

Defence Committee

Oral evidence: F-35 Procurement, HC 326

Tuesday 17 October 2017

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Members present: Dr Julian Lewis (Chair); Leo Docherty; Martin Docherty-Hughes; Mr Mark Francois; Gavin Robinson; Ruth Smeeth.

Questions 72-254

Witnesses

I: Mr Peter Ruddock, Chief Executive, Lockheed Martin UK, Mr Jeff Babione, Executive Vice President and General Manager, F-35 Programme, and Mr Steve Over, Director, F-35 International Strategy and Customer Engagement.

II: Harriett Baldwin MP, Minister for Defence Procurement, Stephen Lovegrove, Permanent Secretary, Ministry of Defence, Lt General Mark Poffley, Deputy Chief of Defence Staff (Military Capability), Ministry of Defence, Tony Douglas, Chief Executive Officer for Defence Equipment and Support, Ministry of Defence, and Air Commodore Lincoln Taylor, Assistant Chief of Staff, Capability Delivery Combat Air, RAF.

Examination of witnesses

Witnesses: Mr Peter Ruddock, Mr Jeff Babione and Mr Steve Over.

Q72 **Chair:** Good afternoon and welcome everybody to the second hearing to do with the discussion and investigation raised by *The Times* newspaper a few weeks ago. I would like our witnesses to introduce themselves briefly for the record.

Mr Ruddock: I am Peter Ruddock, chief executive of Lockheed Martin in the UK. In my first career I was in the Royal Air Force for 37 years and had the opportunity to fly 30 different aircraft types. I ran the fighter weapons course, which is like "Top Gun" and I did a lot of test and development flying.

Mr Babione: Hello, I am Jeff Babione, the executive vice president of the F-35 programme for Lockheed Martin.

Mr Over: I am Steve Over, the director of international strategy and customer engagement for the F-35 programme.

Q73 **Leo Docherty:** Good afternoon, and thank you very much for coming along today. Mr Babione, how do you respond to the allegations that the F-35 programme is "way over budget, unreliable, full of software glitches and potentially unsafe"?

Mr Babione: To open, I want to thank the Committee for the opportunity to come and update on the great progress we are making on the F-35. The UK's F-35 is the most capable multi-role airplane in the world. The pilots will know the sensor fusion, the stealth capabilities and unprecedented capability.

Relative to your question, it is clear the programme has gone on longer than we originally anticipated, but look at the facts of where we are with the programme, as far as the capability of the airplane: the US Marine Corps is already at operational capability with it. The US Air Force has already declared operational capability. Clearly, it is at a war-fighter level and only getting better as we wrap up the development programme.

As I am sure we will talk about today, the unit recurring flyaway cost, or the cost of purchase an airplane, has been going down year over year and we see that going down further in the future.

When you look at the F-35 programme in the whole context, yes, it has taken us longer to get here than it should have, but I think we have developed an amazing product for our customers, including the UK, and I think you will see there is good value for the money.

Q74 **Leo Docherty:** Thank you. Do you accept the findings of the Pentagon's Director of Operational Tests and Evaluation 2016 report, which included the suggestion that attempts to keep the F-35 programme on schedule and to minimise delays by reducing or truncating planned development testing represented a "risky, schedule-driven approach"? What is your response to the accusations or judgments made in the Pentagon's report?

Mr Babione: I would offer that I had a different perspective. This test programme is unrivalled in its complexity and robustness—65,000 test points across all three variants and nearly 9,000 flying hours, so without a doubt the most tested weapons system in the history of aircraft development. As with any development programme, there are going to be issues along the way, but the hallmark of the F-35 programme and some of these things that have been brought up by the DOT&E were issues that we discovered in the testing and we have gone out, put the engineering time and effort in and solved those issues. So I am confident that the F-35 will meet all requirements levied upon it through all the customers.

Q75 **Leo Docherty:** In terms of delivering British F-35s, are you confident that is on schedule?

Mr Babione: Yes. We have delivered 12 today. We are on track to deliver two more this year, and if you were in our factory in Fort Worth, you would see the lot 10 jets. I see no reason why those would be late to deliver.

Q76 **Leo Docherty:** If they are not on time, what accountability mechanism is there in your contract to incentivise you to deliver this on time?

Mr Babione: There is no specific penalty in our contract with the joint programme office, because that is how we contract for all the customers, including the UK. There is certainly a reputational element to this. Lockheed Martin is very proud to be able to develop and deliver the F-35 and it is important it is on time. We understand your initial operating capability is little more than 400 days away and we are laser-focused to make sure you have the airplanes you need to declare initial operational capability, as well as the entire air system that you need to do that, including the support equipment, the training systems, all those things you need to declare IOC. So while not a financial penalty, it is certainly something we are focused on as a team and as a corporation to deliver.

Q77 **Chair:** Can I check? It was the Pentagon's DOT&E report that raised a lot of red flags about the project. You will say you are aware of it and that you are catering for it and putting it right. Have you any reason to believe, then, that in their next report they will declare themselves satisfied that everything they were worried about in their previous report has now been dealt with?

Mr Babione: It would always be dangerous for me to perceive what the DOT&E will say. I know this is an annual report. This has been going on for many years. It was not just the one in 2016, which you are referencing. It comes out on an annual basis. So there is tremendous transparency between us, the joint programme office and the DOT&E testers. In fact, we are preparing for the operational testing and evaluation early next year. Our first meeting to discuss that start is in February 2018. If I think, looking forward, to what that report will say, they will always say that there are risks in certain areas, but they will show that there has been tremendous progress since the 2016 report. There has been tremendous progress in all areas and, as far as I know, there is no capability that we

will not provide in meeting the system design and development capabilities that were asked for.

Q78 **Chair:** Are there any areas of concern—and I am sure you know the whole list off by heart—that the DOT&E raised that you think they might still come back to as outstanding?

Mr Babione: Not that I am aware of.

Q79 **Chair:** Okay. When is their next report due out?

Mr Babione: Steve, do you know when the report is coming out?

Mr Over: Typically, their cycle is that they will publish a report in the first quarter of the calendar year.

Q80 **Gavin Robinson:** Building on that, can I take it from the response that you do accept entirely the allegations that were put forward in 2016 about unreliability, about being over budget, about being potentially unsafe, about having the software glitches, but that you have worked through them all and you are satisfied they have been resolved as part of the process? Is that a fair summation?

Mr Babione: I would say there was a large number of areas that the DOT&E report covered. I would say, in general, we agreed with most and most were already in work. There were a handful where we just see the outcome differently, particularly from a risk standpoint, because you are asking two different organisations about the risk of something—in a factual, data-driven area. We agreed with the information provided at that time. Most importantly, much if not all of that has already been taken care of and is part of the baseline design going forward.

Q81 **Gavin Robinson:** Mr Ruddock, as the UK chief executive, who owns the intellectual property to the ALIS system on the F-35Bs purchased by the UK?

Mr Ruddock: The UK has sovereign ownership; they can modify and use it without support from the US for a period, if they so wish. I would not have any concerns about the ALIS system; I think it has come a long way in development and that it is a game-changer in the way it provides support to the entire fleet of our planes. Eventually, that will be more than 3,000. One of the things that we are striving to do is drive cost down in this programme. It is one of the threats to the programme. We need to get that cost down, and we have demonstrated very significant cost reductions over time. Having that single system that allows you to capture all the data—and having it one place—leads to tremendous efficiencies in every area of the support solution, so I have no concerns about ALIS whatsoever going forward.

Mr Babione: I might add that this applies to the entire weapons system. Because it was procured under Government funds—partner funds—we have unlimited rights to use that material.

Q82 **Gavin Robinson:** Rights to use it? Do we have the unfettered ability to stress-test it, to poke around it and to try to augment it, or are there constraints in that regard?

Mr Babione: I am not aware of any constraints you would have.

Q83 **Gavin Robinson:** Full sovereignty over ALIS?

Mr Babione: As far as testing it. Otherwise, I am sure that you can perform whatever tests you think are appropriate from a customer's standpoint.

Q84 **Ruth Smeeth:** So we can test as much as we want? Are we allowed to upgrade it independently? Are we allowed to play with the software? Where does the sovereignty stop in respect of the ALIS system?

Mr Babione: The ALIS system is delivered as part of the weapons system when you procure the aircraft, and we will be shortly be installing that system here in the UK. The UK could certainly perform whatever testing it wanted on that system.

Q85 **Ruth Smeeth:** Okay. Say there are issues for us in relation to the way we would like to use it that come out of that testing. Could you talk me through the process if we wanted to make changes as a result of the testing?

Mr Babione: Typically, you would go back to the joint programme office and provide that feedback.

Q86 **Ruth Smeeth:** So it would be in conjunction? Would we do that because of convention, or because we would not be able to do it independently?

Mr Ruddock: I think it is something that you would not want to do, because one of the benefits of having a common system is that it is common. If you start to step outside and make it different, you are making problems for yourself. You would need to do it in harmony with the rest of the partner nations. If you wished you could go and do something else, but it is not something that the user would find attractive, though I do not want to speak on their behalf. Should they wish to do that, we would clearly listen and look to see how we would support that.

Q87 **Ruth Smeeth:** That is the question: could they, not whether or not they would.

Mr Ruddock: They could do. I just don't think that it would necessarily be attractive.

Q88 **Martin Docherty-Hughes:** How vulnerable is the ALIS system?

Mr Over: First, thank you for the chance to set the record straight and talk about ALIS. The Autonomic Logistics Information System is a remarkable information technology system that goes with the aircraft. Every aspect of how you plan and conduct missions as well as how you perform maintenance on the aircraft is funnelled through ALIS. You have to think about the threat from the cyber-security standpoint. The threat never remains stationary, so there is a very rigorous set of requirements that ALIS was designed to and the requirements have evolved over this development programme. The requirements that we accepted in 2001 have evolved as our and the US Government's understanding of the threat has evolved. Today I can report to you that there has been rigorous cyber-

testing of the ALIS system and we are unaware of any successful efforts to penetrate the system and we are successfully meeting every one of our cyber-security requirements for ALIS.

- Q89 **Martin Docherty-Hughes:** Do you agree or disagree with Christopher Bogdan, former head of the joint programme office, who said that “we have a lot of work to do on ALIS”, given what you have just said, and “it is not nearly as good as it can be, and [...] frankly it’s late”?

Mr Over: I would put his statements in context. Those are the words from significantly earlier this year. ALIS’s development system is continuing to evolve. We are just pushing a very big ALIS upgrade to the fleet right now, and will conclude 2017 with one more significant capability upgrade to ALIS. From our perspective as the manufacturer of this equipment, I would submit that we are on track to deliver the full performance of ALIS before we conclude the system development design programme either late this year or very early in 2018.

- Q90 **Martin Docherty-Hughes:** From the reports and briefs that I have been reading about the future of programme testing, it seems that many of the problems are being stored up, which we all know will have a budgetary consequence. I have got another memo here from the former director of operational test and evaluation, Michael Gilmore, stating that “failure to adequately finish SDD will result in a far greater risk and cost than completing it now.” How confident are you that you won’t be sitting here a couple of years from now telling us the exact same thing?

Mr Babione: It is a similar question, but I will extend the response. As we work in this transparent environment between the joint programme office and our customer, they have an opportunity to see how the system is performing. If the system is not performing to the specification or in the way they want, they direct us to make those changes. That is the process that has been going on for the last 16 years.

More recently, as we wrap up what we think is the final mission software at the end of this year, we believe that we have included all the changes that the customer has required. If there were significant things left to do, I hope they would ask us to continue to do the development under the system design and development phase. We believe we have responded to those inputs, and we will wrap that up at the end of this year—at the latest, early next year—on the mission software.

- Q91 **Mr Francois:** What is the total cost of an F-35B, delivered in the current production line?

Mr Babione: To provide the context around the cost, it would be useful to explain how the air system—the aircraft—is procured. We are currently delivering the lot 9 airplanes—the ninth lot of airplanes. The UK has six airplanes in that lot, out of a total of approximately 66 airplanes in it. They have about nine airplanes out of nearly 70. Lockheed Martin aggregates the purchase of all the partners’ airplanes into a single lot to afford economies of scale, and will continue to do this. The lots have grown

bigger and bigger over time, and that has enabled us to bring the unit cost down for all of the airplanes, including the B model.

The aggregate lot 9 price—the price that I will be discussing here—is in US dollars. It is the one about which I have an agreement with the joint programme office, and that contains only what I know from the Lockheed Martin company. There may be other UK-specific requirements that I am not aware of. For an F-35B in lot 9, it is \$131 million. That represents a significant reduction—about 25%—from the very first lot that the UK bought their airplanes in, which was lot 3.

Q92 **Mr Francois:** *The Times* said that if you include spares, software upgrades and retrofits, the real price of an average F-35B delivered this year will be somewhere between £130 million and £155 million. That includes spares, software upgrades and retrofits. Is that a figure you recognise?

Mr Babione: No, it isn't, but that does not mean it is not an accurate figure. Those entities are probably best addressed by the MoD, which I believe is going to discuss this with you after our testimony.

Q93 **Mr Francois:** Well, what has been the cost to the UK taxpayer of the F-35Bs delivered so far, including retrofits and software upgrades? We have got 12 delivered so far, right?

Mr Babione: Yes.

Q94 **Mr Francois:** So what has been the cost of those 12?

Mr Babione: I can only offer the unit recurring flyaway cost, which I negotiated with our joint programme office. For anything specific or unique to the UK, I would not have that information. I could go through each of the lots and provide you with the prices of the airplanes in them if you would like.

