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A Reckoning Postponed?

The Defence Arithmetic of the
Integrated Review

Malcolm Chalmers



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Executive Summary

THE GOVERNMENT'S DECISION to abandon its plans for a multi-year Comprehensive Spending Review (CSR) has thrown its plans for the Integrated Review into disarray. For Defence, this will be especially costly, as key decisions on long-term defence priorities may now have to wait until a full CSR, in 2021 or 2022.

Meanwhile, the world of external threats, force development and contractual obligations will not stand still. The pressures on the defence programme remain relentless, driven by the increased importance attached to major power competition, and by the government's commitment to play a more active global military role. The MoD's Integrated Operating Concept has added to this pressure through its calls for the military to make fuller use of its capabilities in ongoing operations, with an associated increase in spending on logistical support and heightened readiness.

The need for hard decisions is especially relevant in relation to what are likely to be two of the government's largest procurement programmes of the next decade and beyond: the Future Combat Air System and the Future Nuclear Warhead System.

There will be a temptation to delay key decisions on these two programmes until the Integrated Review that follows the next general election. But this would risk an extended period of planning blight, in which capabilities atrophy and timetables for deployment of the resulting systems slip into the 2040s. If the aerospace industry and the Atomic Weapons Establishment are, respectively, to deliver the first new combat aircraft and new nuclear warhead into operational service before 2040, a lot of development work will need to be done within the next five years.

The UK's largest defence programmes are some of the biggest and most complex capital programmes conducted by government, rivalled in size and challenge only by those for major transport infrastructure. Their technological complexity, together with the changing nature of requirements over time, typically leads to large increases in costs over initial estimates, as well as significant delays. To have the best chance of tackling these issues, the government needs to set clear requirements at an early stage, invest in resolving key design questions before moving to full development, and then ensure that sufficient resources are available to take the programmes to completion over the next decades.

A Reckoning Postponed?

The Defence Arithmetic of the Integrated Review

THE GOVERNMENT'S DECISION to abandon the multi-year Comprehensive Spending Review (CSR) has thrown its plans for the Integrated Review into disarray. For Defence, it could be especially costly, with the prospect of another year of delay and uncertainty. The government has not yet clarified whether some form of review document will be published. Key decisions on long-term defence priorities may have to wait until the government is ready to have a full CSR, either in 2021 or 2022.¹

The arguments for a one-year delay in both the CSR and the Integrated Review have always been strong.² The longer-term economic impact of the pandemic cannot yet be calculated, and the imminent end of the Brexit transition period has cast further doubt on medium-term economic forecasts. Despite the centrality of its alliances to its foreign policy, the Integrated Review would have been published just days after the results of the US election are due, and in the middle of difficult discussions on the future of trade and security relations with the UK's main European allies. It therefore makes sense, both fiscally and geopolitically, to delay both reviews until the dust has begun to clear.

Yet the delay does not make it any easier for defence planners, who have spent much of 2020 working on a long-term Integrated Review, and now face another year of planning blight. Meanwhile, the world of external threats, force development and contractual obligations does not stand still. And, when the Ministry of Defence (MoD) does return to address the implications of the next long-term CSR, whenever that might be, the arithmetical fundamentals of defence planning will remain.

The Defence Funding Challenge

Every major defence review since the end of the Cold War started with the ambition of closing the gap between capability plans and available resources. But most have failed to fully do so. As a result, the typical defence review of the post-Cold War period has been followed by a series of mini-reviews and budgetary readjustment exercises, saving money in the short term at the expense of increased overall costs. Most recently, it is now widely accepted that the

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1. Malcolm Chalmers, 'What Can Be Salvaged from the UK's Integrated Review?', *RUSI Commentary*, 26 October 2020.
 2. Malcolm Chalmers and Will Jessett, 'Defence and the Integrated Review: A Testing Time', *RUSI Whitehall Report*, 2-20 (March 2020). The report concluded that: 'Now that ministers and senior officials are focused on the coronavirus pandemic for the foreseeable future, the government should agree to delay the conclusion of the review until 2021. Current defence plans and programmes should be rolled forward, as part of a one-year Spending Round'.

government failed to provide the resources to implement the full commitments of the 2015 Strategic Defence and Security Review (SDSR), as a result of which the MoD has been engaged in a period of almost continual review since the start of the National Security Capability Review (NSCR) in summer 2017.

A 2020 review announcement, in the absence of a multi-year financial settlement, would not break this pattern. The jury remains out on whether a 2021 or 2022 Integrated Review will be able to do so. As of mid-October, there was still a big gap between the money that the MoD believed it needed to implement its long-term plans for the Integrated Review and the Treasury's willingness to provide the necessary resources as part of the CSR.³ The size of the problem was especially evident in 2021/22 and 2022/23, for which the MoD already had substantial contractual commitments.⁴ The Treasury, for its part, was facing demands for big budget increases from across Whitehall, encouraged by the generosity of the 2019 Spending Round and the new demands created by the coronavirus pandemic. The sheer scale of the combined bids coming into the Treasury, and the limited political bandwidth for addressing the trade-offs between these bids that a long-term Spending Review would have required, played a key role in the Treasury's very late decision to pull the plug on the CSR. Uncertainty over the long-term impact of the pandemic and Brexit on the public finances, and the lack of a clear political commitment to an increase in tax burdens to pay for these, also made the Treasury more reluctant to make longer-term spending commitments.

