HM Government

Defence and Security Industrial Strategy:

A strategic approach to the UK's defence and security industrial sectors.

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Defence and Security Industrial Strategy

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Foreword

Our Armed Forces stand ready to defend our country and its interests. We have set out through the Integrated Review and the Defence Command Paper 'Defence in a competitive age' the threats we face and how the UK will rise to those challenges. We will deter and if needed defeat these threats.

To do so, our forces require equipment which is state of the art. Just as we are refreshing what we require of our Armed Forces, we are reviewing the equipment they will need to face tomorrow's threats and setting out a path for innovation for the future.

We must not only ensure that our forces have the right kit and equipment, but that we maintain capabilities onshore to produce and support critical elements for our national security, and ensure that our supply chains are sustainable and resilient. Through targeted investments we can deliver not only the right equipment but can bolster the Union, deliver on levelling up and enhance the skills and prosperity of the United Kingdom. As we invest more than £85bn over the next four years in our defence equipment and support, we are determined to deliver not just for our Armed Forces but for the whole of the UK.

In addition to MOD and Armed Forces personnel, Defence alone already supports over 200,000 jobs directly and indirectly and tens of thousands of apprentices. Our defence and security industrial base is one of the many binding elements of our successful political union. A world class workforce is building everything from nuclear-powered submarines to advanced multi-role aircraft. We have frigates manufactured in Scotland, state-of-the-art satellites in Northern Ireland, next generation AJAX vehicles in Wales and Typhoons in England.

The UK is one of the largest defence exporters in the world and our industry's products, such as the Type 26 frigate, continue to drive export success and interoperability. Our wider security industry is also a world leader in exports (ranked third globally in 2019), and a hive of innovation, driven by small and medium sized enterprises based across the Union that are targeting a wide variety of domestic and international customers.

But for Global Britain to succeed we need to make more of these great strengths. So with our partners across government we have a vision to unlock the potential of the defence and security industries to make a virtue of the immense social value they bring to our nation.

This Defence and Security Industrial Strategy will see industry, government and academia working ever closer together to drive research, enhance investment and promote innovation. We will do so while fundamentally reforming the regulations that govern

defence and security procurement and single source contracts, improving the speed of acquisition and ensuring that we incentivise innovation and productivity.

We will continue to build on the strong links we enjoy with strategic suppliers to ensure we retain critical capabilities onshore and can offer compelling technology for international collaborations. We will bring our allies with us on this great journey, collectively staying one step ahead of our adversaries, and building mutual resilience.

With clear priorities for our international cooperation, we will make better use of our bilateral and multilateral links with NATO and others to create capability. And we will develop new commercial mechanisms to sell our great defence and security exports to our friends and allies around the world.

This is an ambitious plan to re-energise our defence and security sectors. A plan to treat this great industrial powerhouse as a strategic capability in its own right. A plan to spread opportunity across the nation. In a post-Covid world, we're sending out a powerful signal of Britain's determination to build back better and stronger.

Jeremy Quin MP

Minister for Defence Procurement

Rt Hon Ben Wallace MP

Secretary of State for Defence

Executive Summary

Addressing the Threat, Meeting our Responsibilities

As the Integrated Review sets out, the United Kingdom has a global role and global responsibilities. We are a Permanent Member of the United Nations, a leading member of the Commonwealth, a lynchpin member of NATO, and a vital contributor to wider European security, with enduring relationships to our Five Eyes partners and to our many friends and allies around the world.

As the Defence Command Paper makes clear, this global role requires us to retain Armed Forces equipped: to deter and where necessary defeat the military threats of the future; to be present and persistent; and to be agile and adaptable to the changing face of warfare and global engagement.

To do that, we need a sustainable defence industrial base to ensure that the UK has access to the most sensitive and operationally critical areas of capability for our national security, and that we maximise the economic potential of one of the most successful and innovative sectors of British industry. At the same time, and recognising the different characteristics of the wider security sector, we recognise the opportunities here to take similar approaches based on greater transparency, working together and better cross-government coordination to increase the impact of our support to the security sector too.

This Defence and Security Industrial Strategy (DSIS) aims to establish a more productive and strategic relationship between government and the defence and security industries. These critical industrial capabilities are a vital strategic asset in their own right, to which the government pays close attention to ensure we maintain our operational independence. In support of those industries, the government welcomes investment from overseas to build capacity, introduce new technology and techniques, and generate employment.

The MOD will invest a total of over £85bn on equipment and support in the next four years. This settlement brings stability to the defence programme and provides industry with the certainty they need to plan, invest and grow. Increased investment in R&D and close collaboration with industry will allow us to experiment and bring new and emerging capabilities more rapidly into service, creating military advantage and economic opportunity.

The DSIS is part of a broader, consistent, government drive to promote both our national security in its traditional sense, and the economic growth which both underpins and depends on that security. We want to ensure that the UK continues to have competitive, innovative and

world-class defence and security industries that underpin our national security, drive investment and prosperity across the Union, as well as contribute to strategic advantage through science and technology. We have a great opportunity now to set the conditions for achieving just that, as the DSIS is launched in the wider context of:

- The overall policy framework set out in the Integrated Review, setting out a fresh level of ambition for the UK, and determination to face the challenges of global systemic competition;

- The additional investment of £24bn in Defence over the next four years, and the plans for that investment that have been set out in the Defence Command Paper;

- Wider procurement reform, taking the opportunity to modernise and update regulations;

- Broader government policy changes (including the revised Green Book and new social value procurement policy) to promote economic growth that is distributed more equitably across the UK;

- New national security and investment legislation, increasing government's ability to investigate and where necessary intervene in mergers, acquisitions and other types of transactions that could threaten our national security.

These changes and the policies and programmes within the DSIS itself, set out in more detail below, represent a new opportunity for UK industry to establish a 'virtuous circle' in which:

- The substantial injection of new funding, including at least £6.6bn in Defence Research & Development over the next four years, directly generates growth and development of new technology, created and commercialised in the UK for strategic advantage;

- Companies, informed by government's clear statements of its national security needs, plans and technology priorities, and understanding better how government evaluates industry's offers, have the confidence to invest themselves in developing new technology, products and services and improving productivity;

- The government works more closely with industry to develop the equipment capability it needs, considers the export and international collaboration opportunities earlier, and supports industry more effectively (including where appropriate by entering government-to-government commercial agreements) to increase export market share still further, achieving economies of scale, sustaining the skills base…

…beginning the cycle again by encouraging further reinvestment in R&D, skills and equipment, driving productivity and competitiveness even further.

Creating Economic Prosperity, Bolstering the Union, Levelling Up

Just as the Armed Forces serve the interests of the whole United Kingdom, the defence industry is a truly Union-wide endeavour. MOD spending secures more than 200,000 direct and indirect jobs across the UK, while the industry's success in exports (with the UK being the world's second largest exporter of defence products) supports many thousands more.

Defence investment bolsters the Union, levels up the United Kingdom, enhances our skills base and makes a substantial contribution to national Research and Development.

Alongside the defence sector, the UK security industry has been a success story with significant sales growth in the last decade and export earnings of £7.2bn in 2019. Like the UK defence industry it has invested heavily in skills development offering some 3,000 apprenticeships a year[1] and is spread widely throughout the Union. The security sector though is far less concentrated (95% of it is represented by SMEs) and much less dependent on central government procurement. These different characteristics require different forms of engagement and support. The UK government will continue to support this highly competitive and innovative sector at home and in particular in helping identify and deliver on export opportunities overseas.

Industry as a strategic capability

Through the DSIS we will take a more strategic approach to industrial capability critical to our strategic and operational needs. While competition will remain an important tool to drive value for money in many areas and within supply chains, we need flexibility in our acquisition strategies to deliver and grow the onshore skills, technologies and capabilities we need, and we must ensure consistent consideration of the longer-term implications of the MOD's procurement decisions for military capability and the industry that produces and supports it.

Therefore, we are replacing the former policy of 'global competition by default' with a more flexible and nuanced approach which demands that we consciously assess the markets concerned, the technology we are seeking, our national security requirements, the opportunities to work with international partners, and the prosperity opportunities, before deciding the correct approach to through-life acquisition of a given capability.

This approach allows defence and security departments to use competition where appropriate, but also to establish where global competition at the prime level may be ineffective or incompatible with our national security requirements. In those situations another approach may be needed to secure the capability we need and to deliver long-term value for money, and we may for instance opt instead for long-term strategic partnerships. But in all cases, we will want to ensure that we are as transparent

[1] ADS figures for 2019: https://www.adsgroup.org.uk/facts/facts-figures-2020/

and inclusive as possible about our future plans and priorities.

While the DSIS sets out what we need onshore to meet our national security requirements, the UK defence and security industrial base will remain uniquely open to working with trusted allies and partners. Consistent with the HM Treasury Green Book, our defence and security procurements will take explicit account of the extent to which options contribute to well publicised social value policy priorities, and under our revised industrial participation policy we will encourage and support defence suppliers, whether headquartered here or overseas, to consider carefully what can be sourced from within the UK. But we will continue to welcome overseas-based companies and investment into the onshore industrial base, and will continue to work with international partners to co-develop and collaborate on new capability where our needs align; indeed, one of the changes inside the MOD will be to ensure that international collaborative opportunities are considered earlier and more systematically. We are also strengthening our safeguards against potential malign investment through new legislation, reassuring our partners that jointly developed technology will be protected.

In support of the government's vision, the DSIS delivers an ambitious agenda of policy change, reform and investment, across four main areas, set out below. The annex builds on this by setting out a clearer view of our national security requirements for the key segments, including specifying those which are 'strategic imperatives' to be provided onshore (nuclear, crypt key and offensive cyber), and indicating where, within other segments, there are substantive capabilities we will particularly seek to maintain in this country to maintain our operational independence. Where appropriate the segmental analysis is set alongside the government's investment decisions and plans (as per the Spending Review and detailed further in the Defence Command Paper) to illustrate in more detail some of the opportunities for industry.

Acquisition and Procurement Policy

The DSIS includes a package of legislative reform, policy changes and internal transformation that together will improve the speed and simplicity of procurement, provide more flexibility in how we procure and support capability, and stimulate innovation and technology exploitation. This package is particularly focused on MOD given its market-driving role as a customer, but it includes increasing transparency and improving communication with industry more broadly around the government's defence and security priorities. This includes strengthening relevant government-industry groups such as the Security and Resilience Growth Partnership, the Defence Suppliers Forum and the Defence Growth Partnership.

Other elements include:

- Reforming the Defence and Security Public Contracts Regulations as part of the broader government review of procurement regulations, not least to improve the pace and agility of acquisition and tailor it to better enable innovation.

- Reforming the Single Source Contracts Regulations to simplify the regime, speed up the contracting process and introduce new ways of incentivising suppliers to innovate, take risk and support government objectives.

- Building on progress made by the MOD's Acquisition and Approvals Transformation Portfolio, with a particular focus on category management, technology exploitation, cultural change and increasing the capability of the MOD's commercial function.

- Publishing a fresh MOD SME Action Plan to set out how the department will maximise opportunities for SMEs to do business with the MOD.

- Introducing Intellectual Property (IP) strategies into the MOD's acquisition processes for defence programmes to better incentivise and manage risk.

- Piloting a revised industrial participation policy for defence procurement, to promote onshore supply chain opportunities to companies bidding for MOD contracts.

Enhancing UK Productivity and Resilience

The DSIS aims to strengthen the productivity and resilience of the defence and security sectors, ensuring that the government is able to access the capabilities that it needs, whilst achieving greater prosperity for the UK through improvements in efficiency and productivity. This includes working with industry to understand the complex supply chains that underpin national security capabilities, and enhancing our ability to protect sensitive and advanced technology. Changes include:

- Building greater resilience in defence supply chains in particular by mapping the MOD's most critical supply chains and improving the reporting and management of risk across critical programmes, to ensure potential impacts on the delivery of MOD outputs are minimised.

- Enhancing the productivity and competitiveness of the UK's defence sector. This includes the MOD establishing a Defence Supply Chain Development and Innovation Programme.

- Developing the Joint Economic Data Hub, as well as the UK Defence Solutions Centre, to make better use of analytical tools and market data.

- Implementing the National Security and Investment Bill which will strengthen the UK's ability to investigate and where necessary intervene in mergers, acquisitions

and other transactions that could threaten our national security.

- Protecting defence supply chains and sensitive technologies from malign activity by working with suppliers to establish clear, effective processes which promote security in supply chains.

- Working with industry to nurture and develop relevant skills in the defence and security sectors, including through sharing expertise, and outreach and communication by defence and security departments to identify and attract potential talent.

Technology and 'pull-through'

Government, alongside industry and the defence and security sectors in particular, must understand the opportunities, implications and choices that arise from continuously evolving technological developments, and be able to access, develop and exploit new technologies at the pace of relevance to stay ahead of emerging threats. The increased investment of at least £6.6bn in defence R&D over the next four years will enable this, and we can build on it with clearer communication between industry and government, as well as the acquisition and procurement reforms mentioned above, to encourage innovation across the Union and stimulate further private and public investment.

Relevant elements include:

- Promoting greater government leadership and communication of future R&D and capability needs. The MOD will publish a new defence science and technology collaboration and engagement strategy, while the enhanced Security and Resilience Growth Partnership provides a forum for prioritised technology requirements and areas of interest from across the broader national security community to be communicated to the security industry.

- Developing an ambitious defence Artificial Intelligence (AI) strategy and investing in a defence AI centre to accelerate adoption of this transformative technology across the full spectrum of our capabilities and activities.

- Investment in Defence and Security Accelerator (DASA) challenges to identify innovative solutions to key challenges.

- Expanding the Defence Technology Exploitation Programme being piloted in Northern Ireland into a UK-wide initiative to support collaborative projects between SMEs and prime contractors.

- Supporting industry and Local Enterprise Partnerships in piloting a network of new Regional Defence and Security Clusters.

- Through the National Security Technology and Innovation Exchange (NSTIx), piloting a network of co-creation spaces that will bring together world-class expertise and specialist facilities from government, the private

sector and leading academic communities.

- With the Defence Suppliers Forum and academia, discussing what further access to government expertise, facilities and datasets industry and academia would need to access to accelerate development of new defence and security solutions.

International Cooperation, Exports and Foreign Investment

The Integrated Review described an increasingly contested and competitive global environment, in which the UK must play an active role in shaping the international order of the future and in strengthening international security. This includes cooperating with our allies and partners on the development of defence and security capabilities and associated trade and industrial issues.

Commercially however the same allies may often be supporting competitors for exports, and the DSIS also takes forward a renewed focus on delivering export success at every stage, from requirements definition to building cross-departmental packages and government-to-government commercial arrangements to deliver deals and ensure satisfied overseas customers will continue to seek the world-class products our industries can provide.

Changes include:

- Establishing clear priorities for international cooperation and export opportunities for the defence and security sectors and within MOD, with clear responsibilities for ensuring adaptability and collaboration opportunities are considered early enough in the MOD capability development process.

- Enhancing and diversifying our international strategic partnerships, making the most of our international links for capability development and enabling industrial cooperation, including through multilateral institutions like NATO, the UK's bilateral relationships, and groupings such as the National Technology and Industrial Base grouping with the US, Australia and Canada.

- Establishing a new government-to-government commercial mechanism for defence and security exports, and a renewed level of cross-departmental support for the defence and security sectors, led from the top by Ministers across MOD, the Home Office, DIT, BEIS and FCDO.

- A transformation programme by the Export Control Joint Unit to improve transparency and the customer experience for exporters.

- Establishing a Defence and Security Faculty as part of DIT's Export Academy, to give SMEs access to the regional, financial, and political expertise they need to maximise their chances of winning business overseas.

Context

The UK has a world-leading defence and security industrial base with a broad footprint across the UK. It underpins our national security and makes a significant contribution to the economy through jobs, skills, research and development, and exports.

The MOD alone spends around £20bn a year with UK industry which directly and indirectly supports over 200,000 jobs[2]. The settlement for defence announced as part of Spending Review 2020 provides the MOD with additional funding of over £24bn over the next four years, with at least £6.6bn being spent on R&D, creating further opportunity for industry across the UK in the coming years, with modernised platforms and weapon systems across all domains. The UK's defence and security industrial base plays a crucial role in maintaining the UK's global influence and ultimately ensures that the UK and its allies are able to access the capabilities needed to meet rapidly changing security challenges and to keep their citizens safe.

However, over the past decade, the UK's defence and security industrial base has been under pressure from a varied and complex set of challenges and, as a result, is at risk of losing ground to overseas competitors and potential adversaries. The most significant of these challenges include intense global competition and rapid geopolitical and technological change.

The pace of global technological change in particular is having a significant impact on the defence and security sectors. The far-reaching consequences of the 'Fourth Industrial Revolution', including the significant potential of greater automation, artificial intelligence and the importance of data in maximising capability mean that the UK's industrial base must adapt faster, ensuring that the UK and its allies are able to maintain advantage. Government and industry need to work together to identify the technology with most potential, exploit it and deliver it to the frontline, quicker than our potential adversaries– placing a premium on our shared ability to anticipate and adapt.

[2] https://www.gov.uk/government/statistics/mod-regional-expenditure-with-uk-industry-and-supported-employment-201920/mod-regional-expenditure-with-uk-industry-and-commerce-and-supported-employment-201920 - NB the employment figures here are provisional estimates and will be subject to future revisions in summer 2021.

Adapting to the new technological developments is important for much of UK industry if opportunities for growth are to be seized. But it is particularly pressing for these sectors on which we depend for our national security.

The re-emergence of intense competition between states is driving significant investment across the spectrum of defence and security capabilities. At the same time, non-state actors can access previously inaccessible technology, experimenting and adapting it to add to their tactics. Our national security and ability to successfully prosecute military operations therefore requires an assured industrial base that can adapt to both technological opportunity and rapidly evolving threats.

The UK is well placed to meet these challenges, and there are significant opportunities for the UK's defence and security industrial sectors in doing so. These can be best realised through a significant step change in the relationship between government and industry focused on a clear assessment of strategic needs, future priorities, and the realities of the market. As the Defence Command Paper ('Defence in a competitive age') notes, the government must integrate with its allies and partners, across domains and with industry to enable us to respond most effectively to the future operating environment.

The UK does not face these challenges alone. While we will compete with allies for business in the defence and security sectors just as much as elsewhere, the scale and complexity of national security capability development, and most modern defence equipment in particular, means that international partnerships and cooperation will remain essential to meet our mutual security goals.

The UK's defence and security sectors at a glance…

- The MOD spent a total of £20.3bn with UK industry and commerce in 2019/20 and will invest more than £85bn on equipment and support in the next four years.
- Over 200,000 jobs across the UK are supported as either a direct or indirect result of MOD expenditure with UK industry and commerce.
- The UK is the second largest exporter of defence equipment in the world (winning orders of £11bn in 2019). For security exports, sales were £7.2bn in 2019, putting the UK third in the world rankings.
- A minimum of £6.6bn will be invested in defence research and development over the next four years.

Our Vision for the UK's Defence and Security Industrial Sectors

It is in this context that we need a new Defence and Security Industrial Strategy (DSIS). Through this strategy, the government is determined to ensure that the UK continues to have competitive, innovative and world-class defence and security industries, that drive investment and prosperity, and which underpin our national security now and in the future.

This strategy is an opportunity to reset our relationship with industry, treating the defence and security industrial sectors as strategic capabilities in their own right. These industries not only supply the often highly sophisticated systems we need, but are crucial to our ability to continue to adapt to meet new challenges. The UK has world leading companies in these sectors and this strategy is aimed at maintaining that position, creating an environment where they can remain at the forefront of science, technology and innovation, harnessing novel and emerging technologies, to generate the cutting-edge capability we need to safeguard our national security and build strategic advantage through S&T.

Through a closer and more strategic partnership between government and industry, particularly in the capability and market segments that are most important to our national security, the government, and defence and security departments in particular, will build on these strengths and pursue new opportunities.

We will sustain and grow onshore industrial capability and skills for the future in those areas most critical to defence and security, supporting economic growth across the Union and improving the competitiveness of our companies in the global market. And in strengthening UK industrial capability we will maximise the benefits of international collaboration and the potential for exports.

In doing so however, we cannot and should not attempt to actively maintain industrial capability across all markets and capability areas, and there are areas where we will continue to rely on the global market or key allies for the supply of some defence and security goods and services at both prime and subcontract level. However, this strategy lays out what will be prioritised, including those areas of industrial capability we see as strategically or operationally important in terms of our national security.

Key to realising our vision is establishing a 'virtuous circle', where more transparency and clarity around government's future plans and procurement gives industry the confidence to invest in cutting-edge R&D

and innovation, leading to future technology and productivity gains. Then, through maximising the benefits of international cooperation and exports to achieve more effective capability development and economies of scale, we will sustain key skills in the UK and encourage further reinvestment in R&D, skills and equipment to drive increased productivity and enhanced competitiveness.

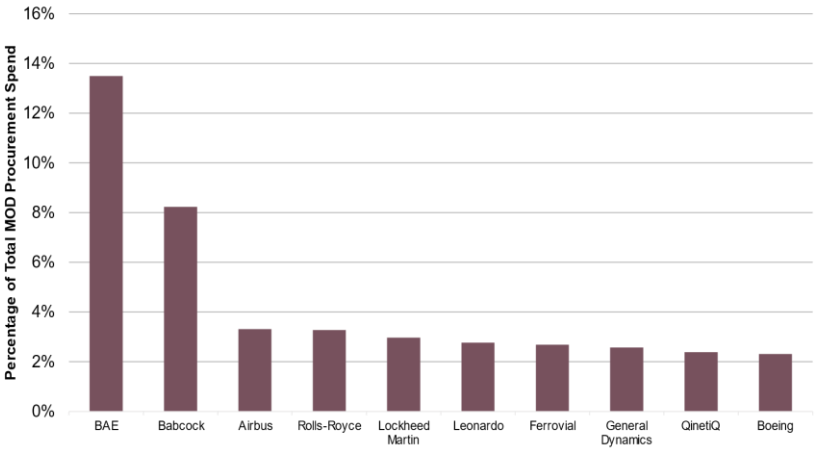
The government recognises that the impact of the COVID-19 pandemic has, in many cases across the economy, led businesses to cut back on research and development, training and other investments in future capacity and productivity. But notwithstanding this and the disproportionate impact on some linked areas of the economy including aerospace, the defence and security industries have a bright future. The UK will continue to spend over 2% of GDP on defence, is a global leader in defence exports, and before the pandemic the security industry was seeing impressive growth in revenue and exports too. By articulating where the government's priorities are for both sectors, we anticipate that companies will be better able to plan and invest for the future.

The sectors

This strategy takes a broad view of both the defence and security sectors and the relationship between government and industry in each. Though the sectors have some significant differences between them, many of the challenges are common and the changes in this strategy will address issues and increase the future potential for both sectors.

