

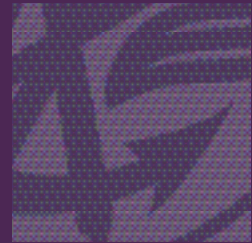
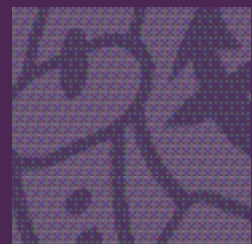
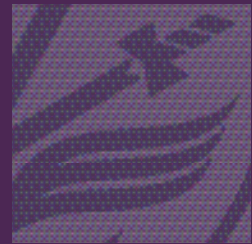


Royal United Services Institute
for Defence and Security Studies

Occasional Paper

A Defence Industrial Strategy for the UK

John Louth and Trevor Taylor



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RUSI Occasional Paper, April 2018



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Foreword by Sir Peter Luff

DURING THE EARLY years of the Conservative–Liberal Democrat coalition government after 2010, as the Minister for Defence Equipment, Support and Technology, I was responsible for the government’s relationship with the private sector in the generation of defence capabilities. In that role, I saw that investment in new technologies and the championing of skills and STEM (science, technology, engineering, and mathematics) competencies were critical to national security. I am passionate, therefore, about increasing spending on science and technology (S&T) for defence and security within a realistic overall defence budget and in the context of a coherent industrial policy. Such a policy should, as a priority, match the strategic needs of defence – and the imperative for sustaining national freedom of action and operational advantage – to the growth in skill and productivity of both the companies in defence’s complex supply chains and the individuals working within them. It is with pleasure, therefore, that I commend this document to you.

John Louth and Trevor Taylor have devised a defence industrial strategy, building upon the stated policy, from first principles and ‘place in the world’ questions through to local imperatives and enabling critical factors. It is a coherent approach, sometimes open to debate, but always ambitious, thoughtful and well argued. Freed from the constraints of governmental policymaking, where the delivery of strategy is always complex, nuanced, contingent and full of difficult trade-offs, this document offers a route-map that is genuinely helpful for political leaders and other policymakers. The wise will turn to this publication and its eight conclusions as such a guide.

Executive Summary

THIS PAPER SEEKS to build on the Ministry of Defence's (MoD) 'Refreshing Defence Industrial Policy' of December 2017¹ by generating eight points that would be key elements of a strategy to implement its intent.

Its premises are that, as laid out in the 2015 National Security Strategy,² it is government policy to present the UK as 'strong, influential, global' and, as argued in the *National Security Through Technology* White Paper of 2012,³ the freedom of a country to use its armed forces as it sees fit should be recognised as related to the 'essence of sovereignty', that is, critical, highly important and sensitive. In addition, government has laid a formal responsibility on the MoD to promote national prosperity.

With this as the policy imperative, the paper discusses the consequential need for the maintenance and development of a strong defence supply base within the UK. Recognising that no decision set is without risk, the paper highlights the risks associated with this policy stance, along with suggestions for their effective mitigation or management. This mitigation, the authors suggest, would augment current policy and practice.

With this background, the paper suggests that the MoD needs to go beyond seeing itself as a simple 'customer' as, the authors suggest, it does now, and accept its responsibility as the prime contractor for the generation of UK defence capability. As such, it would recognise broader portfolio and programme management of the sector as one of its key responsibilities. From those core points, the paper offers eight specific recommendations for government policies, behaviours and practices:

- A commitment to sustain and strengthen national, on-shore defence design, manufacturing and support capabilities in a partnership between the MoD and industry.
- A policy imperative to insist on the ability and technical know-how to modify imported equipment.
- An ambition to collaborate with peer partners on capability development.
- A commitment to design and develop UK capabilities overtly with exports in mind pre-manufacture.
- Emphasising the place of competition among projects and the specification of their worth.

1. Ministry of Defence, 'Industry for Defence and a Prosperous Britain: Refreshing Defence Industrial Policy', December 2017.
2. 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).
3. Ministry of Defence, *National Security Through Technology: Technology, Equipment, and Support for UK Defence and Security*, Cm 8278 (London: The Stationery Office, 2012).

- Commitment to proactive programme and supply-chain management within a complex portfolio.
- Revamping sector prioritisation across defence, focusing on critical strategic industrial sectors.
- Recognising that future defence capabilities remain technology-rich. A commitment, therefore, to an increase in funding of science and technology, especially in the pure research-phases of a development cycle, is critical. So, too, is a change of culture to champion experimentation, adaptability and early adoption of disruptive technologies.

Finally, the authors underline that if high-level policy were to be scaled back – if the UK was to no longer aspire to be globally influential or ‘strong’ and if the MoD was free to leave the pursuit of economic prosperity to others – many of the arguments and recommendations here would lose their relevance.

Introduction

Background

AT THE END of 2017, the UK Ministry of Defence (MoD) was in financial difficulty and there was extensive press coverage about the force structure cuts that were under consideration. However, at the same time, the government had moved towards an explicitly supportive stance for industry and manufacturing in the economy as a whole,⁴ not least because of the economic risks caused by the Brexit vote. Thereafter, at the end of 2017, following an extensive period of consultation, and almost as the last act of the parliamentary session the government published its defence industrial policy.⁵ The overarching policy imperative was clear:

British industry, working alongside our Armed Forces and defence civilians plays a crucial role in delivering the United Kingdom's national security objectives: to **protect** our people, **project** influence overseas and **promote** national prosperity.⁶

The policy stated that the UK defence industrial base was well placed to meet these objectives. After all, in 2016, the sector had a turnover of £23 billion; directly supported 142,000 people in employment; had 4,300 apprentices in training; and generated exports of £5.9 billion.⁷

Policy, however, is different from strategy. Policy refers to an objective or required end-state – in this case, to **Protect**, **Project** and **Promote** – while strategy details the people, plan, actions, activities and other resources necessary to delivery these objectives. The government has articulated its policy, but the document does not amount to a costed and resourced programme of implementation – a strategy – to deliver that policy.

This paper starts with the policy imperative and seeks the courses, methods and practices within government and industries to deliver these stated objectives. In summary, the exam question could be: What defence industrial strategy is necessary, from 2018, to deliver the UK's defence industrial policy?

4. See, for instance, HM Government, 'Industrial Strategy: Building a Britain Fit for the Future', November 2017.

5. Ministry of Defence, 'Industry for Defence and a Prosperous Britain: Refreshing Defence Industrial Policy.'

6. *Ibid.*, p. 1. Emphasis added.

7. See, for instance, ADS, 'UK Defence Outlook 2017', August 2017.

I. Approach

THIS PAPER BUILDS on the policy stated by the UK government in late 2017. It does not evaluate alternative policy options, but seeks to put in place a strategy to deliver the government's wishes. It acknowledges the risks associated with this approach, but the argument that follows has a clear thread that begins with high-level UK security and defence aspirations. The authors recognise that, if those aspirations were to change, the defence industrial measures we suggest would also be different. As analysts, the authors do not see it as their role to recommend a specific policy aspiration for the UK – that is the stuff of politics – but have a responsibility to articulate the behaviours and practices that would be central to putting a stated policy into effect.

