



OXFORD  
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# BAE SYSTEMS' CONTRIBUTION TO THE UK ECONOMY

AN INDEPENDENT REPORT  
BY OXFORD ECONOMICS

2022

**BAE SYSTEMS**

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*A BAE Systems scientist examines LiteHUD® - a world-leading head-up display for pilots developed by teams at the Company's Electronic Systems business at Rochester in Kent.*

# FOREWORD

At BAE Systems we help governments fulfil their prime responsibility by protecting and serving those who serve and protect us. We do this by being performance driven and values led.

Our focus on performance means that we are able to make a significant contribution to the economies and societies in which we operate. To help us quantify our contribution in the UK, we once again asked Oxford Economics to develop an independent analysis of the economic value of our activity.

This analysis demonstrates that BAE Systems made a contribution to the UK's GDP of more than £10 billion in 2020. We delivered almost £4 billion in exports and employed 143,000 people in the UK directly and indirectly through a network of 5,000 suppliers with whom we spent £3.8 billion in 2020.

With 72% of our UK workforce in highly skilled engineering-related roles, we are closely aligned with the UK Government's focus on skills - and to ensure we maintain and increase our pipeline of talent, in 2020 we invested £93 million in education programmes and in training our people - including more than 2,000 apprentices and almost 600 graduates. This includes our work with The Prince's Trust in helping to address youth unemployment through the Movement to Work and Kickstart programmes.

Our ability to support the UK Government's levelling up

agenda and the Chancellor of the Exchequer's Plan for Jobs is further evidenced by our regional footprint - with 16,570 full time employees in the north west of England alone. At Warton and Samlesbury in Lancashire, we build some of the world's most advanced military aircraft - we also build nuclear-powered submarines in Barrow-in-Furness where we employ 26% of the working population. In 2020 we spent nearly £700 million with suppliers in the nation's most deprived local authorities.

We are committed to supporting the UK Government's net zero programme, working closely with the Ministry of Defence in developing sustainable defence technologies, as well as setting a target of achieving net zero greenhouse gas emissions across our operations by 2030.

In Scotland we support a total of 6,420 jobs in shipbuilding including our work in building the Type 26 Frigate, a design developed in the UK and now adopted by Australia and Canada - a tribute to British skills and engineering - and a fine example of the merits of a United Kingdom working as one nation. We provide further capabilities to the Royal Navy in the south by managing Portsmouth Naval Base where we also carry out upgrade and maintenance to warships including the two Queen Elizabeth-class aircraft carriers.

BAE Systems' investment in its people and new technologies pays huge dividends to the economy and society, with average productivity calculated at £83,000 per worker - 29% higher than the overall average across the economy in 2020. Furthermore our leaders in our UK businesses take pride in sharing their business skills, with more than 190 of our leaders mentoring 200 different small and medium sized businesses across the UK. The productivity boost of these mentoring relationships between March 2020 and March 2021 alone is estimated by Be the Business, the organising body, to be £12.2 million.

We take our role as a technology leader seriously, investing some £1.1 billion in emerging technologies both directly and on behalf of the UK Government. We also manage important research and development partnerships with UK universities which focus on strategically important technology areas for our business, including artificial intelligence, autonomy and advanced manufacturing.

I believe that BAE Systems' role in creating a stronger economy and fairer society in the UK is extraordinarily valuable. It is a jewel in the UK's industrial crown. I am very proud to be Chairman of a company which makes such a significant contribution to the collective security and prosperity of our nation - both now and in the future.

**Sir Roger Carr**  
Chairman, BAE Systems plc



# EXECUTIVE SUMMARY

**143,000**

Total full-time equivalent (FTE) jobs supported by BAE Systems in 2020.

*For every 100 jobs at BAE Systems, 410 are supported across the economy as a whole.*

**£10.1 bn**

Total gross value-added contribution to UK GDP in 2020 by BAE Systems.

*For every £100 contributed directly by the Company, a total of £350 is supported across the economy.*

**£3.8 bn**

Procurement spending by BAE Systems in 2020, with 5,000 suppliers across the UK.

*This spending supports a £3.5 billion contribution to GDP and nearly 60,000 jobs.*

**BAE Systems is the largest defence, aerospace, and security company in the UK and, by a wide margin, is the largest supplier (by spend) to the UK's Ministry of Defence.<sup>1</sup> The Company is also one of the country's biggest manufacturing firms.<sup>2</sup>** Across a diverse portfolio ranging from defence equipment manufacturing and developing cutting-edge technologies to providing cyber-security to Government agencies, BAE Systems has a significant impact on the UK economy.

**This report focuses on the contribution that BAE Systems made to the UK economy in 2020.** Its impact is assessed in terms of the Company's contribution to UK GDP, employment, and tax revenues. We also explore the extent of its exports, its capital investment, and its technology, research and development (R&D) activity. The Company's impact is firstly explored at a national level, and then we present in-depth regional analysis focusing on four geographies: the central belt of Scotland, Cumbria, the south of England, and Lancashire.

**In 2020, we estimate that BAE Systems sustained 143,000 full-time equivalent (FTE) jobs in the UK.** This contribution is the sum of three impact channels: direct on-site jobs; indirect jobs within the Company's UK supply chains; and induced employment that results when workers at BAE Systems and in its supply chain spend their wages in the wider consumer economy. The Company itself employed 35,300 people on an FTE basis in the UK in 2020. Nearly 59,000 FTE jobs were supported through the Company's supply chain spending, and more than 49,000 FTE jobs were supported by worker spending at consumer-facing businesses and in their value chains. Therefore, for every 100 jobs at BAE Systems, the Company supported 410 jobs in the UK economy as a whole.<sup>3</sup>

**In total, the Company's operations are estimated to have supported a £10.1 billion contribution to UK GDP in 2020, equivalent to 0.5% of the domestic economy.** Procurement spending in the UK by BAE Systems in 2020 amounted to £3.8 billion, equivalent to 75% of the total procurement expenditure of its operations in the UK. BAE Systems directly contributed £2.9 billion to UK GDP in 2020, while supporting a further £7.2 billion via supply chain and worker spending multiplier effects. In other words, for every £100 in GDP created directly by BAE Systems, a total of £350 is supported across the UK economy as a whole.

**BAE Systems' workforce is highly productive in economic output terms, reflecting the Company's investment in employees, capital, and R&D.** Average productivity at BAE Systems stood at £83,000 per worker, 17% higher than the average for the UK manufacturing sector and 29% higher than the overall average across the economy. This reflects the highly technical nature of its workforce, with 72% employed in engineering-related roles.<sup>4</sup> The importance of the skills needed to undertake this work is reflected in the Company's training programmes: in 2020, more than 2,000 apprentices and nearly 600 graduates were on training schemes.

**BAE Systems' impact extends far beyond the core economic footprint to the wider benefits its activities bring to the UK economy and society.** In support of maintaining and expanding the skills of the country's engineering and manufacturing labour force, in 2020 the Company spent £93 million on skills, training and development activities across its UK workforce and on engagement with schools and young people. In addition, BAE Systems directly employed 14,700 workers—more than 40% of its overall UK workforce—in Britain's most deprived local authorities in 2020. These local authorities rank in the bottom fifth of the Government's Indices for Deprivation for each of England, Scotland, and Wales. The Company also spent nearly £700 million on supply chain purchases in these local authorities.

**In 2020, either directly or through secondary channels, the Company supported a total tax contribution of £2.7 billion to the UK Exchequer.** This is roughly equivalent to the combined departmental budgets in 2020-21 of the Cabinet Office, the Department for International Trade, and HM Treasury. Of this, more than £700 million was directly generated by BAE Systems itself; this included National Insurance contributions paid by both the Company and its employees, as well as employee income tax, and corporation tax.<sup>5</sup>

**72%**

The share of UK employees who work in engineering-related roles.

*£93 million spent on skills and more than 2,000 apprentices and almost 600 graduates in training schemes.*

**14,700**

FTE jobs supported in Britain's most deprived fifth of local authorities.

*Nearly £700 million in supply chain spending concentrated in such areas.*

**£3.9bn**

Value of goods and services exports in 2020.

*Equivalent to 133% of the company's direct contribution to GDP.*

<sup>4</sup> Gov.uk, MOD trade industry and contracts 2020.

<sup>2</sup> Measured by revenue. ZoomInfo, Top 10 Manufacturing companies in United Kingdom by revenue for October 2021.

<sup>3</sup> All multipliers presented in this report include direct contributions.

<sup>4</sup> Including engineers, manufacturing and operations personnel, and project managers.

<sup>5</sup> HM Treasury, Public spending statistics: July 2021, Departmental Budgets table 1.10.

**£1.1bn**

Total value of R&D work carried out in the UK by BAE Systems in 2020.

*BAE Systems itself funded £100 million, equivalent to 3.4% of the Company's direct contribution to GDP.*

**In 2020, BAE Systems exported £3.9 billion worth of goods and services**—representing 0.7% of all UK exports in that year. This is equivalent to 133% of the Company's direct contribution to GDP, providing a significant boost towards the Government's target of exports reaching 35% of GDP. The Company's imports, including those from non-UK BAE Systems entities, totalled £1.3 billion in 2020. Therefore, the Company contributed £2.6 billion in net exports to the country's balance of payments.

**BAE Systems also makes a substantial contribution to the UK wider economy through its technology and R&D activity. In 2020, the Company self-funded £100 million of R&D in the UK, equivalent to 3.4% of its direct contribution to GDP.** This helps contribute to the Government's target for total UK R&D investment to reach 2.4% of GDP by 2027. In addition, BAE Systems also carries out a significant amount of R&D funded by the Government. In 2020 alone, the Company's scientists and research engineers delivered £1.0 billion of R&D activity on behalf of the Government. In 2020 BAE Systems was the ninth largest patent applicant in the UK with 70 applications.



*Sophie Harker is Assistant Chief Engineer of Electric Products in BAE Systems' Air business. In 2018 she won the Young Woman Engineer of the Year Award and in the same year, at the age of 26, was awarded the Sir Henry Royce Medal recognising her research into developing future technologies for the aviation industry. Sophie is committed to encouraging women into a career in science, technology, engineering and maths.*

© Copyright This is Engineering



***In 2020 the final two Offshore Patrol Vessels, HMS Tamar and HMS Spey, were accepted by the customer. The Offshore Patrol Vessels were built at BAE Systems' shipyards in Glasgow. Read more about the Company's presence in Scotland on page 72.***

# 1. INTRODUCTION

BAE Systems is one of the world's largest defence, aerospace and security companies,<sup>6</sup> with nearly £21 billion in total sales in 2020 and a global workforce of 89,600 workers.<sup>7</sup>

**The Company has a significant presence in the UK, with 35,300 workers across more than 50 work sites around the country.** The Company has expertise in engineering, manufacturing, research and development, and service provision across a wide portfolio of operations. This includes: the design and construction of the ships, submarines, and aircraft that form a key part of the UK's defence forces; providing cyber security and intelligence services to Government agencies; and developing advanced electronics used in a variety of military and commercial applications.

