HOUSE OF COMMONS

Defence Committee

Oral evidence: Defending Global Britain, HC 1333

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Watch the meeting

Members present: Mr Tobias Ellwood (Chair); Stuart Anderson; Sarah Atherton; Martin Docherty-Hughes; Richard Drax; Mr Mark Francois; Mr Kevan Jones; Mrs Emma Lewell-Buck; Derek Twigg.

Questions 61-127

Witnesses

I: Rear Admiral (retired) Alex Burton, Former Commander UK Maritime Forces (2016-2017) and Dr Sidharth Kaushal, Research Fellow, Sea Power, RUSI.

Examination of witnesses

Witnesses: Rear Admiral Burton and Dr Kaushal.

Q61 **Chair:** Welcome to this Defence Committee session looking at the Royal Navy, in response to the Integrated Review that was published last month. I am delighted to welcome the witnesses joining us this afternoon: Rear Admiral (retired) Alex Burton, and Dr Sidharth Kaushal, who is a research fellow on sea power at RUSI. You are very welcome here today.

We are meeting in very difficult times at the moment. Parliament was recalled yesterday in order to pay tribute to the Duke of Edinburgh. May I, on behalf of members of the Defence Committee, echo the thoughts and prayers that were given yesterday to Her Majesty the Queen? Obviously, Prince Philip had a huge affinity not least with the Royal Navy, but with all three services. As we discuss our topics here today, thoughts about his commitment to our armed forces are very much in our minds.

I thank our witnesses very much indeed for coming to this session. Before we go into the details of the Integrated Review, I wonder whether I can quickly turn to a very topical area of concern: the build-up of Russian military might on the eastern border of Ukraine. Clearly, this has been a worrying area of Europe for a number of months, indeed years, now, but we have not seen such a scale of military might since 2014, when the events surrounding Crimea unfolded.

Dr Sidharth, may I begin with you? Is this a concern? Is it just sabre rattling? Is this just spring manoeuvres, or is this something that Britain, the west and indeed NATO should be concerned about?

Dr Kaushal: Absolutely. We can rule out the idea of spring manoeuvres because this is very much outside the exercise timetable of the Russian military, so it simply cannot be a routine deployment in line with the traditional annual joint-force exercises that Russia holds. That narrows it down to two possibilities: the first and perhaps less disquieting aspect of this—although certainly concerning—is that it is simple coercive diplomacy, short of outright warfare. That would mirror things like Russia's hybrid blockade in the sea of Azov and its periodic provocations in Donbass—in other words, a drumbeat of low-level provocations to secure Ukrainian concessions on issues like, in this case perhaps, the water supply to Crimea, over which Ukraine has a certain degree of control. Alternatively, and the more concerning prospect, is that this is a prelude to large-scale operations, although I would argue that the former eventuality is more likely than the latter.

On how the west can respond, there are two aspects to the problem: there is the psychological erosion of Ukrainian will and resolve by a steady drumbeat of actions, each of which is not particularly significant, but having a cumulative effect on national resolve. This in some ways mirrors

what we have seen China doing in Taiwan and off the Senkakus in Japan. So, strengthening Ukrainian psychological resolve, whether that is with symbolic gestures such as the deployment of forces to the region, or more substantive gestures such as training and capacity building within the Ukrainian military is critical.

The second aspect that the west in general can lean into is linked to the capacity-building exercise, which would be particularly important in the more high-intensity land-grab scenario, although it is unlikely that the Ukrainian military can be built up to the point where it can defeat Russia in the conventional sense of the term. However, the capacity to deny Russia a cheap, quick and costless victory can certainly be built. Arguably, that is where capacity-building exercises can give the west most value, as a sort of cost-imposition measure against Russia and a deterrent against the more risky of the two eventualities, the limited-aims land grab.

Q62 **Chair:** Doctor, thank you. Admiral, turning to you, it is interesting to note that the Foreign Secretary has come out with a tweet calling on Russia to de-escalate the situation immediately, but this is a reminder, isn't it, that as much as we have tilted towards cyber-resilience and so forth, conventional capability counts? Perhaps this is the wrong time to be reducing the number of tanks, armoured fighting vehicles and indeed infanteers. Force presence, upstream engagement, holding terrain absolutely counts in this day and age.

Rear Admiral Burton: Yes, it does. I think you will probably come on to the commentary of volume post the ISDR later. I cannot add to the eloquence with which Dr Sidharth described the geostrategic situation, but I have practical experience. In 2003, when I was in command of HMS Northumberland, we went into the Black sea, came alongside in Odessa and did some of that very capacity building that Dr Sidharth described. I can only reinforce his view of the value that capacity building offers, with not just the credible training but the knowledge that threatened states have friends. That partnership—the peace process and the capacity-building—that we are delivering now is really compelling, because the one thing that authoritarian states do not like is alliances and friends, because they lack them. I would therefore reinforce Dr Sidharth's comments. Russia has played these games in the north Atlantic, the Baltic and elsewhere for some time. The sort of responses that Dr Sidharth described are needed, both there and up in the Baltic states.

Q63 **Chair:** You talk about alliances. NATO is the obvious alliance, and we have heard from Jan Stoltenberg. Does it not require alliance membership, then to step forward, show determination and act as one?

Rear Admiral Burton: I cannot speak for the politics around the political organisation of NATO, but I can speak for the value that military relationships, alliances and friendships offer as a buttress against authoritarian states. We worked very closely with the Ukrainian navy, and we worked closely with the Ukrainian military beforehand—outside NATO, but within a less political military structure.

Chair: Admiral, thank you. I am sure this is something that the Committee will turn to in the near future.

Turning to the Integrated Review, Derek Twigg, do you want to take us forward?

Q64 **Derek Twigg:** Perhaps I could direct the first question to Rear Admiral Burton. Alex, does the Integrated Review set the right role for the Navy in achieving our national security and foreign policy objectives? Is that role clear and realistic? Has the Integrated Review overlooked any threats or standing commitments?

Rear Admiral Burton: Lovely to see you again, Derek. It seems like only yesterday that we were working together. Let me take you to those points in turn. If I miss any, please come back to me. First, for Defence, I think the Integrated Security and Defence Review has offered a very ambitious and comprehensive picture of what Defence should do. For the Navy, it is offered probably the most ambitious vision of the three services. If you include the full command, it is perhaps on a par with the responsibilities and ambitions that have been handed to Strategic Command in space and cyber.

I think it is no surprise that those two commands have been offered the most ambitious statement because, whatever your views or the politics around our move away from Europe and into a global nation without those structures, we will need to have more influence over maritime, cyber-space and space—those global commons—as a single nation than perhaps we might have done were we part of the European Union. I am not getting into the politics of Brexit, but the clear statement from the Government that we are going to be a global nation means that our ambitions at sea, in cyber- space and in space—those global commons—need to be stronger. The Integrated Review has made those ambitions very clear. It has made them very clear in the Euro Atlantic region, where the Royal Navy has had a long tradition stretching way back to before the first world war, and in the need to act as a buttress against a Russia that is increasingly, as we have just heard, testing alliances' strength. It is not a pivot to the Indo-Pacific region, but I think the Integrated Review has offered a tilt into the Indo-Pacific region, which is a maritime region very similar to the Euro Atlantic one, and one where the Royal Navy is quite rightly going to spend more of its time.

Q65 **Derek Twigg:** Do you agree with how the Integrated Review prioritises the threats to the Navy achieving its mission?

Rear Admiral Burton: Let me pick off those threats. I think the foremost threat is clearly the pacing threat posed by Russia. With the Royal Navy having the sole custody of the strategic nuclear deterrent, the foremost threat that the Royal Navy, alongside all services and national infrastructure, has been vested in the custody of is the strategic nuclear deterrent. If you take that as the first responsibility, that has been really compellingly told with the Integrated Strategic Defence Review. If you then look at the other geostrategic threats, whether that is a more

competitive China or some of the threats within the middle east, those have been played out clearly. If your question then poses the sort of technological threats that might be meted against the Royal Navy I think, "Yes, but." My worry, if I were to have a worry about the Integrated Review—and this is not just a worry for the Navy; it is a worry across Defence—is that it has not been transformative enough. It is not looking to shift the technological focus and with it the resource towards the sort of technologies that are required now and will be required even more over the next decade.

Q66 **Derek Twigg:** Dr Sidharth, do you have anything to add to that?

Dr Kaushal: Yes, I would largely concur with what the Admiral has said. I think that has covered most of the points. There are just one or two addendums I would add to what the Admiral has already laid out. I would argue that while the current review sets out priorities between, as the Admiral said, a pacing threat of Russia and the more competitive challenge of China very well, and resources each threat accordingly, there is a possibility that if the tilt to the Indo-Pacific becomes a pivot—if for example accession to the CPTPP raises the profile and the importance of the Indo-Pacific in the future, if not quite now, to British grand strategy—naval resources that are currently very well appropriated in accordance with the level of the threat and the importance allocated, might find themselves stretched a bit thinner than they are now. If, for example, the CSG is required to operate more frequently in the Indo-Pacific, this might create trade-offs with the primarily NATO-oriented focus that the integrated review has laid out, which makes perfect sense today but is perhaps vulnerable to geopolitical headwinds.

Other than that, I would largely second what the Admiral said; so nothing particularly additional from my side.

Derek Twigg: Okay, thank you.

Q67 **Chair:** Admiral, can I just ask: we have 19 frigates and destroyers, and before you look at what the integrated review wants to take us towards and do, currently are there roughly a third of that number of operational duties, if you like, that we carry out, for which those 19 frigates and destroyers then circulate around? In other words, we have about six duties around the world, and that leaves six other ships to be preparing to go out, and then maybe another six that are in deep maintenance. Is that roughly how the Navy approaches its operational commitments?

Rear Admiral Burton: I am a little historic about how the Navy approaches its operational commitments, but let me come back to you on a few points. I think that one of the points you bring out is what I would describe as a very inefficient force structure to deliver effectiveness for the nation. So a force structure which has up to only a third of our warships ready for operations, and on operations, is not good value for the taxpayer.

Now I see, and at the latter stages of my career there were the glimmers of talk of, double crewing—and we have got double crewing in the Gulf

now. In my mind that should be accelerated, because actually you then do start getting to the sort of global presence and the sort of volume that Dr Sidharth described, that this nation should expect from the treasure that they are spending on a vast shipbuilding campaign.

So I would change the structure, but I would also say that an extra couple of ships or an extra five ships that are not networked into the rest of the Navy, that are not networked into Defence, that are not networked into our allies, are less use than the neural network that is ubiquitous in our civilian lives but is sadly lacking within the military, to the level it is. So it is a slightly different response to your question but my view would be if there is money spare for more capability across all services, let's invest that in the neural network, because that is what our allies will be wanting, and that is what our adversaries will be fearing.