The paper offers both logic and empirical evidence in support of the lines it takes. It extensively references government documents, academic work and other sources that the authors recognise as authoritative and which the reader can also evaluate. Its evidence base is drawn from UK experience and the practices of other states with defence industrial policies. The work builds also on the authors' previous research and writing.¹

As stated, an early premise of this paper is that government needs to formulate a strategy which, in the established meaning of the term, has two components: a desired end-state or condition (the policy); and a viable and articulated means of getting there in light of the difficulties involved (delivery and management). Consequently:

A leader's most important responsibility is identifying the biggest challenges to forward progress and devising a coherent approach to overcoming them. In contexts ranging from corporate direction to national security, strategy matters. Yet we have become so accustomed to strategy as exhortation that we hardly blink an eye when a leader spouts slogans and announces high-sounding goals, calling the mixture a 'strategy'.²

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1. See, for instance, Trevor Taylor and John Louth, 'The Destinations of the Defence Pound', RUSI Briefing Paper, January 2012; John Louth and Trevor Taylor, 'Beyond the Whole Force: The Concept of the Defence Extended Enterprise and its Implications for the Ministry of Defence', *RUSI Occasional Papers* (November 2015); Trevor Taylor, John Louth and Henrik Heidenkamp, 'Industry and the Military Instrument', in A L Johnson (ed.), *Wars in Peace: British Military Operations Since 1991* (London: RUSI, 2014), pp. 291–320; Henrik Heidenkamp, John Louth and Trevor Taylor, *The Defence Industrial Triptych: Government as Customer, Sponsor and Regulator*, RUSI Whitehall Paper 81 (London: Taylor and Francis, 2013); Trevor Taylor and Keith Hayward, 'The UK Defence Industrial Base: Issues and Options', *RUSI Journal* (Vol. 134, No. 2, 1989).
 2. Richard P Rumelt, *Good Strategy/Bad Strategy: The Difference and Why It Matters* (London: Profile Books, 2011), p. 2.

Building on this, the authors argue that a defence industrial strategy should specify a government's aspiration for this specific sector and the means to bring that vision into reality and sustain it. Government behaviours, funding levels and defence acquisition practices must be central to efforts to shape the supply base to enable this intent.

The reasoning points to defence industrial strategy as a most demanding area for government, in part because it lies at the interface of concerns about security, prosperity, military capability and a risk agenda. But it also raises profound questions about the fundamentals of British foreign and security policy, and the UK relationship with key strategic allies.

The government does not appear to find strategy (aims plus direction) an easy concept. In 2012, the Public Administration Select Committee published a report identifying a lack of strategic coherence in the UK.³ Policymakers and stakeholders were adept at a managerialist language of strategy but not at its practice, with government woefully inadequate in articulating or choreographing the delivery of national priorities and objectives. The report went on to state that:

In general, strategic thinking is not highly prized in [the] UK. This stems from our culture: we privilege empirical evidence and empiricism in the philosophical underpinnings of decision making. This has worked for us in many ways for a long time but this clearly is inadequate in a world where the interconnections, influences and politics of other countries are so very strong. The UK thus *must* develop the capability to think and act strategically from the top of the Executive down through Parliament, media, academia, civil society, schools, pressure groups, industry bodies and individuals.⁴

The authors hope that this paper represents a modest contribution in this area.

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3. House of Commons, Public Administration Select Committee, 'Strategic Thinking in Government: Without National Strategy, Can Viable Government Strategy Emerge?', HC 1625, Twenty Fourth Report of Session 2010–12, 24 April 2012; See also, House of Commons, Public Administration Select Committee, 'Who Does UK National Strategy?', HC 435, First Report of Session 2010–11, 18 October 2010.
 4. House of Commons, Public Administration Select Committee, 'Strategic Thinking in Government: Without National Strategy, Can Viable Government Strategy Emerge?', Vol. II, Ev. w14. Emphasis added.

II. Defence Industries: A Concept

THE AUTHORS RECOGNISE the need to elucidate the concept of defence industries. The defence industrial sector in the widest perspective comprises all the industrial and commercial bodies that supply the UK MoD and/or foreign defence ministries, with goods and services, both directly and indirectly in the supply chains of prime contractors. It therefore includes not only manufacturers of weapon systems but also, for example, providers of fuel, pharmaceuticals, clothing, as well as building, health, financial and other services. There are thousands, of such firms in the UK alone, not to mention myriad onshore and offshore businesses in complex and extensive supply chains. Altogether the MoD appears to spend about 65% of its budget (more than £24 billion a year) with this array of businesses, which range from the military specialist to the essentially civil.¹

Where the MoD purchases non-military goods and services from civil markets and there are multiple suppliers available, there is little need for a strategic approach to procurement. The situation is different if a civil contractor provides a key component or sub-component for a critical system or an essential support service and there is no obvious, immediate alternative supplier. It is also different for civil contractors who provide facilities and other support for troops on deployed operations.²

The part of that sector that is of most interest here comprise the businesses associated with defence equipment and services that are specially developed for the military, some of which have little civil application. These goods are subject to extensive government export controls in the 22 Military List categories used by EU states and the Munitions List in the International Traffic

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1. In 2016, The MoD reported it spent more than £3 billion on shipbuilding and repair, more than £2 billion on aircraft and spacecraft, about £1.2 billion on weapons and ammunition, and around £1.4 billion on 'other manufacturing', see Ministry of Defence, 'Finance & Economics Annual Bulletin: Trade, Industry & Contracts 2016', revised 13 April 2017. The MoD has ceased publication of these breakdowns and the 2017 figures are not available. However the MoD's Defence Contracts Online and BiP Solutions' report, 'Doing Business with Defence Handbook: Edition 24', claims that the Ministry spends £19.4 billion with UK businesses. For a total figure for MoD external spending, an estimate for defence imports from foreign firms should be added: the US Department of State finds that between 2004 and 2014, UK defence imports averaged more than \$10 billion a year. Some of these would have been sub-systems imported by UK firms, see Department of State, 'World Military Expenditures and Arms Transfers 2017', Tables II–IV.
 2. Authors' interview with a senior official from Defence, Equipment and Support, 22 February 2018.

in Armaments Regulations in the US.³ They usually require very extensive ‘after-sales’ services, such as the provision of specialised information and goods from the supply base. Indeed, the purchaser of a platform or system can typically expect to spend more than double the original acquisition cost on looking after it. Finally, especially at the platform and major sub-system level, in many areas there are only a small number of firms operating at a high-capability level in the West and the financial and knowledge barriers to entry for new businesses are high. This area of expenditure is largely captured in the Equipment Plan, which shows the MoD spending around £7.8 billion in 2018–19 on new equipment and nearly £8.1 billion on its support.⁴

The defence industrial sector is extensively involved in the support of delivered equipment as well as its initial development and production. This is explored in more detail in the main body of the paper, but here the authors need to underline the sense that governments can rarely use major items of defence equipment for any period of more than a few days or weeks without extensive support from the private sector, unless they carry very large and expensive inventories of spare sub-systems and parts and undertake almost all support work in-house.

The defence industrial sector is not static and, looking forward, it is likely that the defence sector will be making increased use of technologies developed mainly for the civil commercial world. This is not unusual as there is a tradition of dual-use technology within the defence sector since at least the end of the Second World War,⁵ due to the growing significance of information technologies for both defence and civil life, and because of the rising levels of civil research and development (R&D) in comparison with defence. In the EU in 2014, less than 5% of R&D spending was by defence ministries for defence.⁶ This will raise challenges for decision-makers responsible for the lists of dual-use goods to be subjected to export controls and licences. However, it remains likely that, to generate military capabilities not easily available to potential adversaries, Western governments and companies will normally add significant elements of specialist military components to the broader pool of commercial and thus widely available technologies.

Finally, in terms of approach, the Labour government recognised in its 2002 Defence Industrial Policy paper that foreign-owned firms should be treated as British when they add significant value within the UK, whether in terms of R&D, production or support.⁷ Under these criteria, there are several companies, such as Leonardo, Thales, Airbus, Raytheon, Lockheed Martin and Northrop Grumman, parented in continental Europe and the US, that properly qualify as British.

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3. US Department of State, Directorate of Trade Controls, ‘The International Traffic in Arms Regulations (ITAR)’.
 4. National Audit Office, ‘Ministry of Defence: The Equipment Plan 2017 to 2027’, 31 January 2018, p. 11.
 5. See, for instance, Jacques S Gansler, *Democracy’s Arsenal: Creating a Twenty-First-Century Defense Industry* (Cambridge, MA: MIT Press, 2011), p. 129.
 6. David Parkes, ‘A Look at R&D Funding and Performance in the OECD Area and Beyond’, American Association for the Advancement of Science, 14 June 2016.
 7. Ministry of Defence, ‘Defence Industrial Policy’, Policy Paper No. 5, 2002.

While the multinational nature of many modern defence businesses presents challenges around their relationships with their various stakeholder governments,¹ the British character of these enterprises is accepted here.