This business activity has a notable impact on the economy. **In this report, we assess and quantify the contribution that BAE Systems made to the UK's gross domestic product, employment, and tax revenues in 2020.**<sup>8</sup> We derive this impact from the Company's own operations, its supply chain spending, and from consumer spending by

workers employed by BAE Systems and in its supply chain. These impacts are set out in Chapters 2, 3, and 5, and a more detailed explanation of the method we follow to make this assessment is given both on pages 14 and 15 and in Appendix B.

In addition to these headline economic impacts for 2020, we highlight the wider and longer-term socioeconomic contributions that BAE Systems makes to the UK. These include significant research and development activity that helps to boost innovation; capital investment that expands the UK's productive capacity; and training and employee development that help to raise the country's human capital. We also assess how the Company helps to support the most deprived areas in the country through the location of its work sites and its supply chain spending, as well as the areas most affected by COVID-19.

In addition to estimating the national economic impact of BAE Systems, we also examine its footprint in local areas. In Chapter 7, we assess the impact on employment of the Company's activity in four key areas:

- the central belt of Scotland, where the Company has shipyards in Glasgow at Scotstoun and Govan and an electronics manufacturing facility at Hillend outside Dunfermline;
- Cumbria, which hosts BAE Systems' submarine building business at Barrow-in-Furness;
- Lancashire, where the Company's major aircraft production facilities in Warton and Samlesbury, near Preston, are based; and
- the south of England, which includes BAE Systems' sites along the south coast, such as major naval facilities in Portsmouth.

<sup>6</sup> As measured by global revenue in US dollars. Defense News, Top 100 for 2021.

<sup>7</sup> BAE Systems PLC, Annual Report 2020.

<sup>8</sup> Throughout 2020, the global COVID-19 pandemic caused considerable disruption to output, employment and travel. These exceptional changes to the structure of the global supply chain are dynamic, and continue into 2022 as global economic activity slowly moves back towards a version of normalcy. Oxford Economics' global modelling framework is based on the latest published structural data, which relates to 2019, and as such can be thought of what the economic impact would be during a "typical" year.

# DEVELOPING A UK SPACE CAPABILITY

BAE Systems' global business has been engaged in the space sector for more than 50 years, working with multiple space agencies around the world. In that time the Company has developed expertise in the fields of antennae, signal processing, and electronics hardened to protect against the radiation experienced in space. This work has helped to develop a domestic capability reflecting the findings of the UK Government's 2021 integrated defence review, which recognises the strategic importance of space for the UK's future security and prosperity.<sup>9</sup>

Further supporting this focus, in September 2021 BAE Systems acquired In-Space Missions, a Hampshire based SME that designs, builds and operates satellites. The acquisition combines BAE Systems' expertise in highly secure satellite communications with In-Space Missions' full lifecycle satellite capability, to create a sovereign UK space offer. In-Space Missions has an innovative approach which allows multiple organisations to launch payloads in the same satellite, lessening the time taken to get projects into orbit and reducing the number of separate man-made objects in space.

A further example of BAE Systems' work in the space sector is a

collaboration with Goonhilly Earth Station (GES), a large radio-communications site in Cornwall. The two organisations have worked together since 2018 in commercialising deep space communications. BAE Systems has supplied two tracking, telemetry, and command processor systems that allow GES to track and communicate with a wide range of spacecraft including future manned and robotic missions to the Moon and Mars. The partnership involves working closely on the existing deep space programme with the European Space Agency.

BAE Systems is also developing radio technology to provide global satellite navigation systems and command and control services from low earth orbit satellites or even high-altitude aircraft. A report from 2017 for the UK Space Agency estimated that the loss of satellite navigation for just five days would cost the UK economy £5.2 billion through aspects such as a reduced ability for drivers to navigate and reduced emergency service effectiveness.<sup>10</sup> Currently, most of the UK's satellite navigation services are provided by a small number of satellites in medium earth orbit, which are vulnerable to potential attacks, and as such this new technology will help provide greater resilience.



<sup>9</sup> UK Government, Global Britain in a Competitive Age: the Integrated Review of Security, Defence, Development and Foreign Policy, 2021.

<sup>10</sup> London Economics, The economic impact on the UK of a disruption to GNSS, 2017.

# USING AI TO ANALYSE DATA IN ALL THEATRES OF OPERATIONS



Alongside the historically important military domains of land, air and sea, the newer domains of space and cyberspace are growing in importance. The UK Government has set out a vision for tightly integrating its capabilities across these five areas, stating that in the future “multi-domain integration (MDI) will underpin how we operate and fight”.

One facet of MDI will be the collection and use of data from sensors installed across all areas of operations, including from satellites in orbit, as well as from existing military platforms and new uncrewed assets. Artificial intelligence (AI) and machine learning techniques will be required to sift through and analyse the enormous volume of data that this approach will generate.

BAE Systems' All Source Information programme,

which is currently at an early demonstrator phase, is designed to help deal with this deluge of information by collating all datasets onto a single platform. This system is aimed at cataloguing and finding patterns in multi-source data, just as consumers use a search engine to identify the best results when browsing online. Rather than the user asking a question, however, the system will actively present options and recommendations. The programme also aims to exploit the potential for AI to process raw information to compile a comprehensive intelligence picture using automatic recognition of military vehicles, language processing of social media content, and game theory to look at potential outcomes.

AI tools like these can of course only be used if commanders can understand them and trust how they have

generated their conclusions. BAE Systems, and the Company's Air Labs facility in the north of England in particular, has been exploring ways to build this trust by creating data analysis systems that are first fed publicly-available datasets on topography, meteorology, and hydrology, then combined with information from other unclassified and classified data sources to create a fused picture. The Company is working with academic partners on research into deep neural networks to understand how to manage and make sense of vast amounts of sensor data.

Taking advantage of information from across multiple military domains and between allies is typically dependent on using network hardware such as processors, routers and other equipment that can often easily add up to 50kg or more, requiring a small team and a separate vehicle for transport. BAE Systems has worked to miniaturise these requirements through “virtualisation”- using software to perform the functions traditionally carried out by hardware. This means the same connectivity functionality can be fitted into a standard server ratchet typically installed in combat aircraft and ground vehicles, allowing forward personnel to make use of the advantages of multi-domain integration.



*Teams at BAE Systems enabled F-35 aircraft and trained aircrew in advance of the UK Carrier Strike Group's first operational deployment in 2021.*

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# AN INTRODUCTION TO OUR ECONOMIC IMPACT ANALYSIS

The full impact of BAE Systems on the UK economy is assessed using a standard means of analysis called an economic impact assessment. This involves quantifying the Company's total impact on the UK across three "core" channels:

- **Direct impact**—relating to BAE Systems' own UK activities: this encompasses the economic activity, taxes, and employment directly supported by the Company;
- **Indirect impact**—this encapsulates the economic activity, taxes, and employment supported in the UK supply chains of BAE Systems' UK sites, as a result of their procurement of goods and services from other firms. Note: this channel includes the impact of the Company's capital investments, such as new facilities and IT equipment, as well as that of its day-to-day purchases;
- **Induced impact**—this comprises the wider economic benefits that arise when BAE Systems' employees in the UK, and those in the Company's UK supply chains, spend their earnings—for example in local retail and leisure establishments.

This approach enables us to build a picture of BAE Systems' overall contribution to the UK economy across three key metrics:

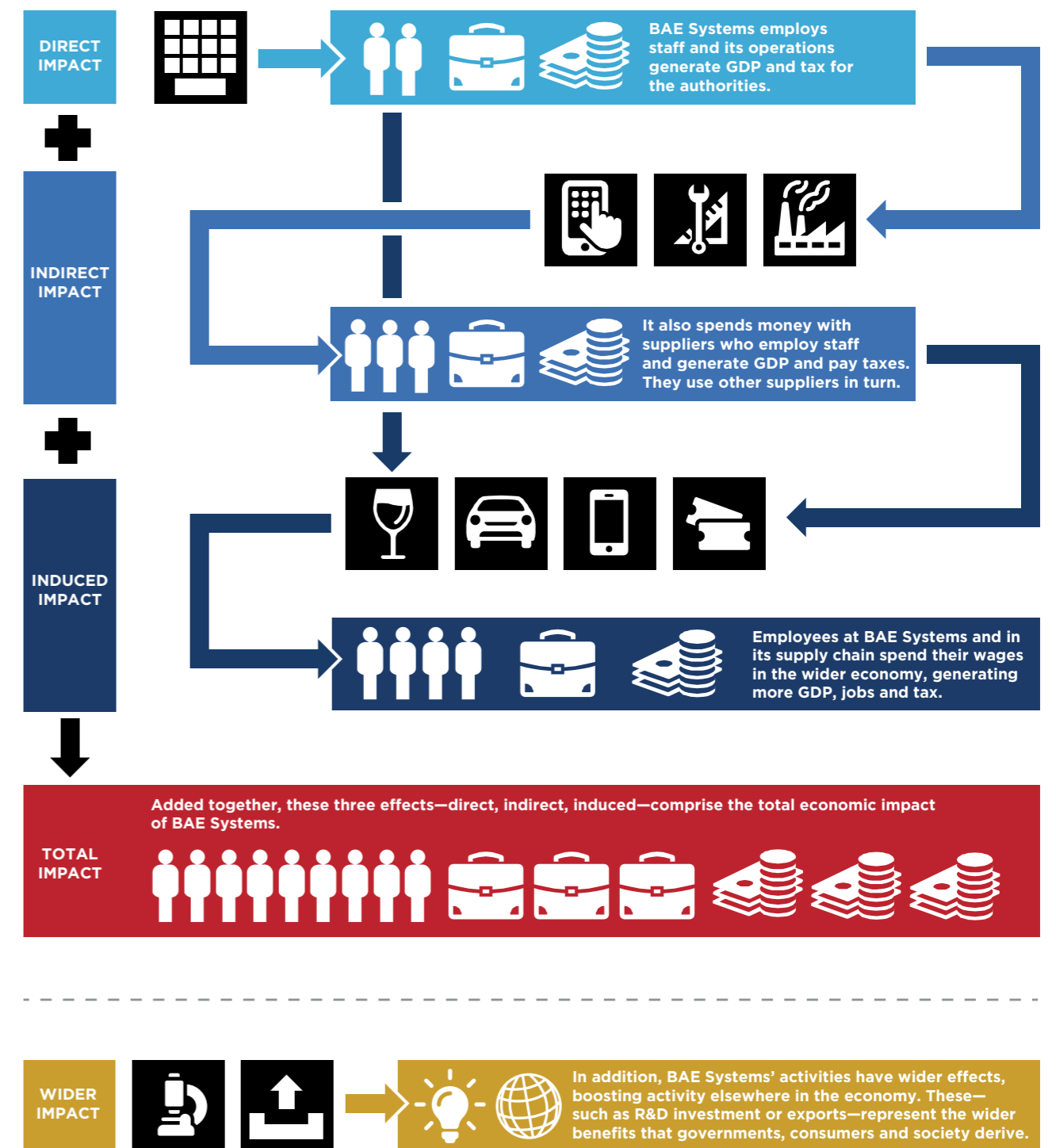
- **Economic contribution**—or more specifically, BAE Systems' "gross value added" (GVA) contribution to GDP. In simple terms, GVA is the Company's revenue minus its procurement costs, or "intermediate consumption" in economic parlance. For brevity, we refer to this as the "economic contribution" throughout the report;
- **Employment**—measured on a full-time equivalent basis;
- **Government revenues**—including income tax, corporation tax, business rates, and National Insurance contributions.