Q68 **Chair:** Okay, but I am still trying to understand. You are saying that perhaps we need to speak to the Navy today, but this rule of three, as far as I understand, still continues today. We will find out more—we are visiting Portsmouth on Thursday—but ultimately, you need deep maintenance, or even short-term maintenance. There needs to be the training as well, and there are about six commitments.

My concern is that we are now going to add to this Global Britain approach, east of Suez, Indo-Pacific tilt and so forth, yet you look to the programme of build—the procurement cycle all the way up to 2045—and it is still only 19 frigates and destroyers.

Rear Admiral Burton: Yes; maybe I was not clear. We have a warship permanently out in the Gulf at the moment, so that starts breaking that rule of three that you described. HMS Montrose, I believe, is permanently out there at the moment with two crew, and you have got more effectiveness from that single warship than you would do if she were single-crewed and doing that roulement. You have the new offshore patrol vessels coming in.

Now, no one pretends that they are going to deliver the same capability that a Type-23 or a Type-45 will deliver, but because they are permanently deployed, you will get a level of presence from that, and it will be that permanent deployment and that double-crewing that is going to break the rule of three.

The rule of three that you described is there for a large part of the Navy at the moment. It is being broken in the permanent deployment of the 23s in the Gulf, and it will increasingly be broken as more of the newer ships come in. I agree with you, Chair: we are going to go through a dip, both in capability with the OPVs and with the retiring of the Type-23s, but I do not believe that it will be like that until 2045.

Chair: Okay. I just recall that in the straits of Hormuz, when there was that problem with Iran, we suddenly had to procure a frigate to get there, and we struggled because we simply did not have one available.

Q69 **Mr Francois:** Admiral, following on from what you are saying, we have 19

frigates and destroyers on paper, but in terms of what we could actually deploy in a crisis at short notice, it is nowhere near that, is it? We have 13 Type-23s, which are capable ships, but they are old and tired and they are increasingly expensive to maintain. Then we have six Type-45s, which are world class in their air defence capability—comparable with a US Ticonderoga—but their propulsion problems are very well known.

We have this massive ship-building programme, which I am sure the Committee wholeheartedly welcomes, but it has taken 10 years to produce HMS Glasgow: a decade for one ship. Isn't the problem that of the 19 we have on paper, most of them are tired, and/or their propulsion systems have got problems and the upgrade programme seems to be taking years for the 45s? Shouldn't we be addressing that seriously now, and also accelerating the build programme of the Type-26s?

Rear Admiral Burton: I have a history with this, Mark, because I was the senior responsible owner for the delivery of the Type-26. Let me go through each of your points in turn. I absolutely agree that the Type-23s are old. They had a lifespan of 18 years; I think the likelihood is that some of them will continue for upwards of 30 years. They should be retired as soon as possible.

I absolutely agree that some of the decisions made over the previous six years to slow down the build creates a more dangerous situation in terms of hull numbers than could have been achieved if that build had not been slowed down. I absolutely agree that the Type-45 unreliability, which was known in 2012 and has taken too long to resolve, should have been resolved sooner. I cannot comment as to whether it is being resolved now at the pace it is, but I do know that one of the ships is in the engine change at the moment.

I will say a "but", though, and I am absolutely convinced of this. In the world that our sailors and Royal Marines—I am particularly talking about the Navy here, but this is also the case for the other two services—are likely to go into at the moment, another ship will not make a difference between winning and losing.

A ship that is properly connected into the network, with the intelligence lead—in this information world, which is ubiquitous in almost every other part of our lives—alongside our allies, will make a difference. I am unashamed in saying that significant mistakes were made over the past 10 years that have got us into a position where we have fewer ships than we need. I agree with you on that. I do not agree that the solution would be to invest more heavily in ships if that is at the expense of giving those ships and other weapons systems the neural network that they need to survive.

Q70 **Mr Francois:** I completely agree that we want our ships to have the best possible IT and comms and related equipment; I do not think anyone argues with the principle of that. However, what is the point of putting the most advanced C3I kit in the world on a warship if its engines do not work?

Rear Admiral Burton: I hope that I have responded to that. I agree that the decisions around the engines were slow—the decision to upgrade the engines was a slow decision. I cannot comment on the pace that that is being delivered on now, but the decision has been made, I think in the last couple of years.

One point worth coming back on is that the Type-45s are now extremely reliable; you may know better than I the last time a Type-45 was taken off operations for any time because of its engines. My understanding is that that problem is a useful comment to put into the press when the ships are seen, but it is history, largely. However, there is significant work going into resolving it.

The Type-45s have been the mainstay of the Gulf. They will be deploying two of them, I think, with the Carrier Strike Group over the next six months. I think the worst of the engine problems are over. There is a mitigation plan in place. I will leave it at that.

Q71 **Mr Francois:** Quickly, do you know when the six of them will all have had their engines repaired? When will that all be finished?

Rear Admiral Burton: I do not, but I will bet you that it is slower than it could be and should have been. The conversation about the engine change started in 2010, I think, and the first one went in last year. Where we are in complete agreement is that history has not been good for the decision making around the Type-45 and engine replacement.

I do not know how quickly they are being done, but I imagine there is a decision around ensuring we have enough available to support the Carrier Strike and other tasks while getting them in for change. There will be broader decisions around it, but they are not as unreliable as the commentariat in the press might describe. Ask any commanding officer of a Type-45 and they will tell you that they are reliable ships.

Mr Francois: To save time, if we are in complete agreement, I will leave it there.

Chair: We will move back to the strategic. I call Kevan Jones.

Q72 **Mr Jones:** Before that, we have become fixated on numbers, in terms of the 19 frigates. However, it is quite clear that, even by 2030, some of what those different frigates can do will be different, in the sense that some were built to do NATO tasking but others were not.

Do you agree that we should talk about capability rather than numbers? For example, the Type-31 has a limited capability for NATO tasking, as I understand, and we are not clear yet what the new Type-32 will actually be.

Rear Admiral Burton: Yes, I agree. That is why I would exclude the offshore patrol vessels as credible warships. If we are to use our warships, as I think the First Sea Lord described them, as embassies, as stations and a warship is a vessel that can deliver retribution, they need to have credibility behind them.

The Type-31 will be a credible warship; I am confident of that. It will not be as credible as the Type-26, but that is quite right and a conscious design. You are absolutely right, Kevan, that it should be the capability rather than the hull numbers that the nation should focus on.

Q73 **Mr Jones:** May I turn to a broader question? I will bring Dr Sidharth in first. Two CDSs who have given evidence to us say that we should be concentrating on the Euro-Atlantic and the north, rather than on the so-called pivot to the Indo-Pacific. Are they right?

Dr Kaushal: To an extent, in the sense that the proximate challenge posed by Russia is arguably more immediate than that posed by the People's Republic of China, which is still primarily a concern for regional powers within the so-called first island chain.

However, it is worth reiterating how quickly that could change. Russia, after all, is a stagnant power whose ambitions are probably limited by what its economy can sustain in the long term, whereas the PRC, being a more dynamic state in one of the more economically pivotal regions of the world, could outpace Russia as the facing challenge for the Royal Navy in, for example, a 10-year timeframe.

Although the assessment that, for example, Russia's resurgent northern fleet—its special-purpose submarines and their ability to tamper with critical and national infrastructure such as undersea cables—may be, probably, the most important proximate challenge for the Royal Navy, I would argue that this relationship will be inverted within, roughly speaking, a 10-year timeframe, given the limitations on Russia's powers and, conversely, the seemingly steady rise of the PRC.

Rear Admiral Burton: Perhaps I may offer a practitioner's view. I think that both threats can be managed at the naval level. My understanding is that we would be able to move a Carrier Strike Group from the Indo-Pacific into the Euro-Atlantic region more quickly than we can move a division into eastern Europe.

The globe seems massive, but ships move and they can move quickly. In terms of the timeline, therefore, that movement could be made. It would probably not be there as quickly as we would want, but it would be there sufficiently quickly if we responded to the triggers. That time would be reduced further if the northern route continues to de-ice, as we expect. So, I am not as concerned about the fear of a split between Indo-Pacific and Euro-Atlantic, and all the reading that I have done suggests a tilt rather than a pivot. I am comfortable with what appears on first pass to be strategic ambiguity.

Q74 **Chair:** To follow up on Kevan's question and the interesting reply, we can of course quickly shift an aircraft carrier and a battle group across to the Indo-Pacific, but for what means? Are we going to change China's behaviour? Taking a battle group or a brigade and sticking it in Ukraine or eastern Europe, however, will affect Russia's behaviour.

As much as you say there is a simplicity to what we are doing, is there

not a wider geostrategic question mark as to why you would want to move to sail across the South China sea, other than to show support for and solidarity with our US friends?

Rear Admiral Burton: It is a good question to ask. My first reply to Kevan was about moving from the Indo-Pacific in response to our pacing threat in Russia, rather than moving the other way. However, your point, I think, is: why are we worrying and bothering about the Asia-Pacific region and putting a priority on it?

I am sure that Dr Sidharth has more eloquence on this than I have but, fundamentally, we will have a huge number of trading partners in the region so, if nothing else, offering some form of reassurance, some form of alliance with those like-minded countries in the region is a compelling part of being a major player on the global stage.

Will our Carrier Task Group, on its own, have a significant effect on China's behaviour? No. Will our task group, alongside those of the Americans and our other like-minded friends in the region, shape and potentially temper China's expansionist and competitive approach? I believe it will. More importantly, I believe we should at least try and stand alongside those allies.

Chair: Okay, thank you for that. That's very good. Martin, over to you.

Q75 **Martin Docherty-Hughes:** Thank you, Chair. I was quite surprised at some of the answers that Alex gave to my colleagues, especially to Kevan Jones. I was glad to hear some of the responses, I have to say.

One of my concerns, just briefly on that, is that in the last Parliament I was aware that our friends in the United States were concerned about our lack of ability in the north Atlantic to assist them to get a division to the eastern front in 10 days, while, at the same time, having a pivot to the Indo-Pacific. Is that something you think the Royal Navy takes on board, Alex? Is it reflected or do they understand that concern, at least from the previous Administration in the White House?

Rear Admiral Burton: Sorry, but I might have misunderstood the question, Mr Docherty-Hughes. Are you asking me to respond to whether we can move our division to eastern Europe or support the movement of American forces from CONUS into Europe?

Q76 **Martin Docherty-Hughes:** The movement of American forces from the continental United States to the eastern front. That came over very clear to us when we visited Washington: that it was a grave concern that this pivot to the Indo-Pacific would undermine that capability.