1. See, for instance, Heidenkamp, Louth and Taylor, *The Defence Industrial Triptych*.

III. National Policies, Ambitions and Stances

A GOVERNMENT STANCE TOWARDS its defence industrial sector is a function of wider national ambitions and concerns. There are three areas of policy direction that should be highlighted as having significant implications for defence industrial issues. In the 2015 Strategic Defence and Security Review, *National Security Strategy and Strategic Defence and Security Review 2015: A Secure and Prosperous United Kingdom*, the government stressed its vision of the UK as a significant player on the world security stage, summarised in the title of Chapter Two that the UK was to be 'Strong, Influential, Global'. The chapter states:

The UK plays a strong, positive global role. We project our power, influence and values to help shape a secure, prosperous future for the UK and to build wider security, stability and prosperity. We have unique strengths that enable us to do this.²

In the 2012 White Paper, *National Security Through Technology*, there were other government assertions:

53. Freedom of action is the ability to determine our internal and external affairs and act in the country's interests free from intervention by other states or entities, in accordance with our legal obligations. This freedom is the essence of national sovereignty. It is also essential to be able to use a capability effectively, although not at any cost.

54. For national security capabilities in general, freedom of action rests on the assurance that we will be able to use them – or continue to use them – whenever we need to; and that when we do so, they will perform as we require. In the field of defence, freedom of action includes being able to conduct combat operations at a time and place of our choosing.³

Integrating these two points, the government's aim for the UK is seemingly that the country should be 'strong, influential, global' and be able to use its armed forces as Whitehall sees fit.

A third element of government policy is that the MoD should contribute to and promote national prosperity, indeed 'Promote Our Prosperity' is Objective 3 in the MoD's annual report

2. HM Government, *National Security Strategy and Strategic Defence and Security Review 2015*, p. 13.

3. Ministry of Defence, *National Security Through Technology*, p. 26.

and accounts.⁴ While a secure UK is more likely to attract investment, the main link of the MoD with national prosperity concerns how it spends its budget.

At his first appearance before the House of Commons Defence Select Committee on 21 February 2018, Defence Secretary Gavin Williamson reasserted his commitment for UK defence to be strong, leading to a strong, stable and sovereign country.⁵ Critical to this was a strong and supported defence industrial sector on-shore. Shadow Defence Secretary Nia Griffith repeated almost an identical message to the Prospect Trade Union Defence Seminar the day after.⁶ There appears to be a level of compatibility and consistency between the two main political parties' defence policy and its defence industrial derivative.

Global Influence

The UK's defence industrial stance sends messages to the world about the government's confidence in UK industry and society, and about its ambition for the future. When Whitehall appears content to buy its defence equipment from elsewhere, it sends a signal to both friendly and competitor states about its lack of confidence in its own industry and society and the modest nature of its national ambitions. If that country also says it wants to play a significant role on the international military stage, issues of credibility become salient.

In this context, Isaac Ben Israel and Deganit Paikowsky, among others, have argued that powerful states that wish to impress others must show the confidence to take on and successfully deliver major projects in the defence field. They wrote:

States that choose to take on the difficulties, risks and high costs of projects such as space and nuclear programmes usually do so because proving indigenous expertise in such areas is perceived as an important mark of a nation's strength, capabilities and sovereignty. Furthermore, by accepting the heavy burden of developing an indigenous capability that will not necessarily or immediately provide direct or indirect benefits, a state sends a credible message about its national power or at least its intentions to acquire power.⁷

What matters from this perspective is public readiness to take responsibility for major projects and their management, and to accept the risks involved. The international standing and reputation that Sweden has gained because of the Gripen fighter aircraft project is an

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4. Ministry of Defence, *Annual Report and Accounts 2016–2017*, HC 21 (London: The Stationery Office, 2017).
 5. House of Commons, Defence Committee, 'Oral Evidence: Departmental Priorities', HC 814, 21 February 2018.
 6. Nia Griffith, 'Civilians in Defence: Skills Capacity and Sovereign Capability', speech given at the Prospect Union's seminar, London, 22 February 2018.
 7. See, for instance, Isaac Ben Israel and Deganit Paikowsky, 'The Iron Wall of Israel's Space Programme', *Survival: Global Politics and Strategy* (Vol. 59, No. 4, August–September 2017), pp. 155–56.

illustration of this phenomenon. Such projects can, and do, include imported sub-systems, but the lead state should have sufficient understanding of such sub-systems and how they fit into the system as a whole that nationally they can be a Design Authority for the system, and thus qualified safely to modify it. In project management terms, 'the Design Authority is responsible for ensuring that the consequences of any design decision are understood'.⁸ Marshall's had such status for the C-130H transport aircraft made by Lockheed Martin, and today Raytheon UK has it for some specific changes to the Sentinel system.

Internationally, if the UK government aspires to be 'strong, influential, global', it needs to be able to inspire external confidence that it can use its armed forces as it sees fit. This implies that it understands the performance parameters of its equipment, can modify it for specific operations and is not vulnerable to interference or disruption. This hardly suggests an end to imported equipment, but it would mean a clearer focus in government on technology transfers that are seen to give UK operational sovereignty over the major items in its inventory.

Freedom of Action

In the context of the point above, notions of freedom of action as a policy preference have clear significance for an on-shore defence industrial sector. For example, it is a largely military responsibility to specify the requirements for new equipment and to act as an 'intelligent customer'. Yet, the specification of optimum requirements is a major challenge that requires the customer to grasp what might be most valuable in the future operational space (which involve largely political and technological assessments) and what might be possible in what period of time and at what cost in a world of rapidly changing technology and resource usage. Nothing can make this easy, but the presence of a capable national industrial sector provides a potentially significant source of expertise to supplement that of the military and those monitoring progress in government. Intelligence about the future of technology is required even when buying from an external production line to appreciate how long a specific technology will be effective and available, and the costs of maintaining a viable system. Without a national industrial base, government would have to invest more extensively in research and technology monitoring simply to be able to know what would be best to buy. Crucially, the relationship between government and industry here becomes critical if industry is to objectively inform government in a partnering approach rather than just seek to sell.⁹

Moreover, in considering defence suppliers, security considerations extend beyond prices and quality of product and involve both reliability and agility of supply. It is vital to appreciate the full range of issues to be addressed to keep defence equipment in useful service, with an emphasis on high-level performance: defence equipment is very different from anything in our private lives, with flying platforms often needing more than ten person-hours of maintenance

8. See Programme Governance Model, 'Design Authority: Role Description'.

9. See, for instance, John Louth, 'The Sum of its Parts? Partnering, the MoD and Industry', *RUSI Journal* (Vol. 157, No. 2, April–May 2012), pp. 6–11.

for each hour of flight.¹⁰ Parts and sub-systems must be checked, removed where needed and either scrapped or sent back to the private sector for repair. Support needs are reflected in fleet availability rates and costs per hour of use, figures which the UK government rarely makes public. However, the National Audit Office has reported on the improvements brought by further involving the private sector in the support of, for example, the Tornado and Harrier fleets.¹¹ Major systems such as these require extensive provision of items of test equipment, which themselves require support. On-shore defence industries therefore offer a country more control of its critical supply chains and is less vulnerable to embargoes or other restrictions on supply. Moreover, a national defence industrial sector enables a range of tasks to be undertaken, including the modification of equipment, the acceleration of development into the production phase, the surged production of some items, such as ammunition, and the deployment of industrial personnel to support equipment in-theatre.¹²

The US State Department provided an illustration of the ongoing roles of the contractor when it announced its endorsement of a further five-year deal between the UK government and Boeing for support of the UK fleet of eight C-17s:

The Government of the United Kingdom has requested a possible sale of continued logistics support for eight (8) C-17 aircraft which will include: contract labor for sustainment engineering, on-site COMSEC support, Quality Assurance, support equipment repair, supply chain management, spares replenishment, maintenance, back shop support, centralized maintenance support/associated services, and additional spare and repair parts, publications and technical documentation. Required upgrades will include fixed installation satellite antenna, Mode 5+ installation and sustainment, Automatic Dependent Surveillance-Broadcast Out, Communications Modernization (CNS/ATM) Phase II, Replacement Heads-Up Display and three special operations loading ramps. The estimated total cost is \$400 million.¹³

