UK—very unique, world-class, skilled people who are passionate about this sector, as I think we all are,



who want to see this happen in the UK with the right commercial thinking with our partners. Dare I say it? The team is larger than some similar teams in other OEMs who do not focus on this market as much. I am very confident that we can do it.

**Q90 John Spellar:** I still have some problems with this. On having manufacturing capacity and a workforce that understands how to put planes together, and the idea that that that can all be subcontracted out, I think one might say that has not worked too well for a major commercial aircraft company. Although there is interaction between commercial and military, there is a reason why companies have different divisions dealing with this, not least because of the challenges for military aircraft. For example, the speeds at which they travel, the physical stresses on the pilots, and the fact that somebody is shooting at you provide a quite different concept. Coming back again to the manufacturing side of it all, don't you need experience in manufacturing to be able to manufacture?

**Tristan Crawford:** Absolutely. That is what the construct that we are putting in place is focused on. If you have a fully end-to-end digital enterprise, that means that everything from your requirements and your simulation of your final assembly through to build is seamless with your partner. I can say that because we are doing that today. It is not a question of, "Here's our design; see you later." It is a matter of these organisations working with us, nine to five every day, developing the aeroplane.

**Q91 John Spellar:** Where will it be built?

**Tristan Crawford:** At the moment, we have an enterprise approach, which is allowing it to generate the best possible national footprint—and that includes the regions. Coming back to the point about capacity, I can safely say that our partners on the south coast—Hamble Aerostructures, for example—have capacity. They are looking for a programme. Sometimes, our mapping of the footprint of what we can do in the UK is a little blind to what is available, and we need to be more comprehensive on what we can achieve.

**Q92 John Spellar:** One final point: when you were talking about the previous iteration of trainer aircraft, you mentioned the Hawk, and I think you talked about a "small market", but I would have thought that a worldwide fleet of about 1,100 aircraft was, in military plane terms, quite a sizeable market.

**Tristan Crawford:** Absolutely. I think that has been a bit of the constraint in our sector. The specificity of the platform—it has to meet a specific need—has generated a limited view of how far it can be pushed in a market; that is the problem. We need to break that model, and say that if you have an air system approach that basically uses existing technology, but can be adapted flexibly through modularity to do similar jobs across the market, you basically increase your market by five.

We are seeing a £90-billion market around the world that can mop up not only the fast jet training, but similar roles in surrogacy, Red Air and



operational support, be it ISR or tactical tanking. All those roles operate in a very similar subsonic performance space with a similar size of platform. We just need to use existing technology with the right modular approach, and digital, and then you can create an air-system platform very affordably across global regions. That is a huge scale of opportunity.

**Q93 John Spellar:** You've made an interesting—even persuasive—case that the work that you and the RAF are doing along these lines is coming through, but do other countries and other companies share that view? All of them seem to be still developing traditional trainers. I mean, they will have a different capacity, but still much more of a traditional model.

**Tristan Crawford:** I think we are in a transition mode, where the military is starting to realise that it has to think differently, because otherwise it will carry on paying a high price for niche capability.

**Q94 John Spellar:** But the other countries, surely—for example, Korea, the United States and others, including Italy, I think—all seem to be taking a different view.

**Tristan Crawford:** I can say that the US, Europe—including France—and Japan are issuing requests for information and proposals for what are basically called light-jet air-system solutions, because there has to be another way of procuring aircraft. There are very capable light-jet aircraft on the market today, and they have sparkling performance, but they still perpetuate the traditional model, while defence budgets are increasingly constrained, and we have to prepare for the sixth generation. The platforms that are on the market today have never been designed with the sixth generation in mind, so there is a very clear gap. As I mentioned, the Secretary-General of NATO is asking industries to start thinking differently, and that will involve thinking about the problem holistically. Certainly, from our conversations with our colleagues in Europe, the US and Japan, the mindset is shifting.

**Q95 Jesse Norman:** I have a very quick question for Tristan on the point about the sixth generation. Based on your experience and the work you have done, what are the kinds of things a sixth-generation trainer does that a current trainer does not do?

**Tristan Crawford:** I think we are looking at a brave new world in a sense—Nick gave a good example of that—where you will have a mix of capability, from needing somebody to be in the cockpit through to letting AI do the job for you. There will be a spectrum of capabilities, as Simon said. That is the reality of the future of combat air.