Meanwhile, the pressures on the defence programme remain relentless, driven by the increased importance attached to major power competition in the preparatory process for the Integrated Review, and by the government's commitment to play a more active global military role. The new MoD Integrated Operating Concept has added to this pressure through its calls for the military to make fuller use of its capabilities in ongoing operations, with an associated increase in spending on logistical support and heightened readiness. This enhanced commitment is seen, most notably, in the desire for the new *Queen Elizabeth*-class aircraft carriers to be actively deployed, along with the plans for establishing new forward bases in the Gulf and Southeast Asia.⁵

The need for hard decisions – if not in 2020, then in a 2021 or 2022 Review – is especially relevant in relation to what are likely to be the MoD's two largest procurement programmes of the next decade and beyond – the Future Combat Air System (FCAS) and the Future Nuclear Warhead System (FNWS). For all the Integrated Operating Concept's rhetoric on the need to focus on new dimensions of competition, these two programmes are squarely focused on renewing capabilities which have been central to the military's force structure for more than half a century.

3. Author's interviews with senior officials, summer 2020.

4. National Audit Office (NAO), *The Equipment Plan 2019 to 2029*, HC 111 (London: NAO, 2020), pp. 6–8.

5. Nick Carter, 'Future Defence: The Integrated Operating Concept', speech given at Policy Exchange, London, 30 September 2020; Public Accounts Committee, 'Oral Evidence – Carrier Strike, HC684', 28 September 2020, with witness team led by Stephen Lovegrove, Permanent Under-Secretary, MoD; author's interviews with senior officials, summer 2020.

At the heart of any discussion of the budgetary challenge that these programmes could pose is the assessment of intergenerational equipment cost inflation. During the post-1990 relaxation of major power military competition, the pace of growth in the real unit costs of major equipment appears to have slowed somewhat.⁶ With the pace of competition now increasing, however, military planners are increasingly concerned with ensuring that their future systems will be fit for purpose against whatever the West's competitors are likely to have 20 or 30 years from now. For the FCAS, this means a system of piloted, remote-controlled and autonomous platforms that can compete effectively against whatever Russia and China have in the 2040s. For the FNWS, it means a UK capability that can overcome whatever new homeland anti-missile defences that these powers are able to deploy by the 2040s and beyond. Given the scale of the uncertainties involved in both these calculations, the desire for enhanced performance, with all the associated costs, is understandably strong.

Faced with these multiple challenges, and the likelihood of a long-term financial settlement that does not fully fund all the MoD's ambitions, there will be a temptation to delay the key decisions on the FCAS and the new warhead until the Integrated Review that follows the next general election, likely to take place in late 2024. But such a decision could risk an extended period of planning blight, in which capabilities atrophy and timetables for the deployment of these new systems slip further into the 2040s. It would also likely mean pushing more planned expenditure into the years immediately after the next CSR period, replicating the problem that MoD planners face today for the next two years. If the aerospace industry and the Atomic Weapons Establishment (AWE) are, respectively, to deliver the first new combat aircraft and new nuclear warhead into operational service before 2040, a lot of development work will need to start within the next five years. To proceed with large-scale development and then production, moreover, key design decisions will be needed well before 2025. If such a timetable is not realistic, the next full Integrated Review should make this clear, so that those most directly concerned – operators and industrial providers – can respond accordingly.

The Integrated Review

The Integrated Review was due to have been published in mid- to late November 2020, in parallel with the cross-government CSR. Bids from all departments to the CSR were submitted to the Treasury in late September and early October.⁷ The plan was for the CSR to set departmental day-to-day spending budgets (Resource Departmental Expenditure Limits, RDEL) for the three

6. For detailed figures, see Malcolm Chalmers, 'The Myth of Defence Inflation', *RUSI Defence Systems* (June 2009), p. 14; see also N Davies et al., *Intergenerational Equipment Cost Escalation*, MoD, Defence Economic Research Paper, 18 December 2012, <<https://www.gov.uk/government/statistics/increasing-cost-of-uk-defence-equipment>>, accessed 21 October 2020.

7. Author's interviews with senior officials, October 2020; George Parker, Helen Warrell and Peggy Hollinger, 'Boris Johnson Forced to Ditch Public Spending Master Plan', *Financial Times*, 21 October 2020.

years up to 2023/24, alongside investment budgets (Capital Departmental Expenditure Limits, CDEL) for the four years to 2024/25.⁸

Agreement on an affordable forward defence programme would have been of considerable value to hard-pressed planners across the MoD. While the 2015 SDSR saw a welcome reversal of some of the austerity cuts imposed in its 2010 predecessor, the funds allocated were never sufficient to fund the ambitious additional commitments that were made.⁹ When implausible 'efficiency savings' failed to materialise as rapidly as envisaged, the MoD found itself facing a series of inconclusive interim reviews – the NSCR, followed by the Modernising Defence Programme (MDP) review – that lasted through most of Theresa May's three-year term as prime minister.¹⁰ The worst effects of the budgetary imbalance were avoided by a series of one-off cash injections from the Treasury, amounting to some £4.5 billion over three years.¹¹ But neither of these reviews made any significant progress in making the hard choices needed to refocus defence effort on emerging strategic priorities. As a result, as in the years before the 2010 SDSR, the costs of short-term budgetary crisis management have grown, and the scope for investments in new areas has been constrained.

The mounting financial costs of the coronavirus pandemic have increased the possibility that the defence budget will be asked to share in the burden of subsequent austerity, as it was asked to do in the 2010 Spending Review that followed the 2008 financial crisis. So far, however, this has not been the case. The government has made clear that it is committed to meeting the Conservative Party manifesto commitment to increase the defence budget by 'at least 0.5%' in every year of this Parliament.¹²

During the run up to this year's CSR, now cancelled, the MoD was also making a case for additional long-term capital funds to allow it to use the defence budget to promote wider national prosperity, investing in key defence research and design capabilities that can contribute over time to increased sales of both military and civil products.¹³ For the latter to gain traction, it would likely have had to involve some ring-fencing of relevant budgets from the annual planning round, perhaps as part of a wider cross-government investment programme. Yet the

8. HM Treasury, *Budget 2020: Delivering on Our Promises to the British People*, HC 121 (London: The Stationery Office, 2020), p. 30.