When the £260-million contract was announced by the MoD in 2018, it was noted that it would support only around 50 UK jobs.¹⁴

Considerations about external dependence were reflected in the earlier 2005 version of a UK defence industrial strategy in the paragraph on appropriate sovereignty, signalling that the UK should be able to manage through life, for example, to sustain and modify even equipment

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10. See, for instance, Giovanni de Briganti, 'Navair Sees F-35 Requiring Up to 50 Maintenance Hours per Flight Hour', *defense-aerospace.com*, 5 December 2016, which bases its figures on US Naval Air Systems Command information. For other sources of information on operating costs, see Jeremy Bender, 'This Chart Shows the Staggering Hourly Cost of Operating US Military Aircraft', *Business Insider UK*, 30 December 2014.
 11. National Audit Office, 'Transforming Logistics Support for Fast Jets', Report by the Comptroller and Auditor General, HC 825, Session 2006–2007, 17 July 2007.
 12. See, for instance, Taylor, Louth and Heidenkamp, 'Industry and the Military Instrument'.
 13. Defense Security Cooperation, 'United Kingdom – Continuation of C-17 Logistics Support Services and Equipment', news release, 23 January 2017.
 14. UK Government, '£260m Deal Signed to Keep RAF Giants Flying', 17 February 2018.

that it had bought from overseas.¹⁵ The logic was that this involved a dynamic and engaged on-shore supply base.

The counter-argument here is that a more large-scale, agile and economical supply chain may be available in another country, but this presents the risk that the external supplier may restrict how and where equipment is used and may not give the external customer priority for the supply of spares. Under US law, American forces' operational needs must be met before any states can be supported, which became an issue for the UK over some Mastiff armoured vehicle spares during the Afghanistan campaign. In this case, the US agreed to a separate production capability being established abroad for specific spares, especially axles. It should not be assumed that the US would always treat the UK as a priority customer and some American thinking is already exploring the serious supply shortage implications of a sustained conventional operation against a peer adversary. Even when a partner government and off-shore business is content to supply, there may be delays due to the time needed for export licences to be secured.¹⁶

The importance of assurances of supply has long been recognised in Europe in both the European Defence Agency and in intergovernmental bodies, including the Letter of Intent (LoI) countries. To quote the British government:

The Letter of Intent (LoI) Framework Agreement (FA) Treaty was signed on 27 July 2000 by the defence ministers of France, Germany, Italy, Spain, Sweden and the UK. It aimed to create the political and legal framework necessary to facilitate industrial restructuring in order to promote a more competitive and robust European Defence Technological and Industrial Base (EDTIB) in the global defence market.¹⁷

Security of supply was the focus of the first LoI sub-committee and it has the virtual status of a recognised risk where governments still lack absolute confidence that other states will deliver equipment, services or consumables when needed and a comprehensive agreement among allies has proved elusive.¹⁸

Beyond this narrative, as well as security of on-shore supply for national sovereignty, it is also critical to consider national defence industries as being significant for operational advantage, particularly within the context of a peer-state adversary such as Russia. The operational advantage

15. Ministry of Defence, *Defence Industrial Strategy: Defence White Paper*, Cm 6697 (London: The Stationery Office, 2005), p. 17.

16. See, for instance, Peter Navarro, 'One Big Reason Why America Isn't Ready for World War Three', *National Interest*, 19 April 2016.

17. UK Government, 'Letter of Intent: Restructuring the European Defence Industry'.

18. See, for instance, European Defence Agency, 'Security of Supply', 6 December 2017; Sophia Besch, 'The EU's Security of Supply Agenda', Armament Industry European Research Group (ARES), October 2016.

offered by on-shore commercial partners is a force multiplier for the British military.¹⁹ It also contributes to the positive reputation that the UK armed forces have with NATO partners.²⁰

National Prosperity

An obvious area of national prosperity is defence jobs. It is a matter about which the government is clearly sensitive given that its announcements about defence contracts always refer to the number of jobs that will be sustained and sometimes created. In cases when a product is being bought from a foreign production line, the reference is usually to the level of work for sub-contractors or in the support phase, but these are usually modest in number in comparison to the money spent and employment per pound spent on a UK product.²¹

In 2009, the MoD stopped publishing official estimates of defence industrial employment in the UK. However, two major studies of the economic benefits of defence industries in the UK point to the strong positive economic consequences involved and Oxford Economics has also assessed the extensive contribution to the UK economy of BAE Systems alone. In the absence of any MoD data, the best figures are from the ADS industrial association, which were accepted by the ministry in its December 2017 Defence Industrial Policy document. The ADS 2016 report asserted that in the supply chain there were 142,000 direct defence sector jobs, with a further 111,000 indirect jobs.²² Defence spending on-shore clearly has an economic benefit.

In addition, there are some areas of the UK, notably Barrow, Preston and Blackburn, as well as Portsmouth, that depend heavily on the defence sector. Should that defence work disappear, empirical evidence from other parts of the UK that have suffered the loss of a key industry suggests that the damage done would take decades to recover. Towns such as Rochdale and Oldham have not yet recovered from the decline of the textile sector, while Stoke-on-Trent has not attracted industries to replace its coal mines and potteries. Some cities, such as Sheffield and Plymouth, have benefited from the growth of universities, and the presence of a large regional hospital can also be a source of reasonably paid employment. However, for many

19. The importance of operational advantage for the UK military being provided and enabled by an on-shore defence industrial base was made by two former UK defence ministers to the authors in an interview on 22 February 2018.

20. Authors' interview with a former senior US general, 5 February 2018.

21. Ministry of Defence, 'MoD Seals the Deal on Nine New Maritime Patrol Aircraft to Keep UK Safe', 11 July 2016; Ministry of Defence, 'MoD Orders New Fleet of Cutting-Edge Apache Helicopters for Army', 11 July 2016. Both articles put an emphasis on UK companies within the supply chain as sub-contractors and the possibility of future support and training arrangements, with the hope that they will support hundreds of jobs.

22. See, for instance, Oxford Economics, 'The Economic Case for Investing in the UK Defence Industry', Final Report, August 2009; Andrew Dorman, Matthew Uttley and Benedict Wilkinson, 'A Benefit, Not a Burden: The Security, Economic and Strategic Value of Britain's Defence Industry', Policy Institute at King's College London, April 2015; See also Oxford Economics, 'The Impact of BAE Systems on the UK Economy', 2015; ADS, 'UK Defence Outlook Report 2016'.

skilled defence people, most likely sources of alternative work would be found in other areas, requiring families to relocate, leaving behind under-used housing and other infrastructure.²³

Beyond employment, there are balance of trade issues that the authors feel unqualified to explore here, other than to point out that US State Department figures show a significant increase in defence imports of goods and services from the US to the UK, with an average of \$10 billion a year in real terms in the eleven years up to 2017.²⁴ If the Equipment Plan is to commit £18 billion per annum, this represents 40% of the spend on equipment and support.²⁵ With a defence budget growing only slowly in real terms, increasing reliance on imports must have an impact on the on-shore defence industrial base as well as issues for balance of trade.

It could also be argued that defence contracts have a series of economic consequences, some of which can be predicted with confidence and some which may be more difficult to calculate with precision. The most obvious and reliable is that, when a defence contract is placed with an on-shore business, depending on how much of that contract is delivered by the firm and its UK sub-contractors, the government receives tax revenues from those employed and the companies involved. Despite the government's reluctance to take account of this consideration in the defence industrial policy paper, the authors stand by the calculations made some years ago that the government receives more than 37% in tax revenues of the money it spent on the original contract when the good or service is generated entirely in the UK.²⁶ This figure makes no reference to the multiplier effects arising from employees' spending habits. This raises a question about government definitions of value for money, which include references to 'whole-life costs': should these be calculated as gross costs to the MoD or net costs to the government?²⁷ The latter would comprise money expended by the MoD less the consequential income and business tax received by the Treasury.²⁸

Given the MoD's responsibility to advance the 'prosperity agenda', it would seem reasonable to include this in assessments of value, especially for security-sensitive procurements excluded from any European pressure to conduct open Europe-wide competition. The authors recognise that the MoD does not directly benefit from Treasury tax revenues generated by its spending

23. See, for instance, NOMIS Official Labour Market Statistics, 'Labour Market Profile – Greater Manchester'.

24. US Department of State, 'World Military Expenditures and Arms Transfers 2017'; For the State Department's scope and methods, see <<https://www.state.gov/documents/organization/277040.pdf>>, accessed 14 January 2018.