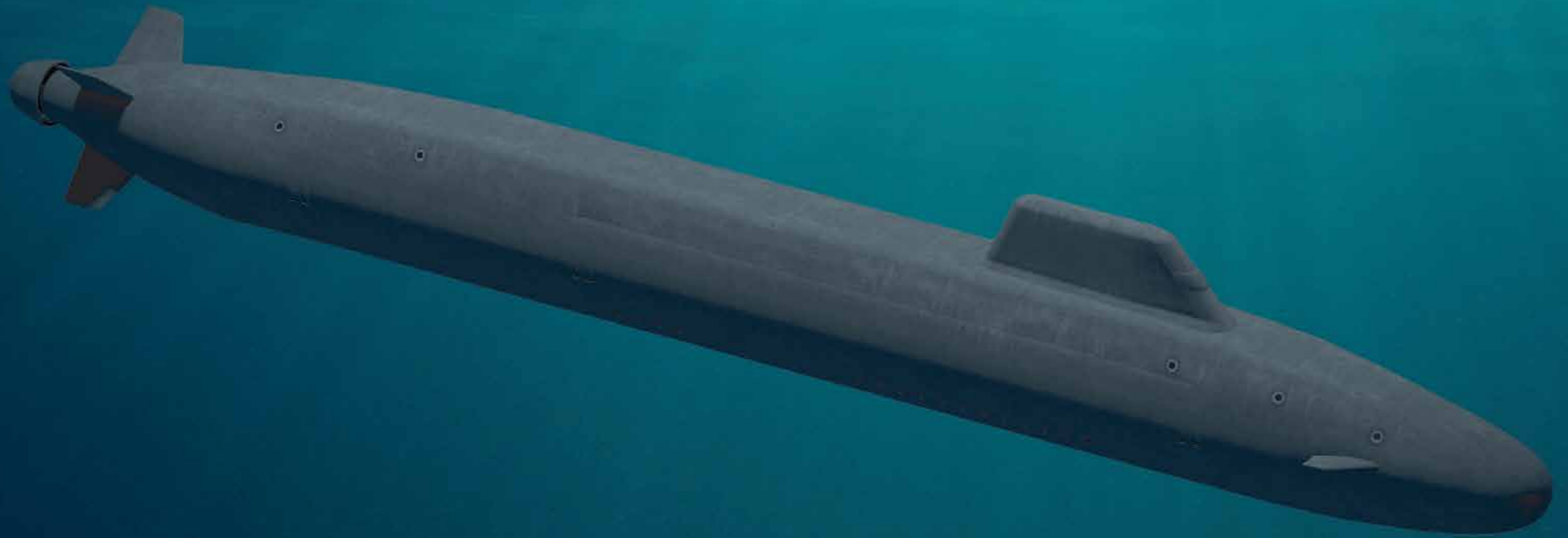
Alongside these core economic impacts, we also consider the wider "catalytic" economic impacts through which BAE Systems contributes to the UK's long-term prosperity. These catalytic effects correspond to a number of the themes identified in recent Government publications, such as export growth, skills development, and building future capabilities through R&D.

The modelling upon which this report is based computes the economic footprint of BAE Systems in the UK for 2020. Our approach uses financial data for that year from BAE Systems' own accounts, plus the latest economic data available at the time of writing.

Fig. 1 (right) presents a schematic diagram of our Economic Impact Analysis model. Additional information on our modelling approach is provided in this report's appendix.

Fig. 1: The five channels of economic impact in our model





## DELIVERING THE NEXT GENERATION OF NUCLEAR SUBMARINES

BAE Systems is the industrial lead in the Dreadnought Alliance, alongside partners Rolls-Royce and the Submarine Delivery Agency, to deliver the Dreadnought programme—a new generation of submarines to carry the UK’s independent nuclear deterrent.

The programme will deliver four new submarines for the Royal Navy to replace the current Vanguard class. They will be the Royal Navy’s largest and most technically

advanced submarines when they begin to enter service in the early 2030s.

They are the largest submarines ever built for the Royal Navy with a displacement of 17,200 tonnes and 153.6 metres long, more than the length of three Olympic-sized swimming pools. Dreadnought is the first Royal Navy submarine to have mixed crews so has been designed with separate male and female crew quarters. It

has also been designed with “day” and “night” lighting.

The Dreadnought programme is the largest defence project underway in the UK today, making it one of the most complex engineering projects in the world. Work on the first two boats in the class—Dreadnought and Valiant—is taking place at BAE Systems’ shipyard in Barrow, where nearly 8,500 employees work on the Dreadnought and Astute submarine programmes.

BAE Systems is applying its extensive avionics experience to Dreadnought. Working alongside the Company’s submarine experts, engineers at the Company’s Electronic Systems business in Rochester, Kent, are taking decades of flight controls expertise underwater, adapting systems usually used in fly-by-wire aircraft and applying them to Dreadnought. The Active Vehicle Control Management system will oversee all major aspects of the submarines’

manoeuvring capability, similar to existing systems on modern aircraft.

The Dreadnought submarine programme will make a significant contribution to the UK economy. In January 2021 it was estimated by Oxford Economics that in 2021, the Dreadnought programme would support almost 30,000 jobs around the UK, including through supply chain and worker spending multiplier effects.

BAE Systems estimates it will spend in the region of £7.5 billion with 1,500 supply chain companies over the life of the Dreadnought programme across England, Scotland, Wales, and Northern Ireland, with more than 90% of the Company’s overall expenditure on the Dreadnought programme accruing to UK businesses.



**Employee Resource Groups enable employees to find their own community within BAE Systems. One of these, ENabled UK, offers support to employees with both visible and non-visible disabilities and gives practical advice to senior leaders in BAE Systems to help the Company meet its commitments as a signatory of The Valuable 500 list. Read more about diversity and inclusion at BAE Systems on page 49.**

## 2. EMPLOYMENT AND SKILLS CONTRIBUTIONS

In this chapter we present estimates of employment supported by BAE Systems in the UK in 2020. Jobs are supported through three channels: the Company directly employs workers; indirectly, the Company supports additional workers through its procurement spending along the supply chain; and still more workers are supported through the wages spent by BAE Systems employees and by its suppliers' employees. Employment figures presented in this chapter are on a full time equivalent (FTE) basis unless specified otherwise.

the UK. This is equivalent to approximately 39% of the Company's global workforce, and 1% of the UK's manufacturing workforce.<sup>12 13</sup>

BAE Systems' sites and facilities are spread across the UK. Its largest site is at Barrow-in-Furness, in Cumbria, employing 8,500 workers. Other major sites are Warton (4,900 employees) and Samlesbury (4,800) in Lancashire; Portsmouth (2,400) on the south coast; and Scotstoun and Govan which together employ 2,700 employees on the River Clyde in Glasgow.

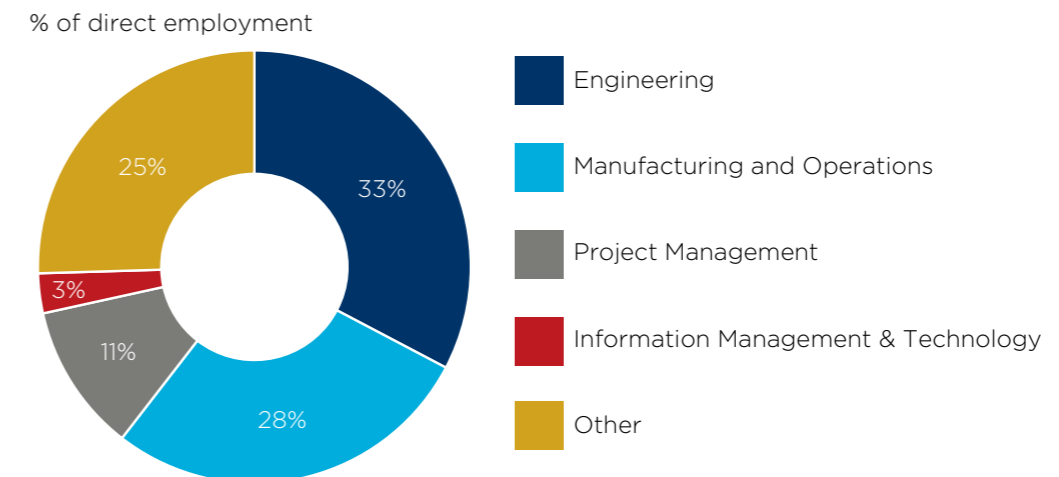
structural, software, and research engineers. Including the 39% of employees in technical roles such as manufacturing, operations, and project management, a total of 72% of BAE Systems' UK employees are in engineering-related roles. The remainder of employees work in departments such as IT, human resources, and administration.