The **security sector** is highly diverse and made up of a relatively large proportion of Small-to-Medium sized Enterprises (SMEs) (95%)[3] providing goods and services to many different government departments and agencies as well as a wide range of private sector customers.

By contrast, the Ministry of Defence (MOD) is often the sole customer for many defence goods produced in the UK and can restrict or prevent companies from selling military and dual-use goods elsewhere. While the MOD has thousands of suppliers for a very wide range of goods and services, many of which would not naturally be considered military capability, the MOD typically procures defence equipment from a smaller number of much larger prime contractors capable of managing the complex financial, technological and engineering demands of delivering highly complex systems, with SMEs typically engaged in their supply chains[4].



[3] As estimated by RISC.

[4] In 2019/20, MOD paid some 13,000 different suppliers, but the top fifteen suppliers accounted for around half of the total procurement expenditure (source: 'MOD trade industry and contracts 2020', National Statistics publication 17 September 2020).

Internationally, states also frequently deviate from free market trade policies and invoke national security exemptions to restrict who can bid, and on what basis, to supply their defence equipment, often favouring national producers.

The levels of investment and access to existing intellectual property required for defence equipment, and the unusual and bespoke facilities sometimes required, can also often create high barriers to entry for new suppliers. This can make it challenging to secure value for money and encourage innovation, and can limit the scope for meaningful competition at prime level.

As a result, government policy has a far more market shaping effect on the UK's defence industry than its security sectors. Therefore, some changes in this strategy are focused solely on the defence sector and the MOD due to its unique and market shaping relationship with the defence sector.

However, despite the differences, government retains an important role as a market enabler for the security sector. Within both the defence and security sectors, there are market segments and specific capability areas which require different approaches.

Overall, this strategy sets out what those different approaches are and how the government will achieve this vision for the defence and security industrial sectors through a package of policies to revitalise the industrial base and the relationship between government and industry in these sectors.

The security sector

There is no exclusive definition of the security sector, but in this document it is taken to include critical national infrastructure protection, cyber security, policing and counter-terrorism, major event security, border security, offender management, and services including consultancy, training, guarding and risk analysis.

In the UK, around 6000 UK security companies are represented through their trade associations by RISC, the UK's Security and Resilience Industry Suppliers Community, which was founded by the trade associations ADS, techUK, and BSIA, in co-operation with the Home Office, in 2007.

Its customer base is similarly diverse, including central government, infrastructure providers (from urban developments to critical national infrastructure, both public and private), first responders, border security, major events security and transport security. It was growing rapidly pre-COVID-19, with a 67% increase in turnover 2014-19.

To realise this vision, this strategy will drive through a range of changes to:

- Foster an innovative, thriving and globally competitive UK defence and security industrial base that can provide value for money in the goods and services government buys.
- Ensure we can effectively acquire and maintain the defence and security capabilities that we need now and in the future.
- Establish a closer, more transparent working relationship between government and industry.
- Encourage diversity in defence and security supply chains, including by reducing barriers to entry for smaller businesses to encourage competition and innovation.
- Grow and improve the diversity of the people and skillsets within government and industry.
- Provide greater clarity on our future requirements and technology priorities which show most potential for national security application, working with industry to promote greater 'pull through' of these technologies into deployable national security capabilities, while contributing to the UK's strategic advantage through S&T.
- Set out our approach to international cooperation on defence and security, including working collaboratively across government and with industry on: exports; developing our strategic industrial relationships with key allies and partners; and encouraging foreign investment whilst protecting and maintaining control over our most sensitive technologies.

To achieve these aims, this strategy delivers change across four main areas (discussed in more detail in the following chapters). It:

1. Ensures that defence and security departments' approaches to **acquisition and procurement** are effective and fit for purpose. This includes providing clarity on where onshore capability is required for reasons of national security and how best government can work with industry to sustain industrial capability across those areas. It entails moving away from a policy of 'competition by default' to a more flexible and nuanced approach that allows us to use competition where appropriate, or opt for strategic partnerships with industry for certain **capability and technology segments**, particularly where this model enhances our ability to meet our national security requirements. It includes launching reform of the regulations covering defence & security public contracts to ensure these regulations are appropriate given the current context and the pace of change we are experiencing. And it also includes taking explicit account of 'social value' in competitive tenders.

2. Strengthens the **productivity and resilience** of the defence and security sectors. This includes changing the way that government and industry work together in a more sophisticated and strategic relationship, understanding the complex supply chains that underpin national security capabilities, protecting technology, and helping promote UK opportunities to overseas suppliers bidding into the UK for MOD contracts.

3. Signals our requirements and where the government will make **future investment in key technologies**. This includes making changes to promote greater 'pull through' of investment in research and development into deployable national security capabilities for the future while contributing to the UK's strategic advantage through S&T. In doing so we will seek to maintain the UK's leading role in international capability development, whilst staying ahead of potential adversaries.

4. Sets out our approach to **international cooperation, exports and foreign investment**. This includes establishing clear priorities for international cooperation and export opportunities, whilst adopting more of a coherent 'TeamUK' approach between government departments and industry in the pursuit of international success – including government being much more ready to take on responsibility for delivery through government-to-government (G2G) commercial agreements.

Defence and Security Capability and Technology Segments

Developing and maintaining military equipment and national security capabilities requires access to skills and technologies that may reside within government, in industry, or in academia. Within the defence and security sectors this is sometimes referred to as the 'industrial and technology base'[5]. This DSIS takes a strategic view in setting out the areas of our industrial and technology base where we need to pursue different approaches to meet our most critical national security requirements. This chapter sets out our overall approach based on closer and more strategic partnerships between government and industry in the capability and market segments that are most important to us. In doing so, we categorise these segments under new headings, including specifying which are 'strategic imperatives' and those in which we need 'operational independence'. A more detailed segment-by-segment breakdown is included as an annex towards the end of this strategy.

If the UK's industrial and technology base is to continue to be successful, it must be able to adapt to the challenges of the future by continuously evolving to respond to emergent technologies, adopt smarter and more agile business practices, and provide innovative solutions to meet national security challenges.

In some cases, government can have a simple transactional relationship with the industrial base, buying commodity items with a high degree of confidence that the market will provide them when needed. But the dysfunctions in global defence markets, the understandable concern of governments to control who has access to equipment capability produced in their

[5] This should not be confused with the US usage of 'National Technology and Industrial Base', which is defined in US law as 'the persons and organizations that are engaged in research, development, production, integration, services, or information technology activities conducted within the United States, the United Kingdom of Great Britain and Northern Ireland, Australia, and Canada' https://www.law.cornell.edu/uscode/text/10/2500

territories and for what purpose, and the dangerous consequences of not being able to acquire and operate national security capabilities as we choose in a crisis, means that all states will consider carefully how they assure their access to those capabilities (and ensure they are not compromised or used against them by others).

There are different techniques available for capability assurance, including having excellent test & evaluation capabilities to confirm that equipment will indeed perform as intended, whether on delivery or post operational modification; stockpiling against the risk of any supply disruption; or cooperating with allies to ensure that mutual assistance can be provided in times of crisis. But many states with domestic defence industries conclude that certain industrial capabilities are so important they must be maintained onshore. Increasingly, other states that previously were happy to rely on imports now also wish to develop their own industries onshore to be able to deliver similar assurance.

The defence and security industries are a strategic capability in their own right and across the UK's industrial and technology base there are specific industrial capability segments that are particularly important for our national security. Some of these segments require specific capability segment strategies to sustain industrial capabilities and protect operational independence, while others will require a close HMG-industry relationship to adapt to the opportunities of the future.

UK Industrial Capability Policy & Priorities

The 2012 White Paper used concepts of Operational Advantage and Freedom of Action to guide when open global competition might not apply, but the link between national security requirements and procurement strategies may not be so straightforward, and the concepts have proved difficult to apply in practice. Instead, in considering what are the industrial capability priorities to be maintained onshore, the concepts of **Strategic Imperatives** and **Operational Independence** have been applied.

Strategic imperatives

There are areas of industrial capability which are so fundamental to our national security, and/or where international law and treaties limit what we can obtain from overseas, that we must sustain the majority of the industrial capability onshore.

For instance, the ultimate guarantee of our national security is nuclear deterrence which relies on us having a credible nuclear capability to deter the most extreme threats to the UK and our Allies. As such, there can be no risk to our ability to deploy this without interference. The Treaty on the Non-Proliferation of Nuclear Weapons prohibits nuclear weapons states from transferring nuclear weapons to other states, including other nuclear weapons states. Therefore, while we can acquire the ballistic missiles from the US, the **warheads** themselves must be produced in the UK. In addition, maintaining the integrity of the broader

platform and system that protects it is essential: all those capabilities unique to **submarines** and their nuclear reactor plants need to be retained in the UK, to enable their design, development, build, support, operation and decommissioning.

More generally, the government needs to ensure that it can protect its national secrets and ensure that material marked 'UK eyes only' is indeed not compromised by other states. Accordingly, the UK needs to maintain a national **cryptography** capability. Furthermore, there is an absolute requirement to respond to the contested nature of cyberspace by developing our national **Offensive Cyber** capabilities. Offensive Cyber offers the UK a range of national flexible, scalable and de-escalatory measures that will help us to maintain strategic advantage. We must continue to nurture our international partnerships on cyber whilst maintaining onshore capability.

Accordingly, **nuclear deterrence capabilities, submarines, cryptography and offensive cyber** are **strategic imperatives:** there are no safe, credible and/or legal ways to meet our security needs otherwise**.**

Operational independence

Elsewhere, there are other areas which include particular aspects that historically we have placed a high priority on maintaining within the UK, particularly to ensure we can **continue to conduct military operations as we choose without external political interference, and to protect the sensitive technologies that underpin those capabilities**. Delivering this operational independence is significantly more than just ensuring delivery of ongoing contracts which might be interrupted should overseas governments object to the UK's policy and operations; it also includes: the ability to respond to (by definition unforeseen) urgent requirements arising during operations, where systems engineering skills and design knowledge must be available; and the support of in-service equipment. Our operational independence will increasingly be shaped by our access and ability to share data with industry and across systems in consistent way, enabled by the Digital Backbone.

This operational independence is not the same as 'procurement independence' – or total reliance on national supply of all elements. Since the end of the Cold War, the UK has not sought to maintain a full spectrum of industrial capability onshore, and has increasingly partnered or imported, from the US in particular, where that had cost advantages and/or secured access to technology that was not available domestically. But the importance of operational independence was reflected in the previously developed

strategies and partnerships for **combat air, maritime, complex weapons and general munitions**. Even in these narrower areas past governments did not seek to maintain procurement independence, and indeed in some areas made major investments in others' programmes (not least F35); but these developed strategies sought to maintain onshore the most significant aspects – typically around systems integration, upgrades, manufacture of the most critical components, and testing and evaluation – to ensure operational independence. Under the DSIS, the implications for operational independence of decisions which affect industrial capabilities will be explicitly evaluated in acquisition-related decisions.

The previously mentioned MOD strategies, and analogous work across government on cyber and space, emerged due to particular pressures in those segments at different periods, but cumulatively they have underlined that the 2012 policy of global competition by default, and the application of the Technology Advantage exception, did not reflect the complexity of the factors in play in defence and security industrial strategy.

The DSIS review has been an opportunity to both review these previous 'exceptional' approaches but also consider how best to ensure operational independence across a much broader range of segments, including the national security industry, against a common framework. This approach took into account future requirements; industrial capability health; the current state of the global market; and, adoption of technology, as well as international and prosperity aspects.

The results have demonstrated which capability segments need more or sustained deliberate approaches across the portfolio of acquisition programmes and set Industrial Capability Priorities. These will be reviewed regularly to inform capability planning and investment processes, with departmental investment appraisal committees responsible for holding Capability Sponsors (e.g. MOD Capability Directors) to account for implementation within their portfolios of responsibility, working closely with procurement and commercial teams. In some cases, we intend, as set out in the annex, to develop further specific segment industrial strategies (e.g. for air platform protection), which will be published as they mature, assuming that we have been able to work successfully with industry to develop a value-for-money proposition that delivers our objectives.

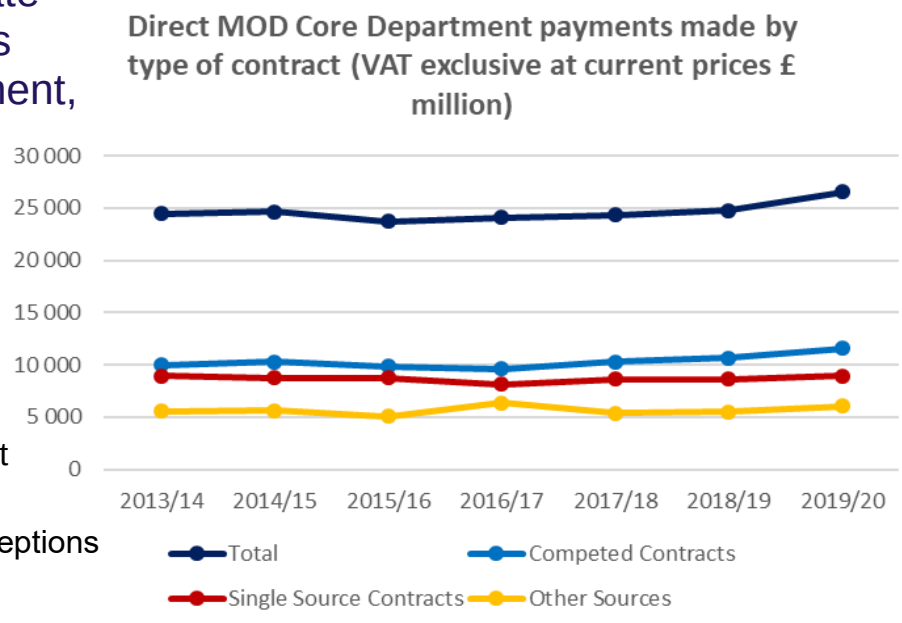
Building on the DSIS, the MOD will review its **Assured Capability Policy** to ensure that we continue to understand the effectiveness and vulnerabilities of technology and capabilities throughout the development, in-service life and export processes, to ensure that the UK defence and security capabilities are protected and we maintain our battle-winning edge.

Acquisition and Procurement Policy

The government's defence and security industrial policy and our approach to acquisition will now be based on a more sophisticated consideration of our national security requirements and the reality of the markets in which we operate, rather than an assumption that global competition is always the best way to meet our needs. Therefore, as well as being clearer on our respective approaches to different capability and technology segments, we must update our overall policy towards acquisition and procurement, as well as setting out what progress national security departments are making on reform in important areas.

The 2012 White Paper 'National Security through Technology'[6] set a policy of 'global competition by default', envisaging only rare exceptions when particular national security concerns applied, at which point single source arrangements would be used. In practice, a more nuanced approach has often been taken, with single source procurement making up a significant percentage (c.35% or some £8bn a year) of the value of MOD contracts signed each year.

This expenditure includes the whole of MOD's procurement (including goods and services from non-defence companies including facilities management and business services), so in practice the majority of MOD's expenditure with the defence industry as it would generally be understood is single-source.



[6] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/27390/cm8278.pdf

This departure from the stated ‘default’ of global competition is partly because in many of the segments in which national security concerns are most acute (as set out in the segments annex) the systems are complex and costly and only within the scope of a very limited number of companies. Therefore, global competition is often not possible or inappropriate, as there are too few companies able to deliver projects and those projects are too infrequent to sustain domestic competition beyond the short term.

At the same time, in some other segments, even where particular national security concerns apply, global and domestic competition has remained viable at the prime contractor level. For example, many security markets function effectively and global competition continues to deliver long-term value for money, and some shipbuilding has been competed domestically in the last decade.

The need for a different approach to the 2012 policy has been previously acknowledged through some more narrowly defined defence sectoral strategies, like the National Shipbuilding and Combat Air strategies, and some broader security-related strategies (e.g. the National Cyber Security Strategy, the Security Exports Strategy and the Aviation Security Strategy). Within the defence sector, other existing strategic partnerships (e.g. with MBDA for complex weapons, and BAE Systems for general munitions) have endured and evolved. This DSIS pulls together these individual areas and puts them in a broader context, and updates our overall policy for these new circumstances.

Accordingly, the ‘global competition by default’ policy will now be replaced with a much more sophisticated and nuanced approach based on understanding the markets concerned, the technology we are seeking, our national security requirements, the opportunities to work with international partners and the prosperity opportunities, before deciding the correct approach to through-life acquisition of a given capability.

This will mean that industrial consequences and commercial strategies will need more case-by-case consideration in future procurement decisions. However, this does not mean we cannot give industry clarity on the strategic picture. Rather than leaving the biggest decisions to individual projects, the DSIS approach includes consciously deciding and communicating now those areas of particular strategic and operational importance, where we need to sustain industrial capability onshore in the UK, as well as specifying where we will continue to reap the benefits of global competition or collaboration. These details are set out in the segments annex.

In all cases, we will of course conduct our procurements consistent with relevant international legal obligations and UK procurement regulation.

As part of this strategy, we need to promote a more collaborative approach between government and industry to improve the way that defence and security departments acquire goods and services.

There is significant enthusiasm for a more strategic and collegiate relationship across both government and industry in both the defence and security sectors. There is much work already underway to improve the way that departments acquire the equipment and capabilities that they need. This is particularly true of the MOD which in recent years has launched a set of transformation and reform initiatives to improve the way it works with industry.

Through this strategy the government will build on these existing efforts to reform approaches to acquisition in defence and security departments and, in doing so, will drive change through a package of policy, process and legislative reform delivered with renewed energy and commitment from both government and industry. We will enable these changes by working with our acquisition communities to drive empowerment, collaboration, professionalisation and effective management of risks.

Through this package of change we will aim to ensure we have acquisition systems that:

- **Improve the speed and simplicity of procurements and upgrades**, underpinned by streamlined processes and empowered teams, to reduce timescales and processes for introducing and upgrading capability.
- **Provide more choice and flexibility** in how we procure and support capabilities, in response to the needs of each capability segment and the status of the market that these segments need to access.
- **Stimulate innovation and exploit technology** through procurement to unlock value from new suppliers, increase responsiveness to technological change and enable our capabilities to remain current whilst they are in service.

Accordingly, defence and security departments will implement reform across a number of areas relating to our policies and processes around acquisition and procurement including those set out in the following pages.

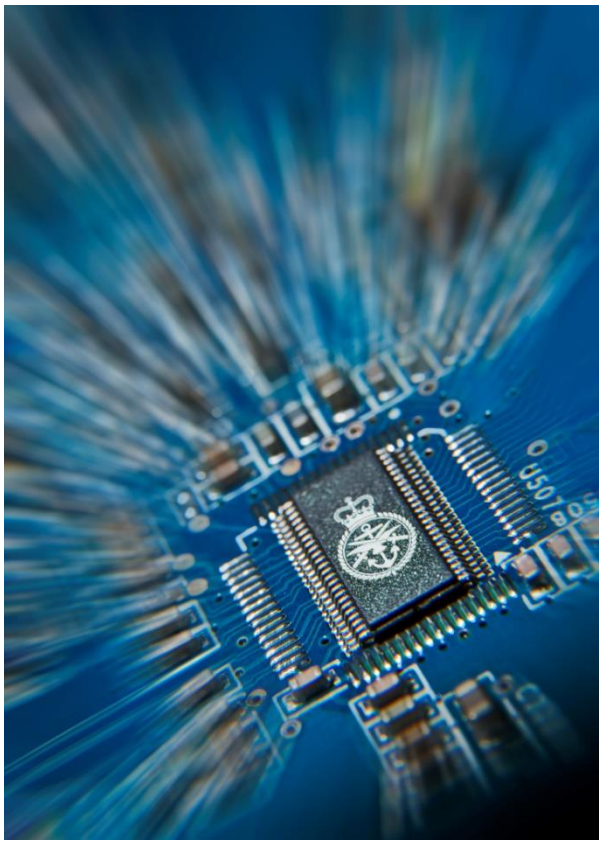
Reforming the Defence and Security Public Contracts Regulations and Single Source Contracts Regulations

The UK's departure from the European Union provides an opportunity to reform the Defence and Security Public Contracts Regulations (2011) (DSPCR) which are derived from an EU Directive and control defence and sensitive security procurement in the public sector. A significant proportion of MOD's procurement is conducted under this regime.

The MOD has embarked on an ambitious and comprehensive review of the DSPCR as part of the broader government review of procurement regulations. The Cabinet Office has published a Green Paper on Transforming Public Procurement[7] which aims to speed up and simplify procurement processes and place value for money at their heart. Through this we will improve the pace and agility of acquisition, simplify the regulatory framework, tailor it to better enable innovation and support the pull through of new technology into defence and security capability.

The Green Paper includes a proposal to rationalise and clarify the parallel rules in the Public Contracts Regulations and DSPCR (and other regulations governing competitive public procurement), replacing them all with a single uniform set of rules. This would be supplemented with defence and security sector-specific rules where these are required to protect our national security interest or our industrial base.

The MOD has also been undertaking a **comprehensive review of the Single Source Contract Regulations**, focusing on simplifying the regime, speeding up the contracting process and introducing new ways of incentivising suppliers to innovate and support government objectives. These reforms will be designed to ensure that we have a sustainable supply base that is capable of meeting the UK's needs in a rapidly changing world.



[7] https://www.gov.uk/government/consultations/green-paper-transforming-public-procurement

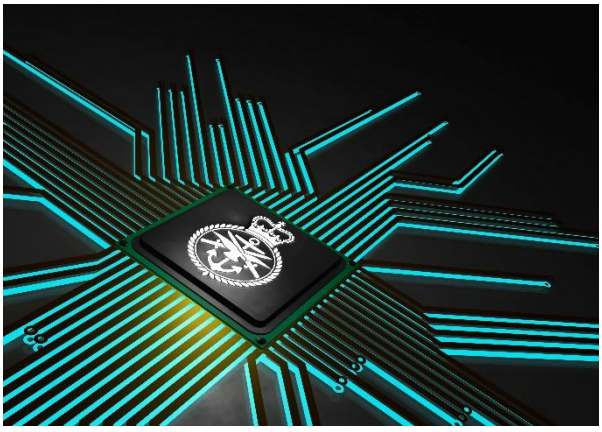
To do this, we will ensure that the regulations allow us to avoid paying unjustifiably low or high profit rates for single source contracts. We will also look at the range of profit rates we can pay on existing single source work to ensure that they properly reflect risk and market conditions across the breadth of what we buy. We will also ensure that we can use profit to properly incentivise suppliers to support delivery of the government priorities set out in this strategy.