**Q96 Jesse Norman:** Right, but on your model, there is always someone in the cockpit. That is what you are training them for.

**Tristan Crawford:** With that in mind, there is the concept of a light-jet air system that is modular, which means that it will generate not only a crewed light-jet aircraft, but an uncrewed variant, all using the same architecture. That means that your customer now has the option to tune that training system, depending on what its combat air system will look like in future. It is a very complex space, and if your training system is not



adaptable enough to flex in line with where the customer needs to go, you have a problem.

**Q97 Jesse Norman:** Your client might be an air force that is not looking to buy 20 trainers, to train a whole bunch of pilots over a period of time; it might be looking to buy a small number of crewed trainers, a rather larger set of uncrewed wingmen or women, and other components of an integrated force approach, which will then place different loads on the pilots, the airframe and the other different components. Is that the kind of thing you are thinking about?

**Tristan Crawford:** Yes, and if I could take that one step further, in our space we have the luxury, given that a lot of the assets are not delivering lethal effect, to start to bring commercial models into this. In other words, if you hand the management of that flexible air system fleet over to a commercial or industry provider, that provider can then allow the customer to pull on whatever access they want, to either an uncrewed or crewed aircraft, to deliver the capability they want, without the customer carrying the capital risk. If the industry provider then has the luxury of a fleet of this scale, which is doing crewed, uncrewed, ISR, AJT, tactical support or aggressor red air, that scale cannot be compared to what we have today.

**Q98 Jesse Norman:** Right, so you have a leasing-type model, where you would go in and provide a solution for a particular period of time for a particular client.

**Tristan Crawford:** Yes. Imagine the Affinity construct, which is used today in flying training, but with a common aircraft system, and times it by five. Suddenly, with the economies of scale you have in spare parts and in your logistics system, which really rationalises the whole fleet, what the customer should see is a 60% cost-down on what they have to pay to access that asset.

**Q99 Jesse Norman:** Also, they are not putting up enormous wads of capital.

**Tristan Crawford:** And they are not carrying the risk.

**Q100 Chair:** One and a half minutes each on a last question. To come back to the culture inside the MoD, when you talk to them about commercial concepts, just as we were talking, and about exports, do you get a warm, happy embrace, and a willingness to give support, or do you get a blank "I don't know what you are talking about"?

**Nick Laird:** I will start with that. The defence security and industrial strategy and the defence Command Paper refresh put exportability right at the heart of all the decisions going forward. We would fully support that, because that is really important for the industrial base.

A good example of that is the new medium helicopter programme. We are part of the H175M taskforce, which Airbus is leading, with Boeing Defence UK, Babcock, Pratt & Whitney and Spirit AeroSystems. There is a high capability, low-risk solution for defence, but key to it are not just the UK



requirements, which have to be satisfied—and we look forward as a taskforce to responding to the tendering process when it gets under way.

Airbus has looked at that from a global perspective, and believes that, for that class of aircraft, the market is about 1,500 aircraft. That is based on their assessment, their footprint and how they can access markets. The reality is that they are confident that 500 of those platforms would generate the export. All those platforms would be built in the UK, the headquarters of Airbus being in Oxford, the final assembly line in Wales and manufacturing support being in Prestwick and Belfast. That is a real four-nations opportunity, which really needs to be grasped. That is decades of high-skilled work for the UK.

**Q101 Chair:** In the interests of balance, I should thank you for the advert, and say, “I dare say other suppliers will become available,” but you have made your pitch, Nick. The answer is: yes, the MoD is in your experience bigger, more export-minded, and more commercially minded.

**Nick Laird:** Yes.

**Q102 Chair:** Tristan, you have 30 seconds. Yes or no?

**Tristan Crawford:** A little bit of yes, but not enough. We have self-generated interest in the export markets, I would say. There has been enormous support from DSE—no question—but the big question always comes back to whether the UK will buy it. That is obviously where we need to move this conversation on. I am looking forward to working with all the stakeholders in the industry to make that happen.

**Chair:** Thank you both. Unless there are any other questions from my colleagues, I thank you both very much indeed for joining us; it is appreciated.

## Examination of witnesses

Witnesses: Rhys McCarthy and Ian Waddell.

**Q103 Chair:** Thank you both for joining us. You are now very experienced as to the format; you have seen it twice before. Ian and Rhys, can I ask you to introduce yourselves?