25. Based on an exchange rate of \$1/£0.7204, as at 13 March 2018.

26. See, for instance, Taylor and Louth, 'The Destinations of the Defence Pound'.

27. See, for instance, the Office of Government Commerce, 'Value for Money Measurement: OGC Business Guidance', May 2004, para. 4.1.

28. In the case of the C-17 contract noted above, 50 UK jobs will be supported for a sum of about £25 million over the five years concerned. It is assumed that each job will cost around £100,000 which, in turn, implies tax revenues of more £8 million for the UK government. The remaining contract value will presumably be spent in the US.

in the UK and so, if a bureaucratic, stove-piped ministry culture prevailed, would be reluctant to take such revenues into account. However, recent governments have endorsed a whole-of-government, joined-up approach to security and the generation of prosperity. Future assessment schemes for competitive procurements could weigh on a bid's impact on UK tax revenues and employment. The government seems keen to explore this.²⁹

Broader Issues

Beyond the policy need for global influence, freedom of action and national prosperity, there are other issues that are pertinent to successful implementation of defence industrial strategy. Once a defence industrial capability to develop and produce complex systems in a specific field has been given up, rebuilding it is difficult, time consuming and risky. The problems experienced with the Astute submarine programme arising from the excessive running down of the Barrow workforce after the completion of the Trident programme illustrate this. The entry barriers in the form of required knowledge, skills and capital to would-be new entrants in major defence industrial areas, such as missiles, aircraft, warships, and even armoured vehicles, are extensive. Once a defence industrial capability is phased out by government, it cannot be easily or quickly reconstituted because the external security context has deteriorated. This is why, for instance, the US maintains a flow of work for its sole tank developer and producer, the government-owned General Dynamics-operated tank plant in Lima, Ohio.³⁰

It must be recognised that the risks of lost industrial capacity would be less important if the assumption is accepted that the UK will only ever want to conduct military operations that the US, as the obvious alternative supply source, recognises as also being in its national interest. However, although increasingly unlikely, it should be acknowledged that the UK might wish to operate independently of the US in its national interest, as it did to recover the Falkland Islands in 1982.

Moreover, a very senior UK official with much experience of transatlantic defence dealings once told one of the authors in a private conversation that 'the US will sell you anything you can make for yourself'. If valid, this puts the UK in a Catch-22 position that it may only be allowed access to the more advanced American technology if it retains the ability to develop its own systems. While this implies that an American company might on occasion offer a US system to prevent the development of a rival system in the UK or wider Europe, it is also reasonable simply to assume that Washington will be more relaxed about the release of highly advanced technologies to a country that already controls material of comparable sensitivity.

In simple terms, should defence industrial capability in the UK further erode, London's chances of securing access to the best technology of others will diminish. Linked to this, it should not be

29. Ministry of Defence, 'Industry for Defence and a Prosperous Britain', p. 16, para. 16.

30. Richard Sisk, 'Ohio Wins Again in Army's Budget for More M1 Abrams Tanks', *Military.com*; See also Carola Hoyos, 'The End of the British Tank', *Financial Times*, 31 May 2012.

assumed that the export version of any defence system has the same performance characteristics as that supplied to the originating country's armed forces.

IV. The Government as Prime Contractor for Military Capability

THE PAPER HAS so far considered the reasons for support of a strong defence industrial sector in light of the government's ambition for global influence, the weight it places on freedom of action, and the need of the MoD to support national prosperity. The authors' fundamental observation, from which other elements follow, is that the government in general, and the MoD in particular, should see itself as the programme director or prime contractor for defence capability generation. Prime contractors bear real responsibility, not least for the management of risks in the supply chains on which they depend, and as such they should hold very different viewpoints than those in a simple 'customer' role.¹ The authors acknowledge that this is a shift in thinking that has commercial implications.

Defence industrial strategy for a government has many parallels with programme and supply chain management for large manufacturing companies. Such companies procure many elements from outside their organisation, add value internally and generate product. Consequently, they pay extensive attention to monitoring and shaping the supply chains and networks on which they depend significantly for the quality and affordability of their existing products and their capacity for future improvement. Although they might seek external advice, such companies would not incur the financial, reputational and other risks of passing the management of their supply chains to a third party.

Similarly, a defence ministry buys goods and services on a large scale from outside bodies and undertakes additional activity within the governmental defence sectors to generate defence capabilities that it can then use if necessary on operations.² Even in the recent past, the MoD has defined force elements at readiness as defence outputs – or products.³ As noted, the authors estimate that the MoD spends more than 55% of its budget with the private sector.

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1. Tom Peck's report in *The Independent* on the prime minister's reaction to the collapse of the Carillion company exposed the extent that some in government feel that responsibility can be easily delegated: 'Theresa May patiently pointed out that the Government is a "customer of Carillion, not the manager", to which Jeremy Corbyn bellowed in response: "It's the Government who've been handing out contracts! It's the Government's responsibility to ensure Carillion is properly managed!"', Tom Peck, 'Sketch: Never Mind Carillion, Theresa May and Jeremy Corbyn are the Stocks to Short', *The Independent*, 17 January 2018.
 2. See, for instance, John Louth and Trevor Taylor, 'Beyond the Whole Force'.
 3. See, for instance, Ministry of Defence, *Annual Report and Accounts 2016–2017*.

Given the uncertainty and demands of defence, governments need to be interested not just in the day-to-day performance in terms of price and quality of their suppliers and their potential for future improvement, but also to be concerned about security of supply and the potential agility and adaptability of firms to respond to the unexpected. As noted, without a constant supply of goods and services, many defence equipment assets would quickly become unusable. To further complicate matters, the launch of a military operation can notably increase consumption rates of spares and the maintenance demands of equipment.

Supply chain management also requires an understanding of potential alternative sources of supply if one firm or link in the chain fails and a replacement cannot easily be found.

Therefore, supply chain management is much more than the control of storage, transport and inventory: the authors would define it as involving the collection and analysis of information that enables understanding of the performance, health and condition of the supply chain and the selection and implementation of measures to sustain and promote its health. It should be of additional importance in defence because of its market structures. Significantly, there is nothing like either a perfect or a free market in terms of advanced defence equipment and thus it cannot be assumed that a capable and responsive supplier will be available. Defence is dominated by a limited number of companies that have become national, regional or even global oligopolies in their sector(s), and their exports are tightly controlled by their governments. The US leads the way in terms of export controls through its International Traffic in Armaments Regulations and their application.⁴

In terms of equipment programmes, there are large entry barriers in terms of capital, knowledge and skills for firms that wish to enter an established, platform-centric defence market. The predominant story of defence firms in NATO since the 1950s has been one of liquidations and mergers and acquisitions, rather than new entrants. Moreover, defence firms have few incentives to develop major new projects without commitment and cash from governments, since these involve massive investment and long development periods to satisfy a single, governmental customer. Securing private finance for projects of that nature is difficult.

Overall, supply chain management is partially about performance specification and monitoring, but it also has a major focus on risk management: the identification of 'hazards' (things that could go wrong); the assessment and treatment of the likelihood and impact of such hazards; the specification and application of risk appetite; and the monitoring of the overall risk management system.