The effect of these changes would mean suppliers can earn higher profits where there is a significant transfer of risk, or they achieve outstanding performance against contract deliverables or wider government priorities. Conversely the profit rate available for low risk work or less challenging performance would be lower. Using profit on single-source contracts to incentivise world-class performance and innovation will improve the sustainability and long-term competitiveness of the UK defence industry.

At the same time, we intend to reduce the administrative burden on industry by ensuring that suppliers are only required to produce the information the MOD needs, and we will be clear about what that information will be used for. We also intend to change the regulations so that they can be sensibly applied to a wider range of contracts, including introducing new ways of determining a fair price for goods or services sold in open markets. And we will adapt the regulations to cater for new contracting approaches such as co-funding research into cutting-edge technologies.

Combined, these changes would ensure that the single source regulatory framework for single-source contracts supports long term sustainability of the UK defence sector by driving high performance and innovation.

MOD will publish a Command Paper later this year setting out in more detail the policy proposals for reforming the SSCRs and the legislative and other mechanisms by which these reforms will be implemented, and are already engaging industry on this through the Defence Industry Council and the Defence Suppliers Forum.



Acquisition Transformation

The MOD will build on progress made through its Acquisition and Approvals Transformation Portfolio, whilst focusing on the following key areas:

- **Category Management** – the MOD is building on the early adoption of Category Management arrangements to increase co-ordination across Defence in the acquisition of capability, goods and services. By leveraging pan-Defence expertise and demand, and by adopting a more joined-up and strategic approach to how we set requirements and leverage the market the department will drive better value for money, deliver capability quicker, and reduce duplication of effort. Through Category Management, the MOD will have more influence on the market, improving how we utilise industry by providing a unified front when dealing with key suppliers.

- **Technology Exploitation** – increasing the pace and agility of the MOD's acquisition processes to enable the effective pull-through of emergent technology and the delivery of capability while it is still technologically relevant. As part of this, the MOD is exploring ways to involve industry partners earlier in the development and procurement processes, to ensure we benefit from innovation and new technology, with greater industry involvement in the development of requirements and end specifications.

- **Cultural Change** – recognising the importance of culture and behaviours within relevant departmental teams to the effective transformation of acquisition. We have already upgraded our investment decision making process, establishing an earlier decision point to better set up programmes for success. The evidence required to support approvals decisions is being made more proportionate to the risk and complexity of cases. By introducing 'Appropriate Risk' and 'One Team' approaches, we are empowering programme teams to tailor acquisition and approvals routes to reflect the level of complexity and risk of each programme, whilst also encouraging collaborative working across organisational and functional boundaries, as well as with industry, to shape programmes from an earlier stage in the acquisition process.

- **Continuing to increase the capability of the commercial function:** defence and security departments have increased the capacity and capability of their commercial functions. Departments will continue to invest in the commercial expertise required to support the delivery of this strategy, for example, by ensuing our teams can assess markets in which we operate in a more sophisticated way and by continuing to develop teams capable of contracting for open systems in an agile way.

MOD-Industry Engagement

There are a variety of existing fora for engagement between MOD and industry and academia, involving other government departments including BEIS and DIT as appropriate, outside of specific commercial arrangements and partnerships. We will build on these by:

- **Increasing transparency and improving communication of longer-term government priorities, requirements and pipelines,** identified through cross-government collaboration and the development of 'road maps' for the pull through of projects. As noted below, this is important for all security focused departments not just the MOD.

- **Driving implementation of the MOD Strategic Partnering Programme** (SPP) to enable greater collaboration with industry and using it to support implementation of this strategy with our strategic suppliers. The SPP aims to unlock mutual benefit, improve value to UK society, and underpin long term economic prosperity and was recognised by the Chartered Institute of Procurement and Supply as the "Best Supplier Relationship Initiative" in their 2020 awards.

- **Refreshing MOD's commitment to SMEs and reducing barriers to entry:** the MOD has undertaken a wide-ranging review of its procurement practices to encourage more SME participation in defence procurement with SME spend already improving from 13.5% in Financial Year 16/17 to 19.3% in Financial Year 18/19. The MOD will publish a refreshed SME Action Plan which will set out how we will further improve access to opportunities for SMEs to do business with the department.

- **Strengthening the Defence Suppliers Forum (DSF)** as the primary MOD-industry engagement mechanism on strategic topics. We will maintain a balance of industry representation to ensure that primes, mid-tiers (who form a vital part of the defence supply-chain) and SMEs have a voice in the development of our approach to the UK defence sector. This includes the creation of a DSF SME Working Group alongside the other existing DSF groups and the SME Forum chaired by the Minister for Defence Procurement. The DSF will drive a common focus on the challenges ahead, including supporting a sustainable future for the defence industry, and its role in supporting the delivery of this strategy and the defence and security industries' contribution to broader national economic success. To support this, we will revisit the *'DSF vision 2025'* and its key supporting deliverables.

- At the same time, and jointly with industry, the MOD will conduct a strategic review of the **Defence Growth Partnership**'s work on exports and economic growth, and strengthen links with other sector groups such as the Aerospace Growth Partnership, and related bodies such as the Security and Resilience Growth Partnership and Cyber Growth Partnership.

MOD-Industry Engagement

The MOD engages with UK defence suppliers through two main fora.

The **Defence Suppliers Forum** (DSF) enables strategic engagement between Government and its suppliers to share information effectively, align objectives and optimise delivery of Defence capability from the available budget.

The DSF is co-chaired by the Secretary of State for Defence and Chief Executive BAE Systems. It has several dedicated Steering and Working groups focussing on our key joint challenges through a number of workstreams, including Commercial Enterprise and Acquisition, Capability Management International and Innovation, People and Skills, and Digital. Across its sub-groups, membership includes senior officials from MOD and other government departments and representatives from MOD's strategic and mid-tier suppliers, as well as SMEs.

The DSF is central to delivering the improved pace and agility required for a joint approach to meeting Defence capability needs. Its work aims to create a more collaborative, but also demanding, approach to MOD's relationship with its industry suppliers as expressed in our Joint Industry Vision 2025.

DSF has collectively responded to the COVID-19 pandemic, and has been an effective engagement mechanism to ensure continuity of delivery to the MOD and cashflow to industry. A recent survey of members found that: 'collaboration was very good' and 'Defence seemed to be leading the way in many areas both in supporting the response to the crisis and in its relationship with its supply chain'.

The **Defence Growth Partnership** (DGP) is a partnership between Government and Industry that works to grow the UK's defence sector by strengthening its global competitiveness to achieve international success.

Sponsored by the Department for Business, Energy and Industrial Strategy, the DGP membership includes MOD, Department for International Trade, thirteen leading defence primes, and ADS, the trade association.

It has established the UK Defence Solutions Centre to provide market intelligence, capability and market development, innovation and aligned investment jointly for the UK government and defence industry; designed to enable UK companies to win significant new business in export defence markets. Its government/industry "Team UK" approach seeks to appeal to international customers by offering a collaborative approach to developing capability solutions. The DGP also works to access the UK's complete value chain and on skills initiatives in areas which support competitiveness in international markets.

Examples of government-industry security sector engagement

Aviation Security

The government promotes the UK's aviation security objectives at an international level, through multilateral bodies such as the International Civil Aviation Organisation (ICAO), and by working in partnership with industry and likeminded international partners to pursue joint approaches on priority issues. We have recently been successful in securing new ICAO Standards to address the risks from insider threat. 2021 is the ICAO Year of Security Culture, during which we will work in partnership with ICAO, the aviation industry and partner countries to deliver practical and sustainable initiatives that will result in positive change to security culture at airports around the world.

Crypt-Key

The government has used an open and evidenced based approach to identify competent companies capable of developing Crypt-Key solutions. The National Cyber Security Centre (NCSC) brings these companies together on a regular basis to discuss common issues, sector challenges and explore the government's expected direction of travel and likely future requirements. Together, government and industry seek to identify improvements in working practices that meet the needs of both parties to ensure successful delivery of Crypt-Key projects. This includes the sharing of risks as appropriate, collaborative and collegiate working between teams and including industry partners as much as possible when articulating the problems that government wishes to solve. In doing so, the NCSC actively encourages innovative ideas and ways of solving problems to develop effective solutions for future Crypt-Key capabilities.

MOD commercial policy changes

The MOD is **introducing Intellectual Property (IP) strategies** into its acquisition processes, which will ensure that defence programmes and projects consider the costs, risks, benefits and constraints associated with different intellectual property approaches early on, when these programmes are defined. Through this, the MOD aims to secure only those rights (for example, those relating to technical data and software delivered) that are necessary to meet the operational needs of the military user and to deliver value for money.

The MOD's commercial policy on the **limitation of contractor's liability** is being updated, responding to industry concerns that too often the department has sought to put uncapped liability onto bidding companies, which they may be unable to manage, may deter competition, and which do not reflect the degree of technical risk inherent in some defence projects.

These reforms and those set out in the previous pages are wide-ranging, and their implementation will be a long-term endeavour. Improvements will be incremental as success will often rely on empowering government commercial teams to take appropriate risk and manage individual projects effectively over the long term, but within strategic guidance established early in the evolution of projects. The MOD will provide the framework, tools and support for staff to enable them to do so while enhancing their skills through training and guidance at all levels.

National security procurement by non-MOD government departments and agencies

The UK government customer base for non-military goods and services is spread across multiple departments and agencies, spanning Whitehall and the wider public sector, including independent operational partners accountable to different governance frameworks and often operating on annual budgetary cycles. It is also worth noting that customers for security related goods and services are often private entities, which is in stark contrast to the defence sector where government is often the main, and sometimes the sole, customer for defence goods.

This all makes it extremely challenging to communicate security capability requirements to industry, and there is limited coordination of procurement to stimulate industrial investment, illustrated for example by the generally independent procurement activity of each police force (notwithstanding the recent establishment of BlueLight Commercial – see box).

The diversity of the security sector and the generally smaller companies within it can make it difficult for industry to engage comprehensively and consistently with government outside of individual competitions and consultation exercises. While there are good examples of dialogue (see boxes), these are not as consistent and formalised as is the case with the defence industry.

The Joint Security and Resilience Centre (JSaRC)

JSaRC was founded in 2016 by the Office of Security and Counter-Terrorism (OSCT) to provide security outcomes for the United Kingdom by combining government, academic and private sector expertise to meet the fast moving and ever-evolving threats to our citizens, both here and overseas. It aims to overcome the traditional barriers that have prevented collaboration between the private and public sectors by improving the understanding both sides have of each other, and of the key issues and trends that have an impact on the UK's security and resilience.

JSaRC has a 'threat-agnostic' approach, championing multi-use technology that has multiple applications and encouraging specialist innovation in ideas and products to meet the possible security and resilience threats facing the UK. This results in relevant, practical and market ready solutions being offered to the public and private sector.

Case Study: BlueLight Commercial

In recent years, it has been noted that commercial services in policing are fragmented without a structured approach to procurement for policing as a whole. This has led to the 43 forces across the UK often taking different approaches and paying different prices for the same goods.

To deliver savings through a more strategic approach to procurement across police forces, BlueLight Commercial, a sector owned company, was created in 2020. This supports the delivery of a commitment made in the *Policing Vision 2025* to change the way support services are delivered to ensure policing is able to meet changing demands, and delivers on expectations set out in the Police Funding Settlement. BlueLight Commercial aims to promote the use of industry best practice, including through dedicated category expertise and effective market engagement, to support forces to procure and manage contracts throughout their life-cycle and deliver savings over the long term. This includes undertaking more shared procurement to realise greater economies of scale. The first major tender exercise was launched in October 2020 to procure more than 8000 vehicles for police forces in England and Wales.

The introduction of BlueLight Commercial is not intended to centralise all commercial and procurement activity and the majority will remain locally managed. However, to drive improvements across these activities, the company is establishing a Centre of Excellence on commissioning and social value to provide advice and support to relevant staff across the policing sector on all aspects of the commercial cycle. Once fully established, BlueLight Commercial is expected to deliver annual savings of £20m in commercial efficiencies.

Future Aviation Security Solutions (FASS)

FASS is a joint initiative between the Department for Transport (DfT) and the Home Office that works collaboratively with other government agencies and a wide range of stakeholders from airports to universities.

The FASS programme was established in 2016 with £25.5m to invest over a five-year period in truly innovative science and technology. The programme has since been embedded into the wider work of the DfT and continues to encourage, fund, and support the development of innovative solutions to deliver a step change in aviation security.

To date, FASS has supported the creation of nine themed competitions and invested 128 projects in areas such as machine learning, passenger screening, x-ray, and vapour/trace detection.

Case study: Security-Technology Research Innovation Grant

In 2020, FASS delivered the Department for Transport's first Security-Technology Research and Innovation Grant (S-TRIG) programme. This scheme provided suppliers with funding to conduct short research projects to tackle some of the challenges that could arise within national security in the UK.

FASS collaborated with several government departments including counter-drones teams in the DfT and Home Office, HM Prison Service, the Centre for the Protection of National Infrastructure (CPNI), and Border Force and delivered the programme with the support of Connected Places Catapult.

Nearly £530k has been awarded to 18 organisations with proposals across five areas of national security by FASS and its government partners.

Case study: Future Aviation Security Solutions Industrial PhD Partnership

The Future Aviation Security Solutions Industrial PhD Partnerships (FASS IPPs) was announced in 2019 and sought to bring academia and industry together to develop innovative ideas capable of transforming the future of aviation security.

Fourteen universities from across the UK applied to the programme and eight were awarded funding to undertake PhDs – four of which began in October 2020 with the others to follow.

The PhDs cover a range of aviation security topics and have received more than £930k from FASS and in-excess of £1.3m cash and in-kind support from industry.

As security markets generally function effectively and given that government is often not the primary customer for security goods, less support and intervention is required with the security sector when compared to defence markets. However, there are still opportunities for government and industry to jointly address several issues which are common to defence and security sectors. These include:

- increased transparency and improved communication of longer-term security priorities (i.e. the ‘problems to solve’), including developing roadmaps from early research to commercialisation and exploitation, including for exports;
- earlier engagement with industry on potential solutions to individual requirements;
- running cross-sector innovation challenges through DASA;
- and reducing barriers to entry for security industry SMEs.

In order to allow for greater strategic alignment between security, industry, academia and government on these issues, the existing **Security and Resilience Growth Partnership (SRGP)** will be expanded further This ministerial board will provide updates on cross-government homeland security priorities and demand signals which will then be communicated to the security industry and academia. The board will set the strategic direction on this joined up approach.

The Security and Resilience Growth Partnership (SRGP)

The Security and Resilience Growth Partnership (SRGP) was established in May 2014 through the Home Office's Office for Security and Counter-Terrorism (OSCT). It established a new government/private sector partnership approach to the innovation, promotion and delivery of UK security capabilities.

As the key strategic level board for engagement with the security sector, both industry and academia, it is jointly chaired by the Minister of State for Security and the Chairman of RISC, the UK security and resilience industry suppliers' community.

Board members include senior representatives of the major security industry trade associations, Academic RiSC (a network of universities formed to promote academic engagement), the Home Office, UK Defence and Security Exports (UK DSE) and other relevant government departments. The Board continues to provide the strategic platform for security sector engagement, leading the way in breaking down communication barriers between government and the private sector to ensure industry is better aware of government's national security requirements.

Since 2016 it has provided governance for JSaRC which combines government, academic and private sector expertise to provide security outcomes for the United Kingdom.

The SRGP will be strengthened to become the focal point for engagement between security-related government departments, the private sector and academia. This will be achieved through expansion of membership across government to include departments with security related interests. Through its enhancement, the SRGP will also drive joint security-related workstreams involving representatives from government as well as industry and academia. This approach will enable even stronger connections between government and the private sector, working in more integrated ways to further shape markets and solve common problems around security and resilience, including on the sector's priorities of procurement, innovation, exports, and skills, as well as support to other government initiatives.

Ensuring long-term value for money and considering industrial consequences

Government has a responsibility to achieve the best value for money from its procurement and will take account of a wide range of factors as part of its decision-making. The HMT Green Book, a revised version of which was published in November 2020, sets out in detail how this is done, but some key points are summarised and illustrated by reference to defence and security procurements below.

In all procurements there will be minimum criteria ('critical success factors') which must be met if the acquisition is to proceed. The factors below are typically evaluated across government investments:

- 'Strategic fit' and whether the option meets business needs, including its synergy with other strategies, programmes and projects. In defence and security procurements these may often be based on national security requirements - e.g. minimum performance requirements if the equipment is to operate as intended; or delivery by a specific date to meet a pressing but potentially temporary operational need. Other non-negotiable areas may include safety and legislative standards. In defence and security industrial strategy terms, this will include the extent to which an option ensures, in segments which we have prioritised operational independence, manufacture and support in-service from onshore facilities; or is otherwise consistent with the relevant segment approach;

- Potential value for money. Value for money needs to take into account the whole-life costs of a capability. For defence platforms like naval ships, which may remain in service for many decades, the costs of maintaining and upgrading the platform as necessary through its life may be at least as great as the initial acquisition cost, and decisions in the initial design phase, e.g. on whether to have open or closed systems architecture, can have very long-lasting cost implications.

The costs and benefits to be considered in the value for money assessment are however not restricted to the financial cost to the procuring government department or the benefits it will directly reap. As specified by the HMT Treasury Green Book, the relevant costs and benefits are those to UK society overall, and all relevant costs and benefits which may arise should be valued and included in the cost-benefit assessment unless it is not proportionate or possible to do so. Government procurement may impact on a range of wider objectives and this needs to be accounted for in considering the value for money of the options being considered.

Given the wide range of potential impacts on UK society – or 'social value' (see box) – from the wide range of government procurement, not all will be appropriate to evaluate for each procurement.

A minimum 10% weighting is now applied in competitions launched under the Public Contract Regulations, and the MOD will apply the same policy to those launched under the Defence & Security Public Contract Regulations after 1 June 2021.

This public value evaluation will ensure that the government takes into account the effect of different procurement options on wider policy objectives, including on the industrial base – and many of the identified themes and outcomes that can contribute to social value are highly relevant to our defence and security industrial strategy, including creating new businesses, jobs and skills, and increasing supply chain resilience and capacity.

This consideration of social value might mean, for instance, that even in a segment which was not identified as a high priority to maintain onshore industrial capability, an option which would generate more investment in intellectual property or skills would, in the social value assessment contributing to the overall potential value for money evaluation, be weighted more heavily than others.

To ensure fairness, the **factors** the government considers relevant and to be focused on in evaluating options, and the weight to be given to such factors, should be settled early in the development of the acquisition strategy in question. This is discussed below under 'setting of strategic objectives'.

- **Supplier capacity and capability.** As a critical success factor, this is whether potential suppliers can and will deliver the requirements. Of course, ensuring supply chains are resilient and productive and that critical suppliers can continue to deliver is important more generally, and the extent to which the options may contribute to maintaining or increasing these aspects may be relevant to consider under the 'strategic fit' factor.

- **Potential achievability** – linked to the previous factor, but also considering how well the customer is prepared to deliver the anticipated outcomes.

- **Potential affordability** - this a distinct factor from value for money, considered separately, but clearly if a project is unaffordable within its initially allocated budget it will struggle to progress, and the costing assumptions (including assumed procurement strategy) used when a project is first bid for can severely constrain its future development.

Complementing the evaluation of social or public value in comparing options, the government also wishes to encourage value for money and maximise opportunities for companies across the UK by ensuring that prime contractors, wherever they are based, have properly considered what the UK industrial base can offer when bidding for MOD projects, while options are still being developed. Accordingly, the government intends to introduce a revised Industrial Participation policy for defence procurement[8] in order to maximise the opportunities for the UK supply-chain.

[8] i.e. for purchases of arms and military materiel, not all procurement by the MOD.

Maximising the opportunities for the UK supply-chain

The revised Industrial Participation policy for defence procurement will ask companies to set voluntary targets for UK content and articulate their plans for opening up opportunities for the UK supply chain pre-contract; they would then be supported by the government to deliver on these plans and regularly assessed against them.

While this is similar to the policy applied before 2012, the government now intends to adopt this approach for all suppliers of defence equipment, not just overseas firms, noting that many defence suppliers are now multinational. This is distinct from the requirement in some areas to maintain specific industrial capabilities onshore. The government will not impose mandatory percentages for UK industry involvement, but intends this revised policy to encourage prime contractors to assess seriously what the UK supply base can offer, as part of incentivising best value for money.

On some projects, the MOD may also invite bidders to offer options for different types and levels of UK content, to test which combinations might best offer value-for-money national security solutions. For example, this might illuminate whether having two production lines, including one onshore, might offer sufficient benefits in terms of earlier delivery and operational independence to outweigh the impacts of duplication.

The government will this year launch a pilot programme to develop this approach, including engaging with major defence equipment suppliers on an initial set of MOD procurement programmes for both options.

Social Value

Launched in September 2020 and mandated for all Public Contract Regulations (2015) procurements, the new Social Value model is being used by central government organisations to take account of the additional social benefits that can be achieved in the delivery of its contracts. A minimum of 10% of the tender evaluation weighting must be allocated to Social Value objectives; a higher weighting can be applied if justified. A range of themes and outcomes can be considered, including:

- Helping local communities to manage and recover from the impact of COVID-19.
- Tackling economic inequality through creating new businesses, new jobs, new skills
- Increasing supply chain resilience and capacity.
- Fighting climate change.
- Equal opportunity through reducing the disability employment gap and tackling workforce inequality.
- Improving health and wellbeing including the physical and mental health in the contract workforce.
- Improving community integration, such as influencing staff, suppliers and communities through the delivery of a contract to support strong, integrated communities.

Case Study – Social Value and the Type 31 Frigate

A social value approach was used as part of the evaluation criteria for the Type 31 Frigate which included a range of outcomes focused on the long-term social well-being and sustainable enhancement of industrial productivity for the shipbuilding sector. Bidders were scored on their proposed approach to support supply chain resilience and productivity, address shortages of technical skills, provide benefits to local communities through improved access to jobs created as part of the programme, and exportability. Babcock International plc were awarded the contract in 2019 and delivery against these criteria is regularly monitored through a joint government-industry Prosperity and Exports Steering Group.

Setting of strategic objectives

Early decisions on strategic objectives for projects and programmes are important to ensure that acquisition strategies and commercial engagement support the full range of desired outcomes. The MOD has introduced Strategic Outline Cases to address the important strategic decisions up-front and give decision-makers the earliest visibility and opportunity to influence new programmes. These are intended to set programmes up for success; identifying and reconciling conflicting policy at the outset, at the most appropriate time and with sufficient authority, and in doing so better enabling the MOD to keep pace with the market and deliver capabilities at the forefront of new technology. Framing a project or programme correctly from the start is particularly important to ensure that its place within the MOD's broader strategy and programmes is understood. With the introduction of this strategy the implications for industrial capability, particularly in segments where there are strategic imperative or operational independence requirements, will be an important part of the 'strategic fit' critical success factor.