Q95 **Mr Francois:** Have you got that with you now?

Mr Babione: I do.

Mr Francois: Okay—fire away.

Mr Babione: As I mentioned, the lot 3 airplanes were \$161 million. Lot 4 was \$139 million; lot 7 was \$137 million; lot 8 was \$134 million; lot 9 was \$131 million; and the lot that we will be delivering next year, which is the most current lot for which we have negotiated prices, is lot 10 at \$122 million. You can see from lot 3 down to lot 10 that there is a 38% reduction in the price of the aeroplane.

Q96 **Mr Francois:** Do you envisage that curve continuing as you go through future lots beyond 10?

Mr Babione: As we enter lots 12, 13 and 14, working with the joint programme office, we have constructed what we call a block buy and an economic order quantity opportunity, which is not the annual buys that we have done in the past. The joint programme office has asked us to aggregate all three lots into approximately about 445 airplanes—that is

lots 12, 13 and 14. That will allow us to provide an economic order quantity to our supply base.

Lockheed Martin has gone out and obligated about \$1 billion to our industrial base to buy the materials we need for those airplanes in quantities, and that will translate to a significant reduction in cost of those airplanes over those three lots. I would estimate right now a reduction of about \$400 million for that opportunity. We will also see additional reduction in the cost of the airplane as our industrial team as well as the Lockheed Martin mechanics, the men and women who build the airplane, become more proficient at the building—what is often called the learning curve.

Q97 **Mr Francois:** So if, for simplicity, we call lots 12, 13 and 14 a kind of super-lot, how many UK aircraft are due to be procured from that super-lot?

Mr Babione: I don't have that number. We could provide that for the record. I am sure the MoD knows that number, but I don't have it in my notes.

Mr Ruddock: I have seven aircraft between 18, 19 and 20, if that is the question.

Q98 **Mr Francois:** 12, 13 and 14.

Mr Ruddock: Yes. I don't have it beyond 20, I'm afraid.

Q99 **Mr Francois:** If you could let us have that, it would be very helpful.

Mr Babione: We will.

Q100 **Leo Docherty:** What mechanism is there for setting a ceiling for the price? Does the MoD accept the price you give it? Or is there any kind of mechanism in the contract that sets some kind of ceiling on the price?

Mr Babione: Absolutely not. Each one of the lots is negotiated independently and there is certainly an expectation from not only the UK customer but all customers that the cost continues to come down. Lockheed Martin recognises that that is extremely important and that the affordability of the airplane is also in our best interests. If we continue to reduce the price of the airplane and we recognise that it is a phenomenal capability, we understand how that will ultimately result in additional orders. We are under great pressure to continue to reduce the cost of the airplane. My CEO has said many times publicly about how important affordability is and the cost target is one that we have provided ourselves, not one that is driven by the customer, to drive the price down for the A model to about \$80 million at the end of that block buy. Our target here would be about \$105 million for the B model by the end of that lot 14.

Q101 **Leo Docherty:** That is interesting. We have of course paid the ticket price, as part of that negotiation—I think some \$200 million. How much did it cost from your side for the British to have a negotiation?

Mr Ruddock: It was actually closer to \$2 billion at that point of entry, to be a level 1 partner.

The huge advantage, if I could just mention it briefly with the Committee's indulgence, is the tremendous benefit to the UK industrial base. We have placed orders—the number is colossal. About \$12.9 billion has been placed in orders with UK industry. That is double the annual input from the music industry, which is quite a remarkable sum. To be clear, that is over the period of the programme, and not an annual figure.

We have got more than 500 companies in our supply chain. The benefit of the UK having been part of this from the beginning is that we get the benefit not just from the 138 aircraft that the UK is buying, but we are providing components for 15% of every aircraft, so more than 3,000. The benefit in terms of jobs is huge: it is more than 20,000 jobs over the production period of the programme.

What I see going round and visiting some of these companies is the remarkable things they are doing to make this a success. It is British engineering at its very finest. It is often very small companies, as well; they are doing a phenomenal job for this programme and keeping it moving forward in a very successful way. That is something we must not lose sight of when talking about the cost: there is a tremendous investment in the UK from this programme as well.

Leo Docherty: That is very useful, thank you.

Q102 **Martin Docherty-Hughes:** In the debate we often hear the UK spoken of as a "tier 1 partner". What does that actually mean?

Mr Ruddock: I think it is fundamental, if I may talk to that, because some time ago I was very much more involved in this and aware of what it brought. The most important thing was that it gave us a one quarter share at the table with the three United States services: the Marine Corps, the Navy and the Air Force. We had a very powerful voice in those early negotiations in terms of deciding what the capabilities were going to be and the key points in terms of what the design ought to look like.

Clearly, you have a lot of choice when you set out on a journey looking at a new fighter aircraft. You will pick particular points that you want to optimise. The UK had particular requirements, both in terms of performance and the weapons sought for integration. I think it was a very important contribution. It also sent a very powerful political message. If you remember, this was in the late 90s: we were standing very close to our US allies and that was sending a powerful message as a tier 1 partner.

So there have been significant benefits, I would say, not just in terms of setting the requirements for the aircraft, but also in that industrial benefit. All those companies are on the programme because they were the best athletes—it was not a case of "we are going to give it to people to allow them to build their industry". These were very good, capable companies providing best of class in the world, which is why they have stayed on the programme—that is fantastic.

Q103 **Mr Francois:** On cost, quickly, before my colleague takes over. Those unit costs you have given us are for the aircraft.

Mr Babione: Yes.

Q104 **Mr Francois:** How much do you have to add on for spares and logistics support?

Mr Babione: Again, that depends on the size of the fleet and if there are any other special requirements. I would have to offer a "it depends", and the MOD was probably the best one to say specifically what additional costs they put into the production.

Q105 **Mr Francois:** Yes, but it is your aircraft, so I would expect you to have some idea of how much extra the spares and logistics cost.

Mr Babione: That is not part of the production contract. The purchase of the spares is done separately; it is aggregated over a longer period of time, so it is difficult to pull out exactly how much it is for each airplane.

Q106 **Mr Francois:** With respect, I gave you a figure earlier, including spares, software upgrades and retrofits, and you said you did not recognise it. How can you not recognise it if you don't know what the spares and the logistics cost?

Mr Babione: I would offer that I don't recognise it as being the unit recurring fly-away cost. There are additional costs for spares and other support equipment that go with any weapon system. Whether or not that is the right number—perhaps I should have said I don't know the delta, rather than that I don't recognise it as the unit recurring fly-away cost.

Q107 **Mr Francois:** I think the stuff you have given us on the unit cost is very helpful, but I find it rather surprising that, as the manufacturer of the aircraft, you are not able to say what kind of delta there is in terms of spares and logistics support. Obviously, in terms of the through-life costs of the aircraft, those numbers are pretty critical. I am going to give you one more stab at it.

Mr Babione: I do not have the specific numbers here. If we were asked specifically on a given scenario—a certain number of spares for a certain number of airplanes—we would be able to generate an estimate. As I offered, that is not the way that the customers procure us. As Peter mentioned, they buy these spares in aggregate, and this is not an annual purchase. It buys spare parts over about a three-year period, so each one of those contracts is slightly different. As the fleet size rose, those spares go with those fleet sizes. It isn't that I don't know it; it is a difficult question to answer. It is not nearly as easily defined as the unit recurring fly-away cost is, but we do know those numbers.

Mr Over: They are not on a per-aircraft basis. The types of equipment we supply are more facilities and infrastructure—capital equipment costs—so it is probably more site-specific. You will buy a pool of spares, a number of training devices and an ALIS system as you stand up each specific site of F-35s. It is really up to the UK MOD. We also do not have complete visibility into all other sustainment costs. As you might imagine, on personnel costs, fuel, petroleum and such things, we have no insight into

what the UK MOD spends. That is the reason we feel the MOD would probably be in a better position to help you understand those costs.

Q108 **Ruth Smeeth:** You talked about Britain buying from lots 3, 4, 7, 8, 9 and 10. Did we not buy any from lot 2? I would be interested to know how many we bought. I thought we bought from lot 2. Also, how many did we buy from lot 4?

Mr Babione: My information shows that the first UK purchase of a B model was from lot 3. We did not build a B model for any customer until lot 2 and I have, for lot 4, one airplane.

Q109 **Ruth Smeeth:** Lot 4 was one airplane. How many came from lot 3?

Mr Babione: Two.

Q110 **Ruth Smeeth:** That is different from previous evidence we have taken, so that is interesting. Are they too heavy to land vertically?

Q111 **Mr Ruddock:** This is, thankfully, a really good news story. The aircraft actually has a really good history in terms of weight. All the aircraft programmes I have been involved with in one way and another over time have actually grown in weight. Remarkably, on the B model there has been no weight growth whatever in the past seven years. You might say, why is that? One reason is because it is an aircraft that is primarily controlled by software. In previous aircraft we have had to do structural changes, put strakes on, strengthen outer wings or something like that. What you may be referring to is that the very first two aeroplanes were slightly above weight, by 0.25%, about 100lbs. That was against a design specification; it did not mean they were too heavy to land, it meant they were outside the specification they were designed to. At that point, there was quite a significant margin. Those aircraft can land and have landed vertically. As we go forward—

Q112 **Ruth Smeeth:** They can land vertically on the aircraft carrier?

Mr Ruddock: Yes, they could. Absolutely.

Q113 **Ruth Smeeth:** Okay. As they come off the production line, but would that include the additional weight of their weapons system, or do they need to jettison before they land?

Mr Ruddock: No, they would not. It depends a bit on the scenario, but even in the most extreme scenario—let us assume that Queen Elizabeth is in a very hot area and the aircraft are carrying a full internal weapon load, those aircraft could come back and at a certain fuel weight, which is a safe fuel weight, they could land vertically on the carrier.

Q114 **Ruth Smeeth:** We are saying they could land with fuel and their entire weapons system, if they had not used it?

Mr Ruddock: Yes, absolutely.

Q115 **Ruth Smeeth:** And specifically the planes that came from lots 3 and 4?

Mr Ruddock: With the exception of the first two aircraft, all of them are actually within weight, but even if those aircraft were deployed, which I

would not expect them to be, they would be able to land and to bring back the entire weapon load internally. If they were carrying a lot more external weapons, then you would have to do a trade between fuel and weapons. In all probability, in very hot weather you would not be able to bring back everything. The aircraft can carry 15,000lbs of ordnance. Clearly, if you got airborne off the carrier with a full load you would not be able to land with that level of ordnance, but with the normal internal weapons and a significant amount of fuel you could come back and land vertically.

The other thing which was pioneered by the UK was something called a shipboard rolling vertical landing, which will allow it to come back with another 2,000lbs on top of that. So I have no concerns about the weight. The weight story on this aircraft is a very positive one. There has been some confusion between the specified point, which was an aggressive point to get the maximum amount of operational flexibility, and the reality. There is actually a much better margin on this airplane than on the Harrier, for example.

Q116 **Ruth Smeeth:** Can I clarify that that would also be the case if we needed to retrofit? Obviously, you do not know what weight we would be adding, but on a likely retrofit.

Mr Ruddock: Yes, I believe so. Within the constraints of what I would expect that weight growth to be, which would be—I am speculating now—let us say 250lbs, we are working with our partners in Pratt & Whitney to start to grow the engine capability to compensate for what would naturally happen on most aircraft programmes, where you would want to carry additional capability. The one thing that future-proofs this aircraft more than any other is that there is so much capability built in. You do not have to carry pods and other sensors externally. The risk of weight growth to the programme is much less than on legacy programmes. So, I am actually very confident on the weight point. It is not an area that is keeping me awake at night, thankfully.

Q117 **Ruth Smeeth:** Then why has there been such an appalling communications strategy? Because that story ended up on the front page of *The Times* without rebuttal, it has become common and undermines the very concept of the F-35 programme for the general public. That is ludicrous. The fact that we are even having this conversation because that has not been rebutted effectively is outrageous. Why has this been allowed to stand up? This was raised at the Public Accounts Committee last week and by us a month to six weeks ago. That we are still talking about it, if you have such a good story to tell us, is extraordinary.

Mr Ruddock: I think we have a lot of good stories to tell across the board. I think what has happened is that things have moved very quickly in the programme. If you look back six years ago, there were lots of challenges on the programme. We are not hiding that; it was very public. I think the level of transparency on this programme has exceeded any other programme that I have ever seen, so these things are very public.

Probably because we saw so much criticism, we did not want to go out and attack each individual entity who said something that we did not

necessarily agree with. We saw that as being counterproductive. We thought what we needed to do was focus on fixing these problems, as Jeff has described. On this particular one, it is not an issue. On many of the other issues, it has taken us longer to fix them and there has been a problem that we have had to rectify, but I do take your point. I think we could perhaps be more forward leaning in helping everyone understand the true capabilities of this quite incredible airplane.

Q118 Ruth Smeeth: If we are at a point where the general public believe that we have bought aircraft that cannot land on the aircraft carrier, then something has gone very wrong with your communications plan and that has not helped with the wider engagement with the general public.

Mr Over: If I could add, we try not to take on the critics in public. There is no point in doing that. We try to focus on providing information to our customers and solving the design challenges we have had.

Q119 Ruth Smeeth: In this instance, you are telling me there was no design challenge. That is what we have just heard; that the evidence says that there was no design challenge at all. So if there was no design challenge, no problem on this issue, then it should have been one line—"That's nonsense"—instead of the front page of our main broadsheet saying that this aircraft could not land on our flagship aircraft carrier.