**Ian Waddell:** I am Ian Waddell. I am the general secretary of the Confederation of Shipbuilding and Engineering Unions, which is a mouthful, so I always say CSEU.

**Rhys McCarthy:** Thank you for inviting me also, Chair. I am Rhys McCarthy. I am the national officer for the aerospace and shipbuilding sector at Unite the union.

**Chair:** Thank you both for joining us. Derek, would you mind leading?

**Q104 Derek Twigg:** We have been told that a constant drumbeat of orders is critical to sustain defence industrial capacity. How, in practice, should this be implemented in the combat air sector, where major programmes can





span decades?

**Rhys McCarthy:** I think there is an absolute need—this is coming not just from the companies but from our members, particularly in BAE Systems and Rolls-Royce—for a new tranche of orders from the UK Government. You will all be aware that Typhoons are flying almost 24 hours a day on our NATO eastern borders. They are burning air time, and they need replacing.

There are also potentially around 175 international orders available from Poland, Turkey, Saudi Arabia and Qatar. This is key, because it will keep the drumbeat of work there, and it will keep the skill base, which is crucial: that is our members' jobs, their livelihoods and the local communities that those feed into. It will also see some of that technology transfer from the new upgraded Typhoons into the Tempest GCAP programme.

**Ian Waddell:** It is fair to regard Typhoon as the bridge to GCAP. Obviously, we took the decision to buy into F-35. We brought technology and manufacturing techniques to that programme to get access to it. It was not a something-for-nothing deal, but it was a conscious decision to buy into an American fifth-generation fighter, rather than develop a home-grown, UK-designed fifth-generation one. Clearly, we have a gap between Typhoon, as the fourth generation, and Tempest GCAP for the sixth generation.

The only way that we can fill that is more orders for Typhoon, developing Typhoon, putting new technology on it, upgrading it and supporting exports across the world. If we do that, we can keep the workforce in place. We already have quite a number of employees working on Tempest and GCAP, and obviously the idea is that we transition more of those into the new jobs as the platform starts to come on stream and as Typhoon starts to approach its end-of-service date.

Q105 **Derek Twigg:** How confident are you that that scenario can play out?

**Ian Waddell:** Well, it is not in our gift.

**Derek Twigg:** I am asking you for your—

**Ian Waddell:** As Rhys said, it relies on a substantial UK RAF element. As previous speakers have said, the RAF is the shop window for our air industry. If the RAF does not fly and operate and upgrade these aircraft, it is difficult to persuade export partners to buy something that is unproven, from a UK point of view.

Obviously, support in the export market is critical. Earlier on, the difficulties with Germany blocking export licences were raised. We are in international partnerships for these things. The politics in some of those other countries are sometimes complicated and create barriers. You can never be 100% confident, but I believe that we are in a position where everybody at least understands the challenge and what is required. Getting moving parts to slot in and placing things in the right order at the



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right time is clearly going to be difficult, but inquiries like the ones you are conducting and the evidence that is being taken is helpful in raising awareness at all levels of Government and in getting us all to understand collectively what needs to be done and when and the scale of the resource that needs to be put in.

**Rhys McCarthy:** There are currently 3,000 people working on the GCAP Tempest programme in the UK, and there are 6,500 within the primes on the Typhoon and 14,000 in the supply chain. They have to transition over. It will be a disaster if they do not.

**Q106 Mr Jones:** Can I follow up on that, because there is a real problem, isn't there? The last time I was at Warton was last summer. We are into the last six Qatari orders, and after that there is nothing, apart from what Rhys has just said about the Saudi and others. If we have that gap, it will create a huge problem to keep the workforce together, will it not?

**Ian Waddell:** If you look at Tempest GCAP, we are looking at the demonstrator being in the air in the next few years, with an in-service date in the 2030s—I think 2035. We are not that far away, are we? It is 11 years.

**Q107 Mr Jones:** But the important thing is keeping the assembly line going and keeping those skills. I accept what Rhys has just said about the amount of people working in Tempest already, but if you have a gap in the actual assembly skills, that will create problems. The only real way of filling that gap is exports, mainly the Saudi order. Is that not the case?