R&D projects and programmes will play an important role in creating, generating, and sustaining the necessary skills, knowledge and capability to maintain a thriving and innovative industrial base. In setting the strategic objectives and the acquisition strategy for R&D programmes particular consideration must be given to the exploitation and industrial route to market to ensure the output of the programme delivers benefit to the end user.

A Senior Responsible Owner (SRO) – or Capability Sponsor for smaller projects – is the individual with overall responsibility and accountability for ensuring that a programme meets its objectives. These objectives will be addressed as part of the scrutiny of strategic outline cases (and guidance given on their recommendations for the relevant social value criteria and weighting, which will be confirmed in the scrutiny of the outline business case). For the most significant programmes in MOD, the Joint Requirements Oversight Committee is responsible for prioritising and endorsing the requirements and policy objectives to be considered in the business case.

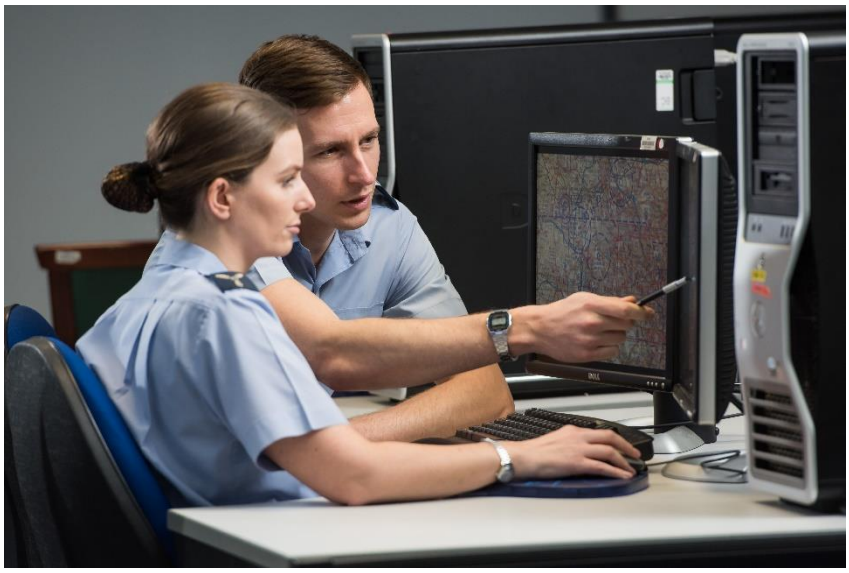
While such decisions are obviously made case-by-case, for military equipment, it is likely that the highest priority social value objectives will be about creating new businesses, skills and jobs, increasing the diversity and resilience of the supply chain, and stimulating innovation.

For other government departments and agencies, commercial officers will be responsible for deciding the relevant social value objectives and weighting in consultation with their policy customers.

Data

Robust data is important to ensure that procurements take account of the fullest range of factors in both quantitative and qualitative assessment of costs and benefits. To improve the quality of data available to support these assessments, the MOD working with industry have established a Joint Economics Data Hub (JEDHub) to collect and aggregate data from across the defence sector.

With the introduction of the social value model, there is also an expectation that additional information on social value benefits will need to be gathered as part of decision-making process on procurements.



Productivity and Resilience

To achieve the defence and security capabilities that we need for the future, as well as greater prosperity for the UK, government and industry must work together to drive innovation, productivity and efficiency. We need to promote resilience across the national security community and in our supply chains, providing assurance that we will continue to have access to the equipment and capabilities that we need.

The MOD will establish a Defence Supply Chain Development and Innovation Programme, leveraging wider government investment and informed by successful BEIS initiatives in civil sectors, to support the development of a more productive and competitive UK defence sector. This will reduce cost and risk within MOD programmes and support a UK defence sector better able to win domestic and export work.

We want to encourage diversity within our supply chains by enabling smaller and mid-tier companies to grow and contribute to projects, encouraging innovation and increasing the overall resilience of our industrial base. The Defence Supply Chain Development and Innovation Programme will address this through developing stronger mid-tier defence companies and supporting SME growth across the UK.

Defence and security departments will also work alongside BEIS to support the delivery of ‘Build Back Better: our plan for growth’. This sets out the government’s new framework for how we will support existing, new and emerging industries: driving growth through significant investment in infrastructure, skills and innovation; and pursuing growth that levels up every part of the UK, enables the transition to net zero, and supports our vision for Global Britain.

Better data will be a key enabler to enhance future decision making and the ability of government to make informed evidence-based decisions.

The MOD will work to ensure access to good quality and timely data on the economic footprint of the defence sector, to monitor the value and effectiveness of prosperity initiatives.

We will continue to grow and develop the Joint Economic Data Hub (JEDHub) working collaboratively across government, industry and academia to provide consistent and impartial economic data on the sector.

We will support a revitalised UK Defence Solutions Centre (UKDSC), jointly resourced by government and industry. The UKDSC will provide strategic planning and development support to the defence sector including delivering high quality market intelligence research to MOD, DIT DSE and industry. The UKDSC will continue to support a wide range of programmes and initiatives within the sector.

Given the global nature of the defence and security markets and the supply chains within, we will continue to work closely with international partners on efforts to promote greater productivity and resilience. This includes continuing to enhance UK involvement in the National Technology and Industrial Base (NTIB), focussing upon improving the sharing of technology and capabilities between participant nations, enhancing industrial cooperation, reducing transactional costs associated with export controls and helping to open up new opportunities for UK companies to contribute to delivering key capabilities for international allies.

JEDHub

In response to the 2018 Dunne Review into growing the contribution of defence to UK prosperity, and as part of the Defence Prosperity Programme, the MOD has been working with industry and government colleagues to develop a Joint Economic Data Hub (JEDHub) within the UK Defence Solutions Centre (UKDSC). The role of JEDHub is to collect and aggregate economic data from across the defence sector. It will provide better, consistent and impartial data than can inform our decision-making processes.

The JEDHub has now reached initial operating capability, having successfully completed a Proof of Concept pilot in 2020 with DGP companies that highlighted the value of aggregated data, developed using agreed definitions and methodologies.

National Technology and Industrial Base (NTIB)

In 2017, the United States, in recognition of the high degree of defence cooperation with Australia, Canada, and the UK, expanded the legal definition of the U.S. National Technology and Industrial Base (NTIB) to include Australia and the UK – in addition to Canada, which had been included previously. This legislation mandates that the Department of Defense works to reduce barriers to defence industrial integration between the four countries (including their respective industrial bases) that make up the NTIB.

In order to facilitate such integration of the NTIB, the US Department of Defense and its NTIB partners, the Department of Defence of Australia, the Department of National Defence of Canada, and the UK MOD, working with other US government departments and agencies, are cooperating in practical areas related to our respective defence industrial bases. Such cooperation is intended to provide better support to the war-fighter, strengthen and build resilience in our respective industrial bases, and enhance innovation to facilitate greater integration of the NTIB including on:

- Eliminating barriers to the flow of knowledge, goods, and services between the governments, industry, and academic and research institutions of the United States, Australia, Canada, and the United Kingdom;

- Consultation and information-sharing for technology and industrial base policies;

- Promoting increased coordination on export control, technology, and industrial base planning issues; and

- Continued regular engagement through bilateral and multilateral engagement pathways.

To date, NTIB achievements have contributed to several shared national security objectives, including close cooperation on measures to resolve specific supply chain issues and for the protection against adversarial foreign investment. This has included sharing of measures on national security screening of Foreign Direct Investments (FDI) which supported the exemption of Australia, Canada, and the UK from the US Foreign Investment Risk Review Modernization Act (FIRRMA) FDI legislation under the Committee on Foreign Investment in the United States (CFIUS). In addition, companies from NTIB nations operating under a Special Security Agreement are no longer required to obtain National Interest Determination (NID) waivers for certain types of proscribed information, removing a key barrier for trusted and secure companies.

Strengthening Supply Chains

The government has already invested in a range of **supply chain development** initiatives across different sectors in attempts to strengthen productivity and resilience in supply chains by providing access to technical and expert resources, including establishing facilities and schemes such as the Catapult Network and Local Enterprise Partnerships. This strategy builds on these initiatives and places priority on making schemes such as these more accessible to UK businesses. Ensuring coherence between the various initiatives will particularly benefit SMEs, making it easier for government to work closely with the most innovative companies in the sectors.

It is also important that we ensure that supply chains are resilient to shocks and threats and that we can have confidence in their ability to deliver. In doing so, we defend the areas that are important for our national security and ensure **security of supply** of the capabilities that we need. In the last two years we have generally included new requirements in contracts to provide more information on supply chains, in particular changes of control, but we can do more to ensure departments have visibility of their supply chains. The MOD will continue to prioritise the mapping of its most critical supply chains. MOD efforts on this will be aligned with the cross-government work on critical supply chains which is currently underway.

We aim to improve risk reporting and management of resilience to supplier failure and potential fragility, and drive greater understanding of the MOD supply chain through increased coordination and alignment of programme activities across the MOD.

It is also recognised that to diversify supply chains and encourage new suppliers, the main challenges businesses may face may not be about technology per se, but business-related – finance, corporate development, etc. Therefore, to support businesses that have demonstrated that they have potential and to help them mature innovative concepts for which they have been funded by DASA, the MOD will expand its **Access to Mentoring and Finance scheme,** providing access to loans, investment funding and expertise. This scheme will also provide mentoring to help SMEs funded through DASA commercialise their innovations.

Protection against malign activity

The government will protect the UK's economic assets - including intellectual property, critical national infrastructure, and supply chains - from unfair practices and malicious intent. This includes the sophisticated and growing threat from hostile actors which can involve the use of a range of overt and obfuscated methods to acquire or undermine defence or dual-use technologies and the broader industrial base and the supply chains within.

This protection is critical in its own right but also essential to our ability to work with trusted partners; if allies do not consider the UK to be a trusted and reliable custodian of other nations' sensitive information, technology and data, then our ability to make the most of our collective investments and to collaborate effectively will be damaged.

To address this, the government will expand powers to make targeted and specific government intervention in limited areas of the economy where there are national security risks. The National Security and Investment Bill will introduce civil and criminal powers to enhance our ability to tackle hostile investment. To support this, government departments and agencies will evaluate and, where necessary, act to mitigate the national security risks from acquisitions of sensitive technology, Critical National Infrastructure and capabilities. But legitimate market participants can be confident that we continue to welcome investment in the UK. Foreign-owned and overseas-based companies will continue to play an essential part in supporting the UK's Armed Forces and security agencies.

A new Investment Security Unit will identify, assess and respond to national security threats arising through economic activity. It will prevent:

- interruption to goods and services on which the government or designated firms rely for core national security or military functions;
- interruption to our critical national infrastructure or related supply chains of strategically important goods or services;
- our adversaries from building their operational capabilities by acquiring sensitive technology or know-how from the UK.

To complement this, the government will work collaboratively with industry to **protect UK intellectual property and classified R&D from external malign activity and influence,** including introducing a personnel security assurance process to be applied to defence supply chains – making sure companies have got the right policies and systems in place to spot warning signs and provide support to staff to avoid security breaches. The MOD has piloted this process and is now looking at introducing it more widely. This work will be delivered under the Cabinet Office-led Transforming Government Security Programme and is to be expanded to other relevant government departments once implemented in MOD.

Skills, talent and diversity

A strong industrial base is reliant on having **the right skills and talent**, both within government and across industry and academia. There are a range of well-documented skills gaps in the defence and security sectors, from marine engineers to analysts in cyber security and these challenges are exacerbated by a national STEM skills gap[9]. While it is in the interests of suppliers to ensure they have the right skills both now and in the future, government also needs to provide complementary support to industry and ensure that the public sector can access the right skills to remain an intelligent customer.

Government can also contribute to industrial skills planning by setting out clearly our own plans and demand, as we are doing in the Integrated Review and Defence Command Paper, and will do so in further detail for the broader shipbuilding industry in the refreshed National Shipbuilding Strategy.

Based on such signals, defence and security departments will work collaboratively with industry to understand the existing skills base and future skills demands – across both government and industry – and then **work together to identify gaps and tackle these skills challenges**. The detail of how and to what degree we need to do this will vary by segment, building on existing efforts including:

- MOD support to nuclear skills and innovation development, including the BAE Systems Submarine Academy for Skills and Knowledge at Barrow-in-Furness.
- As part of Tempest, a dedicated STEM engagement team to inspire young people to be involved in the Combat Air industry. Working closely with BEIS, the MOD has also launched a skills index to monitor the health of industrial and government skills critical to the delivery of Future Combat Air Systems.
- The Department for Transport led analysis of skills for maritime.

Where there are known skills shortages, there is an **opportunity for government, industry and academia to better share scarce skills**. Through the Enterprise Approach project, the department is seeking to encourage collaboration with industry across the MOD. This includes exploring ways to access the skilled people we need across the MOD and industry by: looking at demand across the public and private sector; finding ways to share skills; and making it easier for people to move around different parts of the defence sector and between the MOD and industry.

[9] https://www.raeng.org.uk/publications/reports/engineering-skills-for-the-future

The Pan-Defence Skills Framework will make it easier for people to move between government and industry, thereby developing new skills and retaining talent. This will provide a common structure and governance system for how the MOD manages skills. It is central to unlocking a more agile, flexible and diverse workforce. By developing people with the right skills and talent, we will be able to make the most of that talent. A common architecture that aligns to existing frameworks and externally recognised bodies will allow us to identify further opportunities where the MOD and industry could collaborate on, and share, skills.

Government and industry skills sharing

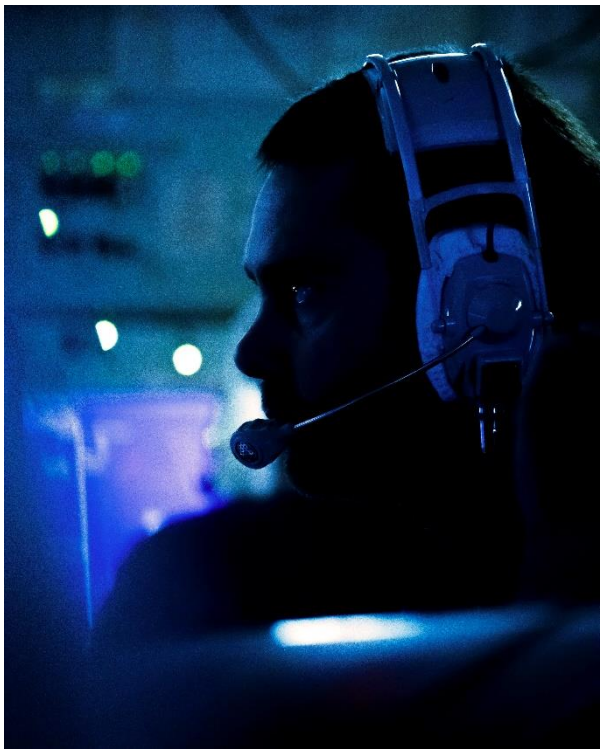
Under the Enterprise Approach project, we are embarking on an Engineering Skills Re-deployment Trial (ESRT), working with the aerospace industry to re-deploy skilled resources during the current economic downturn. This will not only enable defence to close key skills gaps but also help to preserve those skills within the UK allowing the potential for future re-integration into the private sector.

The MOD will continue joint work on skills through the DSF. Addressing the national engineering skills challenge is a common strategic issue for both the MOD and industry. The 2020 DSF Skills Survey has assessed attitudes to engineering across the MOD and industry, and gathered evidence to inform future priorities for joint working, building on existing activities including:

- Exploring the feasibility of a Defence Skills Passport, to enable free movement of skilled people across the Enterprise in support of the wider Enterprise Approach goals.
- Engagement with universities and industry, including through Industry Advisory Boards (IABs), to ensure that the MOD and the defence sector are working collaboratively to set a clear demand signal to academia around future skills needs.
- Supporting the Women in Defence Charter, with a commitment to a more gender balanced workforce to ensure we can make the most of the widest possible pool of skills and talent.

The Tomorrow's Engineer Code

Launched in October 2020, the Tomorrow's Engineers Code is a commitment to work toward common goals to increase the diversity and number of young people entering engineering careers. To achieve these goals, MOD and a number of defence suppliers have made four pledges about their approach to funding, designing, delivering, and learning from engineering-inspiration activities (including STEM programmes dedicated to inspiring young people into engineering).



Outreach continues to be important to inspire more people to pursue subjects relevant to defence and security, such as STEM and relevant social sciences, and to enter careers within government, the Armed Forces, industry or academia. The national security sector needs to be more visible, to expose those in education to what can be achieved within the sector with the skills they are teaching, and to attract talent – especially from more diverse and underrepresented groups. Outreach starts at an early stage, is focused at secondary education and continues through further and higher education. A key part of this is communicating information on potential roles in the defence and security sectors to careers advisors. The MOD is already committed to help generate the next generation of STEM professionals in support of the wider national effort through the Defence STEM and Youth Engagement Strategy, with over 1,000 volunteer STEM ambassadors, as well as a joint programme of major skills events with industry including the Big Bang Fair, World Skills Live and the BAE Systems STEM Roadshow.

For the security industry, the revitalised Security & Resilience Growth Partnership (SRGP) will lead a dedicated skills workstream with representatives from across government and the private security sector, including Academic RiSC, to establish the current level of outreach and communication on security-related skills to the education system and identify initiatives, including existing ones, that could be developed to ensure a wider and more diverse group can be reached.

Case Study: the defence sector's response to COVID-19 – skills and employment

While many sectors were undeniably hit hard by the pandemic and faced redundancies and/or cut back recruitment severely, many defence companies continued to recruit new staff and invest in training throughout 2020. This included BAE Systems which pressed ahead with the recruitment of a record number of just under 800 apprentices in 2020 via a new virtual process, and Leonardo which maintained planned recruitment numbers whilst adapting to virtual assessment centres to hire over 200 graduates, apprentices and interns, adding to their existing population of over 500. In addition to moving recruitment online, a number of companies also quickly brought in new methods of delivering training to continue developing skills and expertise, including rolling out laptops to permit online teaching and work, delivering existing training programmes online, and introducing tailored virtual wellbeing resources to apprentice and graduate staff.

Even in companies active in other sectors facing severely reduced demand, their defence business could offer opportunities to retain and reskill employees, with Rolls Royce continuing to hire apprentices into their defence business. The government supported efforts to continue the recruitment of new staff by increasing the capacity of the security clearance process available for industry partners.

The Defence Prosperity Programme

The Defence Prosperity Programme, launched in 2019, consolidates the recommendations from the 2018 review by Rt Hon. Philip Dunne MP (Growing the Contribution of Defence to UK Prosperity) and the 2017 Defence Industrial Policy Refresh (Industry for Defence and a Prosperous Britain). The programme aims to grow the defence contribution to UK prosperity, and is being taken forward working collaboratively between government, industry and academia. It includes four main strands of work:

First, looking at how we embed prosperity into the MOD's policies, processes and culture. Secondly, working with industry and academia to understand how defence contributes to our economy and to develop the economic data and methods to allow us to grow this in the most effective way. The need for this was highlighted in the Dunne report. Part of our work in this area has been the creation of the new Joint Economic Data Hub within the UK Defence Solutions Centre. Thirdly, working with industry to ensure that UK defence supply chains are the forefront of international competitiveness and productivity. Finally, strengthening our support to exports and growing inward investment.

Levelling Up and the local impact of defence and security activity

The levelling up agenda will spread opportunity to every region and nation of the UK, creating economic growth that is distributed more equitably across the UK. It targets long standing economic and social disparities in order to enhance the life chances of people across the country.

The government is committed to levelling up across the UK by raising productivity and growth in all nations and regions, creating opportunity, and addressing disparities in economic and social outcomes. As part of its commitment to levelling up the whole of the UK, the government will support economic growth across the regions and will strengthen the ties that bind them into a prosperous United Kingdom.

The defence sector in particular has a wide regional footprint and supports high-value, high-skilled jobs across the UK. The Combat Air industry for example supports 18,000 jobs, with tens of thousands more in the wider supply chain, across the breadth of the UK including a significant cluster of employment in the North West of England. Significant sites in Wales include General Dynamics' factory producing Ajax in Merthyr Tydfil, the Defence Electronics and Components Agency at Sealand, and Qioptiq's two sites in North Wales which employ more than 500 people maintaining surveillance and targeting equipment. BAE Systems employs around 9,000 people in its submarine business at Barrow-in-Furness, while the Solent Maritime Enterprise Zone initiative aims to create a centre of excellence for maritime research, innovation, education, skills and training in the Solent region, delivered through a consortium including the Royal Navy, government, industry and academia. The orders for Offshore Patrol Vessels and Type 26 and Type 31 frigates will sustain thousands of jobs in Scottish shipyards and the wider supply chain into the 2030s, while HMNB Clyde is home for the UK's submarine fleet and is one of the largest employers in Scotland, with the number of people employed there due to rise to 8,200 by 2022. Northern Ireland has a long, prestigious history in the aerospace industry, with Spirit AeroSystems leading Project Mosquito to develop cutting-edge uncrewed fighter aircraft. These are just some examples which illustrate how activity in the defence sector in particular is spread right across the UK.

The government has also reviewed the Green Book, which sets out how decisions on major investment programmes are appraised, to ensure that government investment spreads opportunity across the UK. The review has considered how the design and use of project appraisal affects the ability of all areas to achieve their economic potential. The updated Green Book enhances the tools available in the strategic development and assessment of projects, including how government assesses local impacts using analytical methods for transformative or place-based interventions.

Technology and ‘pull-through’

Accelerating technological change poses acute and rapidly evolving challenges for the UK defence and security community. We need to understand the opportunities, implications and choices that arise from technological developments, and be able to access, develop and utilise new technologies at the pace of relevance to stay ahead of emerging threats. Across government and industry, the defence and security sectors must anticipate, invest in, and exploit technologies at pace.

Government’s Research and Development activity grows and sustains skills and jobs across the UK. Science and Technology (S&T) capabilities and R&D programmes attract allies and partners to work with the UK, and sustain our economic and security resilience. They are the basis for generating military and security capabilities and other tangible and intangible assets which are themselves levers of national power and influence. As well as providing the technology of direct defence and security application, S&T is critical to developing the industrial base we need in the future; it can help de-risk future manufacturing technologies and diversify supply chains. At the same time, adversaries are investing heavily in emerging technologies for soft and hard power and themselves seeking strategic advantage through science and technology.

The government has set out ambitious visions for modernisation – including for a more technologically-driven Armed Forces, as set out in the Integrated Operating Concept and Defence Command Paper.