Mr Babione: I did respond in a letter to *The Times* saying that I did not recognise the cost numbers or some of the criticism, but we probably could have done a better job.

Q120 Chair: Can I suggest that it is not too late for you to do a better job in this respect? The fact is that, when a newspaper with the authority of *The Times* goes into such detail that a Select Committee of the House of Commons feels that it has to mount a couple of special sessions to investigate it, it has got beyond the stage of your not wishing to engage with your critics.

I invite you to go through in detail the issues that were laid out in those articles in the newspaper and send us a specific rejoinder to each of the points made in those articles. An organisation of your size and capability surely should not have any difficulty in doing that, so will you do it for us and send it to us?

Mr Babione: Absolutely.

Q121 Chair: Thank you.

While I have the floor, I will ask one or two things that I will try not to make too specific to the British scenario. Is it true to say that there has been doubt raised in the United States about whether the bandwidth of the American carriers is sufficient to support flying a certain number of F-35s? I think the USS America is supposed to have a bandwidth of 32 megabits, yet some have felt that that may not be enough. First, is it right that questions have been asked about whether that bandwidth is sufficient?

Mr Over: The subject we are talking about is the ship-to-shore communication bandwidth for the autonomic logistics information system that goes with F-35. There is no specification requirement. The scenario that we have been given as a contract requirement is to ensure that we perform under a certain set of mission scenarios. I can report to you that, based on testing done earlier this year by the United States Navy, we have proven demonstrably that 8-megabit bandwidth, ship-to-shore, is satisfactory for operation of F-35s on board the ship.

Q122 **Chair:** You mentioned 8 megabit because that is what the Queen Elizabeth carries?

Mr Over: That was the test parameter that the United States Navy did as part of this testing. I am not here to speak about the bandwidth capacity of the Queen Elizabeth-class carriers. It was a test parameter that the United State Navy chose to ensure.

They were able to demonstrate with disciplined communication that 8 megabits was sufficient bandwidth. Now, this is little bit like internet bandwidth at your house—more is always better—but recognising in ship-to-shore communications, this is an incredibly precious commodity. So we are doing a test—in a matter fact, starting next week—on the USS Essex with US Marine Corps F-35Bs to continue to refine the communications between these ALIS servers, trying to optimise it even better, to make sure that we absolutely optimise this for the most efficient communications. We not satisfied that 8 megabits is sufficient: we are trying to make it even better.

Q123 **Chair:** I have two more points. One is about the questions that were raised earlier about the weight of the aircraft. Peter, you said that you are very happy with the position. I understand from the DOT&E report that the original aircraft came in at just 135 lbs under the specified weight, and yet it says that in lots 8 and 10 there has been a slight increase in weight—in one lot, up to 90 lbs. If my mathematics are correct, that leaves a margin of only 45 lbs. Is there anything you want to say to modify your earlier answer about how happy you are with the weight margins?

Mr Ruddock: No, I don't believe so. The evidence that I have got—I would hold by my earlier point. I have been through the numbers in some detail; I believe they are correct, and I am confident that the aircraft is capable of meeting all of the mission sets that the UK may demand of it. I will certainly go away and review it, and come back to you should there be any need to change that.

Mr Babione: Let me just add that into the other elements we are putting in for record.

Mr Over: The one thing I can add, however, is that we track the weight of each and every individual airplane as we deliver those airplanes and we have seen a steady reduction as we produce production airplanes. Right now, the airplanes we are delivering have about a 350 lb margin, give or take.

Q124 **Chair:** Again, trying not to be too Anglo-specific, one of the main functions of this fifth-generation aircraft is its ability to act as a data source and have a force multiplier effect for other, less sophisticated, aircraft that you are flying at the same time. An issue that has been raised in relation to the UK—but it presumably applies to older aircraft in the US as well—is that there is a danger that, when communicating all of this data to legacy aircraft, this can only be done at the risk of damaging the stealth capability of the F-35 and exposing it to countermeasures. How has the US dealt with this problem of not making the F-35 vulnerable when it is communicating its hoovered-up data to older aircraft?

Mr Over: That is a great question. If you don't mind, I will take it.

The F-35s are remarkable airplanes with world-class capability, and they will provide nations like the UK the ability to secure the safety of their people for at least a generation to come. We are very excited about that.

The F-35 will be able to go where no other fourth-generation, or as you would say, legacy fighter will be able to go. When they are in that type of environment, the concept of operations that the user will have will likely limit their communications on Link 16. That is the way the airplane was designed: it is up to the user to decide when they will communicate, and when they won't.

F-35s have a very purposeful and specific data link that is, right now, unique to the F-35 that we call the multifunction advanced data link, or sometimes abbreviated, MADL, and that allows the airplanes to communicate in a stealthy fashion, if you will.

Q125 **Chair:** With each other?

Mr Over: Yes. Now, there is nothing that would prohibit MADL being employed on other assets, but today in the UK or in any other service, MADL is used only on the F-35. For instance, in the United States Air Force, the United States Navy, the United States Marine Corps, the UK and seven other partner nations, the F-35 is designed to communicate with other assets, be they airborne or ground-based, through a Link 16 data link. That is the way that it was designed, and there are lots of times when that is a fabulous capability.

Q126 **Chair:** Sorry, but if it uses Link 16 instead of MADL, as I understand it does with our older aircraft, does that or does that not make the F-35 less stealthy, or indeed not stealthy at all?

Mr Over: It does not affect the stealthiness of the aircraft—the ability of radars to see the aeroplane is completely unaffected—but it is an omnidirectional transmitter, so if someone has a receiver that is listening for a Link 16 transmitter, they could potentially be able to see the F-35s.

Q127 **Chair:** So it does not make it less stealthy, but it makes it more detectable.

Mr Ruddock: Exactly.

Mr Over: It is the potential. As I said, users will decide when Link 16 on the F-35 can operate in a transmit/receive mode. It can also operate in a receive-only mode.

Q128 **Chair:** Have the American services all decided to fit MADL on their legacy aircraft so that this danger, or vulnerability, is avoided?

Mr Over: No, and that is one of the things that I am glad to set the record straight on today. Just as in the UK, the US today is exclusively using Link 16 for the communication of the remarkable sensor picture that F-35 generates with legacy fighters.

If I might add, the United States Air Force does large force-on-force exercises several times of year, which they call Red Flag exercises. The F-35s were employed in Red Flag for the first time in a significant way in January this year. In January, eight F-35s were employed, there were a number of US Air Force assets, and RAF Typhoons from Lossiemouth were also present in the exercise, so there was a large blue force package. From that, the US Air Force reported that one of the enormous benefits of F-35 in an incredibly dense threat environment is that they not only provide the game-changing capability that we all thought they would, but made every other fourth-generation fighter, including RAF Typhoons, much better and much more lethal in the fight. They did that by communicating their sensor picture with only Link 16. So it has been demonstrated. Having said that, there will be times and places that F-35s go—where only F-35s can go—and they will communicate with each other via MADL.

Q129 **Chair:** Thank you very much for that very full answer. I know that Gavin wants to come in briefly, and then I have one or maybe two brief questions from Martin. May I ask, because we are beginning to get into the technical aspect, whether you would be willing to give us written answers to a few supplementary technical questions that we might send to you after this hearing?

Mr Babione: Absolutely.

Chair: We will do that as soon as possible, and then you will perhaps be able to incorporate those into that comprehensive paper. Had that been published before, it might have helped ameliorate some of the alarm that people have been feeling about our purchase of these very expensive, albeit very powerful and sophisticated, aircraft.

Q130 **Gavin Robinson:** It may be that the answers to my two discrete questions would be better served if they were addressed in that written communication. First, Mr Ruddock, am I right in thinking that your answers relating to landing vertically and the weight apply to all aircraft but the first two, which you indicated you would not expect to be deployed?

Mr Ruddock: No. I am being completely open and transparent. There was a slight overweight on those very first two aeroplanes. They are involved in the development programme and we expect them to remain at Edwards as part of the tier 1 status. The UK has freedom of action—they can do as they wish—but it is not likely that those would be deployed. If they were,

they could operate perfectly safely from an aircraft carrier. The difference is about 100 lbs, which makes very little difference given the fuel burden, but we are not shying away from the fact that it was slightly above the specification. The specification was there as a goal for us to achieve and we did not achieve it on those first two aeroplanes. Since then, as my colleague has said, the weight has been coming down. I think it gives a very healthy margin for operations, but it is for the customer to decide how they want to use it.

Q131 **Gavin Robinson:** Thank you for that clarity. The second point is about the safe level of fuel load for vertical landings. Who sets that safe level? How is it derived and what are the options should you be in an emergency situation and happen to be carrying just a little too much?

Mr Ruddock: You have several options here. The actual figure is 1800 lbs—that is the planned figure to come back to the ship with. That would allow you to position to have an abortive wave-off, as they would call it, so they would have to go round again and reposition and land, and then there is a minimum amount of fuel to land with, in this case it is 500 lbs. Typically, you might come back with more than that, but that is the planning assumption. That would allow you to bring back the maximum amount of weapons. But there is some margin beyond that that would allow you to come back with more than that. The UK might decide to have either more fuel or less depending on the scenario, but that is broadly the planning assumption that we would be working with.

Q132 **Gavin Robinson:** So that is an internal consideration for those deploying the asset as opposed to something you said—a technical specification to land vertically.

Mr Ruddock: It is, correct.

Q133 **Martin Docherty-Hughes:** First, on Ruth's point, in general terms your critics happen to be British taxpayers, who have been vocalised by *The Times*. I think you may need again to reflect on that. What are you doing about the objectionable or unacceptable flying qualities of transonic speeds? Aerodynamic forces on the aircraft are rapidly changing, as identified in the Director, Operational Test and Evaluation 2016 report.

Mr Ruddock: That is absolutely correct. In common with all aircraft, that is one of the most difficult regimes to legislate for. The benefit we have with this aircraft is that it is controlled by software. We did have challenges in that regime between just below supersonic speed and getting out the other side of it at maybe 1.05 Mach or something like that, where it will stabilise again.

The problem here is that different parts of the aircraft become supersonic at different times and there is always a controllability issue with that. I am now very confident having seen the latest reports and spoken to some of the test pilots who have been involved in this that the quality of the handling is more than satisfactory in that regime. In fact, it is satisfactory or better throughout the entire flight regime. I am setting a very high bar here, because we are looking for an aircraft that is safe to fly and

effective. It is highly effective throughout the regime. Its collective handling qualities are way beyond the sort of angles of attack that you would get in most fourth-generation aeroplanes. It is very safe in terms of recovery as well.

All the pilots that I have spoken to or heard from—we had Squadron Leader Andy Edgell very recently saying how excited he was about flying this magnificent aeroplane. He is a very high-quality test pilot. He is looking forward to taking the aircraft to “Queen Elizabeth” and possibly being the first pilot to land and then take off from “Queen Elizabeth”. I think those trials will go very well, but I do not want to prejudge it. We take all these things very seriously and we want to see a progressive development in terms of the handling characteristics. At this point I have no concerns about the handling characteristics in any part of the flight envelope.

Q134 **Martin Docherty-Hughes:** It may be useful to have that material so that there is a bit more depth for additional questions.

Mr Ruddock: I am happy to do so.

Chair: Thank you for your very full answers. We are grateful to you for coming this afternoon and we look forward to having this further information, hopefully reasonably quickly, so that we can incorporate it in any report that we produce. In the meantime, thank you very much and we will assemble the second panel.

Mr Babione: Chair, could I go back to the question from Mr Francois? You are so particular on the numbers, and I misspoke on the difference between the lot 3 number of \$161 million and the lot 10 number of \$122 million is not 38%, it is more like 24%. There has been a 38% reduction from the lot 2 number, which the UK did not buy an aeroplane in. I wanted to make sure I corrected that.

As we end here, I want to thank you again for this opportunity. We understand how important the F-35 is to the UK and we are coming up on the IOC in a little over 400 days. You have my personal commitment and Lockheed Martin is going to do everything we can to ensure that is successful and we continue to partner with the UK on the F-35 programme, so thank you very much.

Examination of witnesses

Witnesses: Harriett Baldwin MP, Stephen Lovegrove, Lt General Mark Poffley, Tony Douglas and Air Commodore Lincoln Taylor.

Q135 **Chair:** Minister, gentlemen, I apologise for starting 10 minutes late, but we had a fascinating session with Lockheed Martin and got quite involved in some technical questions, which we hope to return to with your panel.

Would the witnesses, other than the Minister, like to introduce themselves very briefly, for the record?

Lt General Poffley: My name is Lt General Mark Poffley. I am the Deputy Chief of the Defence Staff responsible for military capability.

Stephen Lovegrove: I am Stephen Lovegrove, permanent secretary at the Ministry of Defence.

Air Commodore Taylor: I am Air Commodore Lincoln Taylor, senior responsible owner for the UK's F-35 and Typhoon programmes. My background is predominantly on the Harrier, including shipborne operations from Invincible class. I have also had the privilege of doing the stealth fighter exchange with the US air force. Prior to this role, I was responsible for operational test of the UK's F-35.

Tony Douglas: My name is Tony Douglas. I am the chief executive of Defence Equipment and Support.

Chair: I believe you are moving to pastures new at some point. Is that right?

Tony Douglas: Indeed I am, Chairman.

Q136 **Chair:** So you will be able to make that much more forthright a contribution even than we would normally expect.