Rear Admiral Burton: I am confident that we will be able to offer significant support deterrents. The Future Commando Force has a long history of support, of operating in the high north. My understanding is that they will support the US marine corps in maintaining access around the Norwegian area and the high north there. The Royal Navy is a substantive support on that. The Royal Navy has a really strong lineage in anti-submarine warfare and ensuring that the Greenland, Iceland and UK gap is

secure, using the Royal Navy and the Royal Air Force Poseidons and the Norwegian ones. I am confident that that will be delivered as well.

People keep using the word "pivot". I do not recognise a commentary on the Indo-Pacific as a pivot; I recognise it as a tilt and all the way through the review there has been commentary that the pacing threat is Russia.

The Carrier Strike Group will be a huge buttress against any Russian adventurism into the Atlantic. It is not going to be permanently based in the Indo-Pacific, so for a large part of the time it will be in support of NATO, in support of that reinforcement that you describe.

A short answer to your question: I cannot speak for the Americans, but I imagine that, as they look into this decade, they will be more reassured by the support that the Royal Navy can give to protecting the reinforcement of the NATO flank than they had been in the last decade.

Q77 **Martin Docherty-Hughes:** Thank you. I am going to the general question now, in terms of the impact of technology and the changing character of conflict. Maybe I can come to you first, Alex. Do you agree with the Integrated Review's assessment of how advances in technology can change the character of naval conflict? Importantly, though, what technology would you see our potential adversaries developing that would have the biggest impact on the future of naval warfare?

Rear Admiral Burton: The answer to your first question is yes, definitely. New technologies will change elements of naval conflict. All conflict—others have said this before me—is fundamentally very visceral and violent. Therefore, the fundamental character of it will not change. The hope is that we deliver a level of deterrence that avoids that conflict. In this grey zone that I know you have heard a lot about in the review and through your previous questioning, there is going to be significant action below conflict. Some of that action will be in cyber space, and that will affect the Royal Navy if we are not sufficiently protected. Some of that action will involve trying to gain the advantage in the narrative. Whether that is driving fishing vessels in front of warships and then broadcasting that those warships sank a fishing vessel, there is a whole host of things that, if we are not careful, we will be responding to rather than being proactive.

In answer to your question as to what technologies: cyber, both offensive and defensive; directed-energy weapons; and particularly autonomy need to be at the front and centre of naval technological advancement over the next decade.

Q78 **Martin Docherty-Hughes:** Sometimes, even in the civilian sphere when it comes to technology, leadership is key to countering or developing technology and utilising it to your best. Do you think that the senior command has a good enough grasp of the impact of these new technologies in the field of naval conflict?

Rear Admiral Burton: Gosh, that is a rich question, which I feel ill qualified to answer fully. If I had a reflection, it would be that I think we

have got an extraordinary coincidence of leadership and technology. Across Whitehall you have got an acknowledgement that defence needs to change and embrace a level of technology, and you have got senior military leaders—I can speak most confidently about the Navy, but I believe it is the case in all services and commands—that are not just receptive to that, but are championing it themselves. They do not claim to be technologists, which is fine, but they are very ready to lean into technologists to deliver some of the transformation that is required.

Q79 **Martin Docherty-Hughes:** The Chief of the Defence Staff recently stated that the future of warfare will be defined by "a competition between hiding and finding". From your perspective, what does that mean for the Navy and how it should respond?

Rear Admiral Burton: In the most strategic sense, it is still clear that the environment where it is most easy to deliver stealth is in the underwater battle space. That is stealth both for our adversaries and for us and our allies. It is therefore no surprise that we have chosen to place our strategic nuclear deterrent there. Hiding and finding in strategic terms for this country is all about the nuclear deterrent. It is a hugely complex and expensive game, but it has been the mainstay of our peace for half a century.

When you look beyond the strategic deterrent, hiding and finding, I go back to my point about the neural network and the digitisation of that battle space, both for the future commando force and for the warships. It is not a physical hiding in the oceans. It is ensuring that you can find your adversary more swiftly than they can find you, and then be able to respond. You will only be able to do that if you have the digital network with your friends, and you are able to see the information and respond to it at a faster speed than your adversaries.

Q80 **Martin Docherty-Hughes:** I am sorry not to bring Dr Kaushal in, but you have mentioned the neural network a few times. I am concerned that it is not higher up the agenda in the Integrated Review and that it is not one of the main areas for investment. To me, that means there is a lack of understanding about the importance of such things as a neural network, which you clearly understand. I will ask you again: do you think that the senior command understand the importance of investing in the basic infrastructure, through things such as the neural network, to enable them to move into the future?

Rear Admiral Burton: Here I will be more blunt. I think it is £1.7 billion per year that is being spent in ship building. I think in space over the entire programme it is less than £2 billion. In the digitisation it is even less. Fundamentally, Mr Docherty-Hughes, I absolutely agree with you that for all of the talk and fears in the press that this is a defence review which is moving too fast into technology, when I look at it, it is insufficiently innovative. It is certainly insufficiently innovative at pace if we are to ensure that we keep pace with our adversaries. In fact, in some instances we need to catch up with them.

Chair: Dr Kaushal, did you want to make any comments?

Dr Kaushal: Briefly, on the question of disruptive changes and the dynamic between hiders and finders that was mentioned, I would like to extend some of the Admiral's points and point out the key importance of so-called reconnaissance strike complexes that our adversaries are developing—long-range, ground-based strike assets such as the Chinese DF-21D anti-ship ballistic missile or the Russian Kinzhal. These not only have the accuracy to target surface vessels at ranges that would previously not have been conceivable, but increasingly we are seeing that these strike assets are being complemented with the sensors and processing systems needed to actually find large surface vessels.

Space-based assets are proliferating both at a state level and increasingly to non-state actors— commercial firms, for example, field increasingly large satellite constellations. Things like proliferating fleets of relatively low-cost UAVs, along with improvements in processing speeds in terms of fusing the data from multiple sensors, will increasingly make it possible to target surface vessels from the ground or air at ranges previously thought to be highly unlikely and unviable.

From this emerges an important part of the hider/finder dynamic for us relative to our adversaries. There will be an imperative moving forward to shift towards what the US navy calls distributed lethality—moving from single, expensive points of failure, such as individual, high-cost surface vessels towards large, distributed fleets of cheaper, optionally manned or even unmanned surface vessels that you can afford to lose. One needs to expect to lose vessels in the context of this reconnaissance strike complex battle, and they need to be networked through exactly the sort of neural networking system the Admiral laid out. In many ways, part of the hider/finder dynamic is breaking down the failings of a large force of high value assets into a more distributed force that is both more difficult to find and brings greater mask to the battlefield.

Q81 **Richard Drax:** Before I ask the question I have been set, I want to ask about numbers. It seems to me that with everything in the military, the bigger the capability, the more expensive the item gets and the less of it we have. However sophisticated a ship is, if it sinks it is gone. So ideally we would like another one, whether in the future it is autonomous or manned. Do you think 19, the figure we have got now, is sufficient to meet all the commitments and threats that we now have? Should we not have more ships in the event of a conflict where we lose one?

Rear Admiral Burton: That question is very similar to one posed previously. I am and I was an admiral. If you asked me whether I want more ships and if you asked anyone in the Navy whether they want more ships, the answer will, of course, be yes.

Actually, the answer is that we do have more ships; we have now got six offshore patrol vessels when previously we only had three. If you take the basic premise of having more mass and more volume and acknowledging that some of the capability will be lesser, then the ship-building

programme has delivered on that. My worry is that we should not confuse a grey painted hull with a small gun on the front with a warship. I think you could acknowledge that that was a ship that delivered tangible effect to the maritime battle space if it had a sophisticated set of sensors and some novel weaponry. I would expect that to happen in time.

I will close, Richard, with a similar response to that I gave last time. Of course, we should have more warships, but two more warships in a fighting war in the next five years will mean more warships sunk. The same number of warships with a proper ability to share information, not just with each other but with the intelligence agencies and our allies, means it is less likely that one of them will be sunk. So, given your very compelling opening point, which is that a warship is no warship if it is sunk, a warship is more likely to be sunk if it is not connected to the information that it requires not only to survive but to take violence to the enemy.

Q82 **Richard Drax:** Thank you. My point was more about the budget, which is 2% or thereabouts. In my view, and I suspect yours, that is not nearly sufficient. It was 5% in my day, and now it is 2% and the kit is a lot more expensive. We are dealing with an unrealistic budget to face a very real threat. That was more my point.

Before I come to my question on the grey zone, will you explain briefly to our listeners and viewers what the grey zone is? To some, I suspect, it sounds like something out of "Star Wars".

Rear Admiral Burton: Others will have defined it more eloquently, but to use the metaphor of colour, where white is peace and no conflict and black is hard conflict, grey is that bit in the middle. Grey is that area that, in reality, has been occurring for generations, probably beyond the public eye. It is using plausible deniability, proxies and your own state actors, short of war but to threaten and coerce us and our adversaries to do what the other wants. In my mind, it is cyber-attacks, or embarrassing military units by forcing them to do something that they do not want to do or by playing into the media narrative that they have done something wrong—it is cyber-attacks on critical national infrastructure, it is taking advantage of the strategic narrative. That is what I would describe as the grey zone.

Q83 **Richard Drax:** Thank you. My question is, therefore, should more of the Navy's focus be on threats in that zone or below the threshold of warfare?

Rear Admiral Burton: I think it should be in both. If you look at the capabilities that we have now, there are capabilities that can operate well within the grey zone—they have been operating in the grey zone for, as I said, several generations. Fundamentally, however, if we are to win in the grey zone, we have to be able to show credible deterrence, and to show credible deterrence, we have to be able to deliver a credible retribution when required. Winning in the grey zone only works if we can also show that we are able to win in a shooting war. Therefore, that is why we have the strategic deterrent, and we have the strategic conventional deterrent in the carrier—I speak solely for the maritime areas.

Richard Drax: Doctor, would you like to say something?

Dr Kaushal: I second the admiral's point about the need to meet the needs of both grey zone competition and high-end warfare. It is worth noting that part of the reason that our adversaries restrict their activities to the grey zone is that they are deterred from high-end war fighting by the still preponderant capabilities of the western and allied coalitions they face. It is not so much a strategic choice as a strategic necessity for them—one that would probably change if western capabilities at the high end eroded.

It is also worth noting that in both Russian and Chinese military and doctrinal thinking, there is no real concept of the grey zone per se. Rather, activities short of warfare, as the admiral so eloquently described, are seen more as preparatory work for what is usually described in both countries' thinking as local wars, or local wars in "informatised" conditions in the Chinese framework—in other words, ways of hermetically sealing the battlefield, deterring allied intervention, isolating a target. The final step, however, is always high-end war fighting so, important as it is to focus on the grey zone, we do ourselves a disservice if we see it as a substitute for the high-end fight and build our capabilities accordingly.