### 2.1 BAE SYSTEMS' DIRECT EMPLOYMENT

In 2020 BAE Systems directly employed 35,300 workers at more than 30 sites in

Reflecting the highly technical nature of BAE Systems' operations, one in three (33%) employees at the Company are in engineering roles, such as electronics, and electrical,

**Fig. 2: Share of employment in each job function at BAE Systems, 2020**

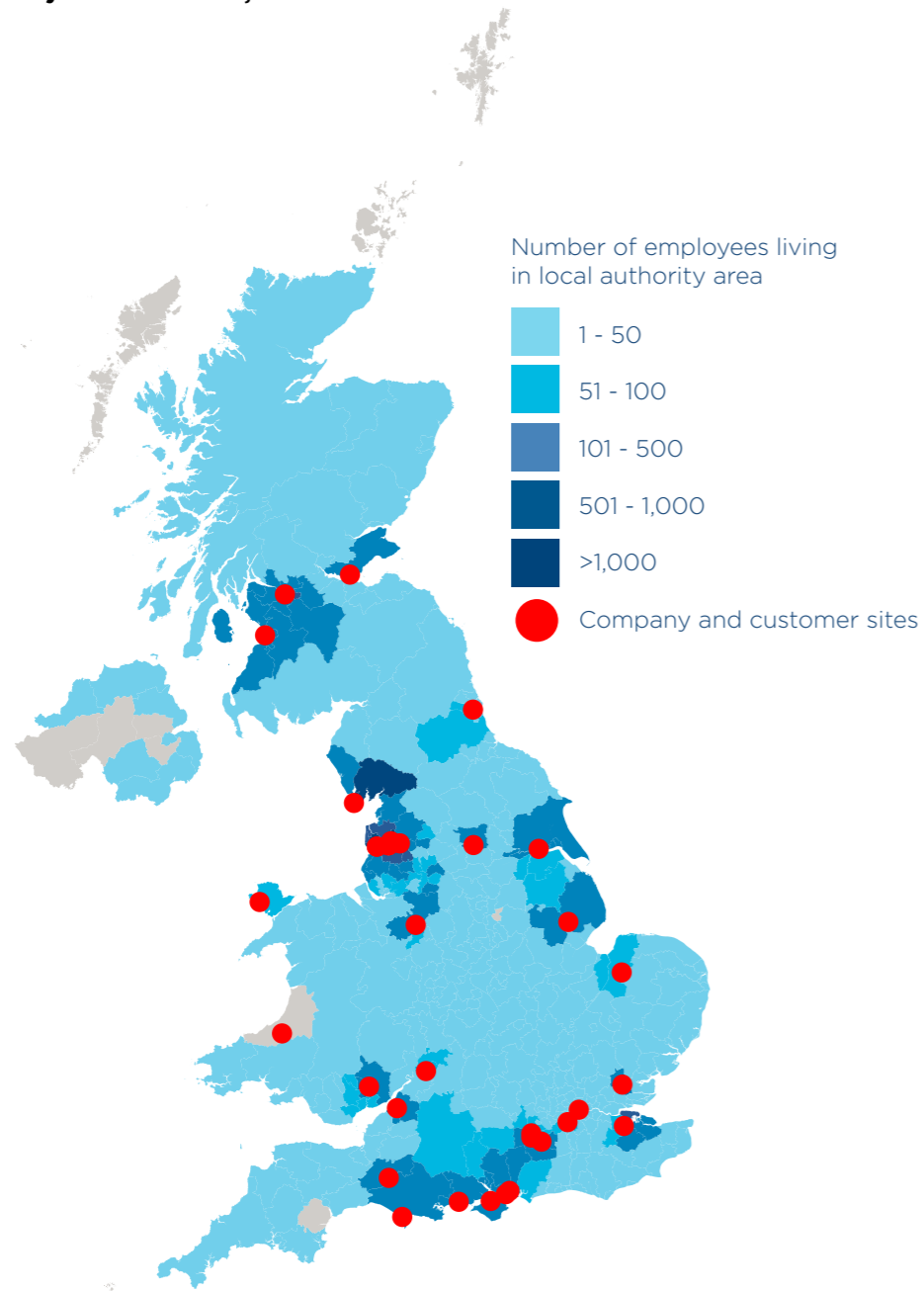


Source: Oxford Economics. Totals may not sum due to rounding.

<sup>12</sup> Based on the Office for National Statistics' JOBS05: Workforce jobs by region and industry June 2021 release.

<sup>13</sup> In November 2021 BAE Systems was accredited as a Living Wage Employer by the Living Wage Foundation.

**Fig. 3: BAE Systems' employees by area of residence, and Company and customer sites with more than 100 BAE Systems workers, 2020**



Source: Oxford Economics, BAE Systems

## SUPPORTING 24/7/365 OPERATIONS OF THE RAF'S TYPHOON FLEET



Under a long-term servicing contract the “Typhoon Total Availability Enterprise (TyTAN)”, BAE Systems supports the continuous operation of the UK’s fast jet fleet of Typhoon fighter aircraft to deliver Quick Reaction Alert (QRA) and protect UK airspace. Working alongside Royal Air Force (RAF) and Ministry of Defence (MOD) personnel, BAE Systems’ teams provide maintenance, operations and technical expertise, as well as advanced simulation training for aircrew and ground crew.

The Company employs staff at both RAF Coningsby in Lincolnshire and RAF Lossiemouth in north-east Scotland—the country’s two QRA stations.

As part of TyTAN, BAE Systems teams are also embedded in a joint planning cell alongside MOD and RAF personnel focussing on how further efficiencies can be built into support and servicing plans. Innovations brought to fruition in recent years include more efficient working practices that have led to the jets being

able to fly for longer between maintenance cycles—up to 625 hours from 400 hours over the lifespan of the Typhoon aircraft. This reduction in the number of maintenance visits will result in significant cost savings in terms of spare parts and labour costs. Through a number of innovations under the TyTAN contract, BAE Systems has realised £500 million in savings for the UK customer, which has been reinvested in further capability enhancements to the aircraft.

**2.2 SUPPLY CHAIN CONTRIBUTION TO EMPLOYMENT**

BAE Systems supports employment in the UK much more widely than the number of employees it employs directly at its sites. The Company spent £3.8 billion with over 5,000 UK suppliers in 2020. This is equivalent to 75% of the total procurement expenditure of BAE Systems' operations in the UK. This expenditure supports companies all along its supply chain. These companies, in turn, employ workers to produce the goods and services procured by BAE Systems, and to produce the inputs

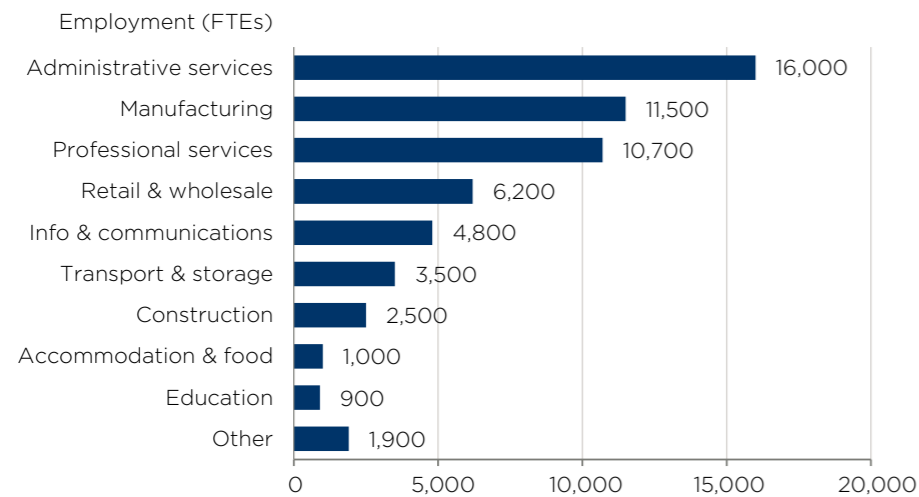
used in the production of such goods and services. We estimate that such indirect employment supported by the Company in 2020 amounted to approximately 58,900 workers.

While the Company procures goods and services across the UK, the majority of its expenditure takes place in the south and north west of England and in Scotland. Chapter 7 examines local employment impacts in these regions.

Employment in many sectors of the UK economy indirectly benefits from BAE Systems' supply chain spending. The largest impacts are seen in

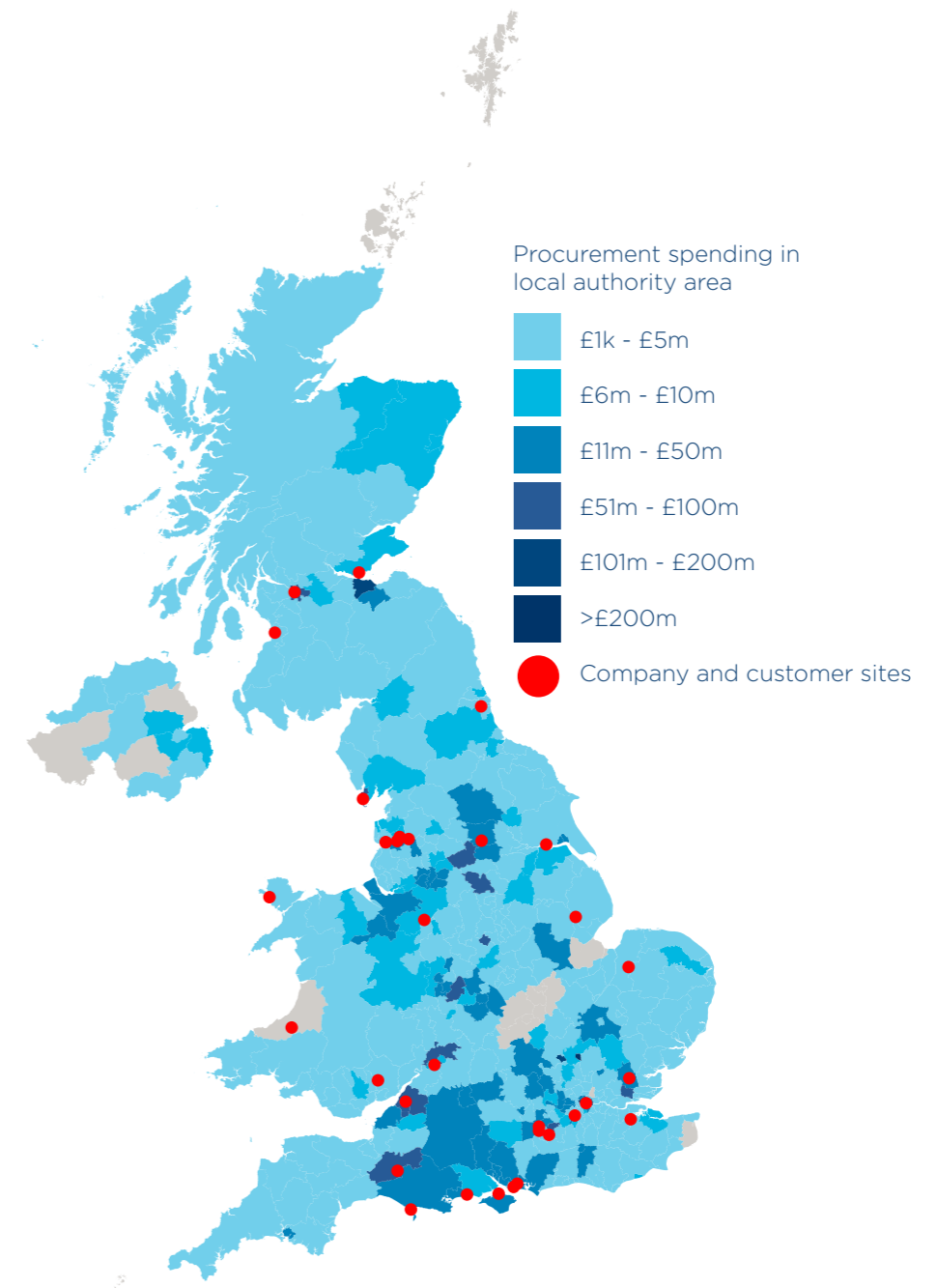
the administrative services sector (16,000 jobs), the manufacturing sector (11,500), the professional services sector (10,700), and the retail and wholesale sector (6,200).