There is no need for each of the five of you to answer every question, because otherwise we will struggle a bit, so please do a bit of self-selection. I would like to start by giving you collectively a platform to explain the main benefits to the United Kingdom from the F-35 joint strike fighter. Who would like to go first?

Harriett Baldwin: First, may I thank the Committee for taking the time to cover this programme? It is within its budgets approvals, it is on time and, as you know, it is a game-changer in terms of UK capability. The fighters will be arriving in the UK next year, so it seems like an appropriate moment for us to update you—particularly since the coverage in the media earlier this summer—on some of the milestones we have passed since then, some of the factual inaccuracies in that statement and some of the measures that have been taken since then. We are really grateful to the Committee for taking the time this afternoon to cover it. I will ask Air Commodore Taylor to answer about the actual capability.

Air Commodore Taylor: Certainly, Minister. As the threat environment evolves over the next 30, 40 and 50 years, it is really important that UK air capability keeps up. What we have with the F-35 is a fifth-generation aeroplane with phenomenal sensors and a very impressive radar cross-section—a stealth aircraft, which alongside the Royal Air Force's Typhoons gives a really impressive capability to 2040, 2050 and beyond. With these aircraft we are matching the threat and making sure that we in the UK remain ready to do those things that defence asks of us. The second part of the F-35 is probably its importance to the UK economy, and how so much of the UK economy supports it as we joined the programme so early.

Harriett Baldwin: General Poffley, as the senior responsible owner for the carrier strike, would you like to also answer the question on the

capability side?

Lt General Poffley: I would say that, inevitably, it is a pretty critical enabler in delivering the carrier strike capability in the round. That affords us significant advantage, not only in our ability to prosecute operations independently at the highest end of the military spectrum, but also, more particularly, to operate alongside our major partners, most notably the United States, which again reinforces our position as a tier 1 military alongside our international comparators. That affords us traction and a whole raft of choices that the political and strategic decision makers may wish to take.

Q137 **Chair:** Anyone else? Very good; you have admirable self-discipline. Let's see whether I can follow your good example.

It was explained to us in the previous session that the F-35s are able to communicate securely with each other thanks to the MADL system, and that they can communicate with older generations of aircraft using the MADL system if that is fitted to them, but I think I am correct in saying that it is not fitted in many cases, so they have to use an alternative system, which might reveal their presence. Is that correct? If so, given the huge investment made, why have we not fitted the system that would enable the fifth-generation aircraft to pass on all that valuable data, which is supposed to be their force multiplier capability, to fourth-generation aircraft without exposing themselves to discovery?

Harriett Baldwin: You hit on a crucial point about capability, which is the stealth characteristics. For civilians such as ourselves to appreciate how much capability has moved on and evolved compared with the way that historically we expected jets to fight, we have to understand, as has been said earlier, that there has been a generational shift. Air Commodore Taylor will talk about how that stealthiness leads to the fact that you would want to communicate in a different way and what is so groundbreaking about the MADL capability.

Air Commodore Taylor: The MADL capability is very impressive. Looking back at previous generations of stealth aircraft, including the one that I used to fly, we could not communicate at all. Previous generations of stealth aircraft could not do that. The F-35 is groundbreaking in the way that it exchanges data. Four F-35s will be able to operate, sharing data between them, in a way that no others have done before. MADL is very high bandwidth and it is designed to share F-35 information with F-35s, so that they all work as one. It is phenomenal capability.

What we are starting to look at, and I think that we are world leading in some of this, is a trial called Babel Fish III, which you may have heard of. Last year, with my SRO Typhoon hat on, I started to explore what the benefits were of sharing other bits of the MADL capability with other legacy fighters. Of course, one has to consider that in the highest threat environments, the F-35 will be up front as a stealth aircraft and the other aircraft will be somewhat further back if they are not stealthy. The ability for F-35s to share is most prominent. We are starting to research—through Babel Fish III and the like, and we are starting to plan Babel Fish

IV—what we can use outside F-35. I think that we are world leading in this.

Q138 **Chair:** That does not quite answer the point. Is it not the case that, at least for the foreseeable future, when we are communicating between fifth and fourth-generation aircraft we will have to use the older Link system? Is that not going to expose a vulnerability in the fifth-generation aircraft?

Air Commodore Taylor: We use the Link system and it provides incredible situational awareness to other fourth-generation assets. When we have flown on things like Exercise Red Flag and the like, all those assets get a picture from F-35.

Q139 **Chair:** I know it works, but does it make the fifth-generation aircraft vulnerable?

Air Commodore Taylor: Any transmission, if it is not a discreet thing, might lead to identification that an aircraft is out there. You may not be able to do anything about it.

Q140 **Chair:** So unless we can purchase some form of MADL and apply it to our legacy aircraft, we are going to have to face up to the fact that we have to choose between either a greater vulnerability for the new aircraft or not sharing that data from the new aircraft with the older aircraft.

Air Commodore Taylor: Not necessarily. The Babel Fish series of trials actually looks to see the value—before we go out and buy these boxes and just fit them to the fleet, we should understand if there is value in sharing that information. It is designed as an F-35-to-F-35 data link; we are just exploring those things. So we will continue to explore, and if there is benefit we will try to progress that requirement.

Q141 **Mr Francois:** If an F-35 transmits on Link 16, can you triangulate it?

Air Commodore Taylor: No, you shouldn't be able to. With a single transmission, you will not be able to do that.

Q142 **Mr Francois:** So if you are the enemy, you know something is out there, but you cannot necessarily get an exact fix on it.

Air Commodore Taylor: Yes.

Q143 **Mr Francois:** Okay. Technically, can you retrofit MADL into Typhoon?

Air Commodore Taylor: I cannot answer that at the moment. We have not looked at that yet.

Q144 **Mr Francois:** Forgive me. We heard that in Red Flag, by combining F-35s and Typhoons, you got an extremely effective package, but presumably that was using Link 16. I find it surprising that, given the tremendous amount of money we are spending on these aeroplanes, you have not yet worked out whether you can put a MADL in a Typhoon.

Air Commodore Taylor: The first stage is to understand that in Red Flag, we went through those exercises in a realistic threat environment.

Mr Francois: Yes.

Air Commodore Taylor: We provided situational awareness to legacy types through our existing links—through Link 16—and we were very, very effective. What we have started to do—I think we are world-leading in this—is we have started to understand: is there a requirement to share F-35-to-F-35 data with other aeroplanes? If that proves to be a benefit, we will look into how we might enable that.

Q145 **Mr Francois:** Sorry, but it is a straightforward question. Can you fit MADL in Typhoon or not? You are telling me, “I don’t know,” and I find that an amazing response.

Harriett Baldwin: Can I bring in General Poffley here? He will want to talk to the way in which we would use F-35, using carrier strike, and the fact that F-35 would be something that in stealth mode would only want to communicate with other F-35s. The concept in terms of—

Q146 **Mr Francois:** With respect, I think we have already got that, Minister. But a few years in the future, we are going to have a fleet of F-35s and Typhoons—that will be our combat air, right? So the ability of the F-35 to talk discreetly to the Typhoon seems to me to be fundamental. It just sounds like you are behind the curve here.

Lt General Poffley: If I can add and, I hope, provide some understanding, we need to be clear that the introduction of the fifth-generation fighter has fundamentally changed the dynamic and how we move data around a battlefield in a stealth mode. We, like many of our sister nations, are currently coming to terms with the ability to move that data from the platform—the F-35—to a number of other platforms, of which Typhoon, in the future, will undoubtedly be one we will wish to transfer that data to. As it stands at the moment, the NATO standard is a Link 16 link; that is not a MADL link. MADL will undoubtedly start to be a very attractive option to move data, even when in a stealth mode and the aircraft is operating in that mode.

That it has not got to that stage at the moment is a reflection of the fact that we are introducing a fifth-generation capability on to a battle field that has traditionally been fourth generation and below. As we introduce new technologies and new capabilities such as this, we are always going to find there will be a lag. We are still developing the tactics, techniques and procedures, and we will be looking at not just the Typhoon but a raft of different platforms as to how best to integrate the ability to burst data down a very precise data link rather than an omnidirectional link, which is what Link 16 provides us at the moment.

Q147 **Mr Francois:** You are talking about this being a capability for the next 30 to 50 years. You are talking about looking at having to cope with a threat that will evolve over those several decades. This seems to be a very effective way of countermanding that threat and yet, you are telling me it’s all very early days.

Another quick question: can you fit MADL to the Crowsnest AEW helicopter, can you fit MADL on the carrier itself and can you fit MADL on a Type 45?

Lt General Poffley: Technically, I do not know the answer to that question, but it is certainly an ambition to do so.

Q148 **Mr Francois:** It is an ambition to do that?

Lt General Poffley: Absolutely.

Q149 **Mr Francois:** But you do not know if we can.

Lt General Poffley: I technically do not know the answer. I can get that answer.

Q150 **Mr Francois:** Is it an ambition to fit MADL on Typhoon?

Lt General Poffley: It certainly will be to have MADL universally delivered across our fleets. The precise nature of the technical challenge associated with that, I am not familiar with, but I am happy to provide an answer.

Q151 **Mr Francois:** But in principle, you want to fit it on those platforms.

Lt General Poffley: In principle, it remains an ambition to have MADL-type capabilities across the portfolio of capabilities.

Q152 **Gavin Robinson:** It was reported in 2016 that the UK does not have the equipment or the processes in place or on order to make use of the F-35's data gathering and data sharing potential. Do you agree that in 2016 we had neither the equipment nor the processes to fully utilise the data gathering and data sharing potential of F-35?

Harriett Baldwin: No, that is not the correct state of play at the moment.

Q153 **Gavin Robinson:** Was it something you agreed with at the time in 2016?

Harriett Baldwin: There is a principle that we try to follow and I am sure the chief executive of Defence Equipment and Support will want to elaborate on this. As the Committee will appreciate, the equipment we are procuring has a very long projected life. Technology is something that is changing very rapidly. When we are doing things with a long lead time, such as building an aircraft carrier, in terms of the principles we follow we will need to procure the things that are likely to evolve the fastest at what is known as the last responsible moment. I think it is fair to say that this particular area, because of this new technology, is one of the areas evolving the fastest and where we will need to make sure that we have the built-in intrinsic ability to upgrade to future evolving technologies across the whole platform in due course, which is the point the General was making. Tony, I don't know if you want to elaborate further on the point the team always uses about waiting until the last responsible moment to enter into the commercial negotiations and write the cheques in terms of these upgrades, because this is an area where technology is evolving very rapidly.

Tony Douglas: Yes, Minister. In terms of two principles, one has already been mentioned, which is last responsible moment. The second one is active safeguarding. The platforms in question have a much longer life cycle than the life cycle of the evolving technologies, so we are trying to actively safeguard the ability to continually upgrade as and when that capability is available. But we do not make that decision until, first of all, it is clear what opportunity that represents and, of course, how we have satisfactorily given a commercial conclusion to do so. We have applied that across all of our complex platforms as a piece of thinking.

Q154 **Gavin Robinson:** As a supplementary, when you apply that logic to the gateway load that the US has successfully demonstrated works in maintaining the stealth nature of the aircraft communications with Typhoon and F-35, is that something you are actively considering?

Harriett Baldwin: The Babel Fish exercise.

Air Commodore Taylor: I don't believe the US has yet trialled what we have done on Babel Fish. I can't say for certain, but I don't believe they have.

Q155 **Gavin Robinson:** They have on their airborne gateway. Is that right?

Air Commodore Taylor: They do have an airborne gateway. I don't believe they have used it with MADL into legacy the way we have, but I am not exactly certain what they have done. I am not aware of anything.

Q156 **Gavin Robinson:** So, while there was a reticence to agree with the reported indication in 2016 that we have neither the equipment nor the processes to deal with data gathering and sharing, we recognise that this is an evolving piece and that we are always going to try to seek the best technology. Is that the position?

Lt General Poffley: You can be assured that, from our point of view, we are at the leading edge of the conversation about the transfer of data between platforms on the battlefield. It is absolutely the case that we believe we have currently got the capacity to move data around. So, I think we would disagree with the statement you are describing.

Q157 **Gavin Robinson:** You would disagree with the statement that was reported in 2016, that we do not currently have either the equipment or the processes in play.

Lt General Poffley: It is not a statement I would recognise in reality from my perception. It is not correct.

Stephen Lovegrove: Nor is it a static picture; I think that is the point. These capabilities will improve over the years, indeed decades. In 2016, did we have everything that was available to have? I think the answer to that would be yes.

Q158 **Chair:** But we still do not have it yet, do we, because we are saying that it is an ambition to fit MADL to everything in fullness of time? It is not featured in the equipment plan for retrofitting to our fourth-generation platforms. Is this now a new commitment that we are going to try to fit MADL to the fourth-generation platforms?

Lt General Poffley: At this stage we have not programmed that activity, but we are still in the foothills of understanding quite what the technical options are and, indeed, what the requirement would be, sensibly set against other priorities. It would be wrong for us to give a commitment here to the fitting of MADL per se.

What I am saying is that there is an absolute ambition to ensure that we are in a position to pass data in an effective way, even in a stealth mode, when the F-35 is operating. At the moment, that remains a challenge and it remains an ambition for us to overcome it.

Q159 **Chair:** It is pretty obvious that, if one of the greatest advantages of having a fifth-generation plane is the multiplier effect that older planes can see what it sees, but we can't give it to the older planes without opening up the newer planes to discovery, then surely this has to be a fairly obvious path that we wish to follow.