Q84 **Richard Drax:** Would you agree, though, to maintain our conventional force to ensure that the limit of warfare—if that is the right phrase—remains in the grey zone, so is a deterrent, is very important.

Dr Kaushal: Absolutely.

Q85 **Sarah Atherton:** Admiral, you have mentioned OPVs a number of times. You are correct, that we are to have an increase in ships, with five or six more OPVs. However, the standing commitment for the Royal Navy in the integrated review is greater, with a far greater global reach—there will be a permanent station for an OPV in the Falklands, and Trent in Gibraltar. We are asking the OPVs to support broader surveillance, shipping lanes, maritime environment, fisheries and so on—we are asking them to do a lot more. They are also quite lightly manned, with a 30-mm gun and two mini-cannons, and they do not have a hangar, but they have a flight deck. I am sensing that you have an opinion here.

Rear Admiral Burton: Yes. These are hugely effective warships—they are hugely effective ships for presence, for soft power and for what the maritime calls constabulary duties. As they stand, they are not acts of war—I would not want to take an OPV into the Gulf at a time of heightened tension—but they are hugely capable. Some have only come in in the past 12 to 18 months but—this is the key point—they have the opportunity to offer so much more than they currently do, and they have got the space.

They could have autonomous systems put on to them. We might come on to the mine countermeasures transition, which was announced in the ISDR, and OPVs could be used to hold autonomous systems to conduct mine countermeasures. They could be used to hold a whole host of autonomous air systems to provide overwatch and sensing for other task

groups. At the moment, they are very useful platforms to carry people, with a self-defence—at most—light gun on the front, but the Navy has a long tradition of growing capabilities within the hulls that it has, and I would hope that that occurred with the OPVs, whether with sensors or autonomous systems.

Sarah Atherton: Thank you, Admiral. Dr Sidharth?

Dr Kaushal: Mostly, I would second what the admiral said. Broadly, OPVs serve a more narrowly delineated function, but of course there is room for capability growth, as circumstances demand. I do not have much to add there.

Sarah Atherton: Thank you, both.

Q86 **Chair:** May I pursue that for a second? This is where the Navy—I listened carefully to what you are saying, Admiral—does not look over the horizon. Instead of building Type-31s, which are bespoke, with things welded down—it is getting more modular, which is welcome—ultimately, it should be an entire new fleet, with 20 Bay class equivalents, which have a well deck, an open platform and literally nothing else but stuff that you can put on regularly, whether that be rotary systems or UAVs, which can do the underwater stuff. To have a fleet of those would give such versatility no matter where we are—the variety of tasks that we are asked to do, from NATO to the Caribbean or the Middle East and so forth has been mentioned.

We have such high-tech, highly bespoke niche capabilities placed on our naval vessels, instead of having something like the Argus, which you will be familiar with and which is loved by the Navy, simply because of its versatility, because there is nothing on it. It is treated as a platform that you put capability on, and that capability can be updated in its own time, so its shelf life is much, much longer. Shouldn't we have a more blue-skies approach to working out what we might need and the openness that we might require over the next two or three decades? Dr Kaushal, do you want to respond to that first?

Dr Kaushal: Absolutely. In the long term, the changing character of war seems to lend itself to precisely that approach of larger numbers of vessels that can more readily have more modular capabilities placed on them. We have seen this even with very expensive strike capabilities. The Russians, for example, have containerised their Club-K cruise missile, and it can now be placed on anything from a cargo ship to a support vessel. You see this with increasingly cheap and available loitering munitions and UAVs for more ISR capabilities, which will likely become more readily available in mass moving forward, given advances in our manufacturing and automation.

Broadly speaking, particularly when it comes to warfighting, particularly on an increasingly transparent ocean surface, more nondescript vessels that can hold large numbers of strike and surveillance assets might well be the future. I think the trade-off, though, is between presence in peacetime and a more warfighting capability because, arguably in peacetime, the

Navy has a symbolic role as well, and that is quite key to deterrence. Naval vessels, bespoke and visible as they are, are important symbols of national commitment and capability in a way that redesigned auxiliary vessels are not. And yet in wartime, paradoxically, some of the changes that we have discussed might indeed make the sort of more modular asset that you described more valuable. The key trade-off that navies need to adjudicate as they move forward in this operating environment is how much of an emphasis they put on bespoke vessels that are key to much of what navies do in peacetime, and how much of an emphasis they put on the less visible, more rugged and more modular assets that might serve them quite well in wartime.

Chair: Thank you. Admiral, any thoughts?

Rear Admiral Burton: I agree with Dr Sidharth. I think that we can achieve his view of the compelling sight of a grey warship in peacetime at a lower cost than we currently do. If the point is whether we can build warships more cheaply, have modularisation and have them more flexible, I absolutely—I am a visionary—would buy into that, and I would not just stop at the modularisation of the weapons systems. There is absolutely no reason why you could not completely upgrade and update the software system by having it all on the cloud. This open architecture in terms of the physical structure of a warship and its software is absolutely where it needs to go. It is happening, but it is probably not happening at the pace that we would want. The Type-26 has got space for a whole host of modules in it, but the vast majority of it is inbuilt infrastructure. The Type-31 has got space for modules, but the vast majority of it is inbuilt infrastructure. If we were going to be adventurous, I would say take two of those OPVs and start doing and proving exactly what you have just described. Use them as laboratories to start delivering proper modular capabilities. They will still look like warships, so they will still fulfil Dr Sidharth's needs.

Chair: During Operation Ellamy, which you might recall, the Apaches were tested in Libya and put on aircraft carriers or on the back of our destroyers. The Apaches themselves have a range of over 400 kilometres. With Hellfire missiles you could put Storm Shadow and Brimstone on there as well. We have never pursued making the platform a locality for other assets to be placed on there, depending on whatever task you have. Kevan, over to you.

Mr Jones: I do not, perhaps, disagree with you, but unless Type-31, or the OPVs for that matter, have a surface-to-air protection capability, they will be pretty vulnerable to any potential aggressor. It is a matter of making sure not just that you can be a module, but that in the first place they have that protection, which is not there at the moment.

Chair: If no one wants to respond to that, I call Mark Francois.

Q87 **Mr Francois:** I want to look at mine hunting now. I declare an interest: my father Reginald Francois was on a minesweeper at D-day—a ship called HMS Bressay. I suppose I have some emotional investment in this;

I think Mr Twigg, our Committee colleague, has a constituency link with those small ships, too.

The IR proposes to phase out our mine hunters by 2030. Conversely, according to the March-April edition of "Warship World", the Belgian and Dutch navies have just confirmed that they will be replacing all their mine hunters by 2030. A 10-year contract has been placed to supply 12 2,700-tonne motherships—six for each navy. The lead ship is due for delivery in 2024: note the three-year build period.

So the Belgians and the Dutch, who have to guard those vital Benelux ports in the event of reinforcement across the Atlantic, are building new mine hunters to do that. We are proposing to go in a different direction. How confident are you that these so-called autonomous systems are actually going to work?

Rear Admiral Burton: Shall I take this one? I also declare an interest: back in 2000, I was in command of HMS Inverness; sadly, she is no longer in service, but many of her sister ships are.

This is a serious and emotive debate. The warships that we have currently built—both the Hunt class and the Sandown class—were the most expensive warships, inch for inch, that this country has ever built. So as a starting position, let us understand how expensive it will be to replace like for like MCM hulls that are able to go into a high-threat mine zone to do mine clearance at close distance—which is what they were designed to do, because autonomy did not offer them the opportunity to displace themselves from the threat zone.

If we go down that route, we will be spending a significant amount of money not just on the GRP hubs but on getting rid of all sorts of ferrous magnetic signature to ensure that we can sit inside the zone. Conversely, we started looking at autonomy in about 2010-11; I was head of the capability area and I think we put our first £10 million in there.

I think Defence is now about to put £1 billion into MCM. But £1 billion will not buy you six mine counter-measure vessels; by the way, I do not think it is enough to deliver the sort of autonomous transformation required. When you compare £1 billion on mine counter-measures with £1.7 billion a year on ship building—I go back to my point that transformation is not happening quickly enough—that is imbalanced.

But in terms of capability, we will be able to deliver mine counter-measures five to 10 times more quickly using autonomous vessels, with people less close to the danger zone and with probably a broader capability than if we spent that same money building extremely expensive ships.

You can tell from my commentary that I fundamentally believe for this nation that the most effective way of providing mine counter-measures for this decade and beyond is not to invest in hugely expensive ships, but to invest in the autonomy. My belief is that we are not doing it quickly

enough, but that does not mean that we should go back to non-ferrous warships.

Q88 **Mr Francois:** The Belgian and Dutch navies, for their own reasons, if they have placed contracts, presumably take a different view. The thrust of your evidence today—which is very good—seems to be that high tech conquers all, but for instance, in the presence we have under Operation Kipion in the Gulf with those mine hunters, we are generally acknowledged to be world class in that field. I do not say that for any personal, emotional reason, but the Americans pay great regard to that mine-hunting force that would have to keep the straits of Hormuz open in an emergency. Aren't you worried that we would lose a lot of that political clout if we invested very heavily in the technology that you are talking about, if it were to prove unreliable in practice? These ships may be expensive, but everybody accepts that they can do what they are intended to do. You are taking a bit of a gamble on new technology that politically may or may not be credible, aren't you?

Rear Admiral Burton: I also served in the Gulf, in HMS Inverness, so I have first-hand experience of not only the environment but the value that it offers to the Americans. I think that is an interesting comparison, and I offer no comment. I have worked with the Dutch and the Belgian mine counter-measures in the Baltic on board HMS Inverness as well, and they are extremely capable at mine counter-measures, but if you can pick one nation that has operated mine counter-measures in the Euro-Atlantic region and in the Gulf in war and in peace, it is the Royal Navy. Those people who cut their teeth on mine counter-measures within the Sandown and the Hunt class vessels are those people who are looking to transform towards autonomy.

The reality is that the autonomy has been operating within the commercial underwater sector for 10 years, so in some instances, we are not talking about high-risk, novel technology: we are merely talking about exploiting technology that has been hugely effective in the oil industry and taking that to the next level, specifically for the MCM world. I am very confident—because I know the leaders of the Navy—that the last relationship that the Royal Navy would be prepared to compromise is that with the US navy. Therefore, they have sufficient confidence in autonomy and MCM that they are prepared to make that change, and it is best that we make that change now, rather than leaving it for five years and finding that we are unable to do mine counter-measures with our existing ships.