**Fig. 4: Indirect employment contribution by industry, 2020**



Source: Oxford Economics

**Fig. 5: BAE Systems' total procurement spending by local authority district, and Company and customer sites with more than 100 BAE Systems workers, 2020**



Source: Oxford Economics, BAE Systems

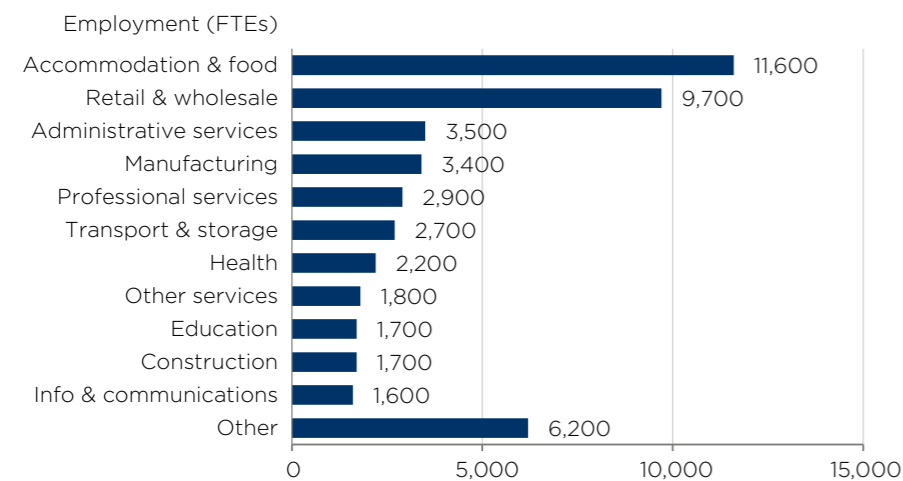
**2.3 EMPLOYMENT SUPPORTED BY WORKER SPENDING**

The two previous sections have discussed BAE Systems' direct contribution to jobs and its indirect contribution through its supply chain spending. The Company supports additional jobs via a third channel: when BAE Systems' employees, and the workers supported by the Company through its procurement expenditure, spend their wages in consumer-facing sectors (such as leisure and retail, and transport), still more employment is stimulated in such sectors. We call this third channel of employment impacts "induced" employment.

We estimate that BAE Systems' induced employment contribution to the UK in 2020 was approximately 49,000 jobs.

The accommodation and food sector as well as the retail and wholesale sectors saw the largest induced employment impacts—11,600 and 9,700 jobs respectively.

**Fig. 6: Induced employment contribution by industry, 2020**



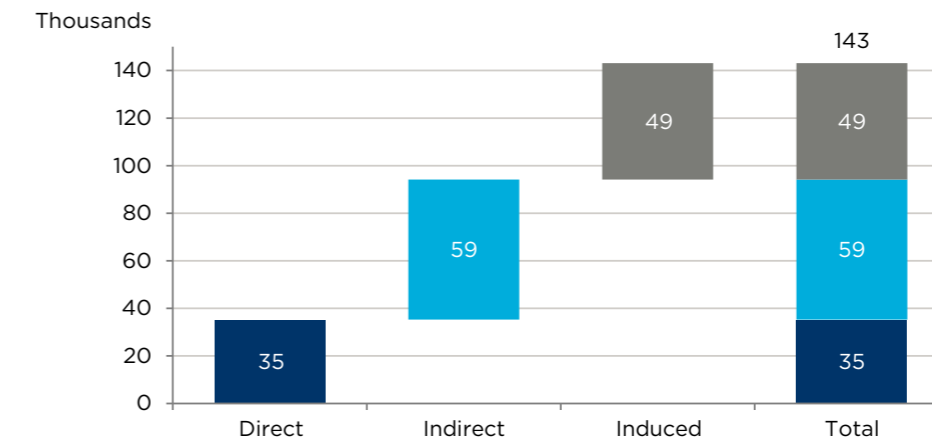
Source: Oxford Economics

**2.4 TOTAL EMPLOYMENT CONTRIBUTION**

In 2020, BAE Systems' economic activity supported a total of more than 143,000 jobs in the UK. The Company directly employed 35,300 workers across the UK. For every hundred workers employed directly by the Company, a total of 410 jobs were supported throughout the country.

BAE Systems indirectly supported 58,900 jobs, as businesses along its supply chain produced the goods and services purchased by the Company and inputs to these. Consumer spending by the Company's employees, as well as by workers supported via its supply chain, supported an additional 49,000 jobs.

**Fig. 7: BAE Systems' contribution to UK employment, 2020**



Source: Oxford Economics. Totals may not sum due to rounding.



*BAE Systems was the first defence company to sign the UK's Armed Forces Corporate Covenant and is committed to supporting the armed forces, veterans and the Company's employee reservists. More information can be found on page 51.*

## OPPORTUNITIES THROUGH MOVEMENT TO WORK



In the UK, BAE Systems invests around £93 million each year in skills and training. This ranges from delivering a nationwide coding programme for school pupils, to training 2,000 apprentices and 600 graduates in its own business.

As part of this investment, the Company is a founder member of the Movement to Work programme (MTW), which provides quality work experience for disadvantaged young people. Working with The Prince's Trust BAE Systems delivers around 100 work placements for young unemployed people each year. This programme had a 78% positive outcome in 2019, meaning that the vast majority of young people went on to work with the Company

or another employer, or went into education.<sup>14</sup>

Mia Baxter now works at BAE Systems' Submarines business as a qualified gas tester in some of the shipyard's most confined spaces. Before starting the MTW programme, she worked in a tanning studio and as a chambermaid in a hotel. Mia says: "I didn't have much confidence when I joined BAE Systems but after taking part in Movement to Work I completed my two year Ancillary Apprenticeship with flying colours. I'm also a workplace first aider."

Another successful MTW participant is Olivia Clare, now a payroll administrator for BAE Systems in Portsmouth. As well as acquiring key skills and greater self-confidence,

Olivia says that an important takeaway from the placement was to learn about working in an office environment, which she had not experienced before. "It was great to be welcomed by so many people and just instantly feel part of the team," she says.

BAE Systems' involvement in MTW led the Company to commit support for the Government's Kickstart Scheme—which provides six-month job opportunities for unemployed young people to gain experience of working in some of Britain's most exciting companies. In 2021, BAE Systems had 28 Kickstart placements in its UK business, which are progressing well and, as a result, the Company plans to continue its support by recruiting a second cohort.

<sup>14</sup> Movement to Work, BAE SYSTEMS: Work placements into apprenticeships, 2019.

## 2.5 SKILLS BASE

As highlighted by the large share of BAE Systems employees in the UK in technical engineering and operations roles, the availability of specialist skills is crucial to maintaining the UK's defence and aerospace capability. To support the development of these skills, the Company spent £93 million on skills and training in 2020. This includes £58 million in apprenticeship employment and training costs. It also includes £13 million of cost of workforce training programmes and the value of the 330,000 hours spent by BAE Systems' employees in training in 2020.

To support the "pipeline" of skills availability in the future, BAE Systems also makes significant investments in outreach activities to school children and university students in an attempt to increase take-up of science, technology, engineering, and mathematics (STEM) subjects and careers. In 2020, BAE Systems was able to run engagement activities in the first months of the year prior to the COVID-19 pandemic, such as a roadshow to schools around the country, and the Royal Academy of Engineering's This is Engineering outreach programme. In the wake of the pandemic it moved to delivering its education activities virtually and the Company joined The Smallpeice Trust, the Royal Air Force and Royal Navy in

launching "Coding Success"—an initiative for 600 non-selective schools that helps educators and students develop confidence with coding and robotics in the classroom. The Company invested in total over £400,000 in education activities in 2020.

In October 2021, BAE Systems also announced an investment of £300,000 in a programme designed to enhance the digital skills of up to 7,500 students aged 12 to 16 in Lancashire. The programme, a partnership with Lancashire Enterprise Partnership, CREATE Education and InnovateHer, aims to develop Lancashire's future digital workforce. It will provide online education, 3D printers, and practical training to 70 schools across the region. As research has shown that the majority of the Lancashire digital workforce is male,<sup>15</sup> the programme also seeks to increase involvement of female and non-binary students and inspire them to take up careers in the industry. More details about STEM activities can be found in the case study on pages 36 and 37.

Aside from increasing the future supply of STEM workers, BAE Systems directly trains its employees to ensure they have the skills the business requires. In 2020 and 2021 the Company trained more than 2,000 apprentices—BAE Systems estimates that a quarter of those who joined in these years came from the most disadvantaged communities in England.

The Company's apprentice training programme is recognised as being of a very high quality—in 2020 BAE Systems was awarded the National Apprenticeship Service Macro Employer of the Year accolade, and it has also received The Princess Royal Training Award and The Institute of Student Employers Award. The Company is also ensuring it is developing the new skills that will help drive progress towards net zero—BAE Systems announced in November 2021 a new programme of Masters-level sustainability apprenticeships to be delivered in partnership with Cranfield University and to start in March 2022.

The Company had two cohorts of university students on an industrial placement year—73 up to June, and another 62 that began in September. Summer internships were cancelled in 2020 due to the COVID-19 pandemic, but in previous years the Company has taken on around 100 young people on this 12-week scheme. Lastly, BAE Systems has training schemes for university graduates, with 30 on the finance programme in 2020 and a peak of 550 graduates on other programmes across the Company in the summer.

BAE Systems is also involved in programmes aimed at developing digital skills and know-how to boost innovation and the wider skills base in the UK. One example of this is Made Smarter, an initiative launched with a pilot scheme in the north west of England in 2019 with £20 million of Government funding and technical support and guidance from major manufacturers. The scheme, now being rolled out nationally, aims to boost UK manufacturing sector growth through the development and adoption of new production technologies: for instance, in February 2021, £8 million in Government funding was announced to support up to 1,000 SME manufacturers in digitising their production processes.





# TEAM TEMPEST: WORKING IN PARTNERSHIP TO DELIVER UK SECURITY AND PROSPERITY

The Tempest programme was unveiled in July 2018 alongside the launch of the UK's Combat Air Strategy, which set out a future vision to safeguard the UK's combat air capabilities through collaboration with UK industry and international partners, as well as continued investment in technology and skills.

The programme is underpinned by Team Tempest, a UK partnership between Government, military and industry. Team Tempest's core industry partners are BAE Systems, Rolls-Royce, Leonardo UK, and MBDA UK. Seven more companies signed collaborative agreements to progress opportunities to support the enterprise in July 2020.<sup>16</sup> They work with the Royal Air Force's (RAF) Rapid Capabilities Office and the UK Ministry of Defence (MOD). In parallel, the programme is continuing to develop discussions with international partners and a Memorandum of Understanding agreement was signed in December 2020 between the governments of the UK, Italy, and Sweden.