In brief, it could reasonably be asserted that defence industrial strategy is to a defence ministry what supply chain management is to a major manufacturing company, that is, critical to the delivery of organisational core objectives. It is encouraging that the December 2017 policy document at least hinted at MoD recognition of this point with its acknowledgment that

4. See, for instance, Richard Lamming, *Beyond Partnership: Strategies for Innovation and Lean Supply* (London: Prentice Hall, 1993). See, also, Gansler, *Democracy's Arsenal*, pp. 271, 319 and 340.

government needed more information about its supply chains.⁵ This requires a degree of open-book accounting and continual partnering reviews, which can be contentious, but this has been explored in previous defence programmes with some success.⁶

From this we would derive eight specific points to take the government policy articulated in December 2017 to the strategy level.

5. Ministry of Defence, 'Industry for Defence and a Prosperous Britain', pp. 14 and 18.

6. The CBRN Key Strategic Partnership and JAVELIN Support Contract for VC10 were both open-book partnering contracts. See John Louth, 'The Sum of its Parts?', pp. 6–11.

V. A UK Defence Industrial Strategy for 2018

A Commitment to Sustain and Strengthen On-Shore Defence Industrial Capabilities

IF THE UK aspires to be recognised as ‘strong, global, influential’, it needs access to a capable, assured and resilient supply chain for its armed forces that is visible to foreign governments as an indicator of the UK’s strength and freedom of action. Not least for the support of equipment, it needs much of that supply base to be national (irrespective of where businesses are ultimately headquartered) and for external sources of capability to be seen as very low risk. Countries that lack such a national base, but which require high-technology armed forces with advanced equipment, can use those forces over any extended period only with the permission and support of their supplying countries and companies. That is why Frank Kendall as the US Under Secretary of Defense for Acquisition, Technology and Logistics, has said that industry ... is part of our force structure. We are dependent on industry to perform and, if we don’t have a healthy industry, we don’t have a healthy force’.¹

It is the basis for the long-standing American concern with the health of its defence industrial sector. It is also why so many countries of ambition and optimism are seeking to develop their own defence industrial capabilities in development, production and support.

The UK, along with other EU states, may be seen as a country in relative decline compared with countries in East Asia and North America, given its declining share of the global economy and world defence expenditure. A senior US military officer told one of the authors that he viewed the role of the MoD was to manage the decline of UK power projection in a manner that met the needs of key allies. This is not a view that the UK government accepts, but significantly, even the view that the core role of the MoD is to manage the decline of British military power implies that the defence industrial sector should receive close care and attention.

The wider economic context is that there is considerable uncertainty relating to the economic and growth prospects of a country whose manufacturing sector has shrunk to just above 10% of GDP (with even that sustained by significant foreign investment, not least in the automobile and defence sectors). The result has been a large balance of trade deficit, decreasingly moderated by a surplus in services.

1. See, for instance, Center for Strategic and International Studies (CSIS), *Better Buying Power Initiative 2.0* (Washington, DC: CSIS, 2012).

In the light of the above, allowing further decline in the UK defence industrial sector, which traditionally generated a balance of trade surplus (the current position is less certain) would be a reckless economic step. The government needs to be nurturing, not neglecting, what remains of UK manufacturing.

At one level, this commitment can already be seen to be in place, as this parliamentary exchange between Williamson and Labour MP Diana Johnson in January 2018 reveals:

Diana Johnson Labour, Kingston upon Hull North: My constituents have raised with me the importance of sovereign capability – that is, retaining the ability to produce in this country the equipment that we need for our armed forces. What importance does the new Secretary of State put on that?

Gavin Williamson, Secretary of State for Defence: I put a great deal of importance on it. I want us, wherever we can, to purchase products that are manufactured here in Britain. We also have to look at manufacturing products that we can sell not just to the Ministry of Defence but right across the globe. The larger the product portfolio that we can sell to the Gulf, Europe and the United States, the better it will be for British industry.²

The size of the UK MoD market means it can support only domestic monopolies in many fields, and there is therefore a need to devise a means of securing efficient and motivated suppliers without requiring them to compete against each other. Arguably this has already been demonstrated in the complex weapons area where the MoD's British/European partner, MBDA, has produced a series of weapons (Storm Shadow, Dual-Mode Brimstone, ASRAAM and Meteor), working closely with government. The nature of long-term partnering between key businesses and government is at the heart of a successful on-shore defence industrial sector where joint-working and public–private collaboration outstrips the imperatives of continual competition.

In working with companies, the Single Source Regulatory Office (SSRO) can contribute from the position of a regulator and can clearly address sole source contracts with British companies, although it is not clear how it can interfere with contractual terms that have been agreed by the Defence Equipment and Support (DE&S) agency. More broadly, the government needs to recognise and build on the psychological drivers of corporate and individual performance, and not view its suppliers as driven only by transactional considerations. It needs, in short, to take advantage of the 'commitment to the mission' that the authors have observed among many contractors, partnered with MoD, and further to inspire and motivate the entire defence enterprise by underlining the importance of its work. The authors recognise that, for some MoD commercial officers accustomed to relying on the terms of a contract to assure corporate performance, this will be a radical change. However, the authors would point to countries that clearly punch above their weight in defence industrial performance, including Sweden, Singapore and Israel, where defence development is based on very close government–industry relations.

2. *Hansard*, House of Commons, 'Modernising Defence Programme', Volume 635, 25 January 2018.

The Right and Capacity to Sustain and Modify Imported Equipment

To preserve national freedom of action and the capacity to respond to the unexpected, the government should insist, as it recognised in 2005, that any purchases from overseas should also involve the technology transfer to allow the British firms using UK-cleared nationals to sustain and modify the equipment. Without this, the ability to adapt capabilities during periods of crises is lost to the UK as it is dependent upon another state's permissions. As a rule, should the supplying company or its government be unwilling to transfer the technology, the purchase should not proceed if UK higher-level policy ambitions remain in place.³

These proposals would be a trauma to many in government and seen as threatening the US relationship, but in fact they involve only practices and policies that are currently pursued by the US government itself: even the Brazilian Tucano basic trainer aircraft supplied by the US to Afghanistan are being manufactured under licence in the US. Washington would be the capital most affected and may not like a British stance of this nature, but it would surely understand it. The UK contract to support much of the electronic content of the F-35 at a government site in North Wales is encouraging,⁴ but UK capacity to modify the aircraft remains very limited.

Stress Collaborative Projects with Peer Partners

The UK is not alone in facing pressure from larger defence competitors, and collaborative development work needs to be emphasised as a means of pooling intellectual resources and reducing risk, securing up-front capital and enabling longer production runs. The government's recognition of this point should be welcomed.⁵ While Western European states will continue to form an obvious set of potential partners, there is properly growing recognition that countries such as Japan and Australia, and even South Korea and Singapore also have useful capital and technological alongside political compatibility. The BAE Systems and Rolls Royce link with Turkey on its emerging fighter programme is an exciting prospect marred only by President Recep Tayyip Erdogan's increasing authoritarianism.

Ideally, defence collaboration has the best chance of success when the partners are inter-dependent, which discourages damaging action by one because of how the other might well respond. Trying to collaborate with – or even buy directly from – the US, on the other hand, invariably means a relationship of dependence. This means that Washington would not, because it does not need to, ever put itself in a position where it would be vulnerable to restrictions imposed by an external state. Moreover, the history of collaborative projects with the US, going

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3. The arrangement with the US under which the UK leases Trident missiles for its nuclear deterrent is financially appealing, but would enable the US to significantly erode UK nuclear capability over a period of years if it withdrew consent for the continued supply of refurbished missiles.
 4. Defence Electronics and Components Agency, 'UK Wins Global F-35 Lightning II Support Work', 7 November 2016.
 5. Ministry of Defence, 'Industry for Defence and a Prosperous Britain', p. 13.

back to the Royal Navy's Joint Tactical Information Distribution System programme of the 1980s and 1990s,⁶ the 'Family of Weapons' initiative of former US Secretary of Defense William Perry, and the Tracer project with the UK,⁷ does not make for comfortable reading. Before launching into collaborative projects with the US, America's allies and industrial rivals need to ensure that they have their bargaining power well organised. Clearly, this is not an argument for reducing collaboration with the US, just dependence on it. If our policy stance is for dependence on the US, let us say so. But while our policy stance is for freedom of action, in logic, our collaborative arrangements with our allies must have independence of action as the key prize.