Q89 **Mr Francois:** Quickly, for the avoidance of doubt, you have talked about people using autonomy in a commercial context for a decade or so. I follow you, but presumably there is no private company that has been destroying mines in that time, or is there?

Rear Admiral Burton: No, there isn't. Of course there isn't, but as someone who has spent two years operating a mine counter-measures vessel and using remotely operated vessels, the basic technology around searching the sea bed and identifying very small objects on the sea bed that are difficult to find is the same in the commercial sector as it is in the

military sector. I am not suggesting that the technology can be taken off the shelf, but I am absolutely confident that there is technology out there.

Q90 **Mr Francois:** But in fairness, those small objects do not go bang, do they? Anyway, what would be the motherships that would operate, presumably even if these systems are autonomous? Would they not have a mothership of any kind in your concept? If they would, I think you referred to OPVs earlier, so could you just quickly explain to the Committee how this concept would actually work in practice?

Rear Admiral Burton: It is not my concept: it is the Royal Navy's concept, and as I say, the world leaders in mine counter-measures have gone down this route. The only critique I would offer of the decision is that they are not putting enough money into it—I would say that up front—and they are not putting enough money into it quickly enough, but their decision is right. The concept would be to ensure that wherever the command and the resource—those autonomous vehicles—is held, they are outside the mine danger area. That could be onshore, on a Type-26, on a commercial vessel that has been taken up for trade, on an offshore patrol vessel or on one of our survey vessels. What it offers you is far more choice and the ability to get it into theatre at a vastly quicker pace than the three weeks that it took me, in extremely unpleasant sea conditions, to get Inverness out to the Gulf.

Q91 **Mr Francois:** That is why we forward-base them; that is what Kipion is about. Lastly, because there are other questions to be asked, I don't want to put words in your mouth, sir, but are you saying that you would have a number of autonomous systems—in layman's terms, robot-type systems—that could go down and disarm the mines, which could be operated from the shore or from another vessel?

Rear Admiral Burton: Yes, that is correct.

Mr Francois: I suspect that this is going to be quite a lively debate, but you have at least given the Committee a flavour of how it might work. Thank you very much, Admiral.

Q92 **Chair:** To round that off, I am deeply concerned, and that has been expressed by the Committee as well, that we are heading towards a capability gap when it comes to counter-mines capability. The Hunter and the Sandown classes are due to retire, and yet here we are attempting to procure automated replacements in that time span. I don't think we are going to be able to do it. As Mark Francois said, we gain a lot of credibility, not least with our closest ally, the United States, because of this.

You might be familiar with ScanEagle, which is now typically found on all American warships. Yet, we have very limited UAV capability at all on any of our naval ships. We are very late in coming to the show here. All we are talking about here now is the conversion into subsurface capable automation, but still the Navy is not picking this up fast enough. This should have been thought about five years ago, in the same way that the Americans thought about ScanEagle 20 years ago. The film "Captain

Phillips," which you might be familiar with, illustrated how useful a UAV is to have on any frigate or destroyer. None of our frigates or destroyers have that ability to utilise an unmanned aerial vehicle today. We need to change.

My concern is that the money is not available. We have skated over this; Richard Drax brought it up. Were money made available, we could have these replacements in time, not just to replace this but every single frigate or destroyer could have a counter-mine capability in a UAV form, on board, so they could look after their own. Isn't that where we should be going, Admiral?

Rear Admiral Burton: Thank you, Chair. There is a risk that we are in violent agreement. I am absolutely adamant that the concept of using autonomy for mine counter-measures, rather than placing ships and people in danger's way, is the right way to go and it is technologically viable. That was the point I hope I put across to Mr Francois.

I likewise said that there is not enough money going into that programme at the speed that is needed to ensure that that capability can be delivered. When this programme was set up in 2012, £10 million or £20 million was being given; I was running the programme. There has never been the volume of money that is needed. I could quite happily have a strong argument as to whether autonomous systems are better than manned systems in MCM. I firmly believe that it is autonomy and technology that should be done, but I equally firmly believe that the Government and the Department are not being innovative and pacey enough in delivering that.

Q93 **Mr Francois:** Quickly, in a world of cyber, disruption and deception, if you take manned vessels out of the equation—the Americans don't really invest in manned mine hunters; they have basically left it to us—and you were relying on autonomous systems to clear mines in vital world choke points, what is to stop the enemy disrupting, jamming or cyber-destroying those autonomous systems? If they do that, you've got no capability at all, do you?

Rear Admiral Burton: No. My response to that would be that you are absolutely right. Defence and the country need to invest in credible cyber-defence. That issue is not just for MCM and autonomy; it is an issue for the manned MCMs if they are in danger's way. In reality, they are probably more likely, because they are on the surface, to be hijacked by a cyber-attack and degraded than an autonomous system underwater. I absolutely agree with you that there is a threat from actors conducting cyber-attacks across defence and across the Navy. I don't believe that that is a threat peculiar to autonomy.

Chair: Richard, did you want to come in quickly?

Q94 **Richard Drax:** I think my question has been answered. Quickly, Atlas Elektronik—does that company ring a bell to you?

Rear Admiral Burton: It does.

Q95 **Richard Drax:** It is in my constituency—I declare an interest, of course—

and I have done a lot of visits there. They are fascinating, because they are leading experts in the autonomous mine-hunting world. Just one question. Does the mothership, wherever it is, deliver in effect a baby ship that then delivers the autonomy, or does it have to operate from the mothership? I am just thinking of capability. If you can deliver something smaller, the big mothership is free to do other tasks, or available to be alert to other tasks. What is it?

Rear Admiral Burton: I don't have a deep understanding of the latest concepts, but what we will see is significant flexibility. I can imagine a collection of autonomous vehicles on a Type-26. I can imagine a collection of autonomous vehicles sat in the corner of the carrier or some RFA. There is no reason why the command link to those autonomous vessels, both surface and sub-surface, can't be based in the maritime component commander's headquarters in the Gulf with satellite communications down to the vessels.

As a visionary, I am keen to break from this idea that you have a ship with a collection of things connected to it, either by an umbilical cord or by close communications. The reality is that that network will reach back to either the afloat commander or the ashore commander. The autonomous vessels that you describe could be dropped by a helicopter or a merchantman. They could be dropped from ashore, and drive out to the area where the mines are.

The joy of autonomy is that you dislocate the human from the physical proximity to both the threat and the vehicle, but what you don't do is take away the human from the decision-making process.

Chair: You will be familiar with HMS Jufair. As you mentioned before, our mine-hunting capability has a massive impact in the middle east, not just because they are doing their job but because of all the other things they do in upstream engagement and that bond—that bilateral relationship that we have not just with the Bahrainis and the UAE but right across the Gulf. My concern is that we are going to lose some of that. We talk about the grey zone, but there are so many other things that the Hunt class can do in addition to mine hunting. There is that bond—that relationship. Ultimately, the bigger picture is that we get nudged out by adversaries that come on and replace us if we are not there with the presence. That is the concern that we have. Let's move forward.

Q96 **Stuart Anderson:** I want to look more at capabilities, which the Chairman touched on. We have bounced in and out of this, but I want to go back to the Integrated Review and get your views, initially, on whether you think it gives the Navy the right mix of vessels, bases and other capabilities. I am happy for whoever to go first on that.

Dr Kaushal: Broadly speaking, the review gives the Navy what you might call a fairly balanced force of relatively low-end assets—OPVs and, to a certain extent, the Type-31s for more constabulary and competitive work, with a good level of emphasis on the sort of engagement that the Chair described, particularly the work of the littoral readiness groups—and the

ability to scale up those assets, along with the higher-end components of the force, into a war-fighting capability. Broadly speaking, therefore, in terms of the imperative to balance the twin challenges of engagement to constrain adversaries and of, eventually, if necessary, preparing to fight, I would say that the tiered force, the almost high-low mix, that the integrated review lays out is relatively well suited to that task.

With regards to the higher-end component of the competitive spectrum, war fighting, some questions were left open—some of which we have already gone through in detail, so I will not repeat them—particularly on countering ground-based anti-access capabilities, as well as shifting towards a more distributed and partially autonomous force capable of operating within so-called A2/AD bubbles, which the Integrated Review left out. These are questions that will have to be revisited in the future.

The force generated is well suited to meet the strategic challenges of competition. It is a credible force, capable of operating in tandem with allies in a war-fighting scenario, but particularly for higher-end war fighting with peer competitors the review perhaps left open certain questions that the Navy and the MoD will probably have to answer going forward.

Q97 **Stuart Anderson:** Thank you. Do you see any particular areas of concern with what has been set out, doctor?

Dr Kaushal: I would not necessarily state that the force structure laid out produced any particular areas of concern for me. The temporary trough in capability that the Navy will endure when the two Type-23s are retired will probably generate certain force generation issues, although in all likelihood not insurmountable ones.

The Navy, however, will need to look at two key questions: first, the absence of a capability to counter anti-ship ballistic missiles on the Type-45 destroyer. That was discussed in the 2015 strategic defence and security review, as part of a wider ballistic missile defence capability for the vessel, but it was absent in this review, which I thought was noteworthy. The second aspect, which is not necessarily a missing capability but is a question of concern, is the Royal Navy's capacity for anti-submarine warfare, particularly in the high north, and whether the force of Type-26s frigates is fit for the task.

Finally, more generally, the subject of disruptive change and a more ambitious and in some ways blue-sky force structure was left unsaid. That is not necessarily a bad thing—though there is something to be said for conservatism—but it perhaps creates some questions for the future operating environment, in particular as adversary anti-access capabilities mature in the decade going forward.

Stuart Anderson: Thank you, doctor. Admiral, anything you would like to add to my question?

Rear Admiral Burton: If I were to be bipartisan and looked across all the commands, the command that should feel least bruised and most

confident coming out of this review is the Royal Navy. That has been relatively well publicised elsewhere, but I would endorse it. I do not critique the Government for that, but the Royal Navy has come out well.

I share Dr Sidharth's view. I think there were a couple of areas that he did not mention, but perhaps that was an oversight. Carrier Strike is well balanced. I do not know the numbers, but they will probably not get the numbers of F-35s previously announced. In my mind that is right, because what should happen—you will expect me to say this—is an increased investment in autonomous aircraft that place people further from the threat. If there is money left over for aircraft, it should be invested in autonomous aircraft that can go from the carrier.

Future Commando Force on first pass have come out, quite rightly, very well. They have got a clear role and they have gone through what I think is a tremendous transformation over the last five years. If I looked at the *[Inaudible]* behind it, I would say that the flow of money seems to be light in the early years, so they will probably not deliver the level of transformation that they aspire to early on.