Lt General Poffley: It is absolutely the case that we would wish to be in the position to rectify that particular set of circumstances, but that does not mean that the aircraft is markedly less usable than it is in its current form. That is clearly not the case. When operating in stealth mode, it would be very reluctant, I would suggest, to even unmask itself in any form.

Q160 **Chair:** Even to other stealth aircraft?

Lt General Poffley: Maybe, if it can do so discreetly but, again, it is about the preservation of stealth.

Q161 **Chair:** That's why we are having this discussion about MADL.

Lt General Poffley: Indeed.

Chair: Gavin, do you want to carry on? I know Martin wants to come in as well.

Gavin Robinson: I'd like to take it a step further.

Chair: Martin, come in on that and then we will go back to Gavin.

Q162 **Martin Docherty-Hughes:** Air Commodore, I agree with you about the sharing of information—that you should share only what is required. Anybody who disagrees with that should have a think about it. My concern is about the statement—General, forgive me—that we now have only a principle of a MADL system across a range of platforms to allow the sharing of information. The Minister used the term “evolving technology”. If we are now looking in principle at moving that forward, is there a contingency for that to be done, in terms of how much it is going to cost? If you have agreed in principle, there must be a consideration of cost.

Lt General Poffley: It is agreed in principle as an ambition to improve our ability to move data around the battlefield. What is not approved in principle is that that would necessarily be MADL, nor that it would be between particular systems. There is a conversation that needs to take

place as to what is the most cost-effective route to improve our ability to move data around.

Martin Docherty-Hughes: That's clear, Chair. Thank you.

Q163 **Gavin Robinson:** Can you confirm that the broadband capacity of the Queen Elizabeth class is 8 megabits?

Harriett Baldwin: We do not recognise that figure. In the letter I sent to colleagues earlier in the year, we made it clear that the capacity of the carrier is what we need it to be now. To refer back to my previous point about the potential necessity of upgrading that in future, we think that is something that we should again procure at the last responsible moment. The current capacity to communicate on the carrier is exactly what we need it to be.

Q164 **Chair:** I am sorry to interject, Minister, but were you able to listen to the earlier session as we were having it?

Harriett Baldwin: Not the last bit, Chairman, no.

Q165 **Chair:** At one point, Lockheed Martin were saying to us that they had been requested, I think I am right in saying, to do their modelling on the basis of 8 megabits for the Queen Elizabeth class. It would appear to be a figure that they recognise, even if you have a policy of not officially confirming those details.

Harriett Baldwin: As I say, the capacity that we have is exactly sufficient for what we currently need.

Q166 **Gavin Robinson:** I take it that you do not want to share with us what it is.

Harriett Baldwin: Obviously, we are keen to share with the Committee what we think it is responsible to share, and we will retain for ourselves stuff that we would not want to get out in so public a forum as this. For example, our communications are much more reliant on satellite technology than what you might find in a US carrier, so we have a different configuration in the way that we communicate across our fleet. Therefore, we are happy with what we have at the moment, but we accept that this is something that, over the life of the carrier—which is expected to be 50 years—we can safely agree is going to need to be under constant review.

Q167 **Gavin Robinson:** Can I just clarify that? Is there a figure that you are prepared to share with us privately on a closed basis, if it is not something you wish to share in this public forum?

Harriett Baldwin: There may be a number of items that may come up during this session that, if the Committee wants to take them further, we could certainly share with the Committee on a more controlled basis.

Q168 **Gavin Robinson:** Whatever the capacity is at this stage—just to confirm—you clearly recognise that it is sufficient currently but that there will be scope for improvement in the years or decades to come?

Harriett Baldwin: That is indeed the point I am making, but I can see that my two colleagues are trying to come in as well.

Lt General Poffley: For the avoidance of doubt, there is a tendency for us to dumb down this debate to something akin to your mobile phone and the movement of data, in the same way as we might move data around on our mobile phones. The reality is that we are confident that we have sufficient capacity inside the Queen Elizabeth class carrier to be able to accommodate all the tasks that we wish to proceed with. It has the capacity for us to upgrade it downstream as we see fit. There is resilience built in.

I hope you will understand that we are very reluctant for security reasons to be drawn in a public hearing on the precise nature of that. Suffice to say that the Queen Elizabeth carriers, and indeed many of the other platforms, are compartmented in terms of the way that we structure the handling of data in and out of those platforms. They are managed by us, so it is not like your mobile phone, where they are managed by some other provider. We can dedicate the passage of information in a way that, perhaps, you are not able to in the commercial sector. But, again, I am very happy to provide some additional detail in a slightly more secure environment.

Q169 **Gavin Robinson:** Thank you, Chairman. I am not sure we will want to take that very much further forward in this setting, but I appreciate the answers we have been given. I will ask just one rider to that: is the capacity that we are considering, in the round—without mentioning it—purely sufficient for operational need, or does it include everyday leisure communications and so on that service personnel would wish to be engaged with to have connectivity back home?

Lt General Poffley: The ships themselves have a clear delineation between that which we communicate for welfare provision and that which is integrated into the ship's systems.

Q170 **Martin Docherty-Hughes:** Shall we talk about ALIS? It is true that no other plane relies more significantly on its software than the F-35. What have you done to ensure that this reliance on software does not result in the F-35 being particularly vulnerable to hacking and software glitches?

Harriett Baldwin: I will start on that and then I will bring in the Air Commodore. The ALIS system will be installed at RAF Marham and essentially gives information about what kind of maintenance routines are needed on the aircrafts. It is not, as I understand it, an operational part of what is required day to day. In terms of the way in which it will communicate with the planes, we are very comfortable that we have the appropriate communication links for that to be secure.

However, as you rightly point out, this plane has more software than previous iterations, so it is something that will rely on our continuing to be able to upgrade and sustain that software in the future—not just at the ground systems but, of course, the operational side of things. Do you want to elaborate a bit more on the ALIS issues and the cyber-security and the

steps that we can disclose that we have taken on that, as well? I am sure the Committee will want to hear about that.

Air Commodore Taylor: Like any IT system, it can be vulnerable to cyber-attack, so from the very outset of this programme—ALIS has developed along with the programme—ALIS was delivered to be cyber-resilient. That will continue, and it must continue through life, because the threats will evolve through life as well. As the Minister said, we will continue to evolve and update this. Lockheed Martin and the joint operational test team have done significant testing into cyber-resilience, and I am assured that we are as resilient as we possibly can be at the moment. We will continue that position through life through continued effort.

Q171 **Martin Docherty-Hughes:** Have the bugs within the ALIS system and its software that have been mentioned been remedied at all?

Air Commodore Taylor: Mostly, I believe. Just like the air vehicle itself, as it is in the design and development phase, bugs have been found. That is normal business; in fact, it is good that we find them. Software bugs and both the air vehicle and, indeed, ALIS, are constantly fixed and upgraded. We treat ALIS in the same way we treat the air vehicle—by sentencing and prioritising all those things we must fix. It is a good-news story in the way we have developed ALIS.

Harriett Baldwin: I will give the Committee an example. When the *Times* article was published, it took an overview of a major development programme for a cutting-edge aircraft and drew out one or two examples to create headlines. There was a statement in the article about the fact that the entire fleet had been grounded in the US, or something along those lines. Indeed, some B aircraft had to be grounded locally for one day at one base because they were putting in a software upgrade. That is a small example of exactly the kind of things you would think would be normal in the development of an aircraft, but which were put in the context of making some headlines about a real crisis in a programme that—I really want to reiterate to the Committee—is not only on time but is adding an enormous amount of capability and is also within its budget approvals.

Chair: Thank you. I am going to bring in Ruth at this point, and then Mark and Leo to talk about costs.

Q172 **Ruth Smeeth:** On the F-35Bs from lots 3 and 4—the three planes we have just had confirmed to us—can you confirm their weight and whether they are able to land vertically, please?

Harriett Baldwin: Yes. All of the planes are designed to land vertically.

Q173 **Ruth Smeeth:** Can they land on an aircraft carrier?

Harriett Baldwin: Yes. In fact, one thing we want to announce to the Committee today is that the whole ski ramp testing in the States has now been completed and signed off, so we now have the permissions to start the next round of trials off the carrier. That has been a milestone since July. In terms of the specific aircraft—

Ruth Smeeth: The first three.

Harriett Baldwin: The first three—are those the three that remain in the United States for the lifetime of the aircraft?

Air Commodore Taylor: They are. We have three aircraft at Edwards Air Force Base. They are test aeroplanes. They have test instrumentation fitted to them. They are slightly heavier than baseline weight. All will still be able to land vertically on the carrier.

Q174 **Ruth Smeeth:** That is interesting, because page 63 of the DOT&E report states: “Estimates for FoM weight growth include an additional 250 pounds, which will exceed the vertical landing structural limit not-to-exceed weight of 33,029 pounds for the Lot 2 through Lot 4 aircraft.” That suggests that they structurally cannot go on the carrier.

Air Commodore Taylor: That is an all-up weight with a bring-back of weapons, fuel and—

Q175 **Ruth Smeeth:** So we would have to jettison weapons and fuel to land on the carrier.

Air Commodore Taylor: No, we would not have to. Unless it is in the extreme circumstances of being really heavy with fuel—in other words, in an emergency—we should not have to do that. We had to do that on legacy aeroplanes. The performance of F-35 is simply exceptional. We are bringing back and vertically landing on to the carrier full stores loadout, with enough fuel to land or, if you cannot land the first time, to go round and have another go and still land vertical with the aeroplane.

Those first three aeroplanes are test aeroplanes. If we took the test instrumentation out, they would be lighter. Even at that point, with estimated weights of follow-on modernisation, we should be able to land vertically on the carrier. We just may not be able to have the standard loadout that was specified in the report. In terms of my key point parameters—those things that the specification must meet—I am green against that for the F-35B for all of the fleet. We will be able to do that in the UK.

Harriett Baldwin: It is fair to say that in 2005, there was an issue with the early designs in terms of the weight, and they did have to take steps to adjust the design, to make sure that the weight came within the Air Commodore’s key point parameters.

Q176 **Chair:** Have we bought a small number of planes that are too heavy, or is it the case that some of the early planes we bought are not going to be totally fit for frontline service? Would they be upgraded in some way?

Harriett Baldwin: The three test aircraft will remain test aircraft.

Air Commodore Taylor: Early test aircraft will remain as test aircraft. They have instrumentation kits fitted to them. Those are also light enough to land on the carriers, so we will be able to vertically land on the carriers with those aeroplanes as well.

Q177 **Ruth Smeeth:** Even though the report said that you cannot.

Air Commodore Taylor: With estimated weights through life from follow-on modernisation. This is perhaps going into a bit too much detail, but the key point parameter for that specification is the 2,000 lb bombs. In the UK, we are only carrying 500 lb bombs, so we can still bring back two bombs and have additional weight available to us. But those are our test aircraft as well, so there is no plan at the moment to put them on the frontline. We will be able to put them on to the ship, and they will be able to land vertically.

Q178 **Ruth Smeeth:** I want to move on slightly. I am not sure whether this question is for you, Minister, or the Permanent Secretary. The coverage in *The Times* totally undermines public confidence in this project. Stories saying things such as, "Our jets can't land on our new aircraft carrier" do not help us to sell this to the general public. What responses has DDC given to defend this and ensure that there is public support for this activity? As far as I can tell, DDC has not been doing what we need it to do to promote or defend this project.

Harriett Baldwin: You will have to and probably have taken that up directly with the publication concerned. Certainly we always take the view that we should rebut specific points, and we always try to engage with journalists through our comms team to do that. I also took the trouble, after that report, to write a letter to all colleagues rebutting the allegation sent round in July. There does come a point—again, this is a judgment call in terms of media management—where if you continue to give the story legs, they just keep reporting it. It was notable that that story did not get picked up much more widely in terms of reporting. I hope that it has not undermined public confidence in what is actually a capability that the population of the UK should be very excited about us getting. Permanent Secretary, do you want to say anything—

Q179 **Ruth Smeeth:** Sorry to interrupt, but we have now discussed this twice in the last month, and PAC discussed it last week. The idea that the story has gone away is nonsense. I have constituents who have contacted me, who I am meeting at the weekend because they are concerned about this project. This should be a good news story so I do not understand where—and Lockheed just sat where you are sitting to tell us that they did not see the point in rebutting it. So, they didn't rebut—

Harriett Baldwin: Well, they wrote a letter. They did write a letter.

Q180 **Ruth Smeeth:** Writing a letter to *The Times*, as well you know, is not a marketing plan and is not a comms plan. If it is, I am mis-running my own political campaigns. This isn't working, so I am interested in what DDC is doing to defend the most expensive capability currently on our books, outside of CASD, in order to ensure that there is public support for it.

Harriett Baldwin: And it's why we are so pleased that we are in front of the Committee today as well.

I am sure you get the same letters as I do about the fact we that we have aircraft carriers but no planes. I keep on making the point that, actually, we do have 12 planes—they are in the States; they will come over and the first squadron will be formed next year. That, to me, seems like a point at which we can do an enormous amount to celebrate the arrival of the new aircraft. Permanent Secretary.

Stephen Lovegrove: Thank you, Minister.

You raise an interesting point. The way in which we have described this particular project so far has been within the context of what we call CEPP—carrier enabled power projection—that is the carrier itself, the Crowsnest system on the Merlins, and the F-35s as well. That is the right way to describe it, because it is a very big, integrated, dynamic and long-lasting system that will change over time.