Tempest will deliver initial capability into service in the mid-2030s. As the capability requirements at the heart of Tempest are defined, technologies central to Tempest will be deployed on Typhoon.

In July 2021 the MOD awarded a £250 million contract to BAE Systems that marked the start of the concept and assessment phase. This will see the Team Tempest partners develop a range of digital concepts, using new tools and techniques to create, evaluate, and shape its final design and capability requirements. The partners and their supply chains are aiming to take an innovative approach to development and delivery, to drive significant pace and cost-effectiveness into the programme.

The partnership is working on more than 60 demonstration projects across the breadth of combat air and has already delivered new innovations, technologies, and designs. For example, in January 2020, Rolls-Royce announced that its newly developed electrical starter-generator has been adopted for use in Tempest. This equipment saves space, cutting down on the aircraft's radar signature, and helps to provide the large amount of electrical power required by the fighter for various systems such as sensors, communications, and weapons.

Innovation is also being led by engagement with more than 600 suppliers, including high-technology small and medium-sized enterprises (SMEs), adjacent sectors

such as the gaming and automotive industries, catapult organisations and academic institutions across the UK. One example is the work with Electroimpact, a Flintshire-based specialist in the design of aircraft factories, to create more flexible production facilities that will reduce the time taken to build future aircraft. BAE Systems is also working with DIEManalytics, an SME with specialist understanding of data analysis and artificial intelligence, to explore the potential of new and untested technologies in the development of a future combat air system.

The R&D effort being carried out by Team Tempest will help towards achieving the goals of the UK's Integrated Review of Security, Defence, Development and Foreign Policy, such as to maintain a strategic advantage through science and technology.<sup>17</sup> The Integrated Review also sets out the vital importance of the Tempest programme to global security and UK prosperity.<sup>18</sup>

The overall Tempest programme is expected to have a significant economic impact over many decades. According to an impact assessment by PwC, the programme is expected to deliver a £26.2 billion economic contribution between 2021 and 2050.<sup>19</sup>

<sup>16</sup> The seven new companies are: GEUK, GKN, Collins Aerospace, Martin Baker, QinetiQ, Bombardier, and Thales UK.

<sup>17</sup> Gov.UK, Global Britain in a Competitive Age: the Integrated Review of Security, Defence, Development and Foreign Policy, 2021.

<sup>18</sup> Gov.UK, Defence Minister Jeremy Quin has warned that the 'freedom of the air cannot be taken for granted' as threat picture changes in RUSI speech, 2021.

<sup>19</sup> PwC, Assessment of expected economic impact of the Tempest Programme (2021-2050), 2021.

# MENTORING LEADS TO INCREASES IN REVENUE AND PRODUCTIVITY



One BtB volunteer is Sarah-Jane Penman, a business improvement manager at BAE Systems Maritime in Hillend, Dunfermline, who has been mentoring CGA Strategy, a data, research, and insight consultancy in Manchester. The company was keen to make programmes it was already developing—such as workforce development and retention, and cross-departmental communication—available for remote work. Sarah-Jane helped the company by suggesting how they might adopt and adapt some of the tools and techniques she uses in BAE Systems, such as using staff consultative committees to facilitate cross-departmental communications. Fiona Speakman, client director at CGA, says: “Sarah recommended books to read, or formats for documents, as well as process frameworks she has adopted and adapted in her own business that we could use here. We realised we had opportunities to explore each other’s experiences in different fields.”



In 2020, BAE Systems employees in the UK undertook a total of 7,043 hours of voluntary work during regular working time—the equivalent of almost 940 working days—to which the Company has attributed a donation-in-kind value of £264,000.

The majority of this volunteering effort is related to education or local community initiatives. However, in the past two years a significant number of business leaders at BAE Systems have offered their time as mentors under the Be the Business (BtB) initiative that helps business owners and leaders at small and medium-sized businesses (SMEs) improve the performance of their organisations. Following a call at the start of the COVID-19 pandemic for “rapid response

mentoring”, dozens of employees are now mentoring 200 different SMEs across the UK. To date, 139 mentors are supporting companies through a 12-month programme and 54 mentors have provided accelerated support through a three-month programme. According to a BtB impact report, the productivity boost of the mentoring relationships alone is estimated to be £12.2 million,<sup>20</sup> and BtB estimates that between March 2020 and March 2021, BAE Systems made the single largest contribution—valued at over £1.7 million—of any UK company. This is in addition to a £200,000 donation made by BAE Systems to Be the Business in 2020.

## 3. GDP CONTRIBUTIONS

This chapter presents BAE Systems' contribution to UK GDP in 2020. Its total GDP contribution consists of its direct contribution through its own business operations; its indirect contribution through the business operations of its suppliers; and its induced contribution via the wage spending of the Company's employees and those of its suppliers.

### 3.1 BAE SYSTEMS' DIRECT CONTRIBUTION TO GDP

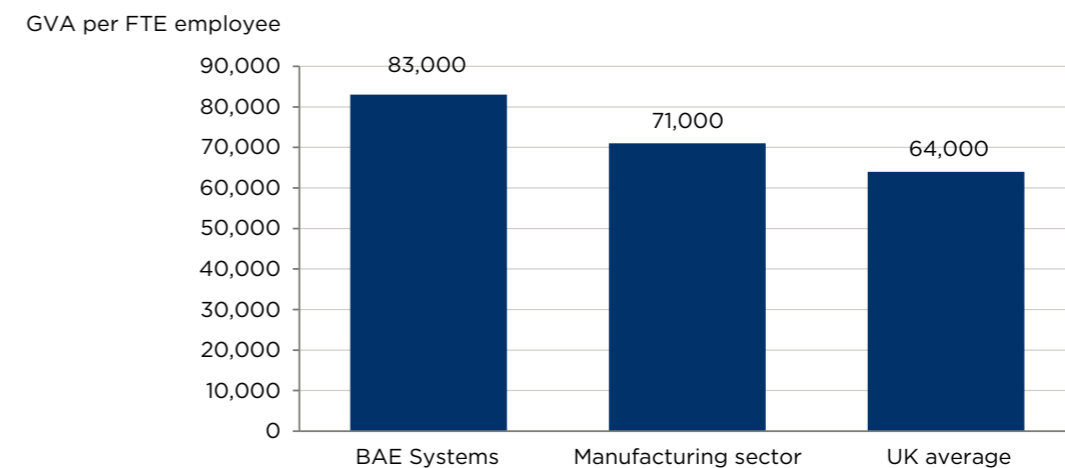
In 2020, BAE Systems' operations in the UK generated £8.3 billion in revenue. The Company's defence and security operations generated the majority of this figure (£7.9 billion), while commercial activity produced over £400 million.

From this revenue, we estimate that BAE Systems directly generated £2.9 billion in gross value added (GVA) contributions to the national economy in 2020 through its own business operations. This direct GVA figure includes the activities

of BAE Systems' businesses based overseas but operating at UK sites, and was calculated through the “production approach” to estimating GVA contributions, in which the cost of procurement inputs is subtracted from revenue.

As noted in chapter 2, the Company directly employs 35,300 employees. Combining the GDP and employment results suggests that BAE Systems employees' average productivity in 2020 was approximately £83,000. This figure is 29% higher than UK average productivity in the same year, and 17% higher than productivity within the manufacturing sector.

Fig. 8: Labour productivity by entity, 2020



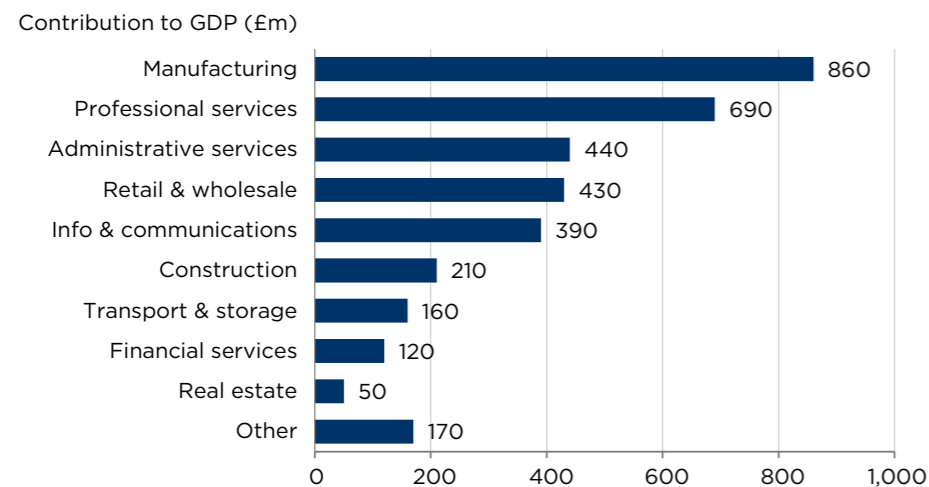
Source: Oxford Economics.

**3.2 SUPPLY CHAIN CONTRIBUTION TO GDP**

BAE Systems' £3.8 billion of supply chain spending with over 5,000 companies in 2020 supported business activity across the UK economy. The largest category of procurement spending comprised payments made to the major manufacturing subcontractors that supply the various programmes BAE Systems leads, such as hulls and nuclear reactors for submarines. Other notable procurement categories included manufacturing of weapons systems, business consultancy, IT, and facilities management.

We estimate that this procurement expenditure supported a total of £3.5 billion in GVA along the Company's domestic supply chain in 2020. The sectors with the largest indirect GVA impacts were manufacturing (£860m); professional services (£690m) and administrative services (£440m), both of which include the wages of BAE Systems contractors; retail and wholesale (£430m); and the communications sector (£390m).

**Fig. 9: Breakdown of economic activity supported by BAE Systems' supply chain spending, 2020**



Source: Oxford Economics

**3.3 GDP SUPPORTED BY WORKER SPENDING**

Wage spending by BAE Systems' employees, contractors, and workers of businesses that make up the Company's supply chain provide a further boost to economic activity. We estimate that this consumer-spending impact contributed £3.6 billion in GVA to the UK economy in 2020.

The induced GVA impact is greater in sectors that are consumer-facing. Real estate was supported with £1.05 billion worth of GDP contribution, while the retail and wholesale sector received £510 million.