That plays to one of my worries about how the Navy, and perhaps Defence—I can speak most cogently about the Navy—deliver their transformation, which is that they herald boutique trials very heavily, but we have seen very little industrialisation and productionisation of some of their transformative technologies. If there is one thing I want to see delivered over the next couple of years, it is to start to industrialise some of the transformative technologies that are heralded in the press but are not ubiquitous across their arms.

The support shipping I think has been good. One vital unique capability that has been highlighted in the review is the multi-role survey ship with a particular focus on the underwater space. I would just reinforce Dr Sidharth's view on the anti-ballistic missile defence, which I think was a wrong absence within the review.

Q98 **Stuart Anderson:** Thank you. Admiral, I know you both spoke about the Future Commando Force and the Littoral Strike Group. Are they appropriately equipped and organised?

Rear Admiral Burton: Shall I go first? They are not yet, and this goes back to my point. The Royal Marines are extraordinary at innovating. They are extraordinary at adapting, and they have got an over-350-year history of innovation and action. My worry at the moment is that the general public and Defence confuse a few innovative capabilities that have been seen in the press as something that has been spread out across the force. Unless those capabilities are delivered across the force, the capability that the force as a whole delivers will not be there.

Q99 **Stuart Anderson:** That is very interesting. Innovation gets you so far, and you can't live just off innovation; you have to have the equipment, support and everything else. I have worked alongside the Marines in the past, and they are phenomenal at what they do. Do you think we will get

to that place where they will be appropriately equipped and organised to carry out the roles we are expecting of them? Looking at the Marines, they have a can-do approach and will make things work, but that eventually runs out and you need the support to be there as well. Do you think that will be in place?

Rear Admiral Burton: I do not have sight of the funding to deliver the Future Commando Force. My understanding is that the funding to deliver the Future Commando Force is not happening at the pace that we would want. The innovation is fine, but unless it has been industrialised, it will not deliver the impact that Defence expects. I do not believe that that transformation will happen at the pace that we need.

Q100 **Stuart Anderson:** Thank you. What would you like to add to that, Dr Sidharth?

Dr Kaushal: I broadly second the Admiral's point that at present, the Future Commando Force concept is very much in its nascent stages in terms of laying out the contours of the force. Some of its more ambitious elements that have been discussed—for example, precision tactical fires and access to a range of manned and unmanned air and surface assets—are potentially quite ambitious in the funding requirement they pose on the force. On the other hand, they could deliver a rather credible capability, particularly for the early stages at the seams between competition and conflict as the grey zone escalates to the red. It is a valuable capability if it can be developed.

The other aspect I would touch on is the importance of engagement to the commandos' future role, in terms of peacetime engagement of partners and allies, and capacity building. I would say that this perhaps represents an organisational challenge more than a capability challenge, as the commandos perhaps build that institutional capability to sustain long-term engagement and capacity-building relationships with partners across a number of geographical regions.

Q101 **Stuart Anderson:** Dr Sidharth, while we are on the budget side, do you think that the planned frigate and destroyer replacement programmes are, first, affordable, and secondly, deliverable?

Dr Kaushal: In terms of the affordability of the programmes, I would say that we would probably need more clarity on the funding available before I could conclusively speak to that. One can certainly see the requirement for something like the future destroyer programme in particular. The trend towards larger surface combatants seems to be a global trend, whether you look at China's Type-55 cruiser or the US navy's—our ally—future large surface combatant programme. In terms of the character of the future operating environment, there is a case to be made for something along the lines of, for example, the future destroyer, but in terms of the funding and deliverability, I think we would probably need more clarity before I could comment on that.

Stuart Anderson: Where would you sit on that, Admiral?

Rear Admiral Burton: I have lived it. I would say that the biggest challenge from my experience of shipbuilding is being in a world where money gets taken off at short notice and you have annual budgets that you have to land on a pinhead. Just like Dr Sidharth, I cannot speak to what the money flow is like over the next 10 years, but I would hope that the procurement process and the acquisition process have been matured such that money is not taken away at short notice, which is what happened to the carrier programme and the Type-26 programme. We all know that that adds unaffordability later on. There is a more mature approach to the annual funding that incentivises the shipyards to deliver on time and on budget.

Q102 **Stuart Anderson:** Going back, if we push their budgets to one side, Admiral, and say that money is not withdrawn, is the procurement deliverable if the budgets are in place? Is the capability there to deliver on time?

Rear Admiral Burton: I am not sure what area you are questioning me on. If you are asking me whether I think the shipyards are able to deliver these ships at the pace that they need, I am too out of date in knowing the credibility of those shipyards. If you are asking me whether the technology is there and whether these ships are technologically innovative, the answer is, fundamentally, no. We are not talking about technologically innovative warships. Can the yards build them to time and cost? You would need to ask the Defence Equipment and Support acquisition leads on that.

Stuart Anderson: Thank you. I think I was dipping into both sides of that. Thank you both very much.

Chair: Thank you, Stuart. Sarah, did you want to come in?

Q103 **Sarah Atherton:** I am minded of that old saying, "spoiling the ship for a ha'p'orth of tar." I am particularly thinking of the Carrier Strike and the support mechanisms that are in place. There is always a solution offered by the MoD around supplies for equipment for repairs to the F-35—pre-loading is the term, and the use of Merlins for Carrier onboard delivery. Are these realistic long-term options?

Rear Admiral Burton: No, but let me answer that in two parts. First, you will, I am sure, have been on board Queen Elizabeth or Prince of Wales. These are very, very big ships so they are not short of space to put stores on. The first question, I suppose, that you imply is: have Defence got a proper store system in place to ensure that actually the parts—for want of a better phrase—are there, rather than having to be collected from the manufacturer? If the store system is in place, then the carrier and her support shipping have got ample space to store most stuff.

I think there was significant discussion around Lightning engines, which I think is the testing weight and volume for moving across. The answer to that is probably buy more Lightning engines, rather than buying an entirely new aircraft fleet to move Lightning engines around.

If we talk about the long term and moving stores around a battlefield—whether that battlefield is at sea or on the land—I am afraid I go back to my rather hackneyed comment, which is that the answer is autonomy. There will be increasing weight lift from autonomous vehicles, which will be cheaper and they will not put humans in the space. So, in the longer term, which was your question, I would expect autonomous vehicles to provide that level of support. But the reality is there is sufficient space to cover what I think is the stressing point, which is Lightning engines around the fleet.

Dr Kaushal: I do not think that I have much to add over what the Admiral said, except to concur with both points—particularly the role of autonomous assets in taking on some of this logistical burden. I would just point to some of the work, for example, the US Marine Corps is doing in this area and perhaps the opportunity to generate synergies with partners in terms of delivering autonomous logistics capabilities.

Q104 **Mr Francois:** General the Lord Richards, the former Chief of the Defence Staff, warned us prior to Easter that as the UK armed forces transition from industrial to information age capabilities, we might not have enough of either in a crisis. One of the challenges for the integrated review is you said yourself that the flow of money is light in the early years, so we end up with very highly capable armed forces, but it takes us quite a few years to get there, and there may arguably be a period of some vulnerability during the transition.

I think this is a live issue for debate. Perhaps I could give you a few examples. The Navy is starting to retire its Type-23 frigates at least four years before the replacement Type-26 and Type-31 are expected to be in service. So, there will actually be a dip from 19. Moreover, as the Chairman has established you do not get 19 anyway, you get barely a third of that. How are we going to manage that gap for three or four years?

Rear Admiral Burton: There are a couple of questions there. Here is where I would violently agree with the entire tone of the Committee, which is that the integrated review—I have got it written down here—said it was going to be "identifying…developing and deploying new technologies and capabilities faster than our potential adversaries".

I do not see the pace and level of investment to live that statement. To your first point on the transition from the industrial to the information age, that investment for the information age is not there at the quantum that I would expect to deliver on that integrated review.

We then come onto your second point, which is a point of frigate numbers. I would agree as an Admiral, of course, I would like as many frigates as possible. But I return to my point: two more frigates will not make us a better ally or more likely to win in a hot war. But not being networked, not being able to talk to our allies and not being able to live in that information age—and we are behind the curve—will make us incredible

alongside our allies. More worryingly, it will make us incredible to our adversaries.

Of course I would like two more frigates, but if the cost of getting that neural network in is a temporary dip in frigate numbers, I would prefer that because that would mean that we were less likely to lose.

Q105 **Mr Francois:** I take that point, Admiral, but we are not talking about two more but four fewer. To follow on partly from the point made by my colleague Mr Drax, even the most capable ship in the world cannot physically be in two oceans at once. The risk is that for several years we are going to have—however well networked they are—a relatively old number of warships, and even that number is going to go down.

The Type-26 is an incredibly capable ASW frigate. It is world-class, which is presumably why the Australians and Canadians have opted to buy it; I think they call them the Hunter class. All credit to BAE Systems because it is a remarkable export success. No one is knocking the capability of the warship, but it is taking a decade to build HMS Glasgow and bring her into commission. That is a very long time for a ship, even a first of class.

Supposing you had to fight what is called a "come as you are" war—in other words, with relatively little strategic warning. If it takes years to build a complex warship, would there be some merit in placing some of those Type-23s, old though they are, in temporary reserve? Then at least we would have some additional hulls in a crisis, until sufficient Type-26s were in service. Let's use the word: if war were to break out in the next few years, when we have hardly any Type-26s in service, what would we do then?

Rear Admiral Burton: I will rather cheekily go back to your point about Type-26 and export because I do think that this is a point worth making. I was the senior responsible officer for Type-26 when we were doing the export campaign to Canada and Australia. I am not surprised, but I am delighted that they have chosen it—it is an exceptional warship.

I have already spoken about my disappointment that those ships are not in service now or in the very near future because of short-term cost savings over the past few years.

Let me go back to your compelling point about ships not being able to be in two places at once and ships sunk not being able to fight. Ship numbers are a compelling conversation during competition and in soft diplomacy. If ordered I would do it, but I would not want to go into a hot war with a Type-23 that had been in reserve.

I go back to my point, which perhaps was worded wrongly. If the choice was two fewer ships but the other ships were properly connected alongside our allies, I would take two fewer ships because I guarantee you that more would be floating at the end of the war with the neural network than would be floating if two Type-23s were taken up for reserve. In a competitive environment with soft diplomacy, I can buy the argument for

hull numbers, which is why the OPVs are so valuable. In a hot war, do not send ships from the reserve to the frontline—they will not survive.

Q106 **Mr Francois:** But as other members of the Committee have touched on, for many years we have seen a trend in defence in which we end up with fewer and fewer numbers of increasingly capable bits of kit. At some point, you need mass. If you have to escort convoys, for instance, how do you do that with one ship, however capable? Surely, there is some trade-off. Otherwise, you end up with phenomenally expensive warships, but hardly any of them. They may not get sunk, but, equally, they may not actually be able to achieve their effect.