9. Stephen Lovegrove, oral evidence given to the Public Accounts Committee Inquiry on Delivering Carrier Strike, HC 684, 28 September 2020, Question 75, <<https://committees.parliament.uk/event/2143/formal-meeting-oral-evidence-session/>>, accessed 20 October 2020.

10. Malcolm Chalmers, 'A Long and Winding Road: The UK's Defence Review Could Last for Some Time Yet', *RUSI Commentary*, 20 July 2018.

11. Malcolm Chalmers, 'The End of Defence Austerity? The 2019 Spending Round and the UK Defence Budget', *RUSI Commentary*, 30 September 2019.

12. Conservative and Unionist Party, 'Get Brexit Done, Unleash Britain's Potential: The Conservative and Unionist Party Manifesto 2019', November 2019, p. 53.

13. Peter Roberts, 'The UK Stimulus: Spending on Defence for Economic Benefit', *RUSI Newsbrief* (Vol. 40, No. 7, 7 August 2020).

Chancellor's statement on the cancellation of the CSR omitted any reference to defence capital investment, while making clear that recurrent multi-year budgets for health and schools would be protected, along with 'priority infrastructure projects', such as hospital building and HS-2.¹⁴

Now that the multi-year CSR has been postponed, there is a strong risk that any Integrated Review document that is published (at least as far as the MoD is concerned) will become another important statement of high-level policy and doctrine, building on the good work of the MDP, but will fail to make progress towards agreement on a coherent and balanced long-term defence programme.

When the government does eventually hold a multi-year Spending Review, moreover, the climate is likely to be less favourable to calls for increased public spending than is currently the case. Defence is unlikely to be exempt from these pressures.

Given this prospect, the Treasury is likely to be reluctant to sign off on major new commitments without clarity on their future affordability. The armed forces, for their part, will have less incentive to make decisions on long-term savings without assurance that these will be reinvested in defence.

Until the results of the one-year Spending Review are known, the reasonable medium-case assumption for analysts remains that the government will stick to its manifesto commitment to increase spending by at least 0.5% per annum in real terms, but do no more than this. This would mean planning for a 2030/31 defence budget that is only some 5–10% higher in real terms than it is now. Capital investment in new military systems and infrastructure (CDEL, amounting to £10.3 billion in 2019/20¹⁵) would likely rise more rapidly in this scenario, perhaps by 2% per annum in real terms, but spending on day-to-day running costs (RDEL, £29.5 billion in 2019/20¹⁶) would be limited to no more than the current level in real terms. The discussion that follows is based on these assumptions.

Running Costs

An RDEL freeze will not be easy. With projected inflation (measured by the GDP deflator) now close to zero, the chancellor has indicated that there is unlikely to be a repetition of the 2% annual pay increase for the armed forces (and similar awards for other public servants) for

14. HM Treasury, 'Spending Review to Conclude Late November', <<https://www.gov.uk/government/news/spending-review-to-conclude-late-november>>, news story, 21 October 2020, accessed 21 October 2020.

15. HM Treasury, *Public Expenditure: Statistical Analyses 2020*, CP 276 (London: The Stationery Office, 2020), Table 1.8.

16. *Ibid.*, Table 1.5.

2020/21.¹⁷ As the economy recovers from recession, however, some further pay increases during the next CSR period remain likely, and MoD planners will need to make some provision for this if their budget projections are to be realistic. The Institute for Fiscal Studies has estimated that an average annual pay increase of 1.2% across the public sector is plausible during the CSR period. If this were to be the case, it would add a further £0.6 billion to annual MoD RDEL costs in 2024/25.¹⁸

In addition to the increased costs of employing existing personnel, the strategic direction set by the Integrated Operating Concept will likely involve further demands on the RDEL budget. The imminent operational deployment of two carriers, and the associated F-35 aircraft – a substantial addition to the UK's previous capability – has already added a significant amount to planned operational costs (fuel, spare parts and maintenance). The wider commitment to increased defence agility and readiness, along with the increased forward presence in the Indo-Pacific and elsewhere that is being proposed, is set to involve operating current assets – people, platforms, infrastructure – at an increased tempo, with increased expenditure on deterrence and reassurance operations in areas of interest, and with more spent on building up stocks of munitions and spares. The strategic logic of this more active posture may make sense,¹⁹ but it is more expensive than one that keeps a larger part of the force in a lower-readiness state.

Something will have to give. Given the pressures for higher readiness across the force, a freeze in total recurrent spending in real terms is likely to involve further downward pressure on personnel numbers. Ministers will be wary of giving too much prominence to this in their public messaging. Yet, if resources are to be made available for other priorities within a static recurrent budget, a significant reduction seems probable.

The Investment Programme

So, what are the challenges on the capital side of the budget (which accounts for some 25% of total defence spending)? Both carriers are now entering operational service, and it is expected that they will remain in service for several decades to come. Other replacement decisions will need to be made in due course, for example in relation to the *Astute*-class submarine and the Type 45 destroyer. This is a matter for the 2025 or 2030 reviews, not for the reviews of 2021 or 2022.

But the next fully resourced Integrated Review will have to make choices in other areas. Until the CSR was abandoned, the authors of the Integrated Review were bracing themselves to make difficult decisions on the direction of army modernisation, especially on the balance between

17. HM Treasury, 'Chancellor Launches Comprehensive Spending Review', news story, 21 July 2020, <<https://www.gov.uk/government/news/chancellor-launches-comprehensive-spending-review>>, accessed 20 October 2020.

18. Ben Zaranko, 'Spending Review 2020: COVID-19, Brexit and Beyond', in Carl Emmerson, Christine Farquharson and Paul Johnson (eds), *IFS Green Budget 2020* (London: Institute for Fiscal Studies, 2020), pp. 263–314. Spending on military and civilian personnel was £11.7 billion in 2018/19.