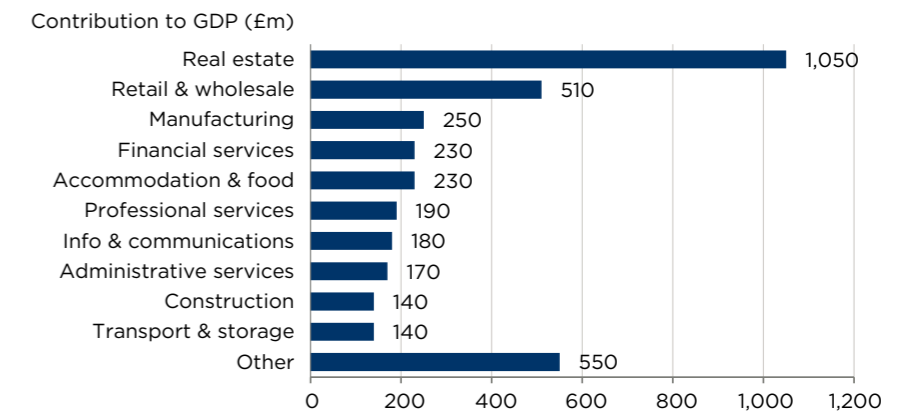
**3.4 TOTAL ECONOMIC CONTRIBUTION**

BAE Systems' business operations in the UK in 2020 supported a total of £10.1 billion in GVA. Of this total, £2.9 billion was directly supported by the Company's own operations.

The Company's supply chain spending generated an additional £3.5 billion. Finally, wage spending by BAE Systems' employees and by the workers along its supply chain contributed a further £3.6 billion to the national economy.

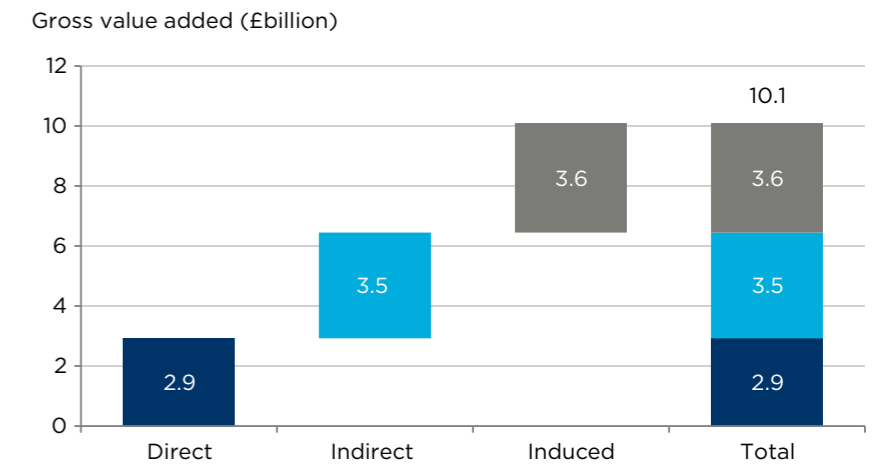
BAE Systems' total GVA contribution implies that for every £100 of GVA directly generated by the Company a total of £350 was contributed to the UK's economy in 2020. In other words, the Company's GVA multiplier is approximately 3.5.

**Fig. 10: Breakdown of induced economic activity, 2020**



Source: Oxford Economics.

**Fig. 11: BAE Systems' contribution to the UK economy, 2020**



Source: Oxford Economics. Totals may not sum due to rounding.



## ADDRESSING GENDER DIVERSITY

There is a historical systemic issue relating to the number of women in engineering occupations in the UK—in 2020 for instance, just 14.5% of engineers in the UK were women.<sup>21</sup> This is in part a knock-on effect from women making up a minority of undergraduates in engineering, at 15% in the UK in 2017.<sup>22</sup>

With the aim of addressing this imbalance in the defence sector, BAE Systems has set an ambition that by 2030 at the latest, at least half of its Executive Committee will be female, while more

than 30% of its overall UK workforce will be women—including more women in senior grades and in science, technology, engineering, and maths (STEM) roles. The company is beginning to make some strides in this objective—in 2020, for example, 23% of its 2,000 apprentices were female.

To continue its work towards these goals, BAE Systems has established a series of programmes starting with education outreach work at school level. This includes more than 800 BAE Systems

employees who are trained STEM Learning Ambassadors, offering their expertise to inspire young people and bring to life the value of STEM subjects in careers, regardless of gender. In the wake of the COVID-19 pandemic, BAE Systems launched its Coding Success programme in place of its Schools Roadshow. This is aimed at helping both educators and students develop confidence with coding and robotics in the classroom, with employee Ambassadors supporting the creation and delivery of STEM curriculum resources for the programme.

Another example comes from three female BAE Systems engineers who secured company sponsorship to work with GirlGuiding North West to launch the “Clever Cogs” programme. This initiative features a range of activities such as building a boat or a chocolate bridge, and includes themes such as transportation and environmental engineering, and has been completed by more than 23,000 girls and young women aged 5 to 24 across the UK since 2017.

Aside from encouraging more girls and young women to study STEM subjects, the Company also puts practices in place to encourage more women into leadership positions and support them throughout their careers. For instance, BAE Systems was one of the 50 founding signatories of the Women in Defence Charter and Women in Aviation and Aerospace Charter. The charters commit signatories to work together to build a more balanced and fair industry for women through actions including having a senior executive

team member accountable for gender inclusion; setting targets, where appropriate, for gender diversity and publicly reporting against them; and to have an intention to ensure executive pay is linked to delivery against these targets. In development are a number of activities specifically to support women in their careers at BAE Systems. These include a buddying programme, a STEM career life cycle project and programmes to offer support throughout the menopause.

<sup>21</sup> Women's Engineering Society, Useful Statistics, June 2021.

<sup>22</sup> Ibid.



*The fourth Astute Class submarine, HMS Audacious, is pictured departing Barrow-in-Furness for sea trials.*

## 4. SOCIO-ECONOMIC AND SUSTAINABILITY CONTRIBUTIONS

This chapter presents examples of the ways that BAE Systems makes significant socio-economic contributions to the UK and to the areas in which it operates, as well as examples of the Company's investments in improving the environmental sustainability of its operations.

### 4.1 HELPING DEPRIVED COMMUNITIES TO 'LEVEL UP'

The Government's "levelling up" agenda aims to bring economic prosperity across the regions of the UK, helping to ensure that the benefits of growth are felt evenly and not concentrated in certain areas.

We assessed BAE Systems' business activity to understand how the Company supports the Government's "levelling up" agenda, which aims to boost opportunities across all parts of Britain. We find that the Company directly employs 14,700 workers in the most deprived local authorities in Great Britain. These workers are employed in the local authorities that appear in the bottom fifth of the Government's Indices of Deprivation for each of England, Scotland, and Wales. This represents more than 40% of BAE Systems' total employment in the UK.

One particularly notable example is Barrow-in-Furness, a town and local authority that was the 44th most deprived area out of 317 in England in 2019. In particular,

the area faces deprivation in the form of employment opportunities and income and is the fourth most deprived area in England in terms of public health. BAE Systems operates the country's largest shipyard (by workforce) in Barrow-in-Furness,<sup>23</sup> at which it produces submarines for the Royal Navy. Approximately 6,400 staff resided in this locality in 2020, equivalent to 26% of all those employed in Barrow-in-Furness. Aside from acting as an employer in the area, BAE Systems helps to support the regional economy and local communities in other ways. In Barrow-in-Furness, for example, it is a key stakeholder in the "Town Deal" partnership and in this role has worked with a number of local partners to develop a town investment plan, resulting in a successful £25 million application from central Government to improve the local area. This will include the creation of the £13.4 million Barrow Learning Quarter, which will create both a university campus and a skills hub.

The Company has also supported the local Dock Museum project in Barrow which helped attract some £900,000 of further investment, and funds a counselling service with the Cumbria Alcohol and Drug Advisory Service to those who signal they may have a drug or alcohol problem.

As well as acting as a direct employer, we also find that BAE Systems spent nearly £700 million on supply chain purchases in 2020 in Britain's most deprived local authorities. For instance, the Company spent more than £60 million with suppliers in Birmingham, which is England's sixth most deprived local authority district. Aside from Birmingham, the other areas in the bottom quintile where BAE Systems spent the most with local suppliers were Luton, Portsmouth, Barrow-in-Furness, and Tower Hamlets.

<sup>23</sup> BAE Systems, Barrow-in-Furness.

# USING DATA ANALYTICS TO PROTECT VULNERABLE CHILDREN



BAE Systems has found a way to use its experience of bringing together and interpreting disparate datasets to help UK child protection organisations identify at-risk children earlier and spot those who could otherwise fall through the net of existing warning systems.

The National Society for the Prevention of Cruelty to Children estimates that one in 10 children in the UK has suffered some form of abuse or neglect. With resources stretched due to rising numbers of cases of neglect in Britain,<sup>24</sup> the current manual processes are becoming strained, with the potential to miss vulnerable children.

Information about children at risk is spread across different systems in different organisations. Currently, data-sharing processes only kick in

when serious “red flag” events are seen and a risk threshold is breached—such as a child self-harming or coming into A&E with multiple broken bones. If a child is subject to multiple mid-to-low risk events over a sustained period of time, it is hard to see the developing picture unless a single event breaches that threshold.

In partnership with several child protection organisations, BAE Systems used its own financial crime and fraud detection platform to analyse the vast amounts of available data held by the various protection organisations. This approach provides a more holistic view of the possible risks to the child and indicates to child protection practitioners (CPP) those children likely to be at risk, enabling early intervention. The new systems allow CPPs to see patterns

hidden in the data within minutes that would otherwise have been difficult or almost impossible to detect without countless hours of manual investigation.

In 2019 BAE Systems set up a child protection information analytics pilot demonstration with Gloucestershire’s Multi-Agency Safeguarding Hub, gathering data from all relevant agencies. In just four hours, the Company’s software analysed three years’ worth of data containing over 100 risk indicators and 50 free text fields and presented back conclusions.

According to Gloucestershire Constabulary the pilot proved that, with increased information, professionals have a greater chance of intervening early and preventing catastrophic events from happening further down the line.

40 <sup>24</sup> The Office for National Statistics shows the number of children who were the subject of a Child Protection Plan rose fairly steadily over the five-year period to 2019. ONS, Child neglect in England and Wales, 2020.

## 4.2 SUPPORTING COVID RECOVERY

Throughout the COVID-19 pandemic, BAE Systems prioritised the safety of its employees and worked to mitigate the impact of COVID-19 on its business and supply chain. The Company supported national efforts to develop ventilators in 2020 as well as engineering and manufacturing personal protective equipment and innovative gadgets for the NHS and other care settings. It also made online resources available to schools and donated through foodbanks.

In addition, more than 190 employees continue to mentor small and medium sized businesses (SMEs). More about support for the pandemic can be found in the case study on page 43.

During the pandemic, many areas throughout the UK inevitably experienced an increase in unemployment rates. We assessed BAE Systems’ activities in these areas and found that the Company directly employed 2,800 workers in the local authority areas whose labour markets were most affected by the pandemic.<sup>25</sup>

Alternatively, measuring the impact of COVID-19 through the number of infection cases per 100,000 of population throughout the whole pandemic,<sup>26</sup> we found that BAE Systems spent £800 million with suppliers in the worst-hit fifth of the country, supporting local economies. The Company also directly employed 8,900 workers in these areas, or 25% of its total staff headcount.