And more broadly the government is committed to a renewed focus on S&T and data at the heart of our national strategy as a driver for prosperity and international influence. Therefore the Integrated Review has made sustaining strategic advantage though S&T an essential component of the UK’s national security and international policy –and strengthening the UK’s world-class S&T base. To support this, the Spending Review included commitments to increase investment in R&D across government substantially. For the defence

industry and the MOD this includes reversing the decline in military research and development spending, providing significant new resources to rapidly and systematically modernise, addressing emerging threats and maintaining our technological edge. This will accelerate the transition from an Industrial Age Joint Force to an Information Age Integrated Force that harnesses data, digitisation and technology, one which innovates, experiments and exploits cutting-edge S&T faster than our adversaries. Our renewed focus on R&D will enable us to integrate across domains and make bold leaps in our capability development.

Through this strategy and the investments made through the Spending Review and expanded on in the Defence Command Paper, we aim to provide industry with the confidence they need to invest in their own R&D, as well as identify areas where the defence and security sectors can benefit from collaboration with the civil sector. Both sectors should have a leading role supporting (directly and indirectly) the development of a strong, R&D driven, high value manufacturing base, driving productivity, national economic recovery and, for defence, military advantage.

This strategy is therefore an opportunity to change how government and industry work together on R&D in the following areas set out in this chapter.

Promoting greater government leadership and communication of future R&D and capability needs, to help shape and develop key technologies and the future industrial base.

The imperative to rapidly transform the Armed Forces in particular into an integrated, Information Age force requires a new relationship with our partners in industry and academia - including non-traditional suppliers - focusing efforts to accelerate the research, development and exploitation of new technologies and capabilities. This must start from better communication of defence and security challenges and requirements to enable a deeper and more systematic dialogue with partners in industry (large and small) and academia.

In 2019, the MOD set out its understanding of the key technology ‘families’ that will be critical to the development of future military capability through the Defence Technology Framework, along with areas where we see the greatest potential to collaborate with the civil sector through the Defence Innovation Priorities.

The recently published MOD S&T Strategy builds on this understanding, highlighting critical and enduring capability challenges where we will focus R&D investment to drive modernisation of the Armed Forces, and setting out the five most pressing areas where capability development can deliver a decisive edge to the UK in

future[10]. In addition, all departments also publish Areas of Research Interest to encourage engagement with academia and new suppliers.

We are expanding on this existing activity, recognising there is more we can do to communicate more clearly and to a wider group of potential suppliers. The MOD will establish a new integrated framework for engaging with external partners in order to improve understanding, identify new opportunities and develop more inclusive and joint forward research and technology plans.

As part of this, within a year the MOD will publish **a new defence S&T collaboration and engagement strategy**. This will include the Defence Suppliers Forum (DSF) Research, Technology and Innovation Group's (RTIG) Academic Pathways initiative to improve how the MOD communicates requirements to academia, to ensure academics will have access to jargon-free, actionable requests from departments to drive their research.

We will also build on – and increase investment in - **DASA Challenges** to identify innovative solutions to key defence challenges. Relevant teams will also develop specific **cross-sector innovation campaigns** through partnership between MOD, BEIS and other government departments, structured around the Defence Innovation Priorities.

It is more challenging to compile and prioritise technology requirements and areas of interest from across the broader national security community (given the broad variety of challenges faced by these organisations) to provide the common demand signal that industry would want. However, the enhanced and revitalised SRGP will provide the senior forum for these perspectives to be brought together and shared with industry, along with addressing strategic security priorities around procurement, innovation, exports and skills, in a more coherent way, as well as more specific sectoral engagements e.g. on aviation security, and the individual departmental Areas of Research Interest publications.

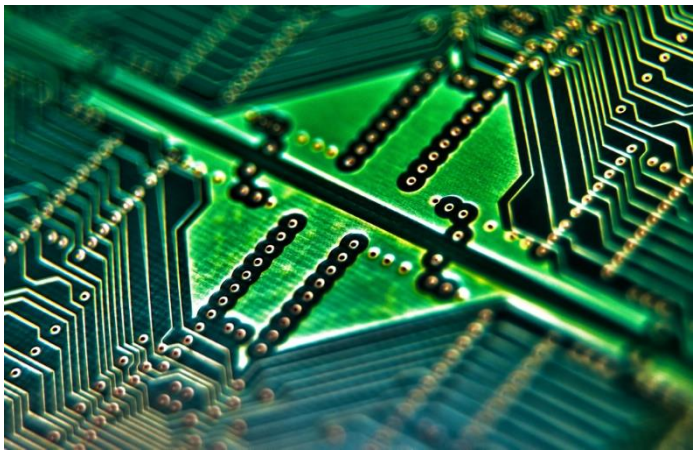
National security departments will discuss widely with industry and academic partners where we can do more to clarify and communicate our defence and security requirements and forward plans, and thereby provide these essential partners with the confidence needed to underpin their own R&D investment strategies. For MOD this may build upon initiatives such as the Defence Suppliers Forum Capability Management, International and Innovation Working Group's discussions on defined 'Problem Statements' (see box).

[10] Pervasive, full spectrum Intelligence, Surveillance and Reconnaissance; multi-domain Command and Control, Communications and Computers; securing and sustaining advantage in the sub-threshold; asymmetric hard power; and Freedom of Access and Manoeuvre.

Defence and Security Accelerator (DASA)

DASA was announced in the 2015 Strategic Defence and Security Review and forms part of the Defence Innovation Initiative. DASA is a cross-government defence and security organisation which aims to find and fund exploitable innovation to support UK defence and security quickly and effectively. It also aims to support UK prosperity through supporting potential suppliers (especially SMEs and start-ups) in the defence and security sectors, leading to a more diverse and innovative market.

DASA brings together the Armed Forces, security organisations, and government departments with the best science and technology innovations from a diverse range of business and academia. DASA helps scout out and fast-track project development, and works in partnership with SMEs, enablers and end users to help exploit their innovative solutions to the most pressing issues in defence and security. Over the last 4 years DASA has funded over £130m on innovative projects with industry and academia.



Dialogues with industry: the DSF CMI&I

The Defence Suppliers Forum Capability Management, International and Innovation working group (DSF CMI&I) was established in 2018 to deepen understanding between MOD and industry of our future capability and technology needs for defence, the risks involved in tackling them, and the development of a joint MOD and industry innovation process that would increase the likelihood of investment in innovation translating into military capability. The working group has overseen development of a new approach to capability collaboration between MOD and industry, which includes a focus on risks, innovation, international market opportunities and UK industrial capability and the implementation of an Innovation Operating Model. Importantly for industry, the MOD representation involves its central Finance and Military Capability staff as well as Defence Science & Technology, the Defence Innovation Unit, DASA and the Front Line Commands. This ensures a joined-up military capability perspective and a direct dialogue with the staff responsible for the MOD's overall Equipment Plan.

As part of this, the MOD has produced and shared with industry a number of 'Problem Statements' setting out current and future challenges, on which their views are being collated. This is in addition to a Capability Prioritisation Collaboration Process (CPCP) through which MOD is seeking fresh insights on UK industrial capability and capacity. The CPCP has as its focus technological and product maturity (including R&D already in train in the civil sector) and awareness of further opportunities or risks which MOD may not have previously considered. The approach to moving beyond exchanging information and considering 'Problem Statements' may differ depending on the structure of the industry and competitive environment. As a first step a pilot study, 'Energising Defence', is using the Army's near-term powerplant needs for vehicles and operational infrastructure to test the CPCP approach and demonstrate how this can add value to MOD's capability choices and industry's investment decisions. While the pilot is still to report it has brought industry, academia and the MOD together to discuss potential solutions to this issue; possible market opportunities have been identified and possible capability solutions provided.

Giving industry and academia greater access to government science, data and technology, test facilities and expertise

Government has access to unique datasets, niche scientific expertise and specialist test and evaluation facilities which are not otherwise available to our external partners and are often essential to push the boundaries of what is possible within the extreme operating environments of sea, land, air, cyber and space.

Through industry and academia's access to defence data, technology, expertise and facilities, scientists can go on to make new discoveries in their related fields and industry can develop innovative new technologies and spin-out companies that increase the prosperity of the UK. In return, government can benefit from enhanced collaboration, providing it with a wider-range of academic and industry-led novel solutions to its strategic capability challenge areas.

Significant benefit can be achieved by increasing exploitation of, and industry and academia's access to, government controlled technology and Intellectual Property (IP) and thereby enabling more effective collaboration. This is particularly the case for government and academia spin-outs, SMEs and non-defence companies, who can take defence and security research and technology IP and apply it to wider, civil or dual-use, problems and applications, and attract additional private investment.

It is however also important that government does not simply hand over technology or IP to a company or institution without ensuring it is suitably protected and effectively exploited. We must also ensure that knowledge flows both ways including between the defence, security and civil sectors. Success on these grounds has already been demonstrated on a small scale as part of Ploughshare Innovations Ltd and 'Easy Access IP'.

Ploughshare Innovations Ltd. & Easy Access IP

Established in 2005 to maximise the benefits achieved from the knowledge and technologies developed by the Defence Science & Technology Laboratory (Dstl), Ploughshare Innovations Limited is Dstl's wholly owned technology transfer company. Ploughshare Innovations specialises in the commercialisation of intellectual property from Dstl and wider MOD, enhancing the impact of, and benefits received from, defence science and technology. In doing so, MOD funded science and technology is taken to full market deployment in both defence and non-defence applications. Such exploitation is achieved either through licensing technologies to established businesses (who then go on to invest in the technology development and go to market), or through the establishment of a new spinout company. To date, Ploughshare has licensed over 130 technologies and created 14 spinout companies, resulting in £170m of inward investment into government owned technologies, the creation of 585 additional jobs and has supported £75m of exports.

'Easy Access IP' makes early stage research available free of charge to academic and industrial partners. The Dstl-led scheme aims to build new relationships, often with non-traditional suppliers, and to share research to enable development and exploitation of Defence controlled Science and Technology into wider applications.

Both initiatives have already had significant success in defence, but there is an aspiration to expand them across the wider defence and security community.

More needs to be done to effectively support the exploitation of government-controlled technology and IP and to enable academia and industry access to government science, technology, data, expertise and facilities.

The government will explore with industry through the Defence Suppliers Forum, and with academic partners, the expertise, facilities and datasets that industry and academia need to access, to accelerate the development of new defence and security solutions, and to co-develop optimal new partnership models.

For research funded by the public sector, many departments have explored using **Open Access** as a standard means for publishing its results. Using an Open Access model has already generated technical and licensing benefits for MOD, but has sometimes been constrained by unanticipated funding barriers late in the publication process, and more needs to be done to ensure Open Access is planned from the start of a project. Accordingly, we will mandate that defence research proposals include a suitable publication strategy from the outset, setting out how Open Access will be funded and delivered where applicable.

The MOD will also explore options for a greater use of Ploughshare Innovations Ltd to accelerate the commercialisation of government controlled dual-use IP through incubation, licensing and creation of spin out companies.

Identifying opportunities for development of, and access to, dual-use technologies, co-creation and investment

Many emerging and disruptive technologies are inherently dual-use, and notwithstanding the essential role of government's own R&D, the vast majority of technological advances are driven by industry for commercial applications.

Recognising these linkages, the MOD will partner with BEIS and use the Defence Innovation Priorities to set out where the most pressing defence problems overlap with challenges faced by other sectors of the economy. Based on this analysis, **specific cross-sector innovation campaigns** will be developed that exploit the strengths of the UK civil and defence sectors. These are to be implemented in partnership between MOD, BEIS, other government departments and public and private technology centres as appropriate. This approach builds on lessons from the Subsea Autonomous Systems Challenge, developed in partnership with the Royal Navy, the Oil and Gas industry and InnovateUK, and from emerging opportunities linked to electric vehicles for the British Army.

The defence and security sectors have a wide presence right across the UK. Many sites are significant providers of high quality and skilled jobs in their local areas. Taking more of a **regionally focused approach**, there are opportunities for government, industry and academia to work together to boost collaboration and increase opportunities for suppliers. Co-creation is also a critical means for the defence and security community to develop novel technologies and ensure they are suitable from the outset to address our most critical capability challenges. Our approach will be centred around a mix of physical and virtual clusters:

- We will publish an ambitious **defence AI strategy** and invest in a defence AI centre to accelerate adoption of this transformative technology across the full spectrum of our capabilities and activities.

- Through the Defence Suppliers Forum, MOD is supporting industry and Local Enterprise Partnerships (LEPs) in piloting a network of new **Regional Defence and Security Clusters** (RDSCs), starting with the South West of England. These clusters, which may be physical or virtual, will allow industry and government to share ideas, promoting collaboration and commercialisation. They are intended to develop innovative regional industrial capabilities to contribute to UK military capability by creating collaborative pathways for SMEs as a route into the defence supply chain. Businesses and LEPs are currently working to establish the next RDSCs in Scotland, North West England and London with other areas under active consideration. As part of the MOD's S&T collaboration and engagement strategy, we will explore how to open up further opportunities for collaboration with academia and industry on early stage S&T through to demonstration, testing and delivery of next generation capabilities.

- The new National Security Technology and Innovation Exchange (NSTIx) is a cross-government partnership to enable a world leading, agile and responsive defence and security S&T ecosystem that amplifies the UK's strength to deliver advantage through an end-to-end approach. NSTIx is piloting a network of co-creation spaces that will bring together world-class expertise and specialist facilities from government, the private sector and leading academic communities. The spaces will bring together government users with innovative partners in industry and academia, encouraging seamless exchanges of ideas and data, iterative prototyping and rapid capability development. They should drive the development of effective, user-driven technology at a pace and scale that could not otherwise be achieved.

National Security Technology and Innovation Exchange (NSTIx)

The NSTIx partnership was established in January 2020 to pilot a science, technology and innovation partnership across government departments and agencies to cohere and support the effective delivery of national security S&T outcomes through a co-ordinated approach to investment and activity. The NSTIx Core Programme team is formed of experienced officials from six different national security departments.

Core functions include: strategic analysis of the national security community's R&D portfolio and capabilities; coordination of complementary plans and capabilities to facilitate partnerships on common areas of interest; and incentivising co-creation and collaboration to drive development of new technologies and solutions.

These initiatives will build on and complement the work already undertaken by JSaRC, DASA and the Defence Science & Technology Laboratory (Dstl) to join up innovation in the defence and security industrial sectors with relevant customers in government.

Finally, it is recognised that many of the most transformative innovations are developed by entrepreneurs and small companies that often struggle to scale up and commercialise their products. Therefore, to support businesses that have demonstrated that they have significant potential and to help them mature innovative concepts for which they have been funded by DASA, the MOD will expand its Access to Mentoring and Finance scheme to help SMEs funded through DASA commercialise their innovations. In addition, the MOD will expand the Defence Technology Exploitation Programme (DTEP), currently being piloted in Northern Ireland, into a UK-wide initiative. DTEP will support collaborative projects between SMEs and prime contractors across the UK, enhancing the capability of UK based SMEs to develop innovative products and bring them to market, helping to exploit new technologies as well as growing potential exports and spill over benefits.

National Security Strategic Investment Fund

The National Security Strategic Investment Fund (NSSIF) is the government's corporate venture capital fund that enables national security departments to access advanced dual-use technologies. NSSIF provides equity funding to advanced dual-use technology companies indirectly through fund managers and, in specific circumstances, through direct investment. Government departments work together and participate in the NSSIF to drive innovation supported by strategic venture capital. There is scope to use the NSSIF for more defence activity as well as security, which we will do by identifying priority dual-use technology areas informed by the MOD's Defence Innovation Priorities, communicating those to the market, and making use of the technical expertise within government to support and deliver NSSIF opportunities.

Accelerating deployment of technology and planning for through-life capability management

There is considerable work underway to encourage innovation to meet defence needs. In addition to a Director for Innovation in MOD's Head Office, the Royal Navy, Army, RAF and Strategic Command all have **Innovation Hubs** which either run competitions through DASA or reach out to suppliers on specific challenges, to accelerate exploitation of new technology. These Innovation Hubs are establishing their own defence co-creation centres, such as the Army BattleLab, as part of the Defence BattleLab.

Defence BattleLab

The Defence BattleLab is being built at the Dorset Innovation Park and will feature an engineering workshop, as well as working and conference areas for joint use. MOD has committed £3.1m for the project, while the Dorset Council and Dorset Local Enterprise Partnership will contribute an additional £2.6m. This facility will enable MOD to work with SMEs and academia to develop new products and technologies with commercial potential.

The Army BattleLab will be an integral part of the facility as the Army Research Innovation & Experimentation Laboratory (ARIEL) works with industry to improve existing technology and equipment, and experiment new ideas.

In the first 10 years, the BattleLab is expected to create 90 jobs and provide a £4m boost to the local economy.

However, government and industry agree that we still need improved mechanisms to facilitate more agile and rapid development and procurement of new technologies, including facilitating rapid exploitation of technologies from non-traditional and civil sectors. Adoption of common standards and open systems will be important, with the aim of allowing rapid integration of new technologies, as well as incentivising investment across both existing and new suppliers.

In the short term, the MOD will develop a streamlined approvals process for commercially available and low risk technologies and simpler contractual terms and conditions appropriate to lower value technologies and smaller suppliers.

Together these will help the exploitation of relatively mature technology, including that developed independently for civil markets, and help new suppliers. But as well as these exceptions to normal practice, we need to embed new approaches in the MOD's acquisition, planning and approvals processes, which better and more systematically enable continuous through-life capability management. This is likely to involve continual pipelines of research and development with clear routes to exploitation into frontline systems, approvals and planning processes that can cater for rapid upgrades, and commercial models that incentivise appropriately both the innovators and the systems integrators who need to manage the risks of both regular and opportunistic modification.

As part of this, the MOD is investigating potential changes to planning and commissioning processes to better ensure coordination between S&T (under the oversight of the MOD's Chief Scientific Adviser), and the military planners in the Front Line Commands and Head Office driven by the Deputy Chief Defence Staff (Military Capability), who is responsible for R&D. The aim is to ensure technology is exploited effectively and brought into service seamlessly.

Considering how the MOD might need to change further to deliver this vision will be important activity as we implement the DSIS. The MOD will also take steps to ensure better understanding of technology and its exploitation across the development and acquisition cycle, including investing in learning and development for the non-scientific community, as set out in the recently published MOD S&T Strategy.

Climate Change and Sustainability

As has been set out in the Integrated Review, tackling climate change and biodiversity loss will be the UK's foremost international priority in the years ahead. It will seek to accelerate the global transition to net zero and to strengthen adaptation to the effects of climate change that cannot be prevented or reversed. Defence and security government departments will need to play a strong role in this, as will industry.

The MOD is taking steps to mitigate the impact of its carbon footprint on the climate and is committed to improving the sustainability of operations carried out by the Armed Forces. This includes looking at how the MOD can emphasise climate change and sustainability benefits through the social value outcomes brought in under the new cross-government social value model discussed in a previous chapter.

The MOD will shortly publish an update to its approach to climate change and sustainability to be followed by a more detailed longer-term analysis.

Government and industry will need to work closely to ensure that the defence and security sectors contribute to achieving the government's legal commitment of Net Zero emissions by 2050 and, in doing so, further embed sustainable practices into our infrastructure, contracting, culture, equipment and operating practices; all enhanced by developments in technology.

International Cooperation, Exports and Foreign Investment

The UK is home to many multinational companies and many UK-headquartered companies maintain a significant presence overseas. Overseas based companies support our Armed Forces and security personnel and our industrial base, not just through their products, but in creating employment, investment and research and development within the UK. Our openness to collaboration and investment, as well as our industrial and scientific strengths, are what makes the UK a partner of choice for international partners, whether that be collaboration between governments or businesses.

The government's international relationships and alliances underpin and help define the global links between UK defence and security companies and international partners. These relationships start with Euro-Atlantic partnerships, in particular NATO and the US, and extends to our unique network of strategic partnerships across the globe, including in the Indo-Pacific.

Ensuring that government and industry are working together effectively is important to promote interoperability with allies; establish secure supply chains; co-develop new technologies and capabilities; share the costs and resources associated with capability development; and achieve export success.

The internationalisation of the defence market and overseas based companies in the UK

The UK's defence and security industrial sectors have over recent years increasingly internationalised and several defence and aerospace companies founded in the UK have significant global reach. For instance, BAES' turnover in the US in 2019 was £8.6bn, representing 43% of their total sales, against 19% in the UK[11]; and the majority of its employees are now overseas[12], as are a high proportion of its shareholders. Other examples of companies with significant overseas operations and sales include Rolls Royce, Martin Baker Aircraft and Ultra.

At the same time, overseas based companies have chosen to invest in or move parts of their businesses into the UK. Notable examples include:

- Leonardo, with its headquarters in Italy, which employs over 7,500 people in the UK[13].
- Thales, a multinational aerospace and defence company headquartered in France, which operates nine key sites and employs over 6,500 people across the UK[14].
- Airbus, a European firm headquartered in the Netherlands, which operates more than 25 sites in the UK with a workforce of 12,500[15].

All the top five US-based primes have also invested in sites in the UK[16], primarily to deliver to MOD.

International joint ventures also can play a significant role, with one of the most successful being MBDA, a joint venture of Airbus, BAES and Leonardo, which employs over 11,500 people across France, Germany, Italy, Spain and the UK.

[11] BAE Systems Annual Report 2019
[12] 31,700 employees in the UK out of 87,800 globally. Source BAE Systems Annual Report 2019.
[13] https://uk.leonardocompany.com/en/about-us/uk-profile
[14] https://www.thalesgroup.com/en/countries/europe/united-kingdom/about-thales-uk
[15] https://www.airbus.com/company/worldwide-presence/uk.html
[16] Northrop Grumman, Raytheon Technologies, Boeing, General Dynamics and Lockheed Martin.

International Research, Capability and Industrial Cooperation

As set out in the segment by segment annex, some industrial capabilities must be maintained onshore to protect our national security. Our defence and security industrial strategy will no longer be based on ‘global competition by default’ but we will continue to seek the benefits of international collaboration and promoting interoperability with our allies. To deliver a step change from an Industrial Age Joint Force to an Information Age Integrated Force, we will need to prioritise the long-term development of our defence and security industrial base and **invest in forward-looking strategic international partnerships to drive collaboration on cutting edge technologies and adaptable capabilities**.

A **new strategic partnership approach to working internationally** will ensure that we are able to work with partners to co-develop transformational capabilities to tackle common threats and the operational challenges of the future. This will be based on an objective framework for international research, capability and industrial cooperation, and partnering principles for international programmes (see box), to deliver the best value for the UK as well as mutual benefits for our allies and partners. The UK is open to research, capability and industrial collaboration with trusted allies and partners, and we will support our industrial and technology base to work internationally whilst strengthening our protections against economic security risks and hostile investments in sensitive, defence and dual-use technology and capabilities that could harm national security, as outlined earlier in this strategy. The Defence Command Paper provides more detail of our priorities for cooperation, including capability development, with other nations.