**Ian Waddell:** Absolutely. These are the things that keep us awake at night. In some cases, the intellectual property we talk about and the capability and the high levels of skill rests in the hands of a single figure of individuals, some of whom are approaching their retirement dates. This is absolutely a live issue for us. We have talked at length with BAE Systems about workforce planning, capturing quite clearly where people are in their careers and what skills they hold, and having an advanced plan for how those skills are transferred to the next generation of workers who have work to do.

The demonstrator programme is going to be important, but you are right that getting the phasing right is going to be really difficult. It all boils down to the fact that we took the decision to go for an American solution for the fifth generation. In effect, we consciously created a gap that we now are going to struggle to fill. Those export orders are critical to keep the lines flowing. It is not just the assembly line and the Warton units. If you have been around aerospace factories, you will know that these things are pretty much hand built. It is not like a car production factory, where you have tens of thousands of parts coming in and a supply chain that has a drumbeat of work itself. Sometimes it is almost one-offs. There are small numbers of highly complex parts. Feeding the supply chain and keeping that work running through is really important if we are going to have a supply chain that can support Tempest.

**Q108 Mr Jones:** To what extent do some people in the trade union movement



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actually understand the Saudi order, for example? There are some quite loud voices, including your own union, Rhys, who are not very sympathetic toward Saudi Arabia. From your point of view, should we not be making the point that these are important export orders for jobs?

**Rhys McCarthy:** I slightly disagree. Our union is absolutely focused on jobs and job security.

Q109 **Mr Jones:** You are, but you have also funded some organisations that are not very complimentary of Saudi.

**Rhys McCarthy:** Well, let's be honest. There are issues with Saudi Arabia and human rights. That is not just any trade union's view. I think it is the view of Governments around the world. Our members are absolutely aware that we need to deal with real politics. Saudi Arabia has options. If they do not buy UK Typhoons, they will go and buy French or Russian or Chinese. We kind of have to live in the real world. Our members understand that within aerospace and shipbuilding. We need any UK Government—I know we are in an election year—to be fully focused on winning those export orders and getting all the relevant departments to deliver on it. There is an export potential of 175, which is a huge amount of revenue that would come back into the Treasury and then flow into the national and local economies.

Q110 **Mr Jones:** I will leave it there, but I think some in your union need to think about who they finance in terms of some of their friends who are not friends of the defence industry, or of Saudi Arabia, or actually advocates for this Saudi Arabian order.

What is your overall assessment of the actual skill base in air combat? We heard earlier on from BAE Systems about what they are doing on apprenticeships. What are, for example, the demographics of it? Are we getting enough people coming into the industry to maintain that skill you mentioned, Ian, over a long period of time?

**Ian Waddell:** If you look at the apprenticeships companies such as BAE Systems or Rolls-Royce offer, for every 100 places, they are probably getting 1,000 applicants; they are taking the top 100 out of that 1,000. The big issue—I have been raising this for probably the last 20 years—is that if you want to apply to university, you have a single point of entry. You apply to UCAS, you list your universities in order, and if you don't get the grades and you don't get your first choice, you get the second or third on the list. If you want to apply for an apprenticeship, you have to apply to each company individually. You might go through an assessment, and you might be the 101st choice for those 100 jobs, and just miss out. You then do the same at Rolls-Royce and somewhere else. How many times do you go through that process before, as a young person you say, "You know what, I give up"? Some sort of clearing system for apprenticeships would make a massive difference around supply chains.

There are all sorts of issues around the academic qualifications now required for apprentices. We have some brilliant young people who, just because of the way they are wired, are not good at doing exams. They



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find it difficult to pass the English and Maths exams. Just last week, we had 19 people dismissed at a shipyard, who had been all the way through the apprenticeship process—all that investment of time and money—and failed at the last hurdle, because they could not pass these exams at the eighth time of trying. We are needlessly tying our hands behind our backs.

Aerospace is the same as every other advanced manufacturing industry in the UK: there are just not enough people at the moment, and we are struggling to find the right calibre of people to recruit. That is why transitioning the existing workforce—upskilling the people that are already in work and transitioning them into the new programme—is absolutely critical. We cannot just rely on new entrants to the industry being in place in the next 10 or 15 years. We have to take the existing workers and move them into that programme as far as possible.