19. MoD, 'Introducing the Integrated Operating Concept 2025', September 2020.

light and heavy forces. The army, for example, had already signalled the need to ‘trade reduced physical protection for increased mobility’²⁰ and for ‘longer range and more powerful artillery than the Army have ever used, firing on targets identified by swarms of drones’.²¹

Even if the review had been prepared to signal a significant downgrading of aspirations in relation to heavy armour, increased levels of capital spending by the army would have been needed as it adjusted to the demands of the MoD’s new Integrated Operating Concept. The army does not have procurement projects of the scale of the carrier or the FCAS, but most of its core platforms are nearing the end of their effective service lives and it has serious gaps in its order of battle (for example, in air defence) left by the post-9/11 focus on counterinsurgency. As it seeks to reorient to the challenges of deterring Russian forces as part of NATO, it will need increased investment in equipment if it is to remain relevant to the threats of coming decades.

Beyond modernisation of the army’s own capabilities – likely to involve increased capital costs alongside some reductions in personnel – there will be a demand for more investment in key enablers of front-line capability (including ISTAR, cyber and space). Albeit on a smaller scale, the MoD will also need to examine whether it can generate savings by trading force modernisation for reductions in the number of separate equipment types (for example, in relation to transport aircraft and helicopters) or older platforms (for example, surface ships).

Yet the two decisions of greatest long-term budgetary consequence for the capital budget are likely to be those in relation to the FCAS and the FNWS. These two programmes seem set to be among the largest MoD programmes over the next decade, rivalled only by the Dreadnought submarine programme and the Complex Weapons Programme (the latter a collection of several separate missile and rocket procurements). The decision on the UK’s FCAS is required in order to have a capability to replace Typhoon aircraft as they come to the end of their service life from the late 2030s. Work on the design and development of the UK’s nuclear arsenal needs to start now if it is to replace existing Holbrook warheads from the late 2030s.

The UK’s largest defence programmes are some of the biggest and most complex capital programmes conducted by government, rivalled in both size and challenge only by those for the construction of major transport infrastructure. As the annual report from the government’s Infrastructure and Project Authority makes clear, three of the five largest infrastructure programmes now underway in the UK are defence programmes (see Table 1). The MoD seems set to add a further two to this list of mega-programmes, with both the FCAS and the new warhead likely to involve costs comparable to the largest current defence programme.

The management of such programmes – in defence as in the civil sector – is one of the most difficult delivery tasks that government faces. Each programme is unique. But their technological

20. *Ibid.*, p. 15.

21. Mark Carleton-Smith cited in *Forces Net*, ‘Army Promised “Unrelenting Transformation” In Vision for the Future’, 30 September 2020, <<https://www.forces.net/news/asymmetric-army-fight-grey-zone-between-war-and-peace>>, accessed 20 October 2020.

complexity, together with the changing nature of requirements over time, has typically led to significant increases in costs over initial estimates, as well as significant delays. In order to make a credible case that it has succeeded in balancing the MoD's long-term plans, the next funded Integrated Review will need to set out clear long-term plans (stretching well beyond the likely three- or four-year timescale of the next CSR) for both the cost and timing of these two large programmes, based on agreed technical requirements. All these assumptions can, and should, then be interrogated for their realism.

Because peak spending on these two programmes is not expected until after 2024/25 (and therefore after the date of the next general election), policymakers will be tempted to postpone most key decisions on their future until a 2024 or 2025 Integrated Review. Yet this carries at least two risks. First, in the absence of agreed requirements and associated financial commitments beyond 2024/25, it is likely to delay the delivery (and potentially increase the costs) of whatever replacement capabilities are finally agreed. Second, taken together with similarly deferred decisions in other areas, it risks 'squeezing the bubble' of unfunded commitments, leaving the post-election Integrated Review with a high level of over-commitment after 2025/26. If the MoD is to fulfil its commitment to a sustainable defence programme after the next funded Integrated Review, capabilities and resources will need to be balanced over the next decade, not just for the next four years.

Table 1: The UK's Biggest Approved Infrastructure Programmes and Forthcoming Defence Programmes (£ cash)

The Five Biggest Approved Infrastructure Programmes	
High Speed Rail Programme (HS2)	£55.7 billion
Heathrow New Runway Programme	£32.6 billion*
<i>Dreadnought</i> Submarines	£30.1 billion**
Complex Weapons	£28.7 billion***
Nuclear Warhead Capability Sustainment Programme	£20.9 billion
The Largest Additional Forthcoming Defence Programmes	
Future Air Combat System	£30 –£40 billion****
Future Nuclear Warhead System	£15–£30 billion*****

Source: Ministry of Defence, 'MoD Government Major Project Portfolio Data, September 2019', 9 July 2020. Figures are for baseline whole-life costs (including non-government costs).

* The Heathrow New Runway Programme was paused in February 2020. If it resumes, it is likely to be financed primarily from private sources.

** In addition, the Treasury has set aside a further £10 billion as a contingency for unanticipated cost increases.

*** This includes delivery of complex weapons across all three frontline commands over the period from 2008 to 2032.

**** Includes: design, development and procurement costs for all Future Air Combat System platforms. Excludes: weapon systems procured under Complex Weapons Programme; life-time support costs.

***** This includes Pegasus and Mensa capital costs after 2024/25. It includes the capital expenditure needed to renew or replace the nuclear warhead over the two decades from 2022, apart from that already included in the Nuclear Warhead Capability Sustainment Programme.

Combat Air

The largest investment decision, in budgetary terms, is on the shape of the FCAS. The RAF's 145 Typhoon jets are currently the mainstay of its combat air capability. Although the last of these aircraft only entered service in 2019, work is already well underway to prepare to begin fielding replacement systems from the late 2030s. Given this timetable, and the estimated lag between the initial development decision and first entry into operational service (20 years in the case of Typhoon), decisions will be needed soon on the FCAS's main parameters.