Design for Exports

The government has emphasised its enthusiasm for defence exports. To facilitate exports, British developed equipment should be specified in terms of potential export markets, with an upgrade route and plan so that the equipment capability can be quickly enhanced to meet specific UK operational needs.

The focus on export markets should include a government–commercial export exploitation plan at the design phase of a capability so that potential foreign governmental purchasers can inform an emerging defence solution within the home state. Defence equipment seldom sits on a shelf waiting for a purchaser; it is developed and delivered to order. Traditionally, UK defence equipment is in use by the armed forces before it is sold to third parties, usually through a government-to-government sale. What the authors suggest is that, through active campaigns, friendly governments can influence UK capability design with a view to importing British-made assets. This seems to be pertinent in relation to the Type 31e frigate element of the National Shipbuilding Strategy.

Competition Among Projects and Specifying Their Worth

The MoD should protect itself against poor corporate performance by specifying privately (but sharing the information on a confidential basis with the NAO) the maximum financial value of a project or system in terms of defence capability. Explanation of this point requires a note on how the system currently works.

Internally, the MoD, and within it the individual services, already runs implicitly a competition between projects: the many candidates for military requirements must be prioritised and win a place in the Equipment Plan. This competitive process is based on the cost forecasts that the MoD has conducted internally and on information from industry. What the MoD does not do is

6. National Audit Office, 'Ministry of Defence Major Projects Report 1996', p. 2, para. 1.3.

7. House of Commons, 'Tactical Reconnaissance Armoured Combat Equipment Requirement (TRACER)', Select Committee of Defence written evidence; Military Analysis Network, 'Future Scout and Cavalry System (FSCS), Tactical Reconnaissance Armoured Combat Equipment Requirement (TRACER), Armored Scout and Reconnaissance Vehicle (ASRV)'; Trevor Taylor, *Defence, Technology and International Integration* (London: Pinter, 1982), pp. 155–58.

work out the maximum that it would pay for the capability or system in question. It makes great efforts to ascertain the cost of a system, but it does not calculate the financial worth of a system to the MoD and the country. Sceptics might ask what either the *Dreadnought* programme or the F-35 would have to cost for the government to walk away from them.

This means that if money is spent but the anticipated costs of a system increases, the government tends to stay with the programme, not least because it has sunk cash into it and does not want to be accused of having wasted taxpayers' money. The SSRO may not be able to influence behaviours, either of government or industry, in this regard. Companies know this.

As a tool to incentivise companies and bring discipline to government spending, if the government pre-decided a maximum price that did not represent value to the MoD, it would know when it should stop pouring good money into a programme. This would also take into account that requirements can continue to evolve beyond the User Requirement and Systems' Requirements stages of acquisition. Such a value could be written into the contract as a review trigger.

Once a system was going to cost, and thereafter exceed, what the MoD had decided it was worth, the government would have at least three choices, one of which would be to cancel the project and dismiss the capabilities involved as unaffordable. However, rather than automatic cancellation, the MoD could adopt a system similar to the US Nunn-McCurdy mechanism.⁸ In a UK version, a programme that breached its limit could not be continued without scrutiny by both the NAO and the House of Commons Defence Select Committee, which would hold out the possibility of reputational damage to both the MoD and industry. The Select Committee would not be inclined towards automatic continuation of a programme as the overspend would have an impact on other programmes, perhaps of greater significance to UK defence. Neither government nor industry would relish this and so efficient working and a prudent rather than over-optimistic attitude to risk would be incentivised. Finally, the government could restart the contract with a revised requirement and consider excluding the original supplier from consideration.⁹

Clearly, there is limited scope for competition in several UK defence sectors, so the government needs some protection against the complacent contractor. Moving the emphasis to an ongoing competition for funded projects in the MoD's portfolio should at least be worthy of consideration.

Proactive Programme and Supply Chain Management Within a Complex Portfolio

Once the MoD has an authoritative and up-to-date view of its supply chain, and an intention to actively manage it through effective programme management competencies, it must also anticipate and accept the needs of elements of that supply chain for orders so that capability,

8. Moshe Schwartz and Charles V O'Connor, 'The Nunn-McCurdy Act: Background, Analysis, and Issues for Congress', R41293, Congressional Research Service, 12 May 2016.

9. See, for instance, Lamming, *Beyond Partnership*.

whether for development, manufacture, test or support, is sustained. This is a clear part of US behaviour, for instance regarding submarines and tanks and their respective supply chains. The availability of export orders can help with such issues, and companies must be encouraged to pursue opportunities (with government support). The Naval Shipbuilding Strategy was helpful in recognising the role of the Type 31 in sustaining the UK's ability to design and build surface combat vessels. However, its expectation that the UK's overall orders would be marked by 'peaks and troughs' rather than the 'drumbeat' endorsed for British shipbuilding by the Rand Corporation in the 1990s shows a reluctance to embrace sustained supply chain management responsibilities.¹⁰

The issue here is the difference between a ministry focused on policy writing and one structured to actively manage a strategic sector critical to the UK. Portfolio, programme, project and risk-management competencies are necessary to manage the complexities of a sector such as defence. Government must see itself as the defence enterprise systems' integrator and not merely a customer of businesses. This shift in mindset should help the MoD identify what skills it really requires at the top of the department. The authors' argument is that writing policy is a functional practice – although one seemingly prized by the MoD – but actively managing the defence enterprise (of which the principal component is in the private sector) is strategic and requires managerial, rather than policy-writing, competencies.

Sectors of Strategic Importance and Associated Aims of Industrial Strategy

An attempt at developing defence industrial strategy can struggle with the definition of specific areas of technology and capability that should be pursued. Here a logic chain can be offered to address this issue. There are certain technologies and capability areas where the UK needs leading-edge expertise, but which simply cannot be bought from other states: advanced cryptography; biological and chemical defences; and certain components within the UK deterrent, are leading candidate areas.

The rate of technological change will continue to have a major effect on the capabilities to sense and inform and command. The UK needs to be sufficiently advanced in a range of relevant technologies (secure communications and cyber; optical, infra-red and radar sensors; and signals intelligence) to stay ahead of potential adversaries. The technologies involved in these areas sometimes have origins in the civilian world, and certainly have applications there. So, industrial expertise in military systems is likely at least to offer opportunities for firms in the wider security space and even the purely civilian economy.

10. Ministry of Defence, 'National Shipbuilding Strategy: The Future of Naval Shipbuilding in the UK', 2017; Mark V Arena et al., *The United Kingdom's Naval Shipbuilding Industrial Base: The Next Fifteen Years* (Santa Monica, CA: RAND Corporation, 2005).