**Rhys McCarthy:** I agree. The likes of BAE Systems and Rolls-Royce have got best-in-class apprenticeship programmes, but it is not enough. As Ian touched on, there needs to be a Government-led apprenticeship project and programme. Right across manufacturing there is a tight labour market and an ageing demographic. We are fishing from a smaller and smaller pond, and we are in danger of having a national crisis. It is not just in air combat that we need to upskill people and recruit loads more apprentices—we have AUKUS. If we are not careful, we could turn something potentially hugely successful in terms of jobs and skills into something we cannot deliver on. This is where we need a real collaboration between companies, trade unions and the Government. This would be a slightly different model than it has been for the last 30 years, where if you are a young adult currently, the route is to go to university, and you come out the other side with student debt and all the loans that come with it. The apprenticeship angle would be really welcome and positive, not just for industry, but for communities and families.

**Q111 Mr Jones:** John and I went to Adelaide in Australia—was it last year or the year before? I can't remember. Out there they are looking at transitioning older workers into new skills, which is exactly what you just mentioned. Obviously, the new shipyards are different from when those older workers started their apprenticeships. Are BAE Systems and others looking at that?

**Rhys McCarthy:** We have had it in Babcock. I was down in Devonport in late summer last year. Devonport, as you probably know, is a town in itself, but it is surrounded by huge amounts of poverty, where many people have fallen through the cracks. They have been targeting older people who have come in, and they have found it has been really successful; they are really loyal and want to learn.

The other problem is because the likes of Rolls-Royce and BAE Systems can pick the best—the cream of the crop—they get people in who don't want to do the job that they have done the apprenticeship for; they want to become the CEO or managing director within three or four years, and they leave. You have this leaky bucket situation all the time. I think industry understands, and it is trying to do something. It comes back to



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the fact that we need not just Government, but all political parties to understand that there needs to be a national apprenticeship programme.

**Q112 Mr Jones:** How do you do that, Rhys? You have talked about BAE Systems and Rolls-Royce, which are obviously big primes, but there are many small engineering companies—electronics and others—in the supply chain that are vital for these projects. How do you turn up the dial in terms of apprenticeships and skills bases there? That is going to be just as important, isn't it, for maintaining industry?

**Ian Waddell:** That was the point of the apprenticeship levy. That is what it was supposed to do: provide funding to allow supply chain companies to recruit and train apprentices. I think it is an open question as to how successful that has been. Considering the amount of money that has been raised, which I think is over £1 billion now, my view has always been that if we had been able to invest that in the sort of training centre that BAE has built at Warton—to give one example, which I'm sure you'll have seen: state-of-the-art facilities where they are training supply chain people—if that was replicated up and down the country, imagine what we could do. For me, that would be a really positive use of the apprenticeship levy. It is not like we are trying to steal money—the money is there. It has already been raised, but it is not being used in the way it was designed to.

**Q113 Mr Jones:** But this is nothing new, is it? Look back before apprenticeships, 30 years ago, on Tyneside, for example: NEI Parsons had its own training school; the gas board had its own training school. But they didn't just train their own apprentices; they trained apprentices for other smaller companies that fed into it. Is that what you're suggesting—turning back the clock perhaps 30 or 40 years to something that actually worked quite well, where the prime overtrained because it knew they would actually filter out into the system?

**Rhys McCarthy:** We have talked about something like an apprenticeship passport, which would be kind of for the common good. We do need much more of an altruistic approach in industry. Like you say, it feeds into the supply chain. We have raised it many times. Ian, I think, touched on it. If you apply to Rolls-Royce or Leonardo and you don't get in, and you apply to another place and you don't get in—what happens to those people? We raised the question a few years ago, and at first they were saying, "We don't know," but they are starting to drill down into that and find that detail. I think there's much more of an understanding.

There were cases during the pandemic of problems in the supply chain where they were having to let apprentices go, and I know BAE Systems took them on, which is a good thing. But we need to take on not just going up, but flowing back in to support the supply chain. I know it is a massive issue. You need to stress-test your supply chain—not just whether they can deliver the parts, but whether they can deliver the man and woman power.

**Ian Waddell:** To answer your question directly: yes, you could say it's a throwback to 30 years ago. You could also say that we could learn a



lesson from history of what worked well at the time. John touched on the supply chain issues in some previous questions. For me, that is a way of developing a cluster, which is a model that is applied elsewhere in the world. If you look at successful manufacturing economies, they operate on the basis that you might have a prime—an OEM—and it has a cluster of supply chain companies around it, and they benefit from shared geography, shared knowledge and shared personnel, and you can help to smooth peaks and troughs by redeploying people across businesses. Of course, you could pool resources in that sort of training environment.