I don't think anybody would say that we have not made the most out of aspects of the carrier programme coming down to Portsmouth. The carrier has got a lot of very good and positive press. Possibly we have folded the F-35 underneath the CEPP and, arguably, we should take more opportunities like this to talk about the F-35's extraordinary capabilities, which we are all immensely proud of, and which our American colleagues and other partner nations are immensely proud of. It is a big programme that is coming in absolutely on time and on budget, and providing us with the capabilities that we need.

The other thing I would say is that there were a number of, let's just say, inaccuracies and infelicities in *The Times* article that were sufficiently stark for us—as the Minister said—to write round to colleagues to say that these were what they were. We have been reluctant to be drawn into what could have turned into a slanging match with *The Times*, but the point that you make is a fair one, and if we need to express more fully and completely the extraordinary capabilities of this aircraft—as the aircraft, as opposed to a part of the carrier system—then perhaps we should do that.

Ruth Smeeth: I find that answer extraordinary given that President Trump publicly attacked this programme, obviously, in my view, totally incorrectly. We did not have a proactive media response when the President of our strongest ally attacked the programme, or when we had the media in *The Times* in terms of the costings and the development. Apparently, no one is in charge of President Trump's Twitter feed, but it has an impact and it has reached public consciousness. I find it extraordinary that we have not had a proactive comms campaign from DDC when we are spending this amount of money on the programme.

Stephen Lovegrove: President Trump's criticism—once, very early in his presidency—was around the cost.

Ruth Smeeth: The day before Christmas Eve.

Harriett Baldwin: I think that he has been very helpful in terms of talking about the cost of the programme. That has caused the company to sit up, and in this case that line of discussion on his behalf has been helpful to the UK taxpayer, but I take on board what you say. I hope that

you will take today's cast as our effort to share with you why we think this is a great programme that is coming in on time and on budget and delivering really important capability, but in terms of proactive communication I think that the opportunities that will really resonate with the British public are going to be greater next year than this year. Is that fair?

Air Commodore Taylor: Absolutely, Minister. It is now less than a year until we bring our first aircraft back. We were very successful last year. We brought the aircraft, including UK aircraft, back for RIAT—we had a very proactive session around the Royal International Air Tattoo last summer. We have been involved with those carrier strikes, and we had F-35 representation when HMS Queen Elizabeth came out. We will have an intensive media campaign through next year as we bring the aircraft back in the run-up to IOC. We do try to put out as much as we can to rebut these things. There is a lot of criticism. I agree entirely with the Minister that President Trump has been supportive of the programme recently and has been looking to drive down the costs as well.

Harriett Baldwin: The other positive aspect that I would like to take this opportunity to highlight, because it does not necessarily get across enough, is that we are buying 138 of the aircraft, and 15% of the full 3,000 in the programme are being built here in the UK. At its peak, the programme will be responsible for something like 25,000 jobs in this country across 500 different companies. It is having an enormous impact industrially in the UK as well. That is something that you may have seen in your constituency and that we see right across the UK in terms of the number of companies, the number of jobs and the UK's industrial contribution to this big global programme.

Q181 **Mr Francois:** Are we still committed to 138 F-35s?

Harriett Baldwin: As you know, we are governed by a memorandum of understanding for this programme. I look at it in different stages in terms of overall levels of commitment. For example, I have mentioned the fact that we already own 12 of the aircraft. We will own 14 by the end of the year. Next year, we will get another three, and the year after that another one. In terms of the number that we have ordered, that takes it to 18. As you will be aware from the NAO figures, we have published the detailed costings in terms of all aspects of the ownership of the first 48, which I think takes us out to 2026. The future tranches that we buy are always going to be subject to us haggling, via the joint programme office, with the company. That is the situation that we are in at the moment with the latest bulk buy, but, as you know, it is a public SDSR commitment that we brought forward in the 2015 SDSR.

Q182 **Mr Francois:** I understand about haggling lot by lot—I've got that—but the Government's declared position up to today has been that it wants 138. Those may not all be F-35Bs; I appreciate that you still have to decide whether you want a different variant for the Air Force. Has the Government's public position changed, or is it still 138?

Harriett Baldwin: No, our public position is exactly as I have just outlined.

Q183 **Mr Francois:** Thank you. Presumably your costs are based on that.

Harriett Baldwin: Yes. We have published the costs out to 2026 in the most recent NAO report, which covers the first 48 aircraft.

Q184 **Mr Francois:** In this article, *The Times* said that an F-35 produced this year would cost somewhere between £130 million and £155 million once upgrades and modifications have been taken into account. Do you recognise that as an accurate figure? If not, why not?

Harriett Baldwin: As I say, the NAO has published in great detail in its report the different elements of cost in terms of owning an aircraft. As you know well from your days in the Ministry of Defence, it is not just what you pay for the aircraft; it is obviously the ongoing support, sustainment and so on. In terms of the headline numbers—I think you heard this from the company just now—as you know, there has been a significant drop in terms of cost as we have moved down these low rate initial production lots. The last lot we bought, lot 10, was \$123 million and we are currently in negotiations with the company, via the joint programme office, for the next lot.

Q185 **Mr Francois:** From my experience, I am aware that you have the basic cost of the airframe and then the logistics support, spares and all the rest of it. We were pressing Lockheed to give us a figure for that and they were very reluctant to do so and said they could only give us the cost for the aircraft system itself.

Harriett Baldwin: We have tried to give that total budget.

Q186 **Mr Francois:** What is the cost, then, when you add in spares and logistics support for an aircraft?

Harriett Baldwin: We have tried to give that information: it was published in the NAO report. I have a big sheet of paper somewhere here about it. I think the Committee will have seen this overall cost diagram published out to 2026 and all the different elements.

Q187 **Mr Francois:** In that case, what is the unit cost of one this year, including logistics support and spares?

Harriett Baldwin: You will have to be a little more precise in the question, because obviously we have had to build additional infrastructure at Marham, we have had to install a range of different capabilities and we obviously have to train up pilots to fly them, so we have aggregated all those costs and those are the costs we have put in the NAO report.

Q188 **Mr Francois:** Okay, if you do not want to give me the cost in the way I have articulated, let us try it a different way. What is the total estimated cost of the programme to the United Kingdom?

Harriett Baldwin: As I say, we have published the costs out to 2026 in great detail. Beyond that, obviously, we have not gone. The Committee may want to extrapolate from that or take the point that was made that the marginal cost of buying an aeroplane does seem to be coming down at some point, presumably. We will continue to negotiate and haggle on this. The law of diminishing returns will hit in. I think we are on that kind of

curve in terms of moving from the low initial rate of production into buying bigger batches, yet the costs of supporting and sustaining need to continue to be budgeted for. As I say, we have placed our current budgets in the public domain and the programme is within that cost envelope.

Q189 **Mr Francois:** But that is for 48. You have already confirmed to the Committee that the intention is to buy 138. Part of the issue around this aircraft is that it is so expensive, it threatens to eat other elements of the equipment budget. I would be reassured, and I think the Committee would, if you told us that you knew how much the whole programme would cost. Then we would be more reassured that you had allocated money for it. But what you are saying to me, if I hear you, is that we know roughly what the first 48 are going to cost but we do not know about the rest.

Harriett Baldwin: I will bring in the Permanent Secretary in a moment, but obviously you will be very familiar with the way the forward-looking budgeting cycle is.

Q190 **Mr Francois:** Yes—that is why I am asking the question.

Harriett Baldwin: We are committed to spending at least 2% and growing our overall budget by at least 0.5% over inflation during the life of this Parliament. Clearly, we—you and I—will campaign on the same side in the next election to ensure that we continue to be able to deliver against those Conservative principles. I hope the Labour party will also commit to those so that we can tell the country we are going to be committed to those kinds of totals for the long term. But, as you will have seen, Young Labour voted this week to take us out of NATO and all sorts of ridiculous things.

Q191 **Mr Francois:** With respect, Minister, we are not here to discuss the Labour party's defence policy, not least because I will start to get annoyed. Let us come back to the F-35B programme. With great respect, my translation of your answer is: we don't know what it will cost. We know we are going to buy 138. We roughly know what 48 of them will cost, but the overall programme cost we do not know.

Harriett Baldwin: If anyone told you that they knew precisely what it was going to cost over the entire life of the programme, you would be rightly sceptical of them as well.

Q192 **Mr Francois:** I would like to know that there is at least an estimate on which the MOD has budgeted, because it is our second biggest procurement programme after CASD. So you must have some idea of what it will cost.

Harriett Baldwin: That is where I bring in the Permanent Secretary.

Stephen Lovegrove: As you know, what we do in terms of formal budgeting in the MOD is every year look 10 years ahead. So the 10 years that we have got now are obviously lasting up to 2026-27. That is the period over which we have estimated the costs with a degree of precision and about which we are very confident that the F-35 programme will come under. The total cost in that, as set out in the NAO report, was about £9.1

billion. That includes the 48 aircraft. It also includes all the support and spares. It includes the training and the very substantial and long-lived investment in infrastructure at Marham and elsewhere. And that is the total cost for the next 10 years.

In terms of the cost beyond 2027—obviously, there will be costs beyond 2027—we have rough orders of magnitude. We do not publish those for two principal reasons. One is that they are rough orders of magnitude, and who knows exactly what the world will look like in 10 years' time? In fact, there are no private enterprises that estimate their costs 10 years out with the accuracy that we do, or to the level of fidelity that we do. Secondly—I suspect Mr Douglas will want to talk about this—even the last 17 or 19 F-35s within the first 48 are still under negotiation. To reveal publicly how much we think we might be prepared to pay for those would obviously be compromising our negotiating position and compromising taxpayers' money, so we will not be doing that.

Q193 **Mr Francois:** Okay. You were very critical of *The Times*. You said between £130 million to £155 million per aircraft. For the 48 aircraft, to the back end of the equipment plan out to 2026-27, the cost is £9.1 billion. I am reliably informed by a mathematical expert that that is £189.5 million per aircraft.

Stephen Lovegrove: With respect, I was trying to backsolve where they got £150 million from. I also did a similar sum to that. I think the only way in which they could have got to £150 million was to take £7.3 billion, which is from the second phase of the £9.1 billion that we have committed to 2027, which is the production, sustainment and follow-on phase, which is £7.3 billion, and divided that by 48. I think that comes out at roughly £150 million. That is an extraordinarily crude and misleading calculation, if that is what they have done, because, as I say, there is not only the aircraft and the airframe, but also the support and the spares. There is also the training and the huge investment in infrastructure. So the idea that you can merely amortise that cost in a great big lump sum, smear it across 48 aircraft and say, "Therefore the 48 aircraft cost £150 million each," is, I think, genuinely misleading.

Q194 **Mr Francois:** With respect—with equal respect, Permanent Secretary—Lockheed Martin were very reluctant to talk to us about the costs of logistics and support, and now I understand why. But, again, you told us that you budget up to 10 years, but you have only got ROM—rough order of magnitude—figures beyond that. You have given us a cost of £9.1 billion, with the NAO, for the first 10 years and in that stage we are buying 48 aircraft. Now, when you do the math, it does not come out at £150 million; you are right. It comes out at almost a fifth of £1 billion per aircraft.

Stephen Lovegrove: The reason for that is because within that sum there are very many other figures, which are associated with the design and the total concept of the aircraft. It puts us in a position as the UK to be able to continue to influence that design, which is therefore—it would not be methodologically correct to divide any sum like that by 48 and then just come out with a number. You would have to do a very complicated sum at the end of the life of the programme and divide it by 138. Then

you might be able to do it. You cannot do it just on 48. There are these concepts of first of a kind, second of a kind, next of a kind; the prices go down all the time.

Q195 **Mr Francois:** Sorry, you just said, "Divide it by 138." When I said, "How much does the whole programme cost, based on 138?" you told me you couldn't tell me.

Stephen Lovegrove: I said you would have to do that, and you would only be able to do that when the 138 had been purchased—which they have not.

Q196 **Mr Francois:** To assist the Committee, rather than get completely bogged down with this—because others have questions too—on that £9.1 billion estimate, which you have cited, and the 48 aircraft up to 2026, could someone in the Department do, in your own words, a very complicated sum and give the Committee a breakdown of what you believe the unit cost will be and what the other, additional, costs are?

Stephen Lovegrove: As you know, there is a great deal of detail about—

Q197 **Mr Francois:** Yes, and you have a lot of people in the MOD.

Stephen Lovegrove: There is a great deal of detail in the NAO report about what is included. In fact, there is a whole page and a half of close-typed work on what is included within the £9.1 billion.

Q198 **Mr Francois:** Well, then, it should be pretty easy for you to answer the question.

Stephen Lovegrove: We will come back to the Committee with pleasure.

Q199 **Chair:** Mark made the point about CASD, and we know that we have a global figure there for the four successor submarines of £31 billion and a £10 billion contingency—have we not? I think what we are asking for is some ballpark figure for the overall cost of these 138, analogous to what is in a sense a similarly complex and expensive project for CASD successor submarines.

Stephen Lovegrove: The Committee will understand that we are not always in a position to be able to do that, given that this is a multinational project, where our American colleagues are very much in the lead, and there is an ongoing rolling negotiation, which will last for some decades to come. So there will be some limitations to that figure if we are capable of providing it.

Q200 **Mr Francois:** Sorry, but the reason we are sticking to this—there is a point to it—is because the Committee is worried that if there is cost growth on this programme it may eat other key parts of the equipment plan. You are taking us out to 2026, but clearly the programme goes longer than that. I take the point that it is an American-led programme, but you must, surely, if you are planning to buy 138 aircraft, have some idea of what that is going to cost.