This approach will ensure that the UK remains one of the most open and internationally minded defence and security markets; will place greater emphasis on the removal of barriers to international cooperation and security of supply; and will demonstrate that we can continue to protect shared technology appropriately. While we are specifying what industrial capabilities we expect to be maintained onshore as national security priorities, this does not preclude overseas based companies being involved.

DSIS international cooperation objectives

- **Delivering capability.** Development of effective capability, based on common requirements/standards, for defence and security.
- **Improving value.** Improving the return on UK investment through greater efficiency (e.g. shared acquisition) or cost avoidance (e.g. access to others' industrial capabilities).
- **Advancing technology.** Access to others' technological strengths and leveraging UK technology advances to secure mutual benefits.
- **Innovation.** Identify, share and access new ways to develop, deliver and sustain affordable capability.
- **Interoperability.** Enabling interoperability with international partners in bilateral or multilateral settings.
- **Enabling industry.** Supporting industry to enable access to markets, exports and inward investment.
- **Enabling UK relationships.** To support UK influence and access.

Think NATO

'Think NATO' is a long-term initiative focused on shaping the UK's strategic approach to research, capability and industrial initiatives in NATO. It seeks to raise awareness across government and unlock the potential of future opportunities through NATO for the UK, such as the development of cutting-edge technologies and capabilities. This will involve tapping into the wealth of expertise across government, industry and academia, demonstrating commitment and the value of the UK's contribution to NATO.

Specifically, this strategy will improve our overall approach to international research, capability and industrial collaboration by:

- Maintaining the UK's **global leadership** role by investing in our priority relationships through a **strategic partnership approach** which improves the way we pursue our objectives. We will embed international collaboration objectives within cross-government and departmental regional strategies and ensure greater levels of ownership through senior level sponsorship of each partnership. We will make better use of **strategic communications** focussing on the UK's strengths in R&D, high value manufacturing and skills to amplify our leading role internationally.

- **Enhancing, diversifying and reinforcing our strategic partnerships**, including through our UK/US Next Generation Capability Cooperation[17] and Think NATO initiatives (see box), as well as working closely with Five Eyes countries, ICAO, Letter of Intent and Joint Expeditionary Force partners[18]. The UK has left the European Union but will cooperate with the EU in security and defence, as independent partners, where this is in our interest. We will continue to monitor how EU defence initiatives evolve. The UK has strong capabilities to contribute as a sovereign nation and will be alert to collaboration opportunities which could deliver for our country and European Allies and partners.

- Improving our approach to **developing defence and security capabilities** by considering adaptability, exportability and technology protection (through a refreshed policy) at the earliest stages of our planning and investment processes, informed by early engagement with potential international partners and industry – living up to the concept of allied by design.

- Publishing **partnering principles** (see box) to clarify our expectations for international defence and security capability collaboration, including the UK's starting position for international programme negotiations based on *'best athlete'* partnering principles and full decision-making rights.

- Enhancing **international understanding** across the defence and security community by improving situational awareness of international priorities and

[17] The UK/US Next Generation Capability Cooperation initiative aims to drive the development of innovative, next generation capabilities to tackle shared threats and operational challenges.

[18] The UK's partners in the Letter of Intent Framework Agreement Treaty are France, Germany, Italy, Spain and Sweden. Those in the Joint Expeditionary Force are Denmark, Finland, Estonia, Latvia, Lithuania, the Netherlands, Sweden and Norway.

approaches through UKDSC, the UK's international networks (with the MOD's global network of permanently deployed personnel delivering defence diplomacy being expanded by a third) and industrial liaison including the Defence and Security and Resilience Growth Partnerships and the DSF (this includes promoting greater international focus within these fora, in particular the DSF Capability Management International and Innovation Working Group).

- Implementing **organisational changes** to establish and embed a stronger and clearer approach to international cooperation and exports across the sectors and across relevant government departments. Within MOD this includes designating "keyholders" for International Cooperation and Industrial Capability considerations for planning and investment processes, to ensure DSIS international cooperation objectives and opportunities are properly evaluated.

- Working with international partners to reduce **barriers to technological transfer** whilst also **protecting technology**, **to jointly build greater assurance and resilience for mutual security of supply,** and to prevent adversaries from building their operational capabilities by acquiring sensitive technology or know-how, from the UK and its partners. International partnerships include the NTIB (see box on page 52) and the Defence Trade Task Force (see box below).

- Addressing market failures where these could present national security risks, working closely with like-minded partners and groupings who adhere to the UK's values of openness and high and transparent standards and engaging in **regulatory diplomacy** to influence global norms, standards-development and the regulations of our key partners, whether working bilaterally or in small groups of like-minded nations or in fora such as the International Standardisation Organisation, International Telecommunications Union, or ICAO.

Defence Trade Task Force

The Defence Trade Task Force (DTTF) is the bilateral UK/US forum in which export control issues and reforms are pursued to reduce the time and financial cost of transferring and managing export controlled information and material. The focus of both the NTIB (see page 52) and DTTF is on greater ambition for technology-sharing, alongside more robust technology protection.

DSIS International Partnering Principles

The DSIS introduces the below **partnering principles** to clarify our expectations for international defence and security capability collaboration. The UK's starting position for international programme negotiations are to be based on 'best athlete' partnering principles and full decision-making rights. More broadly, the approach will be based on:

a. Similar or complementary objectives and requirements i.e. requirements based on a balance between military capability, budget, international influence and industrial policy.

b. A delivery-focused government and industry framework that empowers clearly accountable bodies and has, as its primary purpose, the need to deliver capability quickly with minimal bureaucracy and process.

c. Efficient customer constructs, enabled through appropriate inter-governmental arrangements, responsible and accountable for delivery and holding industry to account to meet commitments including exports.

d. A single empowered industrial entity (e.g. Industrial Joint Team, Joint Venture or Special Purpose Vehicle) incentivised to work closely with, and across, government customers to develop and deliver competitive solutions.

e. A construct that is open and flexible to evolve over time, able to welcome and accommodate new partners with different levels of requirement and industrial capabilities, who share common objectives with UK and existing partners.

f. An approach that allows partners to understand and use the technology to enable operation, modification, upgrade, spiral development and support.

g. An approach enabled by open system modular software architecture (which supports a different collaborative model). Full system commonality is the default, but the flexibility of open system modular software allows flexibility for partners to have different national modules, sub-systems and mission data.

h. A partnership built on the strengths of the nations (industrial/technological expertise and value for money). No specific or quantified workshare requirement, but an expectation of a proportionate return for partners' investment through the life of the programme. An agreed and full understanding of the level of risk when allocating work.

i. Technology that is collaboratively developed and funded shall be developed and owned by a single entity that provide all (full system) partners with shared understanding and control.

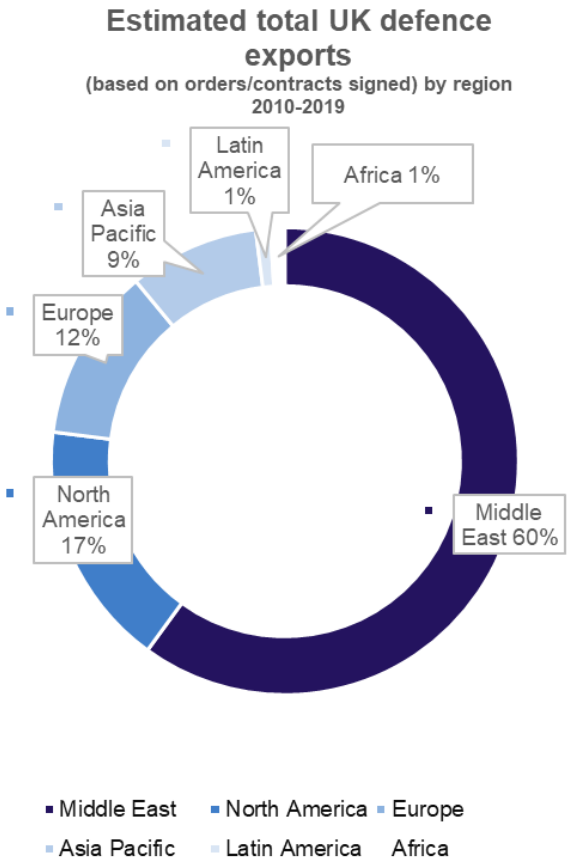
j. A common long-term support strategy.

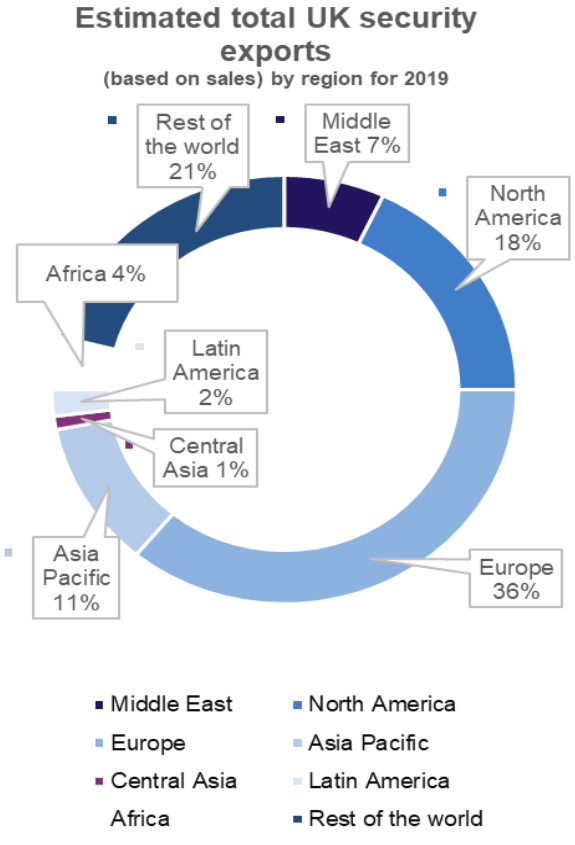
Exports

The UK is the second biggest exporter of defence products globally (after the US) and the third largest for security products. However, the defence sector is extremely reliant on sales of air platforms to the Middle East and is all but unrepresented in exports to 17 of the 20 largest defence importers. The markets for security industry exports are markedly different, with a greater spread of customers by country and type.

There are also new opportunities for growth in these sectors that we will need to work closely with industry to pursue. While most transactions are business-to-business, there is still a significant role for government, including for large individual deals: for instance, since April 2020 three contracts for aviation security equipment sold to Gulf countries were together worth nearly £100m.

For both defence and security industries there are opportunities to diversify and areas where reform and closer collaboration between government and industry would lead to greater export success overall.





Through the DSIS, the government will implement changes to improve the UK's approach to defence and security exports. A more collaborative cross-government approach, across defence and security, will be important to maximise support to UK exports thereby increasing UK prosperity, improving security for our citizens at home and abroad, and reinforcing the UK's place in the world. Changes will therefore be made across the following areas:

- **Aligning priorities and behaviours across government and the industrial sectors.** In order to promote exports more effectively we need to improve cross-government collaboration between relevant departments and also with industry, so that the whole of government delivers together on export success. We will continue to build a much stronger **'TeamUK'** approach based on coordinated propositions between departments across government and industry, particularly incorporating security and cyber security into cross-sectoral offers, and a renewed level of support for the sectors from Ministers across DIT, MOD, the Home Office and other departments.

- This approach will be based on **better use of market intelligence to understand defence and security opportunities**, with a particular focus on fusing open source information with comprehensive intelligence-based analysis of the global geo-political and security context and then disseminating this information effectively to create an informed picture.

- **Developing a standardised Government to Government (G2G) commercial mechanism for defence and security sales.** A new G2G mechanism will establish parameters for HMG's liability, with scope to vary the exact terms for each agreement. This new mechanism will be accompanied by behavioural and structural changes to better promote cross-government collaboration, and ensure effective joint working and risk-sharing between government and industry.

- **Improving the export licensing system.** The UK operates one of the most robust export licensing regimes in the world and this will remain the case. The Export Control Joint Unit is running a Transformation Programme to improve transparency and customer experience for exporters and to identify specific bottlenecks where a lack of resource or expertise causes delays. Working with experts, industry and allies, the UK will maintain an efficient export control system on weapons and dual-use technology that adapts with technological change.

- **Transforming our support for SMEs in the defence and security sectors,** including through building on DIT's Export Academy initiative to establish a **Defence and Security Faculty**. This aims to give SMEs in these sectors access to the regional, financial, and diplomatic expertise they need to maximise their chances of winning business overseas. This will range from general advice on exporting, how to do business overseas, sources of funding through to a structured programme of events and exhibitions linked to specific opportunities.

UK Export Finance

UK Export Finance (UKEF) is the UK government's export credit agency, with a mission to ensure that no viable UK export fails for lack of finance or insurance from the private sector, while operating at no net cost to the taxpayer. UKEF helps exporters access finance and insurance when there is a lack of private sector risk appetite or capacity. In 2019/20 UKEF directly supported 339 UK companies' exports to 69 countries around the world with £4.4 billion of finance. 77% of these companies were SMEs.

UKEF has a strong track record of supporting defence and security exports, including providing a £5bn package of support for the export of 24 Typhoon and 9 Hawk Aircraft to Qatar in 2018. UKEF's wide range of products helps eligible exporters to **win** export contracts by providing attractive financing terms to their buyers, **fulfil** export contracts by supporting working capital loans or contract bonds and **get paid** for exports by insuring against buyer default.

UKEF's maximum capacity of £50bn, with an extra £10bn for those affected by COVID-19, provides UK businesses with access to large amounts of liquidity.

UKEF aims to support exporters and their suppliers throughout the economic cycle, responding to global economic trends, emerging markets, new trading relationships and developing technologies in doing so. As part of this, UKEF is deploying an £8bn Direct Lending Facility which includes £1bn for defence and security exports in particular.

Other products that may be of benefit to the defence and security sectors include the new Export Development Guarantee and General Export Facility that provide working capital support for large and small exporters.

Foreign Direct Investment (FDI)

Overall, the UK is a globally competitive and attractive destination for inward investment, securing more investment than any other European country every year between 1997 and 2018, particularly in key areas like digital technology. According to the OECD, the UK is the third least restrictive nation amongst the G20 in terms of its regulatory approach around FDI, making the UK one of the most open environments for investment in the world[19].

The government will continue to encourage and support investment, including in the defence and security sectors, which enhances the overall capacity and productivity of the industrial base and helps keep the UK at the forefront of defence and security technology and manufacture. FDI is generally positive for the UK economy where it brings greater competition, ideas, jobs, skills, technologies and investment. However, not all foreign investment is equally beneficial. As part of the DSIS, we will work to ensure that MOD is promoting investment in parts of the supply chain where it will have the most economic or strategic impact.

Implementing the overall recommendations of this strategy will ensure that the UK has a competitive and innovative defence and security industrial base which attracts beneficial foreign investment. While doing so we must take steps to protect against malign activity which might attempt to undermine our military or national security capabilities, including by implementing the National Security and Investment Bill and securing access to our most sensitive and advanced technologies, as discussed in the 'Productivity and Resilience' chapter.

Defence and security departments can further ensure that the FDI welcomed into the UK is beneficial by working collaboratively across government to develop a better understanding of the UK's existing industrial capability gaps and using this understanding to target and attract the right investment from overseas, supporting investments and highlighting the opportunities and benefits of working in the UK, working closely with the new Office for Investment.

[19] https://data.oecd.org/fdi/fdi-restrictiveness.htm

Next Steps

Government will work with industry, academia and international partners to deliver the full range of commitments set out in this publication.

This strategy sets out a range of commitments, from changes in our headline policy to undertakings to deliver further segment strategies which will be dependent on collaborative and effective working with the relevant parts of industry. It is intended to provide a robust framework for the future which Ministers across government, led by the Defence Secretary, will regularly review progress against.

To support delivery, within the MOD we are re-organising the Head Office. Directorates for Industrial Strategy & Exports, and International Collaboration will respectively ensure that the industrial and international impacts of MOD's equipment procurement are properly and strategically considered early in programming and scrutiny processes. A separate Directorate will be established focused on broader Economic Security and supporting implementation of the National Security and Investment Bill.

The MOD has also commenced recruitment for a new Director General Commercial role, which will be one of the most senior commercial roles in government. It encompasses all commercial activity across MOD, with accountability for the largest commercial workforce in the Government Commercial Function. This role will be responsible for ensuring commercial activities are discharged coherently, and in line with this industrial strategy and central government Commercial Function policy.

Strategic partnership with industry

Underpinning these changes needs to be a move towards a deeper, more sophisticated and strategic relationship between government and industry which is more direct, trusted and transparent. This requires change on both sides and involvement of a range of departments across government.

The challenge to industry

The DSIS is founded on the fundamental principle that **transparency and commitment** to see through our investment plans can improve industry's productivity and competitiveness, giving companies the confidence to plan ahead and co-invest early. In return, we ask that industry works collaboratively and closely with us. We also expect companies to work better together to tackle shared challenges.

Annex: Capability and Technology Segments - Segment by Segment

This strategy has considered specific segments of the UK's industrial and technology base that support defence and security.

This annex summarises the headline conclusions for the segments considered and the extent to which considerations of "strategic imperatives" or "operational independence" apply or not. Even where these considerations do apply, we may use competition if appropriate to drive value for money within the overall segment strategy. And in areas where we emphasise that operational independence requires specific capability to be onshore, we will consider both international collaboration and importing equipment manufactured overseas, provided we can negotiate with other nations arrangements to share the technologies needed to support and develop such capabilities through life. Equally there may be highly competitive markets in which particular care nevertheless needs to be paid deep in the supply chain to the provision of specific items.

Also, generally applicable to most segments is the growth and diversification in digital and data applications which means that we need to ensure that primes' supply chains and the systems they produce remain open to incorporate innovation and that they can maintain the relative capability of equipment on much shorter cycles than traditional sequences of procurement, mid-life upgrade and obsolescence management in the MOD in particular would have allowed.

With these caveats, we signal below the broad approach to each segment, with the expectation that this will guide scrutiny of individual decisions in these areas.

Strategic Capabilities

Nuclear

Much of the defence nuclear industry must be retained onshore in the UK, either for national security reasons or to meet our international obligations. This national capability is essential for the UK to deliver the government's strategic deterrence policy.

The UK's monopsony demand for defence nuclear is low volume, complex, periodic, generational and cyclic. This presents a considerable efficiency challenge for our industrial base to sustain and develop the long-term skills and infrastructure the UK requires. MOD therefore works closely and collaboratively with our sole-source prime suppliers to drive value for money for the taxpayer. An example of doing so is the MOD's partnership approach through the Dreadnought Alliance, which was formed between the MOD's Submarine Delivery Agency (SDA), BAE Systems and Rolls-Royce to harness effective working relationships and improve performance in this critical programme. MOD also continues to review its requirements to invest as it moves to develop the UK's next generation of nuclear warheads.

For the **submarine** industry we will seek to create efficiency through the adoption of a vessel delivery drumbeat that drives optimised flow within the supply chain and production programme, to give a more sustainable order book to industry. We also seek to establish a submarine disposal drumbeat, building on the learning and industry capability that has been generated over recent years.

Since 2000, the Atomic Weapons Establishment (AWE) had been operated via a management and operations contract with industry partners, using a government owned contractor operated (GoCo) construct. In 2020, the MOD concluded that AWE plc will become an Arms-Length Body, wholly owned by the MOD. This decision was taken in order to simplify and further strengthen the relationship between the MOD and AWE plc, enhancing the MOD's ability to invest in the development of the workforce, technology and infrastructure and therefore the future of AWE plc.

Whilst growth in the defence nuclear segment is limited by our demand, the segment already makes a considerable contribution to the government's levelling up agenda and commitment to R&D through the provision of many highly skilled, high technology jobs. For example:

- Submarine design and construction involves around 9,000 jobs at the BAES' Barrow shipyard.
- The nuclear reactor plants for each submarine, manufactured and supported by Rolls-Royce, employing around 2,900 in Derby.
- AWE employs around 6,500 people, of whom 3,000 are scientists and engineers. A further 4,000 jobs are sustained on AWE sites through subcontractors and partner organisations. AWE

spends approximately £400m in the UK supply chain per year, sustaining jobs across the UK, including in SMEs and in partnerships with UK academia.

- Babcock delivers submarine maintenance and support as well as site management at HMNB Clyde in Scotland and HMNB Devonport in Plymouth. The company are also working on the dismantling project for the UK's decommissioned submarines, with initial dismantling activity underway at the company's Rosyth Dockyard.

The government has committed to a once-in-two-generations programme to modernise our nuclear forces. The four new Dreadnought class submarines will be some of the most advanced machines ever built, and we are also replacing the UK's nuclear warheads, working closely with the US to ensure they are compatible with the Mk7 aeroshell and Trident Strategic Weapon System. At the same time we will continue to cooperate with France on the technology associated with nuclear stockpile stewardship. MOD also remains committed to building seven Astute Class submarines (four of which have already been delivered into service). The MOD will work collaboratively across the nuclear industry to optimise the Defence Nuclear Enterprise for the future, ensuring that the UK retains and develops its world leading skills through a wide range of companies.

Cyber

Cyber is increasingly fundamental to the success of military operations and broader national security for both offensive and defensive purposes – and has been recognised as a domain of operations in its own right. Key elements of cyber will remain a strategic imperative and the National Cyber Force (NCF) – a joint MOD, GCHQ and SIS mission working in close partnership with law enforcement and international partners – is critical to this. NCF provides cyber capabilities that can be used to deceive, degrade, deny, disrupt or destroy targets in and through cyberspace, in the pursuit of our national interests, security and foreign policy goals. Accordingly, this, and the offensive cyber capability it contains, are provided within government.

But in the UK we already have a vibrant broader cyber industrial ecosystem, with an estimated revenue of £8.9bn, that offers a full range of services and products designed to meet government and commercial needs, including export markets. The government cyber strategy sets out our vision and how we are approaching the sector to grow it further.

The main long-term barrier to growth is skills. We are already working in partnership with industry and cross-government through the National Cyber Force to take a whole force approach to skills. Recently, DCMS has funded the creation of the new UK Cyber Security Council. It will act as a governing voice for the cyber security profession in the UK - cohering career pathways and

professional development - and will provide a useful vector into the cyber industry.

The government will continue to work in partnership with industry to ensure we have the right polices and regulations in place to support growth, encourage foreign investment and increase exports. In most cases our cyber needs and those of our Critical National Infrastructure (CNI) can be met through this competitive and innovative market. In some instances, we will continue to need onshore skills and technological expertise to meet requirements and for these we will build on existing partnerships and frameworks with the industrial base. This will be even more important to ensure we understand and address the cyber security implications of emerging technologies such as quantum computing, working closely with industry to drive research and develop new capabilities.

In some areas, such as Crypt Key, we must foster and develop key technologies that we must not rely on adversaries to produce, and take a more active role in the market through regulation and procurement to sustain and grow industrial capability over the long-term.