We are focused on apprentices, but I think it is important to say it's not just about apprentices. The role of semi-skilled people in industry has been raised today. That is something we are exploring with our members, many of whom are former apprentices, and are clearly very passionate about the skills that you come out with and the qualification through an apprenticeship. But there is clearly a place in industry for people who maybe don't aspire to or aren't capable of reaching the full range of skills to still play really important, useful roles in our industry. If we could build those sorts of technical training centres—they could be funded, in my view, from the apprenticeship levy—on a widespread basis across the UK, you could have those spread out in all corners of the country doing a really good job to help to support and build manufacturing clusters. It would be an absolute win-win.

**Rhys McCarthy:** I visited Rolls-Royce Filton in September or October and we raised that question about working collaboratively with other companies. As you know, that is where they build the engine for the Typhoon and are developing the engine for the Tempest. They confirmed that they are working with BAE Systems and the other groups within Tempest to collaborate and share. We need to encourage that, but much deeper into the supply chain.

**Q114 John Spellar:** My recollection is that Rolls-Royce in Derby used to do roughly that. They would have an apprentice intake, take the cream of the crop, and then farm out the others to their supply chain. At the same time, they would also enable them to access the Rolls-Royce training centre, so it was very much a linked enterprise. We have talked a lot about what companies should do.

Surely also—I do not know whether you have approached the Ministry of Defence on this—the Ministry of Defence is the client, and too often the customer and client is ignored in this. The Government purchases about £300 billion of stuff every year. They can specify requirements in that; that is not unique. The Olympic Park laid a requirement for the ratio of apprentices on construction companies working there. They also laid a requirement that, if companies on phase 1 did not get contracts for phase 2, those apprentices would transfer across to phase 2 companies.

I take the point about apprenticeships that are not the traditional ones, but also about the so-called semi-skilled ones. But boy, if you haven't got them, you notice it, as the munitions industry has been finding around the world. Shouldn't we have a more proactive policy in terms of pressing the



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client as well as the companies?

**Ian Waddell:** I think that is one of those questions where you know we are going to say yes.

Q115 **John Spellar:** Not exactly, but it is good to have it on the record. The question I am also posing to you is: in your discussions with companies and with Government, are you pressing on Government that this is the way that they need not only maintain the national enterprise, but to underpin the defence enterprise?

**Ian Waddell:** Absolutely. For me, this is a clear measure that should be part of the social value considerations in all defence contracts. We have raised this time and again. When I have appeared here before, wearing my shipbuilding hat, I have raised the issue of social value and support for apprenticeships. These are measurable and deliverable things that should be built into procurement contracts, in my view. I absolutely agree; not only is it important, but the Government have the capability, and the previous examples that you have cited demonstrate that it can be done.

Q116 **John Spellar:** Can I just come back to a point that Kevan Jones raised a bit earlier about those who are trying to disrupt the industry? At the moment, we have mobs of people trying to both block and vandalise defence companies. Bluntly, should the unions not be taking a much more vigorous position in condemning that behaviour, which is putting both the defence industry, and the jobs of their members and communities, at risk?

**Rhys McCarthy:** It is a really good point. I can assure you that we have done that and are still doing it. Very early on in October, my own sector put out a statement that defence workers should not be paying the price for the Israel-Gaza conflict. That went out to all our members and we sent it to companies as well. We have had issues with BAE Systems, and we have been in close contact with our members, giving them support and sharing in that.

It is not just our union; it has been other unions. There are people of various different unions who have been flying flags and badges, unofficially. This condemning and targeting of defence workers has worked all the way through—not just from our sector—up to our general secretary. This is not their fault and they should be able to peacefully get to work. I should say that our reps and members absolutely uphold the rights of people to protest peacefully. That is a fundamental right in any democracy. But when you are targeting and harassing people, that oversteps the line.

We have had incidents—people turned up at Rolls-Royce in Filton making claims abouts F-35s, but they do not make anything for the F-35A, for example.

**John Spellar:** If only!

**Rhys McCarthy:** People should have a little bit of courtesy—it really upset our shop stewards, because they had to go out and deal with it. They just said, “You could have picked the phone up and asked us, and we would



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have told you straight.” But rest assured, we have been at the forefront of supporting our defence members.