The FCAS could be the MoD's most expensive non-nuclear procurement programme of the coming two decades. The capital cost of the Typhoon programme was estimated at £22.95

billion in 2011, including assessment, development, production and upgrade costs.²² This is around £31 billion at 2019/20 prices, and perhaps £40 billion at the price levels that could prevail during the likely two-decade-long procurement of its successor systems. In addition, a full accounting of its cost also needs to include running costs (an additional 60% for Typhoon²³) and munitions (separately funded through the MoD's Complex Weapons System programme).

The discussions underway between industry and government at present, under the umbrella of the ongoing Tempest programme, are designed to provide greater clarity on the technical alternatives available and their likely costs. It is still early days. But it is unlikely that a one-for-one Typhoon replacement (by a similar number of piloted aircraft) would cost less than Typhoon itself.

If past rates of intergenerational cost growth are repeated, it could cost considerably more. Much academic discourse on defence inflation still references Augustine's Law, which states that the unit cost of major weapon systems (including combat aircraft) grows by between 5% and 10% per annum in real terms, including in the US and the UK.²⁴ Even at the lower end of this range, an annual cost growth of 5% would amount to a compounded real increase of 450% in unit costs over the 35 years between 2003 and 2038 (the approximate 'entry into service' dates for Typhoon and Tempest, respectively).

This figure has, fortunately, already been overtaken by events. Augustine's Law over-estimated the level of intergenerational inflation experienced in the UK in the period after 1990, in part because of the reduced level of arms racing during the post-Cold War interregnum. This author's own calculations have shown that the unit cost of Typhoon was 'only' 76% higher in real terms than that of Tornado F3, which it replaced – equivalent to annual real growth in unit production costs of 3.4%.²⁵

The extent of unit-cost growth if the RAF were to replace Typhoon with a Tempest aircraft (piloted) could, in principle, be reduced if the requirements set for the new aircraft were to be more limited than some expect, for example, by downgrading the importance of stealth capabilities.²⁶ Set against this, however, the coming period seems set to see an intensification of the pace of technological arms racing with the powers (especially China) against whose

22. NAO, *Management of the Typhoon Project*, HC 755 (London: NAO, 2011), p. 26.

23. *Ibid.*, p. 26.

24. David Kirkpatrick, 'Is Defence Inflation Really as High as Claimed?', *RUSI Defence Systems* (October 2008), pp. 66–71.

25. Malcolm Chalmers, 'The Myth of Defence Inflation', *RUSI Defence Systems* (June 2009), p. 14.

26. For the argument that stealth capabilities are not a priority for Tempest, see Trevor Taylor, 'Gambling Responsibly and the UK Tempest Programme: Experiences, Risks and Opportunities', *RUSI Occasional Paper*, forthcoming.

weapon systems the new RAF systems will need to be competitive in the 2040s and beyond.²⁷ While Typhoon came into service during a period in which the pace of the interstate arms race had noticeably slowed, its successor seems set to come into service just as the US and China intensify their race for relative technical advantage, both in their own forces and in the systems they supply to other states. If the UK wants to be competitive, both in its own forces and in the aircraft it seeks to export, it will need to be prepared to keep pace with the superpowers.

A further factor that seems likely to add to the costs of the FCAS, compared with the 145 Typhoons that it is replacing, is that the MoD has made clear that it will involve a range of platforms – piloted, remote controlled and autonomous – with the balance likely to shift towards the latter as technology advances. In addition to the costs of piloted aircraft, therefore, the FCAS will involve substantial expenditure on the procurement and support of new unpiloted platforms.

Taking all this into account, a reasonable baseline assumption is that the cost of the FCAS programme will be at least as high (in real terms) as the Typhoon aircraft that it is replacing. There is a significant possibility that it would cost considerably more.

The main demand on the forward programme from the FCAS during the 2020s will come from its development budget. No firm budget for FCAS development costs is yet agreed. If the ambition is to develop a system of new piloted, remote-controlled and autonomous aircraft, fit for service through the 2040s and 2050s, the cost of the Eurofighter it is due to replace may not be an unreasonable initial point of reference.

The UK's 33% share of the development costs of Typhoon/Eurofighter amounted to some £6.7 billion, equivalent to some £11 billion at 2019/20 prices.²⁸ But the UK only paid for a third of total Eurofighter development. The total development cost for the programme, spread across the UK, Germany, Italy and Spain, was therefore some £33 billion at 2019/20 prices.

Because the sums involved in combat aircraft development are so large, the MoD has long sought international partners for its combat aircraft programmes, either from Europe or with the US. The two most costly conventional procurements of the past four decades – Tornado and Typhoon – were both produced through a European consortium. This allowed participating states to spread development costs over a longer production run, as well as providing for some division of labour between national industries. This looks less likely now, with France, Germany

27. Justin Bronk, 'Modern Russian and Chinese Integrated Air Defence Systems: The Nature of the Threat, Growth Trajectory and Western Options', *RUSI Occasional Papers* (January 2020); see also Justin Bronk, 'Russian and Chinese Combat Air Trends: Current Capabilities and Future Threat Outlook', *RUSI Whitehall Report*, 3-20 (October 2020).

28. NAO, *Management of the Typhoon Project*, p. 7.

and Spain having already launched their own separate Future Combat Air System,²⁹ leaving only Italy and Sweden (relatively smaller defence spenders) as partners with the UK.

If these two remain the UK's only major development partners, its share of total FCAS development costs is likely to be much higher than the 33% share for Typhoon. Collaboration with France and/or Germany is still possible on related systems (such as missiles), but this would not help defray the costs of the core aircraft replacement programme. A reasonable current estimate for UK Tempest development costs, therefore, is around £20–25 billion at today's prices.³⁰ If costs were at this level, the cost to the UK could amount to as much as 20% of total annual MoD procurement spending (on research, development and production) by the late 2020s.³¹

In principle, total costs could be curtailed by reducing the numbers of aircraft being bought. But the economics of developing a new aircraft (piloted or unpiloted) depend, to a very large extent, on how many are produced. A shorter production run means that development costs are spread over fewer aircraft, making the economic case ever more challenging. It is hard to imagine that a production run of less than several hundred (including those bought by consortium partners and export customers) would be viable.³²

It might be possible, in principle, to break the vicious circle of rising costs and declining volume by opting for a lower-specification piloted aircraft. The RAF will need to take a view on the credibility of such proposals, both in terms of the operational value of a reduced-specification aircraft in the face of projected threats in the 2040s and beyond (most of all from China), and the credibility of associated cost estimates. But historical experience (not least with Typhoon) points to the risks of 'optimism bias', with unrealistic cost estimates and low specifications used in gaining initial approval, with extra specifications (and costs) added later.