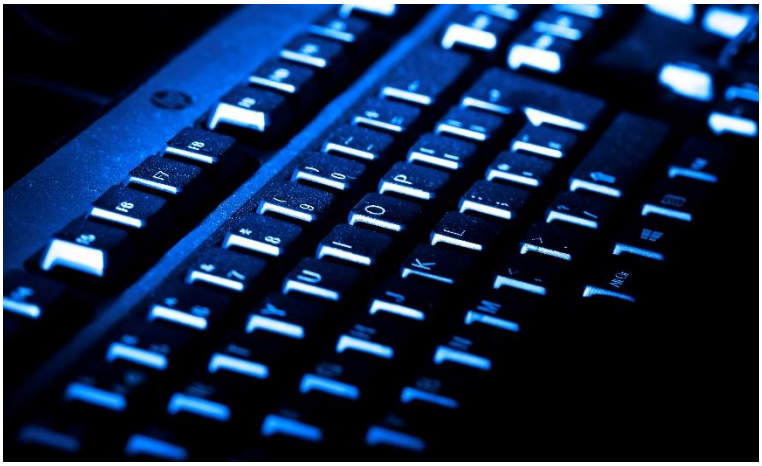
Crypt Key

The UK's most sensitive information and most important capabilities are enabled and protected using Crypt-Key. The ability to develop our own Crypt-Key technologies and capabilities is a strategic imperative for the UK's national security. The government will therefore work closely with industry to develop our industrial capabilities and protect the supply chain to ensure we have access to the right skills and technologies that are core to our digital transformation and can continue to adapt to keep us ahead of the most advanced and persistent threats.

Government qualifies Crypt-Key companies based on their skills, expertise and knowledge and their adherence to exacting security controls (technical, physical and personnel) beyond those used in the majority of government technology acquisitions. This segment requires unique skills that take years to develop, beyond university qualifications, and requires an in depth understanding of national security threats in order to apply those skills successfully. As a result, government funds applied research and works in partnership with companies to develop the skills base by enabling industry to work on the most challenging problems alongside experts within government.

The government seeks to adopt some simple principles when engaging the Crypt Key industrial base by:

- Expressing a single coherent view of future government needs, enabling industry to plan investment and develop the skills needed to deliver capability when required.
- Only doing business with companies that meet our high qualification and security thresholds selected through an evidenced based process judged by the NCSC.
- Pursuing joint success by selecting the most appropriate contracting vehicle for each requirement, remaining cognisant of all of the relevant risks throughout the process.
- Enabling appropriately cleared industry experts to understand the threat and the end-to-end operational context to allow them to deliver the best and most innovative solutions.
- Driving standards-led development approaches which enable adaptable solutions to stay ahead of threats and meet the changing operational need.
- Assessing solutions mindful of the context of business operations, enabling government customers to make informed, risk-aware decisions.
- Investing in the development of the critical skills and knowledge needed to address future government needs, enabling new businesses to enter the market which enables government choice.
- Seeking opportunities to actively support UK exports within the strict controls in place in this segment.



Operational independence

Beyond these strategic capabilities which are an imperative to maintain onshore, there will often be industrial capabilities within different segments that are important to maintain onshore to secure our operational independence. The remainder of this annex covers other important industrial segments and outlines where that consideration is most significant, based on our national security requirements and the state of the relevant domestic and international markets.

Complex Weapons

Complex Weapons – defined as strategic and tactical weapons reliant upon guidance systems to achieve precision effects – can give the Armed Forces unique capabilities and provide battle winning effects. By giving commanders confidence in weapons effects, they can ensure that military objectives can be realistically, safely and legally achieved, attacking enemy forces and facilities (including both highly mobile and hardened targets) while mitigating the risk to civilians and our own and coalition forces. Maintaining their capability is dependent on protecting the highly advanced technology involved, with a deep understanding of the platforms, networks and other systems which host and enable them. On operations, they may need adapting in real time to reflect different environments, target sets and even individual missions.

Maintaining UK industrial capability in these areas is vital to the UK's operational independence. To this end, we will seek to maintain the ability to design, develop, test, manufacture and modify complex weapons, as well as integrate them with wider systems and sensors, within the UK (for instance, we are investing in integrating more UK weapons onto Typhoon and the Lightning II aircraft.). It is particularly important, given the safety and lethality aspects of complex weapons, that they are underpinned by reliable and assured test and evaluation capabilities. It will also be essential for the UK to work internationally to develop future capabilities, utilising effective industrial partnerships, to ensure effective co-development of future complex weapons and associated systems.

Our existing approach to the complex weapons segment means that UK industry has the capability to deliver the majority of our requirements, underpinned by export success. The UK's partnership with MBDA since 2010, through the Portfolio Management Arrangement (PMA), has delivered operational independence and high-end military capabilities, and retained industrial capability in MBDA and its supply chain. This has been enabled by the introduction of a 'family' based approach underpinned by Commonality, Modularity and Re-use principles, which leads to fewer bespoke components, sub-systems and products. With only five families of weapons within the MOD/MBDA PMA, the cost of platform integration has significantly reduced and MBDA has been able to forge different relationships with key suppliers, with longer-term, portfolio-like

approaches flowing into the supply chain and increasing productivity.

This has been underpinned by a joint focus on the long-term engineering, scientific and technical skills across all the necessary disciplines. For example, from 2010 to 2020 there was a significant growth in the volume of integration activity. The volume of work required the enterprise (MOD and industry, both MBDA and platform producers) to build capability and capacity with targeted interventions within the supply chain in key skill areas and long-term workforce planning. This was enabled through innovative commercial and collaborative models and led to successes such as Project Centurion, which integrated Storm Shadow, Brimstone and Meteor onto Typhoon and allowed the early retirement of Tornado. The Portfolio approach generates longer-term industrial confidence to make the necessary investments in skills and productivity, such as in Bolton where MBDA has invested in a new factory and the recently opened Integrated Logistics Centre. To date, the partnership has significantly improved the company's manufacturing and test capabilities, whilst improving value-for-money for the taxpayer, contributing to efficiencies worth over £2.35bn over the last 10 years.

For other providers, Thales UK already provides around 20% of the UK's Complex Weapons from their site in Northern Ireland and has a complementary capability focused on MOD's lightweight weapon requirements. Historically, the MOD has met these through discrete procurements.

There are likely to still be some need to procure off-the-shelf complex weapons from other suppliers than MBDA and Thales and we will continue to do so, mindful of the implications for industrial capabilities and how we maintain our operational independence. The MOD is currently exploring how we move the MBDA relationship forward for the next 10 years, as well as options for new relationships and potentially portfolio procurement with other suppliers.

Novel Weapons

Novel Weapons, such as directed energy weapons, are expected to change radically how armed forces fight and operate. They are high impact, versatile and can have effect from tactical to strategic levels of operation. They will transform supply chains from the earliest design and production through to reload and replacement. Many of the same operational independence considerations apply as for complex weapons, notwithstanding that novel weapons may not rely on guidance systems to the same degree and the safety issues may differ.

The UK has a technological lead and our industries are investing heavily, building on the Weapons Science and Technology Centre which has provided a centre of excellence for weapons research over the last ten years. In 2020, MOD signed the £300m Weapons Sector Research Framework contract with QinetiQ which offers a broader range of research activities, including directed energy as

well as complex and general weapons technologies. The contract is a collaboration between Dstl, industry and academia, with stakeholders working together to plan, task and deliver accelerated weapons S&T research and sustain critical skills and expertise, for development of future systems.

The government intends to build further on this to accelerate the commercialisation and exploitation of novel weapons technologies, to stay ahead of our rivals and to realise the transformational opportunities they offer. By working closely with our industrial base and international partners, we will seek to encourage investment focused on efficient exploitation to boost the segment's value to the UK's economy and scientific edge, whilst protecting technologies with the potential to have significant battle winning effects.

Test & Evaluation

Test & Evaluation is vital to the development and delivery of defence and security capabilities for the UK's Armed Forces and security personnel.

In some cases, a UK based T&E capability is essential for quality assurance, safety or operational security. In other cases, the important element is to retain the ability to direct, understand, analyse and verify results rather than conduct testing onshore, subject to certain safeguards including security of supply. The government will work with industry to identify where such distinctions can be safely made.

Our current strategic intent is to retain industrial capability within the UK, but to look for international cooperation where appropriate. As part of our longer-term strategy, we intend to develop future T&E capability for Novel Weapons, Artificial Intelligence, synthetic/digital systems and space-based systems. These are areas where designing cost-effective and realistic T&E processes are particularly challenging but necessary to deliver the Integrated Operating Concept, and success here would support new areas for UK industry and government to offer as export services. The same synthetic and digital environments used for T&E could also be used for design, concept and tactical development, experimentation and potentially large-scale federated training. These could in turn lead to increased efficiency in acquisition, faster technological refreshes, more cost-effective training at all levels, giving improved value for money and less environmental impact. These are areas we are starting to consider under the T&E Futures programme, in which we intend to invest over £60m over the next four years.

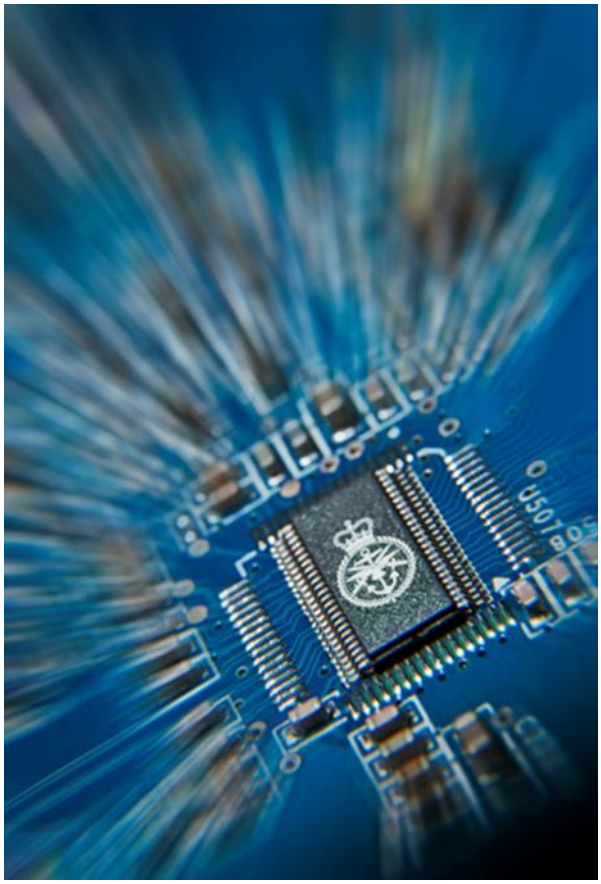
We already have a successful long-term partnering agreement (LTPA) with QinetiQ for many testing & evaluation functions and expect this partnership to play a continued, evolving role as we begin the transformation journey to the future T&E infrastructure we need. This infrastructure, both physical and in future digital, is an important part of the UK's overall industrial landscape.

As noted elsewhere in this white paper, we are also reviewing how we can give industry greater access to government labs and testing and evaluation facilities.

Chemical, Biological, Radiological and Nuclear (CBRN)

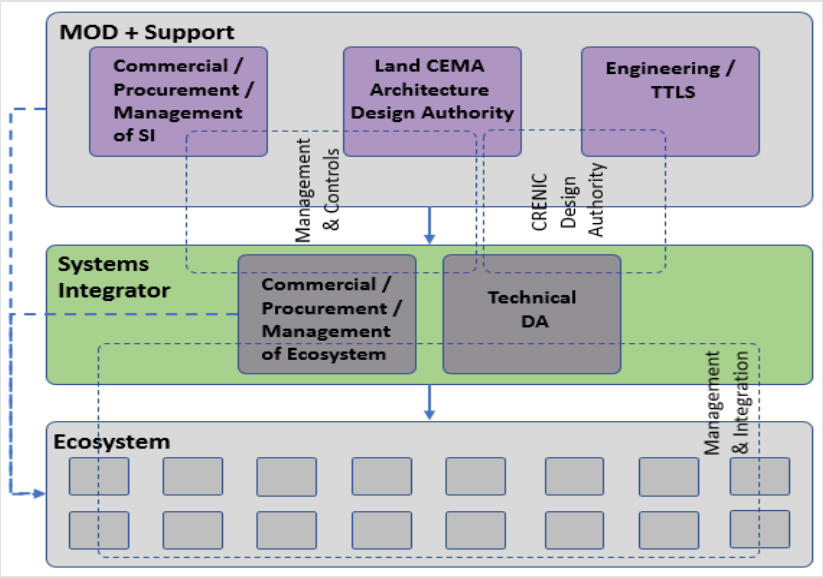
The UK has a world leading counter-CBRN capability through the government's in-house scientific expertise at Dstl which supports both defence and broader national security requirements. There is also some niche private or academic industrial and scientific capability onshore, for which the government has programmes and funding in place to secure continued access, to ensure our operational independence and to respond to events such as in Salisbury in 2018.

The supply chain for broader CBRN-related equipment and countermeasures is diverse and will remain global but we are already taking action, with the trade association CBRN UK, to improve our understanding and build in greater resilience for some of the equipment and underlying materials. The government will continue to work closely with NATO on common standards and with international partners, such as the US and other allies, to maintain security of supply and to develop CBRN defence and security capabilities for the future.



Taking a through-life approach to capability projects with industry - CRENIC

CRENIC is the MOD's future Force Protection Electronic Countermeasures programme that will deliver the next generation of capability to counter the threat posed from Improvised Explosive Devices. This is a £400M procurement that will tender for a Systems Integrator (SI) partner to work with the MOD to design appropriate solutions through spiral delivery and an evolutionary support model. The SI partner will establish and sustain an ecosystem of vendors from which to identify innovative solutions and select best-in-class technology for projects. This approach will promote effective collaborative working between the MOD and industry to set realistic delivery targets, ensure system performance, and promote innovation with a strong focus on through life support and development. The approach is a model that could be used in other areas where we particularly prioritise operational independence and want to ensure timely spiral development.



The MOD has defined a technical architecture which includes common standards and promotes modularity and reconfigurable solutions. This comes with benefits such as reducing the lead time for capability upgrades. In this model, the MOD retains the role of Architecture Design Authority throughout, working with international partners to encourage sharing of knowledge and expertise through strong existing relationships relevant to the project. The MOD has also revised its export policy to enable the SI partner, and other members of the ecosystem, to offer integrated solutions to the international market. The contract is expected to be awarded later this year.

Maritime capabilities

The UK's shipbuilding industry provides the UK Armed Forces and Border Force with vessels and systems that support the protection of the UK and its interests. The 2017 National Shipbuilding Strategy set out how the MOD would create the conditions for a competitive, productive and innovative naval shipbuilding enterprise, capable of winning work in the domestic and overseas market and supporting regional growth and prosperity.

While this ambition still holds true, the government recognises that in order to unlock the full potential of maritime engineering enterprise and maximise its contribution towards jobs, skills, the Union and levelling up, more needs to be done. For this reason, the Prime Minister appointed the Defence Secretary as the government's Shipbuilding Tsar with responsibility for regenerating both the naval and commercial shipbuilding enterprise.

Working across government, the Shipbuilding Tsar is cohering activity to achieve an innovative, efficient and competitive shipbuilding enterprise which is at the forefront of the technical and environmental innovations which drive the sector.

We recognise that we now need a Shipbuilding Strategy which leverages the whole of government and reflects our more ambitious approach for the shipbuilding sector as a whole. The government will therefore publish an update to its 2017 strategy, which will set out how the government intends to create the conditions for success for all parts of the enterprise, from shipyards building warships, to those building Offshore Wind vessels and the companies providing the systems and components which are so critical to our maritime capabilities.

As the most significant UK government procurer of vessels, the MOD has an integral role to play in delivering this strategy. This government's ambition for the UK to be the foremost naval power in Europe brings with it an ambitious shipbuilding pipeline. The demand signal we send through this pipeline has the potential to drive sustainable growth throughout the UK's shipbuilding supply chain, protecting highly skilled jobs across the UK. As part of our strategy refresh, we intend to **develop a continuous shipbuilding pipeline and publish a 30-year plan for Naval and other government-owned vessels**. A continuous pipeline will provide the sector with the confidence needed to encourage innovation, rapid adoption of technology, and investment within the supply chain to improve productivity and delivery.

The intent is to create a virtuous cycle of improvement across the maritime ecosystem. By carefully phasing the programme, we will sustainably grow the capacity and capability of the UK shipbuilding enterprise, potentially drawing on the expertise of international partners where appropriate. The sustainable shipbuilding pipeline approach also allows UK industry to

develop a highly skilled workforce to meet the demand, in turn boosting the productivity and efficiency of the industry, for the benefit of Defence and making the industry more competitive in export markets.

The first step on this journey is the Fleet Solid Support programme (three ships). But the pipeline will also include:

- a Multi-Role Ocean Surveillance Ship, improving our ability to protect our underwater critical national infrastructure and improving our ability to detect threats in the North Atlantic;
- Up to five Type 32 frigates designed to protect territorial waters, provide persistent presence overseas and support Littoral Response Groups;
- Up to six Multi-Role Support Ships (MRSS), to provide the platforms to deliver Littoral Strike, including Maritime Special Operations, in the early 2030s;
- A new class Type 83 destroyer which will begin to replace the Type 45 destroyers in the late 2030s.

This is in addition to the eight Type 26 frigates being built on the Clyde and the five Type 31 frigates in Rosyth. Overall, the MOD's shipbuilding investment will double over the life of this Parliament rising to over £1.7bn a year.

Since 2017, HMG's policy for warship procurement has stated that for reasons of national security, Royal Navy warships would be designed, built and integrated in the UK and would be procured through competition between UK shipyards. It defined warships for acquisition purposes only as destroyers, frigates and aircraft carriers. All other naval and auxiliary ships would be subject to open international competition unless there were compelling national security reasons for constraining them to UK suppliers.

HMG needs a shipbuilding enterprise with the ability to adapt to technology developments and ensure the UK has the maritime capabilities needed to stay ahead of our adversaries. While the 2017 National Shipbuilding Strategy introduced competition to the naval shipbuilding sector, we recognise that we are still operating in an imperfect market.

To drive innovation and modernisation of the maritime industrial capabilities vital for our long-term operational independence, we have extended our naval vessel procurement policy as set out on the next page….

Naval Procurement Policy

All Royal Navy ships and Royal Fleet Auxiliaries are operated by the UK in support of our national defence and security requirements. From frigates to naval auxiliaries, they contribute to the wide range of defence tasks, in peace or conflict; and it is entirely logical to view them as component parts of a broad maritime defence capability. For national security reasons, the UK needs to maintain a maritime enterprise with the industrial capabilities to design, manufacture, integrate, modify and support current and future naval ships (both Royal Navy and Royal Fleet Auxiliary). The procurement approach for each class will be determined on a case-by-case basis. As well as considering the specific capability requirements, we will consider the long-term industrial impact of different options, including delivering value for money for our overall programme and maintaining the key industrial capabilities required for operational independence. These considerations will determine whether the optimum approach would be a single source procurement, a UK competition, an international competition or a blended competitive approach. The chosen procurement approach will be communicated with industry as early as possible to allow for forward planning.

Overall, we consider that a regular drumbeat of design and manufacturing work is needed to maintain the industrial capabilities critical for our national security and to drive efficiencies which will reduce longer-term costs in the shipbuilding portfolio. Whether competed internationally or not, consistent with the government's social value procurement policy, the evaluation of options will include considering their relative contribution to UK social value, for instance the extent to which they create new skills and employment or increase resilience in the supply chain.

Land capabilities

Recent conflicts have demonstrated repeatedly that threats and opportunities evolve quickly in the land environment, and the UK must be able to constantly adapt its capabilities at a relevant pace. As such, the ability to generate technologically advanced land systems and integrate them rapidly continues to be a priority to ensure our operational independence. As the complexity of land systems increases and as the Integrated Operating Concept is implemented, keeping land combat systems effective within an international, multi-domain framework is becoming more challenging.

Our vision is for an innovative, productive and globally competitive land industrial and technology segment in the UK that can export UK products, collaborates domestically and internationally on key defence projects, and contributes to our national prosperity. To achieve this, **we intend to establish a Land industrial strategy for combat systems** that will guide our collective investment choices and chart a course to our next generation of land combat systems.

This is an ambitious vision which requires a change in approach. Much of the current armoured vehicle fleet entered service some years ago, such as the FV430 family and Challenger 2 which were added to the inventory in 1963 and 1998 respectively. Subsequent acquisitions in the first decade of this century focused on equipment that was procured from the global market to service urgent operational requirements arising from operations in Iraq and Afghanistan. Over the same period several major projects, including Challenger 2 upgrades, MRAV[20], TRACER[21] and the Future Rapid Effect System, were delayed or cancelled. Consequently, our onshore industrial capability contracted and consolidated in that period.

However, the MOD's current modernisation programme has stimulated new growth, catalysing new investment in the UK's industrial and technology base. The ARTEC consortium delivering our Boxer vehicles transferred technology to the UK and is subcontracting manufacture to the Rheinmetall BAE Systems Land (RBSL) joint venture based in Telford, and WFEL based in Stockport. And the Ajax programme, led by General Dynamics Land Systems UK and operating out of Merthyr Tydfil in Wales, is the single biggest order of armoured vehicles in over 20 years and is supporting around 4,100 jobs across more than 230 UK suppliers. The Ajax turret is being produced in Ampthill by Lockheed Martin, following their acquisition of Insys and subsequent investment.

The entry into service of Ajax and Boxer in the next four years will mark a step change in land combat systems. They will be digitally enabled, form part of a wider network that is built around the digital

[20] Multi Role Armoured Vehicle.
[21] Tactical Reconnaissance Armoured Combat Equipment Requirement.

backbone and based on an open architecture that allows the rapid integration of new technology. Mission systems and the network connecting them will be critical to the effectiveness of land forces in the future. For example, integrating a protection system that comprises a single information environment, layers of automated sensors, electronic counter measures and active and passive protection systems - tuned to specific threats - can significantly improve system and soldier survivability.

Even where systems such as these may be based on advances in civil technology, they may often be dependent on sensitive technology and MOD-generated information. Accordingly, **the ability to design, develop, integrate, test, evaluate, update, upgrade and assure such systems onshore will be a high priority**.

The UK Armed Forces' current inventory, however, comprises 55 unique land platform types, 400 variants and 26 different engine types. The majority of these are based on analogue technologies, have limited growth capacity, and closed or bespoke architectures. Moreover, as this inventory has aged it has become increasingly costly to maintain diverse supply chains and manage safety and obsolescence. The lack of commonality and modularity stifles our ability to adapt and **we are making reductions in the number and variation of our fleets.**

Importantly, we will also reinforce the excellent progress we have made in developing internationally recognised architectural standards that will shape the design of new platforms and systems entering service. This will create economies over the long-term that can be reinvested in modernising our land forces.