**Q117 John Spellar:** It would be helpful if you could share that communication with us.

**Rhys McCarthy:** Absolutely. No problem at all.

**John Spellar:** Thank you very much.

**Q118 Chair:** My sense has always been that your members, and employees across the sector, are part of a national endeavour. There are critical capabilities; we need to defend ourselves in a very uncertain time. We are grateful for it. I have seen examples—we will all remember covid, where people were really leaning in in very difficult circumstances to keep essential tasks going.

Thank you for your courtesy in being here throughout the session—you are the last two standing, but you were here throughout. You would have heard other witnesses talking about how critical it is to reduce the time, because that reduces cost and makes exports more of an opportunity. They talked about digitalisation and automation. In both cases, I am absolutely convinced: in the context of also having an extremely skilled labour force and making certain we have the skills coming forward. When you hear discussions about digitalisation and automation, do you feel that you are in the room for those discussions and working through how this works, or is this some horrible thing that might hit us at some future date and that we should worry about?

**Ian Waddell:** That is a really timely question, because I have been a passionate campaigner inside the union movement for unions to embrace the issue of productivity and champion productivity improvements—in the way that our German comrades do, for instance. They are proud to wear the badge of being the most productive workforce in the world. I don't know if that is still the case, but last time I was there, that is certainly what they were saying. I would absolutely welcome the involvement and empowerment of the workforce in determining how things can be done more efficiently and effectively.

My simple logic is that in every factory I have ever been in, if you ask the person doing the job if there is a way it could be done better, they will say yes, and list half a dozen things. It might be computer systems, supply chain issues—it could be anything. The challenge then is for the management of the companies to take those things on board. It might take a big investment in terms of purchasing software or supply chain development. But we have seen many examples of self-organised teams finding ways to shave 20% off a process. We did a pilot on the Clyde—a kind of task and finish—and they were finishing on Thursday evening. The job was done—a 20% productivity improvement. It is a shame we have never followed that through into full production, but the potential is absolutely there.





Obviously, there are caveats. We do not want a situation where skilled people are simply being replaced by automated processes, which is always the big fear. But if you look at Germany, they take out the routine parts of jobs, automate them, and free up the skilled human individual to do things that require more brain power and cannot be done in that automated way. I honestly do not think we have anything to fear from it. I see huge opportunities for the trade union movement and for the jobs of the members involved. If your understanding of the process is unlocked and you are empowered—just think of the job satisfaction you get when you can say, “I delivered a 20% productivity improvement on my job.” That is a fantastic situation that we could be in.

Quite often, people’s view of unions is that we are stuck in the past. Kevan’s question about reinventing things from 30 years ago has probably not helped to shake that image. But the people I come across in this industry, Rhys’s members, and the other union members are all extremely proud of what they do. They are all looking for ways to do things more quickly, efficiently and cheaply, and to protect the UK industry so that we can all support the national endeavour. That is absolutely built into the fabric. People wear those polo shirts with the badges with pride in those factories. You will have seen that if you have been around; it is tangible.

**Rhys McCarthy:** What I found quite unique when I came into this sector, because I’m not from it, is that our members see themselves as custodians and guardians to hand on to the next generation. To Ian’s point, they are proud of what they do. They are some of the most loyal, creative and productive workers, and I think they are ready for change.

There were some fears. It wasn’t helped when we went for a BAE Systems site visit and there was a video that was just all robots—even a robot dog—and we said, “Where are the people?” But those fears have been allayed by our convenors—our senior shop stewards. There is an absolute realisation that this will never become like an automotive production line; the work is too skilled. You get lots of orders, although it’s not the volume that you get within the car industry. There are highly skilled jobs. Some of the jobs will change but, as I say, I think our membership always see the big picture and are willing to adapt.

Q119 **John Spellar:** Do management understand that the people who understand how you could improve the process best are the people who are there every day?

**Ian Waddell:** That is a very good question, John. Again, you know you’re pushing at an open door with us, don’t you?

There is always a tendency in our British industry to defer to one of the big consultancy firms and think they’ve got the magic answer, rather than actually asking the people who do the job.

I cannot say hand on heart that, yes, it’s understood. It’s a source of frustration to us, because the obvious thing to do is to talk to people who actually make the things and say, “Is there a way we could do this



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better?" Start with that. You can bring the consultants in after that to shape it and hone it, but don't start by bringing somebody in from outside, walking around with a clipboard and telling people how they should do their jobs. That's an insult.