The Integrated Review will also need to address the trade-off between investing in the development of new aircraft (FCAS) and further procurement of F-35 aircraft beyond the 48 F-35Bs currently in the budget. There are cogent arguments for the RAF to purchase additional F-35s in the late 2020s, both to take full advantage of having two carriers and to ensure that the UK has a capability for overcoming the projected air defence capabilities of potential adversaries.

29. Murielle Delaporte, 'Future Combat Air System: Inside the Franco-German Program', *Breaking Defense*, 24 June 2019.

30. This is based on the assumption that total development costs will be comparable to those of Typhoon, and that the UK will be required to meet approximately 60–75% of this total.

31. This assumes that running costs (Resource Departmental Expenditure Limits) are frozen at current levels in real terms through to 2030, while capital spending (Capital Departmental Expenditure Limits), including equipment procurement, rises by some 2% per annum in real terms from the £8.9 billion annual procurement spend in 2020/21. It assumes a development phase lasting about 10 years, with initial production of piloted aircraft in the late 2030s.

32. The total number of orders for Typhoon aircraft is now 623, of which 563 are in operation. See Airbus, 'Eurofighter: Eurofighter Typhoon', <<https://www.airbus.com/defence/eurofighter.html>>, accessed 20 October 2020.

But this would require significant spending, both to buy and then to operate new aircraft, and would likely reduce the requirement for developing new UK-produced aircraft.

Not all these issues can or should be resolved in the next funded Integrated Review (or its equivalent). But a start will need to be made if the review is to fulfil its central task of setting broad cross-MoD spending priorities for the next decade. Before the FCAS enters its full £20-billion development phase, the MoD will need to be clear whether Tempest will include one or more new aircraft types, whether these aircraft will be piloted and/or unpiloted, and/or how far it proposes to rely on F-35 and/or life-extended Typhoon for the piloted role beyond 2040.

The decision on the FCAS is being watched with keen interest by the UK's military aerospace industry. Without a major UK combat aircraft programme to replace Typhoon, it is feared, the industry will risk long-term erosion, with the RAF becoming ever more dependent on US suppliers and with a key area of UK technological excellence at risk of severe decline.³³

As a result, there was discussion during the now-aborted CSR of a special allocation for the FCAS development, funded through a cross-government R&D fund. While this might have eased the budgetary problem in the short term, however, it would still have required a credible business plan, including plans for future procurement by the RAF. And, inevitably, the bulk of the costs for any new aircraft – procurement and support – will still fall on the RAF budget.

Others argue that these industrial impacts could be mitigated through a strong Integrated Review commitment to the development and procurement of new unpiloted aircraft and weapon systems. For example, the RAF has pointed to the Lightweight Affordable Novel Combat Aircraft concept, which 'looks to offer increased capability ... to be deployed alongside combat aircraft. It could even provide an uncrewed combat air "fleet" in the future'.³⁴ It is far from clear, however, that a programme limited to unpiloted aircraft would provide the same degree of support for national industrial capabilities.

There are no easy, yet affordable, answers. Given the resource constraints and technical uncertainties involved, there will be a political temptation to defer some of the hardest decisions on this for as long as possible. If and when the MoD succeeds in getting a longer-term spending settlement, however, it should use the opportunity that this will present to move towards a clear decision on the future of the FCAS.

Such a decision will be required if businesses are to justify to their shareholders the investment in production capabilities that will be required if they are to deliver significant numbers of aircraft by 2040. Waiting until the Integrated Review after the next election to make such a decision would, in contrast, risk significant additional costs, operational delays and supplier

33. Peggy Hollinger, 'BAE Makes Case for UK's Next-Generation Tempest Fighter', *Financial Times*, 15 October 2020; Taylor, 'Gambling Responsibly and the UK Tempest Programme'.

34. See RAF, 'Team Tempest: LANCA', <<https://www.raf.mod.uk/what-we-do/team-tempest/lanca/>>, accessed 20 October 2020.

uncertainty, especially as it would be far from certain what the eventual decision would be. It will not do either the RAF or the UK's leading defence companies any favours to extend this process for that long.

Nuclear

The second big procurement decision for the MoD (measured by its budgetary implications) relates to the FNWS. The most recently published Equipment Plan, which predated the decision to buy a new warhead, shows that some £43.9 billion was already due to be spent by the Defence Nuclear Organisation over the decade from 2019/20 to 2028/29, out of a total spending allocation for the Equipment Plan of £180.7 billion.³⁵

Within this total, the largest single element of the procurement budget is the programme to build four *Dreadnought* submarines, due to begin entering operational service in the early 2030s. *Dreadnought* spending was some £1.5 billion in 2018/19,³⁶ and is set to remain at around this level for the next decade and perhaps beyond. The 2015 SDSR provided for a total projected cost for this programme of £31 billion, with a further Treasury-held contingency of £10 billion.³⁷ The MoD was able to make use of some £600 million of this contingency fund in 2018/19, and the fund is successfully protecting the rest of the procurement budget from the consequences of unforeseen increases in annual *Dreadnought* costs.³⁸

Management of the *Dreadnought* programme, and the future transition from *Vanguard* to *Dreadnought* at Faslane, will be a major challenge. Maintaining continuous at-sea deterrence is likely to become more difficult as the last *Vanguard* submarine approaches its end-of-service date in the mid-2030s. And many risks remain, some of which could still potentially delay *Dreadnought*'s entry into service still further. But the financial commitment is there, and the £10-billion contingency is thought to be sufficient to see the programme through to completion, whenever that might be.