That takes me on to the carriers. It has already been mentioned by Dr Sidharth that the Chinese have a ballistic missile, the DF-21D, which is specifically designed to destroy aircraft carriers—it is a carrier killer. We are not saying anything that is secret—this is all information that is in the public domain; we are not giving anything away. The Type-45 is primarily there to defend the carrier against air threats, but as you and Dr Sidharth pointed out—very rightly, I think—the review does not upgrade it to an anti-ballistic missile capability.

Given the argument that has been made throughout the review—which is that you have to hide, because if you get found then you can be killed—then assuming that you can find a very large aircraft carrier, what is to stop someone from destroying that carrier with a brace of DF-21Ds if the Type-45 protecting the carrier cannot shoot them down?

For the avoidance of doubt, I am saying that as someone who is pro-aircraft carrier. I am not anti-carrier, I would just be grateful for an answer, because they are £3 billion a go.

Rear Admiral Burton: I think that your point is as compelling for an airfield in Al Udeid as it is for an aircraft carrier. I agree with you, and one of the gaping holes within the defence review is an anti-ballistic missile defence mechanism, both at sea and ashore. Can I come back to the point you started on, because I—

Q107 **Mr Francois:** To be clear, "a gaping hole", in your words?

Rear Admiral Burton: There is a gaping hole in our ability to defend a carrier against a ballistic missile without the support of our allies, so there is mitigation there, but it is mitigation that is reliant on our allies.

Q108 **Mr Francois:** So are you saying that, despite the Type-45, if one of our carriers had to go into harm's way in the South China Sea, she could only do it with an American warship with an ABM capability in company? That is effectively what you just said, wasn't it?

Rear Admiral Burton: Well, yes, and I think that that would be the case for an American carrier as well, but the reality is that that is recognised, and I think it is the USS The Sullivans that is deploying with our current carrier battle group this year, so we have a mitigation in place. However, as far as a national defence capability for our carriers goes, we lack an anti-ballistic missile defence system, and that is a gap in capability.

Q109 **Mr Francois:** Forgive me for asking a direct question, but we are all taxpayers; why have we spent £1 billion a pop on the Type-45 destroyer if it cannot protect a carrier from the primary threat against it? What was the point of the £1 billion?

Rear Admiral Burton: You described yourself that the DF-21D has recently been developed—

Mr Francois: In fact, it was the doctor who brought up, in fairness, a very pertinent point, if I might.

Rear Admiral Burton: I do not think I add value by looking back over the last 20 years as to why we did or did not make decisions.

The Navy has been clear that there has been a national capability gap, for the last 10 years, at least, in an anti-ballistic missile defence capability. That can be mitigated by working alongside our allies, just like the Americans use our capabilities to mitigate their capability gaps. Firstly, this is known, and, secondly, it can be mitigated.

Mr Francois: Sorry to press you on this, but it is quite important; we did spend £6 billion on these two warships. If this problem is so widely known—and you are right, it is; I have not said anything that will surprise anyone—why in the integrated review, which was all about the value of high technology and inter-connectivity in the information age, was that information not acted upon by the MoD and the Royal Navy?

Rear Admiral Burton: Firstly, I was not part of the integrated review, so I can only offer my opinion. Secondly, I know that there is mitigation in place—the USS The Sullivans being the key one for this year—that allows us to work alongside our closest ally, who we are completely interoperable with, or should be, and allows us to provide that protection for the carrier. So the protection is there; the carrier will not go into the South China sea or into the Asia-Pacific at a time of tension without an American carrier—I imagine. I cannot say that authoritatively, but that is the mitigation.

The nation should be reassured that the carrier they spent considerable treasure on will be protected. It will be protected by our allies, given that we would be working alongside them. There will be others that you should ask why the decision was not made to have an indigenous sovereign capability. But if I were commander of strike forces embarked in the carrier with my American allies alongside me, I would be confident that the carrier could be protected.

Q110 **Mr Francois:** We are tight for time. Dr Kaushal, could you comment on this threat to the carriers? You are the one who brought up the DF-21D, not me.

Dr Kaushal: I would say that it is a threat that will probably become more acute going forward, because, although the Chinese have the missile, the reconnaissance strike system—in other words, the network of synthetic aperture, radar satellites, ground-based early warning radar, possibly UAVs and ships and the architecture to integrate data from them in a rapid

manner—is still being built in China. In many ways this is a problem more for five years down the road than for now. So in that respect there is time.

The second point I would make is that although I was surprised by the absence of a counter-ASBM capability, the Type-45 has shown in exercises such as Formidable Shield that it can track a ballistic missile for intercept by another vessel, an allied vessel for example. In the interests of fairness, it does add some value in the counter-ballistic missile role, although it cannot perform the intercept itself.

The third point I would add is, to the extent that the primary pacing threat is still Russia, as identified in the integrated review, Russia's reconnaissance strikes system—a constellation of Liana satellites, early-warning radar—is much older, much smaller and much more decrepit in some regards than that of the PRC. This goes not necessarily for satellites but early-warning systems. Perhaps cueing in these missiles accurately will be even more problematic for Russia.

None of this means that long risk strike capabilities will not be a problem or that attention ought not to be paid to countering them, but I suppose the good news is that it is a problem that will take time to mature, and we do have some early options, particularly when operating in tandem with allies—using the Type-45 in the defensive role, even if they lack the intercept capability themselves. Though I would argue it would still be valuable to introduce it at some future point.

Q111 **Mr Francois:** In a sentence, to paraphrase you, you are saying that we do have a few years to sort this out, but it might be a good idea if we did.

Dr Kaushal: Pretty much.

Q112 **Chair:** That is a nice summary. Just to confirm, the DF-41 operates on the BeiDou satellite system. If one were to hit a carrier, the first thing that would go would be all our satellites, including GPS, and that would mean a huge change in the type of warfare we would be doing. So Admiral, I hope you still have your sextant handy, because you might be needing it to navigate.

On a tactical point, when was the last time Britain was involved in a hot war from a naval perspective?

Rear Admiral Burton: It depends on your definition of hot. I think that if you ask the commanding officer of HMS Montrose, Paul Irving, who I know well and who served with me in the maritime forces, he would say he was ready for a hot war day and night.

Q113 **Chair:** I hear what you are saying. We are sometimes very close. Sometimes it looks like it will get that close, but then it moves away. When was the last time we were actually involved in a hot war, as you described?

Rear Admiral Burton: In 2003 with the invasion of Iraq. Then prior to that 1991, with Kuwait, and then prior to that 1982. I would go back to my point that when warships are on operations, it flicks from heightened

tension to a hot war at a switch, so every single commanding officer who is at sea, particularly in the Gulf, whether it is the MCMs or Montrose, will be ready for that hot war.

Q114 **Chair:** Thank you. In 2003, Navy was engaged, and Tomahawks were used. Was anything used other than Tomahawks?

Rear Admiral Burton: We launched the 3 Commando Brigade over the beach on to the Al-Faw peninsula, and conducted naval gunfire in support of it. So yes, a relatively significant maritime engagement.

Q115 **Chair:** So it was littoral, and in the form of the Royal Marines. Can Type-45s, other than using their 4.5-inch calibre mark 8 gun, hit anything on land?

Rear Admiral Burton: No.

Q116 **Chair:** My concern is that you have a destroyer that is still looking for blue-seas engagement, Battle of Midway stuff, when we have to advance, surely, all our frigates and destroyers so that they can actually participate in land warfare. Would you agree with that?

Rear Admiral Burton: I would. If I sounded hesitant or defensive, I did not mean to. You are absolutely right that the Navy needs a land-strike capability. My understanding is that the replacement for Harpoon—there is no reason it should not be—should be a capability that can conduct anti-ship and land attack.

Chair: We have all been on the Daring class—the Type-45. There are these missile bays in there, and every time I have been on one, I have asked what it is inside them, and they say, "Nothing." You have Aster 15 and 30. The French equivalent are able to have Tomahawk or—

Rear Admiral Burton: I think the French Tomahawk is called SCALP.

Q117 **Chair:** That is correct. How come we have not gone down that route? Why is it that the Navy have focused entirely on the sea as their terrain, and not joining up with the Army and the Air Force?

Rear Admiral Burton: I think that your conclusion is correct; I think your description of the journey to that conclusion is wrong. The Navy has, for the last 20 years, advocated a land-strike capability within the Type-45. The space is there for a land-strike capability. With the Type-26, there is space for a Tomahawk capability. The budget has not been found for that, so I think it would be unfair to suggest that the Navy was somehow wanting to be a blue-sea navy and not touch the shoreline.

Q118 **Chair:** I am not saying that. I am saying that, for different reasons—whether it is the budget or whatever—we are not able to fire Tomahawks from anything other than an Astute. Is that correct?

Rear Admiral Burton: That is correct. The Type-26 will have it, I understand.

Q119 **Chair:** I know that Emma wants to come in on the carriers. My final

question is to do with the budget itself, because a lot of this is all to do with the limits of the money. Can I just step back? Admiral, please jump in if you want to. I put a question to the Prime Minister. I asked him if the security environment is deteriorating. He agreed. I asked him if democracy and pluralism are in decline. He agreed. Are maritime tensions increasing? He agreed. Is China's assertiveness diminishing or increasing? Increasing, as with Russia as well. Are the domains of cyber and space posing more significant challenges? Yes. And you add climate change to that, and extremism growing, too. Add all those things up, and you get a more complex, more dangerous environment than the Cold War. Would you both agree with that brief summary?

Dr Kaushal: I would agree partially with that. In many ways you do have an environment that is more complex and perhaps more volatile that the Cold War. On the other hand, the risk of a system-wide conflict in the way that would have existed had the Cold War gone hot is perhaps less likely. Part of the reason for that is the way our adversaries view war. Unlike the Soviets, who assumed any war, if it turned hot, would be an all-or-nothing global war, both Russia and China have used pretty much the same language actually, of fighting local wars as both their preferred mode of fighting and the way they see the future character of conflict evolving.

In some ways that is worrying, because, unlike the Soviets, it means that both Russia and China would see wars as being in some ways both manageable and winnable, because they are local and they are limited, but it does also mean that both sides might adhere to a degree of limitation that might not have existed had a crisis like the Cuban missile crisis or the Able Archer crisis gone wrong during the cold war. So, paradoxically, I think we are seeing a world that is both more volatile in some ways but also less vulnerable to a system-destroying conflict.