**Q120 Derek Twigg:** Obviously you sat through the last session, and we have asked this question regularly in various other sittings of the prime suppliers and other suppliers. It is about the relationship with the MoD: "Is it good? Could it be better? Are there problems?" What is your view as a trade union of that relationship between the MoD and industry and workforce? Where are the weaknesses, or are there none? Is everything hunky-dory and perfect in the garden?

**Rhys McCarthy:** I will come in first, if I may, because Ian might have a slightly different angle on this.

I have been in this role since 2019 and I have had no involvement with the MoD. The MoD should meet not just me—I don't take it personally, but it's about our shop stewards and members who do the job and know the job.

There is a real collaboration. We work in teams. We have a CSEU air defence forum that brings together GMB members, Prospect members and members of Unite. We work collaboratively with Rolls-Royce and BAE Systems management. Unite has set up a team—a network—with Leonardo, a sister trade union in Italy.

We don't hear anything from the MoD—nothing. That is a real concern. We are working in partnership with everyone else, from a trade union point of view and from the point of view of our members, but the MoD seems to be a missing part of that and that has got to change. But Ian may have a slightly different take on this.

**Ian Waddell:** It depends on what you mean by "the relationship". Rhys has talked about the trade union relationship, which is part of it.

**Derek Twigg:** Well, it's both, really.

**Ian Waddell:** We tend to go and see the Ministers when we are lobbying for something, or we need a decision to be made. I can see the Chair is smiling wryly.

**Chair:** I recall.

**Ian Waddell:** Yes, absolutely. It would be brilliant from our point of view if there was a more regular drumbeat of meetings. If we could move into a phase where the trade unions and the workforce were accepted, as a legitimate voice with legitimate concerns, as part of the industry and as part of that national endeavour, that would be a step forward. I saw Ben Wallace last night; he wasn't very complimentary about me in Parliament when he was the Defence Secretary, which is unfortunate. I don't know what I did to upset him.



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What is more important from our point of view is the relationship between industry and the MoD, which I would classify as a bit of a love-hate relationship. There are moments when we seem to be saying, “Right, we’re going to work collaboratively. It’s a joint endeavour. It’s in the national interest.” And there are other moments when it feels like the industry is being treated like the enemy within. You know: “They have stripped money out of the taxpayer. It’s all cost-plus. They’re fat, inefficient, lazy.” You hear those terms being bandied about and I cannot make the two things add up.

My experience is this. If there is an urgent operational requirement, for instance, or if you look at what’s been done, for example, in supporting Ukraine, people have absolutely stepped up to meet the challenges. Universally, in my experience, that’s what the industry does—every part of it.

We have some amazing success stories in terms of the things that we have built in this country, but we have a collective tendency to talk all that down and be dismissive of it and find problems with it.

So I wouldn’t say it is fixed. Things are moving in a better direction. There is absolutely room for improvement. I am a great believer in a collaborative approach between industry and the Ministry of Defence and the Armed Forces. That has to be based on value for money, realistic contracts at a reasonable rate of return for the companies and their shareholders, and decent wages for our members, of course, but without being seen just as a cash cow that can be milked endlessly from an industry point of view. To be honest, I think those days are long, long gone. I haven’t come across anybody in the management teams in the defence industry who thinks about the MoD in that way. What I am told universally is that it is an extremely difficult Department to work with. It is extremely challenging in terms of cost, timescales and the rest of it—which is what you want. If we could work on that collaborative process, the development of intelligent customer relations, people with the expertise to be able to have those difficult conversations, but in a productive and constructive way, that would be a big step forward. It is a work in progress.

**Chair:** If there are no other questions, let me finish on a positive note. We have probably all had the same experience, but in my experience of seeing colleagues of yours, one thing that really excites them is seeing a new generation coming through and being able to impart their skills and expertise and see that this national endeavour is going to continue. We need it to continue. This was a session about GCAP. I think we all recognise that the skills that we are going to be learning and need to learn on GCAP will set the country up well for generations to come. That is, again, a common endeavour on which we need to deliver on a tight timeframe, which is what our inquiry is about. Talking of tight timeframes, thank you for enabling us to keep to our tight timeframe this afternoon, and thank you for your participation.