The primary focus of budgetary concern in relation to the nuclear weapons programme is therefore no longer *Dreadnought*. Rather, it is the government's decision to move towards a new programme to design, build and introduce into service a new nuclear warhead, along with associated front-end systems. The current Equipment Plan, published on 27 February 2020, only includes funding for 'studies to support a decision on whether to renew or replace the nuclear warhead'.³⁹ Now that the MoD has decided to commission the AWE to design and build a new warhead, therefore, this will involve additional spending over and above that currently programmed in the 10-year Equipment Plan.

35. MoD, 'The Defence Equipment Plan 2019: Financial Summary', 27 February 2020, p. 41.

36. *Ibid.*, p. 42.

37. HM Government, *National Security Strategy and Strategic Defence and Security Review 2015: A Secure and Prosperous United Kingdom*, Cm 9161 (London: The Stationery Office, 2015), p. 6.

38. Chalmers, 'The End of Defence Austerity?', p. 3.

39. *Ibid.*, pp. 17, 43.

Such a programme would be in addition to the ongoing Nuclear Warhead Capability Sustainment Programme (NWCSP), which seeks to replace and modernise a nuclear infrastructure that, in many cases, had been first built in the early days of the UK's nuclear programme in the 1950s and 1960s. Started in 2008, the programme has involved a series of major new investments: the Orion laser facility; the Mensa assembly/disassembly plant; the Pegasus highly enriched uranium facility; the abortive Project Hydrus for a national hydrodynamics capability; and the UK's contribution to the joint UK–French Teutates hydrodynamic testing facility.⁴⁰ The NWCSP is currently the fifth-largest infrastructure project in the country (see Table 1), with spending amounting, on average, to over £1 billion annually. Since an early stage, it has been beset by problems. It is now widely criticised for its initial over-ambition, under-estimation of technical difficulties and likely costs, and over-optimistic delivery dates. Most recently, it was the subject of a critical National Audit Office report.⁴¹

Given this track record, it is right to be concerned that the FNWS could face similar problems. Because of the way in which the UK has chosen to run its nuclear weapons programme, and because (unlike the US and France) it only has one warhead type in service (the Holbrook class), AWE staff lack recent experience in designing and producing a new warhead. Yet they now face having to build the skills and capabilities for doing so in the context of a much tougher regulatory environment than that which prevailed during the Cold War, along with the added difficulties and cost that could be created by the lack of access to yield-producing nuclear testing (prohibited under the Comprehensive Test Ban Treaty). AWE also faces formidable problems in renewing its workforce, an unusually high proportion of whom are due to retire over the next decade. A further complication is that AWE is assuming that its new warhead will need to be designed in order to mirror the key characteristics (including shape and mass) of the US's Trident warhead, so as to be able to benefit from shared test results and certifications. The UK will also be reliant on the US for the aeroshell for the warhead, as well as a number of other key (non-nuclear) components of the warhead assembly, all of which will have to be designed to fit on top of both the US's Trident D5 missile and its successor.

The future of the UK programme, therefore, depends in large part on the future of US plans to acquire a new warhead – the W-93 – for its own Trident missiles. There is some uncertainty over whether, and when, the US will proceed with this programme, particularly if a new Democratic administration were to seek savings in the Pentagon's nuclear budget. In April, after the administration of President Donald Trump requested funding for the W-93 programme, UK Defence Secretary Ben Wallace claimed that 'support to the W93 program in this budget cycle is critical to the success of our replacement warhead programme and to the long-term viability of the UK's nuclear deterrent'.⁴²

40. Tom Plant, 'Britain's Nuclear Projects: Less Bang and More Whimper', *RUSI Commentary*, 22 January 2020.

41. NAO, *Managing Infrastructure Projects on Nuclear-Regulated Sites*, HC 19 (London: NAO, 2020).

42. Julian Borger, 'UK Lobbies US to Support Controversial New Nuclear Warhead', *The Guardian*, 1 August 2020. See also, Matthew Harries, 'Will America Help Britain Build a New Nuclear Warhead?', *War on the Rocks*, 22 October 2020.

Because of the problems left unresolved by the NWCSP – uncompleted infrastructure, serious gaps in human resources, lack of experience in warhead design and production – the FNWS could fall behind schedule and eat up large sums of money. The tighter the timetable that is set, the more that costs could escalate and/or serious regulatory barriers could emerge.

The costs of bringing a new warhead system into service will depend, to a significant extent, on its required performance characteristics. Here it is assumed that the UK is aiming to design and build a new warhead, at least equivalent in deterrent effect and reliability to the Holbrook warhead it replaces, able to operate through to the 2060s, and that maintains interoperability with the US. In order to meet these basic requirements, designers will need to consider how and to what extent the new system will be able to overcome the anti-missile defences (including directed-energy and electromagnetic weapons, as well as kinetic interceptors) that competitors are thought likely to be able to field from the 2040s. Relatedly, decisions will be needed (inter alia) on the yield (or yields) of the new warheads, the mechanisms (if any) through which their re-entry vehicles can be independently targeted, the possible role of decoy warheads, and the extent, and nature, of any hard-target (deep-bunker) capabilities.⁴³

Getting these requirements right will be particularly important for the UK, which (unlike the US and France) is entirely reliant on its submarine-based ballistic missiles to provide its nuclear deterrent capability. But it is unlikely to be cheap or easy to translate into a new warhead system, able to enter service in the late 2030s. Moreover, several of the facilities necessary for the development and non-explosive testing of the system are not yet ready. Given all these factors, and including the costs of completing the NWCSP investments in the Mensa and Pegasus facilities on which the warhead will depend, as well as necessary infrastructure investments at Coulport and elsewhere, the total cost for the FNWS could be in the order of £15–30 billion over the two decades from 2021/22.