Q120 **Chair:** I simply make the point that we can't do everything that we want to do with the scale and complexity of threats we face today, and expand, tilt or pivot—however you want to call it—to the Indo-Pacific with a budget of just 2.2%. We have a peacetime budget, when during the cold war it was at 4%. Surely we should be increasing our defence budget, which would mean that many of these challenges that we have spoken about today would be easier to answer. Admiral?

Rear Admiral Burton: I don't share all of Dr Sidharth's optimism. I think that we have got an assertive China and an aggressive Russia. If we drop our guard on deterrence, we could end up in in a conflict with them, and that is where I think I would disagree with Dr Sidharth.

I agree in part that Defence could justify more money. However, I have been vocal in saying that I am not convinced that Defence is as good as it should be at spending the money it has got. If I were sitting in another Department and, perhaps more importantly, if I were a taxpayer—as I am now—I would start by transforming the pace of their procurement and their agility, and ensuring value for money. Once they have delivered that, we could start coming round to asking whether they want more.

Mr Francois: Amen to that.

Chair: Thank you for that, Admiral. Part of our job is to make sure that we provide that scrutiny. I do hope, though, that you have always been a taxpayer, rather than just after you retired from the military—*[Laughter.]* But that is by the by. Let's just turn to the aircraft carriers as the subject of our final question. I know that Emma has been waiting patiently. Emma, over to you.

Q121 **Mrs Lewell-Buck:** Thanks, Chair. Afternoon, both. Later on this week, the Committee is visiting HMS Queen Elizabeth. What are the key things that we should be asking on that visit?

Dr Kaushal: That is an interesting question. I suppose that one of the key questions for the carrier in terms of its tactical utility moving forward would be a point that has recurred through the day about the integration of unmanned capabilities into the carrier air wing, and whether that is in the form of something like the Australian loyal wingman programme or something that is more autonomous and attritable, like the American XQ-58.

A lot of the challenges that the carrier faces in terms of its reach and its ability to operate within an anti-access bubble are potentially problems that will be solved by longer-range, attritable unmanned assets. I think questions about where the carrier project is going in that regard will be critical.

More broadly, although I suspect that answers on this might be contingent on future outcomes, the engagement programme—where the carrier is to be most deeply engaged moving forward, and what its priority regions and activities are—is something that would be of some interest and probably worth exploring going forward.

Rear Admiral Burton: Thank you, Emma. That is a really good question, and I will go back to the Chair's point when he asked me about being a taxpayer and the budget. I see you as scrutineers of Defence's capability, so I would ask each and every one of the people you speak to—I would hope that you get a really honest answer—are they ready to fight? You should ask the young storesmen and women who are looking at the logistics; you should ask the firefighters; you should ask the pilots; and you should go right the way up to the one-star and the two-star. As some of the last people with authoritative scrutiny within your terms of reference, you should reassure yourselves as you walk away from that ship that they are ready over the next six months to fight for this nation, if required.

Q122 **Mrs Lewell-Buck:** Thanks, both, for that. Dr Sidharth, in your earlier answer to me you mentioned UAVs. It is rumoured that the Royal Navy is looking to make the necessary modifications to a carrier to field UAVs by 2023. Is that a realistic timeframe? Is it achievable?

Dr Kaushal: It depends very much on the nature of the UAV. If you are looking at something like the XQ-58, which is a rocket-launched UAV that

is built to be launched from a variety of very bare-bones vessels, including converted container ships, actually, it is conceivable that that sort of system could be integrated in relatively short order on to the carrier.

By contrast, if you move to something like the MQ-25 Stingray—the unmanned tanker that the US navy is fielding—that would probably require a conversion towards a catapult configuration, which is likely to entail substantial costs, as well as, presumably, a rather time-consuming refitting of the carriers.

Really the key questions that you want to ask are what the weight, the payload and the function of the UAV are. The heavier assets that might fulfil missions such as tanker refuelling to extend the legs of the F-35Bs themselves would require some pretty costly and time-consuming changes to the carrier structure.

However, I would argue that the future in many ways leans towards light, attritable, long-range assets that can be used to, for example, saturate anti-access bubbles. These are the sorts of things that arguably could be integrated on to the carrier much more quickly. Although we need more clarity on what exactly the Royal Navy has in mind, that is, broadly speaking, what both avenues would look like and what the viability is, depending on which avenue you go down.

Mrs Lewell-Buck: Thank you, Doctor. Admiral?

Rear Admiral Burton: Going back to my previous point, I do not mean ready to fight just emotionally; you should ask them about the capabilities that they have and the stores that they have—just in case there was some confusion. I agree with Dr Sidharth. In my mind, '23 is not quick enough. There should be an absolute urgency to field these capabilities as quickly as possible, but what it should not be is tokenism.

One of your members mentioned ScanEagle. Suggesting that ScanEagle is an unmanned autonomous system and therefore proves a dramatic leap in capability if it embarks on the carrier is not right. Suggesting that we could put in some form of rocket-assisted UAV, embarked or swarmed UAVs, to do some of the capabilities that Dr Sidharth has talked about should be deliverable, and should be readily deliverable from the carrier now, where the critical path is more likely the technology of the aircraft rather than the retrofitting within the carrier.

Q123 **Mrs Lewell-Buck:** Thanks for that. Dr Sidharth, you mentioned different types. What would be the gold standard? What should we be aiming for?

Dr Kaushal: In many ways it depends on your vision for the role of the carriers and what you think of the sword arm of the carriers. Is your position that the F-35B is the primary strike capability of the carrier, and that, really, the challenge is extending the range at which it can operate? Currently, if a carrier was to get close enough to contested shores to launch an F-35B, it would be placing itself within the range of land-based anti-ship missiles, among other things.

If the question is extending the carrier's range and including something like what the Americans have in mind—a carrier-based unmanned tanker—then presumably what you want is something heavier like the MQ-25 Stingray; a more expensive and boutique capability, and one that would require substantial changes to the vessel itself.

On the other hand, you may believe that the future character of warfare is characterised more by the many and the cheap—a mass-based solution, rather than the exquisite and the few. The question is really getting numbers of particularly attritable UAVs off carrier decks—some of the things that the Admiral discussed in terms of rocket-assisted take-off and UAVs like the XQ-58, which cost a fraction of the price for manned aircraft. Something to the tune of $1 million to $2 million which could be incorporated on to the carrier with relatively little change and effort is the direction in which you want to go. In many ways, you first want to make a bet about the future character of war and the role of the carrier within it, and that, in many ways, shapes the kind of unmanned capability you build towards.

Q124 **Mrs Lewell-Buck:** That is really helpful. Just one final question from me. With regards to the F-35s, we do not have any clarity yet on the final number that are going to be purchased, but what effect will cuts to the number we buy have on carrier strike capability overall? Do you have an idea of how many we should buy? Admiral, I'm happy for you to take that first.

Rear Admiral Burton: I do not know the numbers either. I think four squadrons of jets onboard a carrier would be what would be expected, and there is a number around 80 on that, but I go back to one of the points that I made earlier. There has been an increase in the number of F-35s announced, the number of which is not known. But if there is going to be an increase in investment beyond that, the decision needs to be made: does that increased investment go into F-35s, or does it go into accelerating the autonomous systems that might fly off a carrier? As well as the ones that Dr Sidharth mentioned, my understanding is that Project Mosquito, which the Committee may well be aware of and which involves a UK autonomous aircraft established by the RAF earlier this year, is expecting to have a technology demonstrator in this half of the decade. That aircraft is being described as a loyal wingman flying alongside the Typhoons and the F-35. If that aircraft is not able to launch and recover from the carrier, something has gone wrong, because here is something that is being designed from the bottom up within the UK, with two sovereign aircraft carriers. What I would like to see is the Mosquito programme—that loyal wingman programme—being able to fly alongside the F-35, whether it is from ashore or at sea. The delivery timeline of that is pacey but perfectly credible.

Mrs Lewell-Buck: Dr Sidharth, do you want to add anything to that?

Dr Kaushal: No, I mostly concur.

Q125 **Mr Francois:** Admiral, we end in violent agreement, because I think you

made a very pertinent point a few minutes ago when you said many other Government Departments sometimes get a bit frustrated with the fact that the MoD does not always spend its money as wisely and effectively as it might. You are quite right: you charge this Committee to hold the Department to account. We try to do that. Sometimes we do not always get thanked for it, including by many people in the industry who, in the end, profit from all the cost overruns, it has to be said. I think we violently agree with you there.

Your critique of the Integrated Review, if I could summarise it—I don't want to misrepresent you—is that although there are some good ideas in it, it is not being delivered, to use an American phrase, at the pace of relevance. There is investment there, but it is coming too slowly and may leave us vulnerable in some areas in the meantime. Is that a fair characterisation of your argument?

Rear Admiral Burton: Yes, and I would not want you to assume from that that I am merely talking about what I would call the traditional and conventional shipbuilding and the other traditional capability. The area where I have most worry is that, actually, having been heralded as a transformational review for the information age, the Department is not going to be able to deliver on the strategy at the pace that is required. If I had a choice—I fully acknowledge that you are not asking me for a choice—between accelerated investment in hardware and accelerated investment in transformational technologies that are required for the information age, that would be where I would focus the Department, because it is really bad at delivering things that are different, and that is the area that would be transformational for defence.

Q126 **Chair:** That almost brings us to a conclusion. My final question is on the carrier. Admiral, if you were in charge of the carrier now, and you had an opportunity to either go across to the South China sea or to visit, let's say, Mombasa and strengthen our bond with Kenya, or go to Palma in Mozambique, where you could actually challenge China in what it is trying to do with its strategy to ensnare countries and lure them away from the bond that we have with them towards its own authoritarian influence? Which way would you head? East or south?

Rear Admiral Burton: You have other choices to gain parity with China in Kenya and in Mozambique than putting a carrier into the port for a capability demonstration. You have no other choices if you are to uphold the international law of the sea but putting a warship through the South China seas and showing a presence in south China, so my answer to you would be, "Send a carrier, at sea, afloat, where the Navy is at its best, and use other arms of Government to influence Kenya and Mozambique."

Q127 **Chair:** A very diplomatic reply. Doctor, any final thoughts?

Dr Kaushal: I broadly concur on that point. In many ways, particularly in the context of competition, the carrier has its greatest value in the Indo-Pacific. The Indian ocean part of the Indo-Pacific might receive greater attention, particularly as not just China's economic interests but, increasingly, its geopolitical reach expands into that region with its broad

projects in the area. Perhaps that is an area where the carrier strike group could back-fill for the Americans as they themselves pivot towards the first island chain going forward.

Chair: Thank you very much indeed. We have overrun. On behalf of the Committee, we are very grateful for your time this afternoon, Admiral Burton and Dr Sidharth; it is very much appreciated. Thank you to the Committee, as well, and to all the staff.