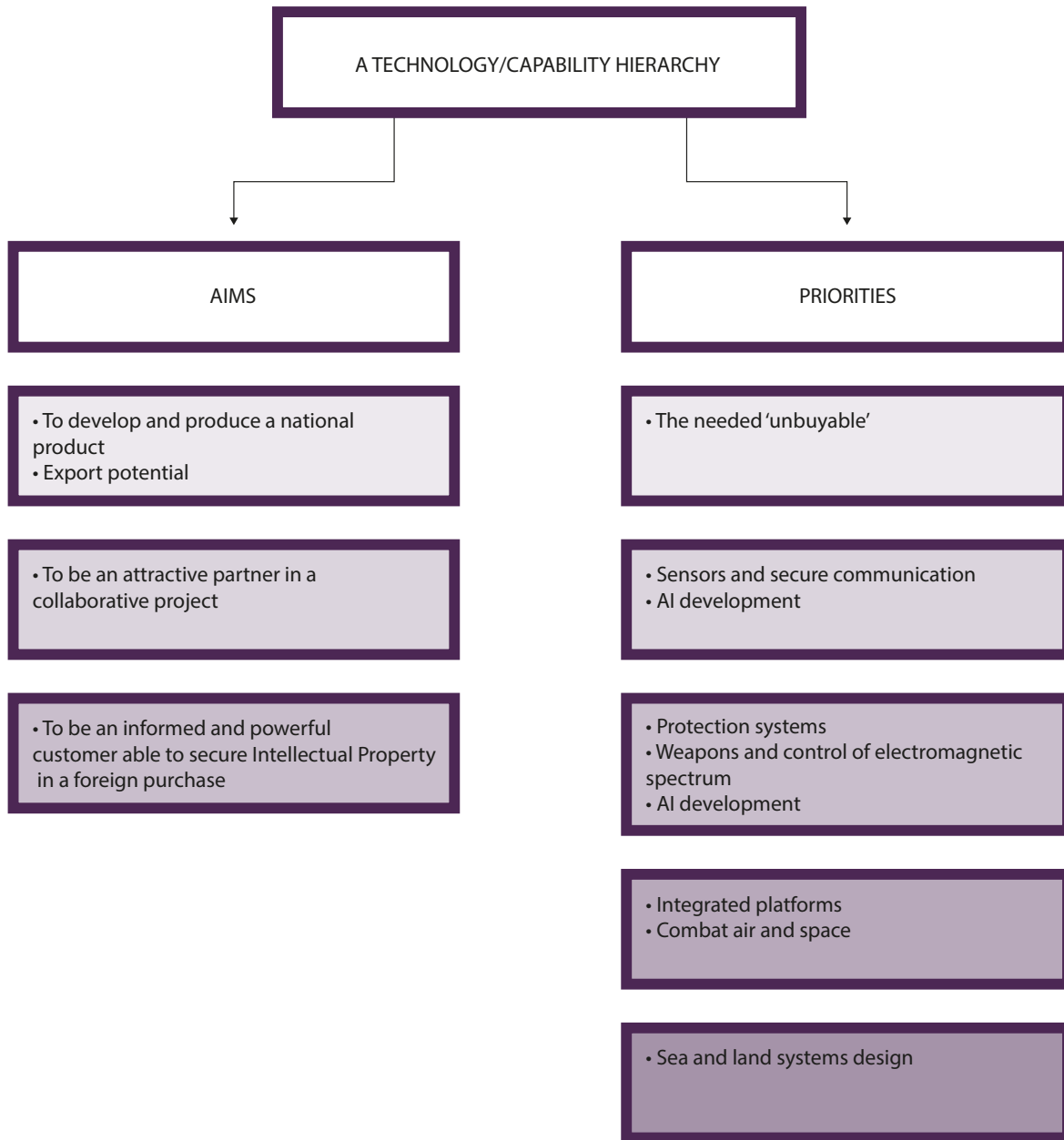
Similar reasoning applies to the need to prioritise the protection function, and thus domination of any potential adversary's control of the electronic magnetic spectrum should be a priority, along with active defences including missiles and lasers.

To control external dependence, the UK needs to maintain its expertise and production capacity in weapons, including small arms ammunition, and to build on the success of the complex weapons programme.

Sensors, communications equipment, active and passive defence, and weapons must all be integrated on to land and air platforms. Due to their complexity and the limited space available, these are the ones where the UK is most vulnerable to challenge and expense in getting its systems integrated on to a foreign platform. There are few positives from having excellent capabilities in these areas if foreign platform producers cannot be induced to integrate them on to their systems at an acceptance cost. The ability to develop and produce combat air platforms will be needed if the sensor and weapons sectors are to be protected from possible predatory activities by foreign firms and governments. The production of naval and land platforms is less sensitive, but a capacity for warship and armoured vehicle design obviously would reduce the risk of difficulty in getting UK sub-systems integrated on to the base platform. Shipbuilding and ship support are also based in sensitive UK areas as far as employment is concerned. Figure 1 summarises the aims and priorities for a defence industrial strategy, and references three levels of ambition.

The military and civilian exploitation of space for a range of purposes is set to advance, although this is where defence will need more attention due to Russian and Chinese interest in anti-satellite warfare. The maintenance and development of British satellite capacities has positive implications for both the military–security and civilian sectors.

The first addresses those areas where the UK should aspire to develop and possess national systems and sub-systems. The second covers those areas in which the UK would aim to possess capabilities to make it an influential and valued partner in collaborative projects with peers. The third comprises those areas where the UK needs the expertise to be an intelligent customer and the bargaining power to be able to buy intelligently from overseas and obtain the technology transfer needed for a 'sustain and modify' capability.

Figure 1: Aims and Priorities for Action

Source: Authors, March 2018.

Sector prioritisation echoes the call for an aviation/combat aircraft national industrial strategy to complement the national shipbuilding strategy. The authors would go further and suggest clear strategies covering land systems industrial strategy, cyber offensive/defensive strategy, complex weapons strategy, ground-based air defence strategy, and strategic communications strategy. Multiple-sector strategies such as these will have the advantage of matching strategic defence and security needs to regional hubs of excellence formed by the private sector with their partner universities and vocational colleges.

Commitment to Science and Technology Investment

The UK has begun to reinvigorate its defence innovation, but this is set against long-term reductions in defence S&T spending.¹¹ To compensate, the Defence Innovation Fund needs to be explicitly geared to leveraging the core S&T budget, the broader equipment plan, and complementary commercial R&D spending. The latter is virtuous in exploiting existing matured technologies. With commercial technologies, a key consideration regarding their adoption and adaption for defence is the speed of the acquisition system involved.

A step-change in innovation approach will require a readiness to acknowledge the risks inherent in true innovation and a change in risk appetite both within government and among those holding it to account. A return to more experimentation and demonstration should feature strongly in the new approach, allowing early failure, discovery and the ability to test relevance and applicability to military needs. Indeed, today's threat environment promotes adaptability and agility as the most prized characteristics for future capabilities. Leveraging the MoD's S&T investment, in the manner envisaged, requires several features or characteristics. These include:

- A commitment to institutional experimentation.
- The greater balance of investment across the technology spectrum.
- A focus on capability sustainment across the equipment plan.
- Flexible decision-making.

The above suggests that partnerships rooted in smart and adaptable contracts – between governments, across the public and private sectors and within supply chains – should be at the heart of the search for innovation and agility.

11. See, for instance, John Louth, Trevor Taylor and Andrew Tyler, 'Defence Innovation and the UK: Responding to the Risks Identified by the US Third Offset Strategy', *RUSI Occasional Papers* (July 2017).

Conclusions

FOLLOWING THE AUTHORS' diagnosis of the challenges and opportunities facing the UK government in deciding on a defence industrial strategy to deliver the stated policy, we suggest that such an approach should contain the following elements:

- A commitment to sustain and strengthen national, on-shore defence design, manufacturing and support capabilities in a partnership between the MoD and industry.
- A policy imperative to insist on the ability and technical know-how to modify imported equipment.
- An ambition to collaborate with peer partners on capability development.
- A commitment to design and develop UK capabilities overtly with exports in mind pre-manufacture.
- Competition among projects and the specification of their worth.
- Pro-active programme and supply chain management within a complex portfolio.
- Sector prioritisation across defence, focusing on critical strategic industrial sectors.
- The recognition that future defence capabilities remain technology-rich. A commitment, therefore, to an increase in funding of science and technology, especially in the pure research-phases of a development cycle, is critical. So too, is a change of culture to champion experimentation, adaptability and early adoption of disruptive technologies.

This analysis is based on the government's ambition to be strong, influential and global in world affairs and to be able to use its armed forces as it sees fit. It also reflects the obligation of the MoD to support the prosperity agenda. Industry is charged with delivering wider economic benefits to the UK, internationally recognised value for money and with meeting national security objectives. These eight points talk to that ambition.

There must be recognition that a defence budget of 2% of GDP might prove insufficient to resource current UK aspirations (to maintain a capable, credible and safe nuclear deterrent; to generate conventional forces able to deter a peer adversary and work alongside US forces from the first stage of a major conflict; to contribute to international stability on the global stage; and to be recognised as strong, global and influential). Specifying and even delivering on ambitious efficiency savings targets for the UK MoD might not change this core consideration. Nonetheless, the authors feel that the government's commitment to a strong defence sector to protect the country, project influence and promote prosperity merits a robust strategy for investing in, prioritising and actively managing the complex private sector portfolio of technologies, skills and capabilities that comprise a key element of the overall UK defence sector. It is hoped that this publication contributes to that intent.

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