This figure is considerably more than the £2–3 billion figure for ‘the possible future refurbishment or replacement of the warhead’ provided in the 2007 White Paper.⁴⁴ This figure, equivalent to £2.5–£3.75 billion at 2020/21 prices, stopped being used by the time of the 2015 SDSR. It soon became clear that it excluded the costs of the capital programme (including the £20-billion NWCSP) that was needed to maintain the capability for refurbishment or renewal, whether or not a new warhead is built. The cost estimate in this paper, in contrast, includes the extra costs involved in renewing and/or replacing the current nuclear warhead over the period through to the early 2040s, when the entry into service of a new warhead is due to be completed.

Not all the uncertainties about how, when and at what cost the nuclear warhead will be replaced can be resolved over the next two years. But it is reasonable to ask that the next fully funded Integrated Review provides a clear public explanation of the likely costs and timetable involved in this programme, an assurance that these costs can be met within the forward plan beyond

43. For further discussion, see Harries, ‘Will America Help Britain Build a New Nuclear Warhead?’.

44. HM Government, ‘The Future of the United Kingdom’s Nuclear Deterrent’, Cm 6994, December 2006, p. 26.

the next multi-year CSR period, and a discussion of how future governments might finance any future cost overruns (for example, through a Dreadnought-style contingency fund).

Conclusion

Judging from the extensive consultations that they have held in recent months, the authors of the Integrated Review had hoped that it would be the most radical review of UK foreign, defence and security policy since the end of the Cold War. There would have been a shift in emphasis away from support for the so-called 'rules-based international system' to a conceptual framework grounded more clearly in the need to protect the national interest (broadly conceived) in an increasingly competitive international environment. As well as increased focus on national resilience (intensified as a result of the coronavirus crisis), there would likely have been a new focus on the need for radical reform of the armed forces to make them fit for new forms of warfare, including increased emphasis on the 'grey zone'.

Despite the cancellation of the multi-year CSR on 21 October, the MoD can still reasonably hope for some real growth in defence spending over the next decade, focused on increased capital spending. Given the prospects for economic growth over this period, it should be able to maintain its commitment to spending 2% of GDP on defence.

If this is the case, the UK can expect to remain one of the world's eight biggest defence spenders in 2030. Its budget will be only a fraction of those of the US and China, the military superpowers of the mid-21st century. It will be much less than that of Russia, once account is taken of the higher purchasing power of the rouble. But UK defence spending should remain roughly on a par with other Western middle powers, including France, Germany and Japan, for the foreseeable future.

The UK can, and should, expect to buy substantial capabilities for this investment. The Integrated Review, whenever it comes, will confirm that the government remains committed to being in the select group of countries who possess both a carrier strike capability and a powerful globally deployable SSN force. It will remain a nuclear weapon state, with new investments ensuring that it remains in the game for future decades, and that its force is protected against potential threats. It will deploy some of the best frigates and destroyers in the world, even as it increases investment in the newer domains of space and cyber. It will be one of only a very few countries that retains national capabilities for the development and production of new generations of combat aircraft, nuclear-powered submarines and leading-edge missiles. In addition, the UK seems set to maintain its forces at a state of operational readiness that remains relatively high compared with most of its European allies. And it is likely to maintain an operating budget (over and above spending on personnel and equipment) that is bigger than any other European NATO member state.⁴⁵

45. Malcolm Chalmers, 'Decision Time: The National Security Capability Review 2017-18 and Defence', *RUSI Whitehall Report*, 1-18 (February 2018), p. 20.

Yet it will be very hard to sustain all this on a total defence budget which, on the basis of the current government's election manifesto, may only increase by some 0.5% in real terms annually for the next decade. Despite the limited resources available, it is perhaps conceivable that all the above commitments can be maintained, provided that the MoD is intelligent and ruthless in its efforts to bear down on lower-priority activities. If this does not happen, the MoD risks deepening the cycle of overcommitment and inefficiency that has bedevilled its planning too often in the past.

The need for hard decisions is especially relevant in relation to what are likely to be the MoD's two largest procurement programmes of the next decade and beyond – the FCAS and the FNWS. For all the government's rhetoric on the need to focus on new dimensions of competition, these two programmes are squarely focused on renewing capabilities which have been central to the military's force structure for more than half a century.

The history of procurement with such large and technologically challenging programmes is salutary, despite the efforts of successive governments to address the cost escalation and long programme delays that are so often involved. To have the best chance of tackling these issues, history shows that the government needs to set clear requirements at an early stage, invest in resolving key design questions before moving to full development, and then ensure that sufficient resources are available to take the project to completion.

A multi-year CSR, combined with a government committed to a radical foreign and defence policy review, would have provided the MoD with an important opportunity to get in front of these issues in relation to these two major programmes, as in other elements of the forward programme.

Now that the government has reverted to a one-year Spending Review, it will be harder to close on the key decisions that need to be taken. There is a risk that, despite the hard work that has gone into the 2020 Integrated Review, and the MDP before it, the MoD may have to repeat the exercise with a new Integrated Review (or at least a defence element of it) in summer 2021 or 2022. Such an outcome would not be good for defence, and it is likely to be bad value for money for the taxpayer.

About the Author

Malcolm Chalmers is Deputy Director-General of RUSI and directs its growing portfolio of research into contemporary defence and security issues. His own work is focused on UK defence, foreign and security policy. His most recent papers have been on the Integrated Review, national interest and UK foreign policy, tensions between the rules-based international systems, UK defence budgeting and the security implications of Brexit. He has been an Adviser to Parliament's Joint Committee on the National Security Strategy since 2020 and was Senior Special Adviser to Foreign Secretaries Jack Straw MP and Margaret Beckett MP.