Stephen Lovegrove: As I say, we have rough orders of magnitude, but we are limited as to what we can disclose, first, by virtue of the

contractual position. Secondly, given that this is a rolling programme of acquisitions over many years, the ROMs are probably very unreliable.

Leo Docherty: I find it frankly extraordinary that you are saying, in terms, that we will only know how much the system costs once we have bought it. I find that quite surprising.

Stephen Lovegrove: I think that would be a slight mischaracterisation of what I am saying. What I am saying is that there will be, and I don't know how many years it will be until we buy the very last of the F-35s—

Harriett Baldwin: Mid-2030s.

Stephen Lovegrove: Mid-2030s. We will not be in a position to be able to give a precise view as to what the whole of this very complicated programme will be until 2035. I don't think that is a particularly extraordinary thing to say.

Q201 **Leo Docherty:** But can you see that it is very concerning for constituents and taxpayers—that we appear to have quite a flexible budget on this?

Stephen Lovegrove: I would hope that we have given, a great deal of reassurance and assurance to the Committee, the NAO and the PAC that for the next 10 years this programme is delivering on time and on budget. I think that is a good deal of reassurance. There will absolutely no doubt be a moment when the NAO will want to come back and look at the next 10 years or the next five years, in which case we will obviously be hoping to provide the same amount of assurance. I cannot in good conscience sit here today and say that we can provide you with assurances as to exactly what the costs of the programme are going to be between 2026 and 2035. I just cannot do that.

Q202 **Leo Docherty:** How about to the nearest £10 billion or the nearest £5 billion?

Stephen Lovegrove: I cannot do that sitting here right now. I don't have the figures.

Q203 **Leo Docherty:** Could you perhaps write to us with an estimate?

Stephen Lovegrove: We will write to the Committee with as much detail as we can within a) the bounds of predictability and b) what we are allowed to do within the context of the contract without compromising the contractual and negotiating positions of the Government and the taxpayer.

Q204 **Leo Docherty:** That would be very kind.

On the contract, I was surprised to learn from Lockheed Martin that there was no mechanism in the contract for controlling either the time of delivery or cost of delivery. Why is that the case?

Stephen Lovegrove: I would pass that to Mr Douglas, I think.

Harriett Baldwin: Obviously, we don't directly contract with the company in this case. We have a memorandum of understanding with the joint

programme office, who do the contracting for us. Tony can elaborate on that.

Q205 **Leo Docherty:** Why was no mechanism established with that body?

Tony Douglas: As no doubt the company probably explained, there are two channels that we procure through in terms of mechanisms. One is the current low rate initial production—the acronym LRIP—and now as the programme moves into volume, there is the opportunity to block buy; we built a couple of those together, notionally three. As we all know, we are one of a number of nations involved in this and they are procured collectively through the programme office. It is a foreign military sales process, through the USA, and what we do is we determine what our requirements are. Our requirements through the programme office are then consolidated with everyone else's requirements. They look to group them together, either in terms of LRIPs, the low rate initial programmes, or as we are now building into, an opportunity to block buy. We are soon moving into the first opportunity for us to negotiate a block buy and that could well be for up to 17 aircraft. For us, it would be the kind of LRIPs of lots 12, 13 and 14. We are in the process of looking to negotiate a step-change in pricing as a result of that. We can only achieve that pricing if it is backed up with other nations who are involved in the same block buy as well.

As other colleagues have already said, commercially, I actually think at the moment that this is a good news story. If we look at where it started at, it was around \$161 million per F-35B.

Q206 **Leo Docherty:** Was that a ceiling that was set? Where did that figure come from?

Tony Douglas: That figure was back in 2009, so that was one of our earlier—

Q207 **Leo Docherty:** Why is there no mechanism to control that upper limit of expenditure?

Tony Douglas: This is a historic cost. The aircraft has been bought, and that is what it cost us. It is a good illustration in terms of the way in which the learning curve has gone down, hence the reference to the fact that this is genuinely a good news story.

Q208 **Leo Docherty:** I appreciate all that and I am very grateful, but what you are saying is that there is no mechanism for control. There is no mechanism in terms of a ceiling of costs.

Tony Douglas: Allow me to finish, because I actually think there is. In terms of the last aircraft that we took in LRIP 10, it was \$123 million, so it has gone from \$161 million to \$123 million. In terms of the block-buy that I described earlier on, at the moment we do not want to get into unnecessary detail, because of the commercial sensitivities around it, but we have a target cost of around \$105 million. So, \$161 million to \$123 million to \$105 million is that journey, in a relatively short period of time, driving the costs down.

Q209 **Leo Docherty:** That is the target. What happens, and who is accountable if you don't meet that target?

Tony Douglas: We will not sign the contract unless we can back it off against that price. That is a commercial negotiation. Of course, with all aircraft programmes, be it military or civil, if you look at the learning curve side of it and project how aggressively you can get down in this fashion, I suggest that best practice globally here is the fact that we have multiple nations procuring together; we are using the leverage of foreign military sales to get best possible value for the British taxpayer. Evidence to date suggests that we are actually all making great progress, and I think we should bear that in mind.

Q210 **Leo Docherty:** Hypothetically, if it was above that \$120 million price, who from the Ministry of Defence would be accountable?

Tony Douglas: If it was above the \$105 million I was talking about?

Leo Docherty: Sorry—if it didn't meet your target?

Tony Douglas: The \$120 million is the one we have just procured, in terms of batch 10—\$123 million. In terms of the target for the next batch, which will be the first batch we have put together, that is a negotiation at the moment to be able to lock that one out.

Q211 **Leo Docherty:** If that target is not met, who is accountable?

Tony Douglas: We would not wish to be signing into anything where we will take anything more than that target at this point in time, hence the reason why it is a negotiation.

Q212 **Leo Docherty:** So no one is accountable?

Harriett Baldwin: Obviously, ministerially, I am responsible to the Secretary of State, and you are the senior responsible officer, aren't you?

Stephen Lovegrove: And I am the accounting officer.

Tony Douglas: If we can't get to that number, we will consider all other options. This is a commercially sensitive negotiation, and we all, collectively, have to be hard with that.

Q213 **Mr Francois:** What currency assumptions have you made over the next 10-year period?

Harriett Baldwin: As I have previously told the Committee, we have a structural programme, in terms of hedging our foreign currency exposures, but it doesn't 100% cover all our currency exposures. Our Annual Report and Accounts, when we last published them, used an exchange rate of \$1.50-something, I think I am right in saying. We do a rolling three-year hedge, in terms of the overall structural hedging of our exposures. Clearly, with this particular programme, it is better for us if the pound is stronger against the dollar, because the negotiations that are taking place are in dollars.

Q214 **Mr Francois:** Does that mean that, over the 10-year projection to 2026, you assumed an exchange rate of \$1.50? That clearly makes a

tremendous amount of difference to the price.

Harriett Baldwin: We hedged quite a lot of it at that rate.

Stephen Lovegrove: We have a hedging programme across the Department, and particularly in the equipment programme, but within this particular programme there is a contingency, within that £9.2 billion that we were talking about earlier on, that is designed to deal with the foreign currency exposure. At the moment, we do not see that there is any problem with that. It is internally hedged, effectively.

Q215 **Mr Francois:** So of the £9.1 billion, how much of that is contingency?

Stephen Lovegrove: I have in my mind about £60 million, but I would have to get back to you on that.

Mr Francois: About £60 million?

Stephen Lovegrove: Yes.

Q216 **Mr Francois:** Per year, or in toto?

Stephen Lovegrove: In toto, but the way in which the programme moves is very dynamic. If pressures arrive in one part of the programme, it is big enough to be able to absorb them in another part of the programme by doing something slightly different.

Q217 **Mr Francois:** But if you budgeted £60 million out to 2027—

Stephen Lovegrove: I wouldn't want you to take that as an absolutely clear figure. That is what I have in my mind; I would want to check that.

Chair: Send us a note on it.

Harriett Baldwin: It is fair to say that, in the last 12 to 18 months we have seen an adverse move in terms of the exchange rate on this programme, but it has not affected the fact that the programme is still within the approval envelope.

Q218 **Martin Docherty-Hughes:** As an aside to some of the questions already, Ministers slipped under the radar somewhat that the overhauls of the Pratt & Whitney F135 engines will be undertaken in Turkey. Why?

Harriett Baldwin: This is a global programme and there are lots of countries in the programme. The UK is one of them and Turkey is another. The UK was successful last year in the competition that the joint programme office ran in terms of the maintenance, repair, upgrade and overhaul of the avionics, which will happen in north Wales. We think that is going to be something in the order of £2 billion-worth of activity to the UK economy. The team did a fantastic job on that.

In terms of the engine programme, that will happen within Turkey. I believe the warehousing is happening within the Netherlands, and there are a series of ongoing competitions happening. Turkey is a NATO country.

Q219 **Martin Docherty-Hughes:** I am keenly aware that Turkey is a NATO country, but this is an unprecedented move—this has never happened

in any programme before. Airframes overhauled in another country, and engines in Turkey because it seems to have been decreed by the United States. Is this value for the UK taxpayer?

Harriett Baldwin: If you look at it in the context of the fact that this is a programme of over 3,000 planes so far, and the UK is doing a very significant part of that maintenance, repair, overhaul and upgrade in the UK for all 3,000 planes, as I understand it, that is a very significant piece of economic activity happening in the UK. Then, not surprisingly, if you are Australia, Turkey, Holland or one of the other partner nations, you will be keen to have an element of that global ongoing support in your country. So the joint programme office is running a series of competitions. The UK has been successful in one of the competitions and we continue to hope that we will be successful in others.

Q220 **Martin Docherty-Hughes:** I am afraid the Minister did not answer the question, "Is it value for the UK taxpayer?" If there is not a contingency for this, are we literally one step away from a bullish joke disaster? This is unprecedented—it has never happened before. I am not satisfied.

Harriett Baldwin: Are you implying that we have never done anything with any of our aeroplanes outside the UK?

Q221 **Martin Docherty-Hughes:** In terms of this type of programme, it is an unprecedented move. It is clear that the United States is directing the Ministry of Defence to put the engines for overhaul in another country. Has that happened before?

Harriett Baldwin: Net, in terms of the benefit to the UK, as I outlined, because we are going to be doing, for example, the avionics—I think Lockheed Martin may have shared with you earlier the fact that so far the programme has ordered over \$13 billion-worth of orders with UK companies since the programme began. That shows that this is having a huge benefit in terms of the UK industrial base, and at its peak it will employ something like 25,000 people across 500 companies in the UK. Of course, other countries are going to want to have some of the ongoing work on that global programme. The joint programme office runs a very rigorous, competitive process for each of those.

Q222 **Chair:** Minister, just so that I understand it properly, because I did not know about this until Martin mentioned it to me before the meeting, is it the case, then, that we are having some—if not all—of our F-35 engines serviced by Turkey, and we will be doing things to F-35s that belong to the Turkish Air Force? Is that the idea?

Harriett Baldwin: That is the idea. And the companies involved—remind me, which companies are involved in doing it in the UK and in Turkey? I think it is DECA, Northrop Grumman—

Air Commodore Taylor: In DECA Sealand, which is the bid that we have won, it is predominantly Northrop Grumman, Lockheed Martin and BAE Systems in that enterprise. That will bring enormous benefit into the UK. So all of the nations will use one of the global hubs, but there is also more than one global hub. So it is not the fact that all components will go to

only one hub. The programme has resilience built in as well, so there will be multiple hubs around the world, which provides resilience as well as capacity.

Q223 **Chair:** So what you are saying is that if, heaven forbid, anything went even further wrong with Turkish politics than has happened already, the whole programme would not be stymied.

Air Commodore Taylor: It is important to say that Turkey are a member of this programme, it is important that the procedures that Turkey use are those that Pratt & Whitney and Lockheed Martin put on to that, and it is good work—similarly for the UK. Resilience is really important to the programme. Similarly, going back to Mr Docherty-Hughes' question, it is good value for the UK, because of the amount—3,000—of aeroplanes we are bringing through UK orders, and not just the 138 we are ordering.

Q224 **Chair:** But the scheme does have alternatives if, for any reason, Turkey were unsuitable to continue with this.

Air Commodore Taylor: Or any of the other hubs.

Martin Docherty-Hughes: It seems bizarre that it has to come to this—that we find out about it in Committee and online. I am not necessarily reassured, but I will take the Minister's and the Department's answers on board.

Q225 **Chair:** I am going to come back to the question of the helmet. Is the Generation III helmet fit for combat use? Have you considered using the Striker II helmet instead of the Generation III helmet, and would you like to make any other general statements about some of the flaws of, and difficulties with, the helmet design that were referred to in the articles?

Harriett Baldwin: We could go on for as long as you like about helmets—

Chair: Please don't.

Harriett Baldwin: I do want the Committee to be aware that there were initially some problems with the helmet. The supplier has been able to correct those to the satisfaction of our senior responsible owner, who can now update on all aspects of Generation II or Generation III to whatever level of detail the Committee would like.

Q226 **Chair:** For a start, did you consider using the Striker II or is that just a completely unnecessary course? While we are it, a figure of £309,000 has been mentioned, presumably for the cost of an individual helmet. Is that the case?

Air Commodore Taylor: I do not recognise that particular figure.

Q227 **Chair:** Do you have a rough idea of what the unit cost is?