As set out in the Defence Command Paper, the Army will receive significant investment in order to become more agile, integrated, lethal and expeditionary, investing an additional £3bn in new Army equipment on top of the more than £20bn previously planned over ten years. This includes investment in new vehicles including Ajax, Boxer and Challenger III, as well as over £250m over ten years in the Guided Multiple Launch Rocket System (GMLRS) and over £800m in the same period on an automated Mobile Fires Platform.

With this level of spending and momentum already building in the UK's industrial base, there is now an opportunity to create a more sustainable pipeline of investment. **We intend to do so by adopting a longer-term approach to our capability investment planning and incorporate more regular upgrades into capability management contracts.** This involves transforming the fragmented approach in which initial acquisition, subsequent support and mid-life upgrades (often deferred) are contracted for separately, into one that is more focused on performance availability and through-life capability management. This will provide industry at all levels with a more sustainable pipeline of work, enable the timely insertion of new

technology, and will make UK products more competitive globally.

To support this, **we will urgently explore with industry the potential of new partnership approaches involving prime contractors, systems providers and new, innovative partners**. Such partnerships would be underpinned by longer-term contracting arrangements and joint planning to give industry the confidence to coinvest – with government being prepared to allocate long term funding to R&D as well as acquisition programmes. We will seek to incentivise greater operating efficiencies from such long-term arrangements and ensure a substantial proportion of savings are reinvested in capability improvements. At the same time and critically, we will also maintain ongoing collaborations with other nations to share R&D, promote interoperability, reduce through-life costs and encourage UK exports. **We will also establish a Land campaigns office in UK DSE** to support industry in capturing a greater share of the accessible global market.

This vision will be developed further over the coming year as we establish a land industrial strategy - including the partnering approach we will take to deliver the future land combat system – and test the long-term value for money of this proposition. Delivering this vision requires industry's keen participation and adoption of appropriate partnering behaviours, acknowledging the competitive tensions and the number of different actors involved. But based on the new investment set out in the Defence Command Paper and the opportunities Army modernisation offers, the government considers that now is the opportunity to adopt this new approach and deliver land forces that are consistently and continually ahead of the threat.

General Munitions

Assured access to General Munitions for the UK Armed Forces through UK and international based industrial capabilities is vital for our operational independence. We have developed a strategy for the next generation of General Munitions to ensure they are fit-for-purpose, available in the quantities required to maximise military capability and to reduce cost throughout the munition lifecycle. At the core of this strategy is a continued partnership with BAE Systems for the next 15 years.

The General Munitions supply chain is inherently international in nature but retention of key industrial capabilities in the UK to act as **an intelligent customer and user of munitions** allowing their safe use and investigation of safety issues is key to our operational independence in addition to particular areas (e.g. countermeasures) where such independence also relies on specific abilities to counter developing threats to the UK Armed Forces.

We will continue to work closely with BAE Systems to ensure the continued investment in world class General Munitions production facilities and skills in the UK in Glascoed (South Wales), Radway Green (Cheshire) and Washington (Tyne and Wear).

Air Capabilities

The aerospace industrial segment provides the UK with defence and security capabilities but the wider civil aerospace industry, due to higher volume and investment, has historically evolved at pace. For defence and security, this often provides the opportunity to leverage civil investment. In the future, a more deliberate approach to leveraging investment in terms of joint R&D and maximising UK's industry's role in global supply chains will be necessary to reflect the evolution and proliferation of technology and threats. **To this end, we will encourage the adoption of open systems architecture to enable spiral development of capabilities.** We will continue to **need assured access to maintenance and support for all platforms onshore or through our closest partners**.

Assuring the safety and protection of our air assets provides us with operational independence. We have world leading technology and industry in the UK and are also leading efforts across NATO to embed open standards. We need to go further to ensure the continued access to cutting edge technology through life and to support the industrial base. **It is our intention to develop an Air Platform Protection strategy that will cover all air assets.** This will embed the principles of the DSIS to ensure pull-through of technology, through life spiral development and a partnership with industry to provide confidence to invest and unlock international markets. This strategy is intended to bolster both sensing and detection and the EMA segment of the UK's industrial capability.

Combat Air

In 2018, the UK set out its ambitions for Combat Air and our determination that the UK remains at the leading edge of Combat Air system development to protect our people, project influence and promote our prosperity.

The Combat Air industry has a proud tradition in the UK, supporting the UK Armed Forces and being highly successful in the global market, accounting for some 85% of defence exports over the past decade. It directly supports over 18,000 jobs with tens of thousands more in the supply chain. The number of highly skilled jobs is set to rise rapidly from 2021 and the industry generates advanced manufacturing, design methods and novel applications which catalyse innovation in the wider economy. The UK is one of a handful of nations able to design and build cutting edge combat air systems, making skills and industrial capability in this segment vital national assets as we seek to maintain our operational independence.

We currently rely on both Typhoon and F35 to provide our Combat Air capability. Typhoon will retire within 20 years and we will require a replacement capability to defend UK interests. By investing now in developing emerging and niche technologies and advanced manufacturing, we can ensure the future force remains world class. We will continue to take the best of these capabilities and spiral-develop them.

The Prime Minister has announced our intention to build on these strengths as the UK leads an international programme to develop and deliver the next generation Combat Air system, replacing Typhoon as it leaves service in the 2030s. This will be a national endeavour, harnessing cutting edge military and civil technologies, to deliver battle winning capability faster while driving down cost. It will fully embrace digital design and manufacture together with open system architectures to foster rapid innovation and put the Future Combat Air System (FCAS) at the heart of the integrated force. The government is making a strategic investment of more than £2bn over the next four years in FCAS.

Our relationship with UK industry under Team Tempest has demonstrated the benefits of close partnership. But we will go further, harnessing strength from across the industrial base to exploit the best products, innovation, and ideas from high-value manufacturing catapults, small and medium-sized enterprises, and other sectors.

And we will work with our international partners to maximise mutual benefits and reinforce our ability to operate together, providing a route for the UK to exploit investments in science, technology, innovative ideas and R&D. We are deepening FCAS partnering with Italy and Sweden through an international Concept & Assessment Phase beginning this year and are exploring important subsystem cooperative opportunities with Japan. And more broadly, Combat Air will remain a key pillar of the UK's global approach as we reinforce interoperability and cooperation with the US, and strengthen our relationships with the Typhoon consortium in Europe and other like-minded nations.

This will ensure that this industry remains sustainable, globally competitive, and at the leading edge of Combat Air system development for decades to come.

Rotary Wing

The UK has continued to invest in Rotary Wing capabilities over the last two decades acquiring the Wildcat, Apache 64-E and delivering significant upgrades to the Merlin, Puma and Chinook helicopters. The UK industrial base has benefited from these investments and means the UK is still able to design and develop new Rotary Wing capabilities and, as importantly, respond to new challenges through the integration and adoption of weapons, defensive systems and digital technologies. This has been enabled by the close relationship the UK MOD has with Leonardo Helicopters

through the Strategic Partnering Arrangement which ensures that together we maximise the opportunities across our current systems, future requirements and exports.

Given the continued relevance of Rotary Wing capabilities to delivering the Integrated Operating Concept and the make-up of the in-service fleet, the UK MOD values operational independence alongside integration with allies. In practice this means we need access in the UK to the know-how to support and upgrade our fleets to respond quickly to changing threats and operational needs. To maintain this capability cost-effectively we aim to consolidate our fleet, initially through procuring a new Medium Helicopter by the middle of the decade to replace the Puma and in due course three other helicopter types. We anticipate that our other main helicopter platforms (Merlin, Wildcat, Chinook and latest Apache) will remain in-service until next generation technologies and unmanned systems start to augment or replace these more conventional systems. We will work in partnership with industry to ensure we can maximise the operational outputs of these fleets through innovative commercial support contracts.

Across NATO, most nations will be modernising or replacing aging Rotary Wing platforms around the 2040s with an interest in transitioning to the next generation platform technologies. This future market offers the UK an opportunity to work with allies and industrial partners to explore future requirements, including the potential for co-development. To this end, the UK is taking a lead in NATO through the Next Generation Rotary Craft Capability project.

Space capabilities

Space, and our assured access to it, is fundamental to military operations and UK space industrial capability is vital to our operational independence. The defence and security approach to space is maturing, following the establishment of the National Space Council, and the expected publication of a new National Space Strategy in the coming year. But as already set out in the Integrated Review, by 2030, the government's ambition is for the UK to have the ability to monitor, protect and defend our interests in and through space, using a mixture of national capabilities and burden-sharing partnerships with our allies.

The UK space industry has an exceptionally skilled workforce employing nearly 42,000 people, from Cornwall to the Scottish Highlands and Islands, while the global space industry is growing and is expected to double by 2040. The UK Space Agency has well established arrangements for engaging with industry across the UK, and with international partners. In tandem, the MOD's new Space Directorate is driving greater coherence of engagement by MOD, and this initiative will be reinforced by the establishment of Space Command.

In support of the government's ambition for space, MOD will deliver the SKYNET 6 programme, investing around £5.2bn over the next ten years to recapitalise and enhance our satellite communication capabilities, and spend an additional £1.4bn on space over the next decade to establish Space Command, enhance space domain awareness including the establishment of a National Space Operations Centre, develop a UK-built ISR satellite constellation and supporting digital backbone in space, and create a Space Academy.

In developing the required technologies, MOD intends to embrace the growing UK space innovation environment and support the wider UK Space Sector growth aspirations through targeted projects that can exploit novel technologies and provide capability to the user faster than traditional procurement methods. Dual-use will be considered at all stages to ensure maximum cross-government benefit is derived, both in capability and value for money.

Cross Cutting Capabilities

Across all domains there are cross-cutting and enabling capabilities vitally important for delivering the Integrated Operating Concept and providing Information Advantage to MOD – command, control, communications and computers; the 'digital backbone'; electromagnetic activity and sensing & detection. These are sometimes standalone or integrated within wider systems. Similar technologies are also frequently relevant to broader security requirements and other government departments and agencies.

These areas are at the core of moving seamlessly from the industrial age to the information age. Underpinning the UK's capability in these areas today is a highly skilled workforce, academic excellence, investment in R&D and our ability to integrate systems.

The government is taking action to manage our data as a strategic asset, and this will need industrial expertise to manage how we tag and store this to make it shareable across systems. We will work with industry so that they can generate and provide data to government in a consistent manner transferable across systems and domains that are integrated within a Digital backbone architecture. The MOD is taking steps to do this through the creation of a Data Office and a data policy to ensure data is curated, is interoperable and delivers effective and optimised **data exploitation** across operational and business environments.

We will need to work with industry to deliver a more coherent and less bespoke digital approach at the platform and system level, and understand challenges to Multi-Domain Integration. We are developing a programme of work with industry within the new DSF Digital Steering Group to take this forward.

The market for the cross-cutting capabilities is generally buoyant and relatively open (compared to platforms) in the UK and globally, and UK companies have had considerable success in having

their products incorporated in collaborative programmes and other countries' procurements. This has often been facilitated by historic collaboration on R&D and pull through of technology. Increasingly much of this technology will be developed by the commercial market and it will be the ability to integrate, update and fuse the data underpinning and generated by these capabilities that the UK will need to have access to in-house or through an onshore industrial base. This means growing the expertise onshore that understands systems architectures and can integrate these data driven systems into wider systems and capabilities. As part of this, we anticipate investing more in next generation capability and technology demonstrators in the following cross-cutting segments to ensure we maintain government and industrial skills, develop UK intellectual property and pull through technology into deployable capability.

Command & Control, Communications and Computers (C4)

Military C4 is a broad, complex and technically challenging area characterised by rapid advances in technologies (including developments in machine learning and, in the future, quantum computing), largely driven by commercial information systems technology but which need to be applied in the military environment and, as the force is increasingly integrated, across domains. The MOD is already evolving our current tactical systems such as BOWMAN to MORPHEUS and is investing in space technology (SKYNET6). Generally, we will continue to procure systems competitively from a diverse global market. But to develop the next generations of C4 and ensure they can be integrated into UK platforms and upgraded through life we will need greater dialogue with industry to ensure the opportunities and demands of the future operating concept are fully understood. This will require greater use of experimentation through demonstrators to test how most effectively to apply new technologies to the evolving force and, outside of major acquisitions, sustain and develop the UK skills base. This will be supported through Multi-domain C4 being prioritised in MOD's Science & Technology Strategy as one of the most pressing areas where capability development can deliver a decisive edge to the UK in the future.

Digital Backbone

Information and data are among the most valuable assets in defence and to exploit these fully we are embarking on an ambitious programme of digital and data transformation. The Digital Backbone – digital infrastructure optimised for information exploitation and enabling multi-domain integration – will underpin the modernisation of the armed forces as well as supporting the broader transformation of defence capability. It is the enabling platform for digital exploitation, and covers a wide range of systems such as the Cloud, gateways, Software Defined Networks, Radio Frequency and non-Radio Frequency communications, and bearers' communication network architecture. A

modern and secure Digital Backbone, which will provide the secure underpinning IT and data platform, will allow the MOD to collaborate seamlessly with other government departments, our international partners and allies, academia and industry across a single information environment, exploiting all data to enable faster, better decisions. Industry will need to reflect the Digital Backbone in the platforms and products they produce for MOD, so that these can seamlessly plug into this environment through common architectures.

To achieve this goal, we will need to grow the expertise within the MOD drawing upon the knowledge and experience within the industrial base, and leverage commercial products and digital solutions. As no single solution will meet all MOD's needs - from strategic planning through to operational deployments - we will develop open architectures and digital interfaces that allows seamless movement and exploitation of data and integration of new effectors, sensors and EMA capabilities.

The Digital Backbone will require **enduring partnerships with our prime infrastructure and hyperscale cloud providers** who already bring value through their investment in scalable IT services and global presence. We will invest to recruit, develop and retain the right skills to build a committed community of civilians, reserves, regulars and industrial and academic partners; we will define a common data framework that ensures we maximise access, integration, security and exploitation of data; and we will set and uphold standards for data, digital technology and cyber defence.

MOD will exploit the Digital Backbone by investing in software-intensive capabilities, which will depend on a strong entrepreneurial industrial and academic base. In particular, as set out in the Defence Command Paper, a new Defence Centre for Artificial Intelligence (AI) will serve as the nucleus to accelerate the development and exploitation of AI technologies from the battlespace to the back office. Activities will range from implementing data management techniques; developing common AI platforms, toolkits and best practices; testing and validating novel capabilities; to delivering scalable solutions.

Electro-Magnetic Activity (EMA)

At the centre of our future Integrated Operating Concept is our ability to manipulate and use the electromagnetic spectrum. EMA is defined, within MOD, as 'all offensive, defensive and inform activities that shape or exploit electromagnetic effects and the enabling activities that support them'.

The UK industrial and technology base has a role to play in many aspects of developing EMA capability, but our approach needs to be MOD led in partnership with other government departments, the intelligence agencies and international partners.

Following internal review of the MOD's approach to this critical capability area, we intend to adopt a more deliberate approach to EMA that:

- Seeks to maintain System Architect and Enterprise Design expertise in the UK in order to build, integrate and utilise system-of-system capabilities. CRENIC (see box) provides an example of how this can be done in practice.

- Provides enough suitably qualified and experienced personnel in MOD (across Dstl, DE&S and Commands) to engage with and influence international partners and industry.

- Draws in international partners to co-develop capability, including through standardisation (e.g. through NATO).

- Through rapid programme development and technology exploitation cycles, seeks to generate an environment which can utilise the best outputs UK SME's have to offer.

- Explores a portfolio approach to allow spiral development through life while strengthening the core UK industrial base, ready for exports and collaboration with 5EYES and NATO partners. We anticipate an ongoing dialogue with industry in this area to explore the potential for jointly funded R&D roadmaps to support this aspiration.

Sensing and Detection

Sensing and detection technologies (from radar to sonar) are often embedded within complex weapons, anti-submarine, or air platform protection capabilities, but can also be substantial defence subsystems in their own right and rely on specific, sensitive technologies which we need to protect, whether developed nationally or in collaboration with allies. The UK is a world leader in this field, partially due to the close relationship and sharing of mission data between government and industry.

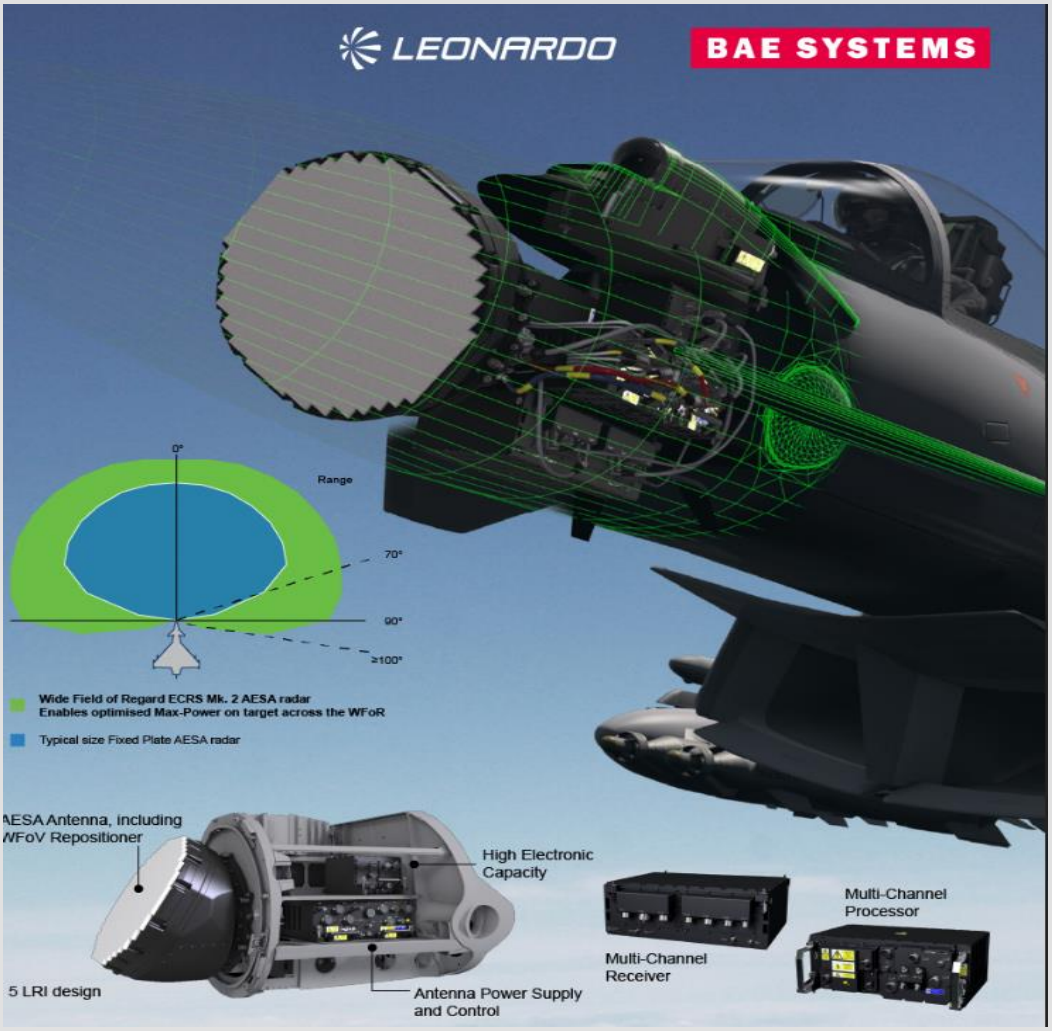
We do not need UK industry to design and build all sensing and detection systems across all domains to maintain our operational independence. But being able to adapt systems through life, understanding and deploying advanced signal and image processing techniques, accessing mission data, and fusing sensor information are critical requirements. This can be achieved through commercial strategies to protect our access rights; open architectures; greater collaboration on S&T and an ecosystem approach to maintain the key industrial skills. This may require targeted investment in the UK industrial base - as the MOD has done with its significant investment in RADAR 2 for Typhoon and the industrial capabilities at Leonardo Edinburgh - to maintain our position for the next generation of combat air sensors and support collaboration in future combat air systems.

We will in the future consider industrial impacts strategically. To support this, and position UK industry for our future needs and market opportunities, the MOD will be investing in generation after next technologies that we aim to pull through. Fora such as the **Electro Magnetic Sensing Interest Group (EMSIG)** will be important to test our thinking and to inform our approach to the segment in future and our R&D choices.

Alongside this, various government departments have particular research interests in sensing and detection, with similar but not identical priorities for e.g. detecting contraband at the border, protecting aviation security, or preventing illicit mobile phone use in prisons. Increased sharing of these needs with the security sector through the SRGP, together with the initiatives covered in previous chapters, will increase opportunities for dual-use technologies to be identified and brought to market effectively.

New Radar for Typhoon: Radar 2

In 2020, MOD committed £317m to the continued development of Radar 2 (ECRS MkII) for Typhoon. This was on the back of previous investment in Active Electronically Scanned Array (AESA) radar technology and building on a long heritage of radar design and development in Edinburgh (now owned by Leonardo). This investment will sustain 600 highly skilled jobs across the UK and ensure the UK has the right skills and technology in place to support the future combat air strategy.



Radar 2 is more than a sensor: it is a multifunctional system that will give UK Typhoons a world-leading Electronic Warfare capability, including wide-band electronic attack, in addition to traditional radar functions, to operate in contested and congested electromagnetic environments. Open architecture design will enable rapid and low-cost capability evolution and modification to maintain the aircrafts' edge throughout their life.

Security-focused capabilities

Across the majority of security segments, from aviation security to crowded places or cyber security, procurement and support is largely carried out by the private sector (e.g. in the form of airports and airlines in the case of aviation security, or venue operators for major events) rather than by the government.

Where (unusually) central government or operational partners including the police procure security goods and services directly, the majority of the technologies and capabilities come from well defined, efficient and viable marketplaces.

International collaboration is very important across these segments, particularly with governments and international organisations in terms of regulation and standards. The UK will continue to be an active proponent of regulations and standards to ensure the safety and protection of our citizens, including through international organisations (e.g. the International Civil Aviation Organization).

Intelligence and communication technologies and systems, and their supply chains, have been identified as an area requiring a deliberate and strategic approach in the future. Whether full systems, or component parts, there is an increasing need to understand the supply chains and security of the technology being employed for security purposes.

And in recognition of the need to understand the national security benefits and the implications of advanced and emergent technologies, BEIS will work in close partnership with the defence and security community to identify the technologies with greatest potential, build deep expertise and connections with the researchers, businesses and investors active in these spaces, and develop strategies for cultivating these technologies in the UK.

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