Air Commodore Taylor: Not that I could say here. I have a suspicion, but it is not for here. What is important to say is that with a fifth generation aeroplane, this is a spectacularly good helmet. It has been

through development, just like the air vehicle, and it has had challenges in the past. I recognise the challenges that the director of operational test and evaluation, Dr Gilmore, put in his note. Those issues have now been resolved—the green glow, the jitter, the gun sight aiming and those things have now been resolved to the satisfaction of the user.

Q228 **Chair:** Who paid the extra money and how much did it cost to modify the helmets to deal with the problems that have now been resolved?

Harriett Baldwin: In the development phase there were no additional costs to the UK taxpayer.

Q229 **Chair:** So the company met the cost of the—

Harriett Baldwin: That is my understanding.

Air Commodore Taylor: I am not sure of the exact division within the programme and the company, but there were no additional costs to the UK taxpayer for rectifying those things.

Q230 **Chair:** And they have all been rectified. You are now satisfied with the helmet.

Air Commodore Taylor: Yes we are. We will fly with the Gen III helmet. We will go to our initial operational capability with the Gen III helmet. Two US services have gone to their own IOCs with the Gen III helmet. The Gen III helmet is really important to the capability. It allows the pilot to look out and see his flight reference and targeting etc. The way that is done on a previous generation aeroplane is that everything is presented in a head-up display, which is fixed in the cockpit. So, the Gen III helmet is actually a really good thing. There were some early development problems, which have now been resolved by the programme, and we will go to IOC with that helmet.

Q231 **Chair:** Moving seamlessly into some slightly broader issues, are the F-35 part of the capability review that is being carried out by the National Security Adviser?

Harriett Baldwin: The capability review is being led by the Cabinet Office. There is a defence strand to the work that is being done by the new National Security Adviser. My understanding of the situation is that he has come into post. We have clearly been working with the strategic defence and security review 2015, and the risks and threats for the future that it outlined. It is fair to say that it does appear that the initial thought about those threats and the external situation was very prescient, so prescient that things are happening somewhat faster than was expected with the strategic defence and security review in 2015. It is in that context that the National Security Adviser is looking at the full range of capability, of which defence is a strand. Given that this is a defence programme, everything within defence is something that is being looked at in terms of capability. But I would not single out this in particular or exclude it.

Stephen Lovegrove: That is true, Minister. It would be fair to say that within the national security capability review the nation's decision for

carrier-enabled power projection is not being questioned, and the F-35 is an integral part of CEPP. It is not front and centre in that sense.

Q232 **Chair:** While we have you here, Permanent Secretary, is the future of the Albion and the Bulwark and our amphibious capability under threat?

Stephen Lovegrove: We are looking at a whole range of capabilities, as we always do. At the moment, no decisions about any capabilities have been made at all, so I am not really in a position to comment on that.

Harriett Baldwin: We have seen the speculation, as the Committee will have seen, too. I can assure the Committee, as the Permanent Secretary said, that as part of the capability review everything is being considered, but certainly nothing has come before Ministers for decisions. There is a lot of speculation in the press—

Q233 **Chair:** Would you not agree that the whole concept of the sea base—a very sound concept that led to the aircraft carriers being decided upon in 1998—was that you project land power from the sea and air power from the sea, and you have an amphibious taskforce and a carrier taskforce? Would it not be a spurious distortion of that doctrine to suggest that the carriers, for example, could carry out the role of the amphibious taskforce as well as that of the carrier strike taskforce?

Stephen Lovegrove: I think the expert on this is Lieutenant General Poffley.

Lt General Poffley: You can describe amphibious operations in a number of ways. Clearly, like any capability, we are looking carefully at the contemporary operating environment and working out whether delivery of troops from ship to shore, in various forms, is appropriate in the contemporary environment. You would expect us to do nothing other than that. What I can assure the Committee is that we do believe that the UK will remain engaged in amphibious operations and we will look to the best mechanism by which we can do that. But it needs to be balanced against the rest of the capability priorities in the context of the review.

Q234 **Chair:** Surely we should be looking at far more than the contemporary operating environment. When I first heard about the threat to the Albion and the Bulwark back in January, I raised it on the Floor of the House. You, Minister, sent me and the Committee a letter, which you put in the Library of the House of Commons, saying, “I can reassure you about the Albion and the Bulwark”, and that the out-of-service dates remained, if I remember correctly, 2034 for one and 2035 for the other. If we are talking about ships that have an anticipated design life into the 2030s, we are surely not talking about the contemporary operating environment, but the operating environment that we might have to face for another 20 years.

Lt General Poffley: Absolutely.

Harriett Baldwin: And we have just spent £90 million upgrading and refitting the Albion.

Chair: Yes.

Harriett Baldwin: We have seen the same speculation that the Committee will have seen, and, as I say, it is speculation.

Q235 **Chair:** And we spent quite a bit on refitting the Ocean, and that is not going to stay for long, is it?

Harriett Baldwin: The Ocean was always scheduled to go out of service in 2018.

Q236 **Chair:** All right. Can I ask a very specific question of Tony, who I think for a moment thought he was going to get through the entire thing without having to say anything at all? How big is the black hole in the defence equipment budget?

Tony Douglas: I do not have any sense whatsoever in that regard, like everybody else who speculates in that space. I am not one to do so without clear evidence, data and facts, and I am not in possession of any data or facts that would suggest that that is the case.

Q237 **Chair:** Well, the Public Accounts Committee produced a report, published just before the election, that I think suggested a figure of about £10 billion. Was that right? Is it something of that sort? Would anyone like to comment on whether there is a black hole in the defence equipment budget?

Harriett Baldwin: The defence budget obviously is growing overall, and the defence equipment budget is £178 billion. I think the NAO report published just before the election said that it was a very ambitious equipment plan, and we agree. It has gone up from the £166 billion that it was before the 2015 SDSR.

Stephen Lovegrove: One of the points the NAO made was that around SDSR '15, we had basically earmarked and allocated a large sum of money that we had been holding back for equipment purchases as a result of the SDSR '15 process. Their thinking about that was that we had removed some of our contingency. I think we had a different interpretation. That money was always, as it were, held back for exactly what it was designed to do, which was to be put against new capabilities—the ones that were specified in SDSR '15—and we still have quite a large amount of contingency. Mr Douglas holds a contingency within each and every one of his programmes. I cannot remember the exact number, but we also have a very large contingency within—

Lt General Poffley: It is £5.5 billion.

Stephen Lovegrove: We have £5.5 billion within the head office as contingency against overrun. I don't think we would recognise this idea of a black hole at all. It is certainly the case that we have very challenging efficiency targets, and we have never made any secret about that, but we are working very hard to be able to meet those.

Q238 **Chair:** We were working on a report when the general election was called, and—roughly, from memory—I think you were suggesting that

there should be up to £14 billion-worth of efficiency savings identified over a period of time, and about £3.9 billion had been identified at that time. Is my memory playing tricks on me?

Stephen Lovegrove: I do not recognise those numbers. Before I came to the Committee, I had a quick look at our efficiency programmes. The efficiency programme for 2013, which was put in place in 2013, and the one that was put in place for 2015, cumulatively, over the 10 years that they are there for, have an overall target together of over £30 billion. But we are on track already, even though we are only a couple of years into that 10-year period, to get £25 billion—so we can have sight of £25 billion—and we are working very hard to be able to close the delta. This is a long-running, ongoing process that we are putting absolutely our best people on to in order to be able to achieve it.

Q239 **Chair:** Are you saying that there should not be a need for any defence cuts?

Harriett Baldwin: The defence budget is growing.

Q240 **Chair:** It is always growing in absolute terms, but—

Harriett Baldwin: And in real terms. We have a real-terms commitment as well.

Q241 **Chair:** Defence inflation grows at a very large pace, doesn't it?

Harriett Baldwin: We have to make sure we work to keep our suppliers competitive and that the money we spend is spent in the most efficient way on behalf of the taxpayer. I know that you have a two-hour session next week with the Secretary of State, and I am sure the Committee will want to ask him about these kinds of thing.

Q242 **Chair:** Permanent Secretary, you are not anticipating us having to make any defence cuts.

Stephen Lovegrove: We always are re-prioritising, as any organisation that does not have unconstrained budgets will have to do.

Q243 **Chair:** How much additional money would be required to fund the commitments made in the 2015 SDSR? Are you saying that all that would be covered by a contingency that you already have in place?

Stephen Lovegrove: My feeling is that as long as we can make our very challenging efficiency targets, which as I say we are working very hard to do, we should have an SDSR '15 that is affordable.

Q244 **Chair:** I do not expect you to be able to tell me this on the spot, but will you drop us a note and just give us a table and say how each of the past seven years of efficiency targets have been translated into real-term savings? It would be very helpful to know, when you are asking us to have such faith in the efficiency and fulfilment of efficiency savings targets for the future, how you have got on over the last few years. Let's say the last seven years. Could you do that for us?

Stephen Lovegrove: Certainly. I will happily drop you a note. Perhaps I can say, though, that three big efficiency programmes were laid on us:

2010, 2013 and 2015. I talked about 2013 and 2015 because they are very current. The 2010 targets have been met in full. They are completely on track.

Q245 **Chair:** Okay, well let's see a table, let's see what the figures were supposed to be and let's see what the figures were. That would be very helpful.

Q246 **Mr Francois:** Sorry to come back to this, but it is important. It has been suggested that most of the contingency that you had left has probably been taken up by currency fluctuations, when you look across P-8, AH-64E and, of course, the F-35. But you are saying that you are able to budget for that and you still have some contingency left.

Stephen Lovegrove: I do not recognise that characterisation of the financial position at all.

Q247 **Mr Francois:** With the national security capability review, ultimately those decisions will be taken by the NSC.

Stephen Lovegrove: I do not think that would be a characterisation that I would recognise either. The NSC does not really get in to the fine-grain detail of capability choices that we will be making at the Ministry of Defence. The national security capability review is to say, of the four things that we identified in 2015—resurgence of state-based threats, the morphing of violent extremism, the challenges of new technology and the threats to the rules-based international order—some of those have moved much more quickly and much more aggressively than possibly we thought in 2015, and to ask whether there are general issues around Britain's security and defence posture, which might then have downstream consequential effects for defence, the agencies, colleagues in the economic and business departments and the Foreign Office. There are many strands involved in that.

Q248 **Mr Francois:** So changes in the Ministry of Defence would be, as it were, changes recommended by the Ministry of Defence. You are not expecting to have anything imposed on you by the NSC.

Stephen Lovegrove: We are not expecting to have anything imposed on us and, of course, we are in constant dialogue with colleagues in the Cabinet Office. It is quite an iterative process. They want to have their thinking informed by our thinking as well. So it is a bit more dynamic and fluid than that.

Q249 **Martin Docherty-Hughes:** Watching the evidence given by the Permanent Secretary and the General last week to the Public Accounts Committee, I was intrigued by one particular piece of MOD-speak. Can the Permanent Secretary explain to the Committee clearly and unambiguously what they meant by referring to a cost envelope? It was the first time I had ever heard of it in terms of defence.

Stephen Lovegrove: What I meant by cost envelope—what I was referring to—was that £9.2 billion budget for the F-35 programme to 2026-27.

Q250 **Chair:** While we are on the subject of terminology, if you think our

figures are wrong, please say so. There has been an awful lot of “not recognising” things. Well, sometimes it is what it seems to be: it’s just one does not recognise it. So if you think it is wrong, please say so.

- Q251 **Leo Docherty:** Is the capability review led by the National Security Adviser considering reducing the strength of the Royal Marines? Do you agree that, if that were the case, that would be to our national detriment, because at a time when we need to be able to project power, the Royal Marines are, in fact, a strategic asset?

Harriett Baldwin: I completely agree with the importance of the Royal Marines. As you will know, that falls very much outside the equipment portfolio, but I can say that, personally, as a Minister in the Ministry of Defence, we see, day in, day out, amazing examples of how the Royal Marines are effective for the nation and, for example, what an amazing job they did just recently in the Caribbean. Clearly, in terms of the growing number of Navy personnel that we have budgeted for, the First Sea Lord will discuss exactly what the right balance is for his forces. That is something that he will look at on an ongoing basis, but given the kind of speculation that we have seen in the press, I would not want any message to come from Ministers at the Ministry of Defence that is anything other than fervently supportive of what the Royal Marines do.

- Q252 **Leo Docherty:** In that case, I will pass that question to the Permanent Secretary. Is there any consideration in the Ministry of Defence to reduce the extent of the Royal Marines?

Harriett Baldwin: I think last week there was a reallocation of 200. Is that not right?

Stephen Lovegrove: There has been a recent reallocation of 200 Royal Marines to the Navy manpower budgets. I echo what the Minister says: we are very conscious of the very great importance of the Marines and their contribution to the amphibious capabilities that we have.

- Q253 **Leo Docherty:** But is there any consideration for reducing that strength?

Stephen Lovegrove: We are looking across a range of different options and absolutely no decisions have been taken about any of those options at the moment.

Leo Docherty: We will watch that with interest.

Harriett Baldwin: You have the Secretary of State next week, I think. I will let him know.

- Q254 **Chair:** For the sake of clarity, when you said that you thought that there was contingency—one hopes, therefore, that capacity will not have to be cut—were you talking purely about contingency for defence equipment programmes only?

Stephen Lovegrove: I was talking about contingency for the defence equipment programme.

Chair: Thank you. I am glad to get that straight. Thank you, Minister, and

all the other members of the panel. You can see from the very large attendance how much interest there was in this hearing, and I think that most people would agree that we have gone into things in great depth and detail. We are grateful to you for your time and for the effort that you have made in giving us your best responses.