### BAE Systems and DXC are donating laptops to schools.



<sup>25</sup> The 20%, or top quintile, of local authorities whose unemployment rate increased the most between 2020 and 2019.

<sup>26</sup> Until accessed for analysis in August 2021.

*BAE Systems employees joined a 'Govan Community Clean-Up Hub' activity as part of BAE Systems' partnership with Keep Scotland Beautiful. Find out more about the Company's impact in the community on pages 32 and 51.*



## SUPPORTING COMMUNITIES DURING THE PANDEMIC



Since the start of the COVID-19 pandemic in 2020, teams across BAE Systems' UK businesses have been organising responses to help deal with the impacts on society.

In addition to supporting the national ventilator manufacturing programme, employees in the Air business designed and manufactured face shields using 3D printing techniques. Together with its supply chain, BAE Systems was able to distribute 120,000 face shields to the NHS in April 2020 alone.

In addition, employees at BAE Systems' submarines facility in Barrow-in-Furness, Cumbria, designed and manufactured 860 specialist curtain hooks for isolation cubicles in hospitals run by University Hospitals of

Morecambe Bay NHS Trust. Engineers at Barrow have also designed a full-face protective hood in conjunction with the Trust and a local firm, Lancaster. In just 11 months the project progressed from concept to production, with the hood gaining Health and Safety Executive approval for use during the pandemic. The design—a full-face protective hood delivering a continuous stream of clean filtered air—significantly reduces “fogging” and aids improved communication and empathy between healthcare staff and patients because facial expressions can be seen more clearly and lip-reading is easier.

A further innovation for the NHS was produced by the Maritime Services team on the Isle of Wight who began 3D-printing an innovative

“door claw” designed by Vestas, a wind-turbine company also based on the Isle of Wight. The innovation enables users to open doors without touching the handle, helping to reduce the spread of infection. BAE Systems' support meant that health workers at the 77 care homes on the island received the devices more quickly.

School closures around the country highlighted the ongoing need for greater access to IT equipment to help support schoolchildren with their learning—either at home or in school. In April 2021, BAE Systems worked in partnership with DXC Technology, the Company's IT services provider, to donate around 1,000 laptops to school children across the UK.

### 4.3 CONTRIBUTIONS TO ENVIRONMENTAL SUSTAINABILITY

BAE Systems is committed to using its world-class technologies to reduce the environmental impact of its activities. The Company has announced that it has set itself the target of achieving net zero greenhouse gas emissions across all its operations by 2030, and is working towards a net zero value chain by 2050. BAE Systems has also joined the United Nation's "Race to Zero" campaign, an initiative that seeks to build participation in the move to a decarbonised economy.

Defence and aerospace activities typically have a larger environmental impact than other sectors, particularly in terms of greenhouse gas emissions, due to the nature of the manufacturing process and equipment used. Military vehicles such as armoured land vehicles, helicopters, and fighter planes tend to use large amounts of fuel, being either heavy, high performance or both, and the UK does not use nuclear-powered surface warships.

While it will be challenging for the armed forces and defence industry to reach true zero greenhouse gas emissions in the near future, there are innovations taking place at BAE Systems and in the sector that help to reduce the impact. For instance, the Ministry of

Defence (MOD) announced in 2021 an investment of £220 million with BAE Systems to deliver ten new immersive training simulators for Royal Air Force (RAF) Typhoon pilots. The use of advanced simulators rather than live training in real aircraft has multiple benefits such as quicker turnaround times, reduced maintenance costs, and the ability to offer a greater variety of training scenarios. Investment in these "synthetic" training facilities will ultimately allow pilots from different locations to fly missions together, and support the RAF's objective for 80% of its training to be synthetic by 2040.<sup>27</sup> Importantly in sustainability terms, simulators require no jet fuel, saving 9.6 tonnes of CO2 per flight.

BAE Systems' technologies and R&D are helping to make incremental improvements like these in many areas of its operations. In the Company's maritime business, engineers have learned lessons from the electric motorsport sector, using electric motors underwater to help improve fuel performance. In addition, additive manufacturing techniques (also known as 3D printing) in the military aircraft business have helped to produce lighter aircraft parts, reducing fuel consumption.

The Company has also developed new, lower-carbon products. For instance, in September 2021 plans for a new electric heavy-lift uncrewed rotocraft system were

announced, to be developed by BAE Systems in partnership with Malloy Aeronautics, a Berkshire-based unmanned aerial vehicle specialist. The new aircraft is hoped to carry up to 300kg at ranges of up to 30km and at speeds of 140km an hour and could be used for applications such as ship-to-ship and ship-to-shore transport. This would reduce the need to use heavier, crewed helicopters for similar operations, lowering greenhouse gas emissions. Another airborne example is the PHASA-35, an unmanned solar-electric aircraft developed by BAE Systems in partnership with Prismatic (now wholly owned by BAE Systems). This vehicle is designed to stay airborne at a high altitude for up to a year at a time and can replace the need for manned aircraft or satellites in operations such as observation and communications, again reducing greenhouse gas emissions.

Alongside this research into electric propulsion BAE Systems is assessing the use of sustainable liquid fuels, as electrification is not currently possible for all vehicle types. In December 2020 the RAF announced that it would now allow fuel with a mix of up to 50% from sustainable sources, made from inputs such as hydrogenated fat, household waste, and algae.<sup>28</sup> These alternative liquid fuels are not currently produced in sufficient quantities to be feasible for the defence sector, and are currently much more expensive than fossil fuels. However, a 2021 MOD paper highlighted sustainable fuels as a high priority area to develop in partnership with industry, to improve aspects such as availability and cost.<sup>29</sup>

The Company also plays an active role in developing innovative sustainability solutions outside of its operations. In September 2021, as part of the Clean Maritime Demonstration Competition delivered by Innovate UK, it secured funding from the UK Department of Transport to design, develop and demonstrate how low- and zero-emission power and propulsion technologies can reduce emissions and increase efficiency along London's waterways. BAE Systems will be collaborating with ferry operator Uber Boat by Thames Clippers, which operates 21 vessels along the River Thames and provides links across the city for commuters and tourists. In a separate study within the same competition,

BAE Systems will collaborate with Cory, a UK recycling and waste management Company that transports waste by river, to explore how similar technologies combined with autonomous capabilities can produce cleaner energy for the waste management industry.

#### **Synthetic pilot training reduces environmental impact.**





# TOWARDS NET ZERO— REDUCING EMISSIONS

In 2021, BAE Systems set a target of achieving net zero greenhouse gas emissions across its own operations by 2030 and working towards a net zero value chain by 2050. The Company has also joined the United Nation's "Race to Zero" campaign, an initiative that seeks to build participation in the move to a decarbonised economy.

As part of this strategy, BAE Systems is investing in low- and zero-carbon technologies and working hard to reduce greenhouse gas emissions. One example is a solar farm the size of eight football pitches installed at the Company's Samlesbury site in Lancashire, used to power the manufacturing of components for military aircraft. BAE Systems installed 9,000 solar panels in mid-2015, producing around 2,300 Megawatt-hours (MWh) of electricity a year. This is equivalent to the average annual energy usage of about 600 homes<sup>30</sup> and prevented over 4,500 tonnes of carbon dioxide emissions since its inception.

Further investment has been made on behalf of the Ministry of Defence at Portsmouth Naval Base, which became the home port for the Aircraft Carriers HMS Queen Elizabeth in 2017 and HMS Prince of Wales in 2019. These are the two biggest ships ever built for the Royal Navy and, as such, the vessels have doubled the



site's peak electricity demand when in port. As a result, there were concerns that the amount of power needed by the Carriers would cause a strain on the capacity within the dockyards and across the city of Portsmouth as a whole. Using on-board or shore-side diesel generators was not possible because of the associated emissions, and so a sustainable energy programme was developed. This required a new power generation plant to be fully commissioned and operational before the arrival of HMS Prince of Wales.

A 13.5MW combined heat and power (CHP) plant was installed with 3MW of batteries for back-up power. It produces electricity from mains gas and captures the heat by-product for use in a site-wide heat network,

reducing the Naval Base's carbon footprint. The CHP plant can produce 100,000 MWh a year of power, enough to power approximately 27,000 homes.

The plant was successfully integrated into a 60-year-old electrical and steam network at the base and provides power at about half the cost of the National Grid supply, saving in the region of £4 million a year for the Royal Navy. In total, the Company estimates that CO2 emissions at the Naval Base have been reduced from 100,000 to 35,000 tonnes a year since 2005. The plant received an award in March 2021 from Sanctuary Magazine for energy efficiency and for helping the Ministry of Defence meet its ambition for net-zero carbon emissions.<sup>31</sup>

## 4.4 DIVERSITY & INCLUSION

BAE Systems is taking many steps to fulfil its ambition to be recognised as the leading employer in the defence and security sectors for valuing diversity and inclusion.

The Company aspires to ensure that women make up at least 50% of its Executive Committee by 2030, and increase the representation of race, ethnicity and gender across its global workforce. In the UK, the Company's ambition is for 30% of its workforce to be made up of women by 2030 at the latest and it has pledged support for the Women in Defence Charter. Further examples of the Company's work in addressing the gender balance in its UK business are given in the case study on pages 36 and 37.

In recent years BAE Systems has also pledged support for Change the Race Ratio, the Mental Health at Work Commitment, and The Valuable 500, a global movement of organisations representing 20 million employees worldwide, who have made a public pledge to advancing disability inclusion within their organisations.

Recruiting managers throughout the UK business have received additional diversity training, and recruitment suppliers' objectives were realigned to facilitate the identification of diverse talent.

In 2020, the proportion of women employed across BAE Systems' global workforce increased by 0.5 percentage points, and in the same year 23% of the 2,000 apprentices in training in the UK were female. The Company is also working to recruit more apprentices from ethnic minority backgrounds, to be reflective of local area demographics. In Lancashire, the intake with an ethnic minority background in 2020 was just under 11% compared to a local demographic of 13%.

In 2020, BAE Systems ran its first Inclusion Week in the UK in which all employees and the Company's leaders were invited to take part in virtual events exploring potential pathways for increasing inclusion. The Company is also now seeing a large participation in its Gender, Veterans, Disability, Race, Mental Health, Menopause, and LGBTQ+ Employee Resource Groups. More information about BAE Systems' diversity and inclusion programmes can be found in the case study on page 49.

46 <sup>30</sup> Department for Business, Energy and Industrial Strategy lists average domestic consumption at 3,371 kWh in 2019. Energy consumption in the UK data tables, 2020.

<sup>31</sup> Royal Navy, Three environmental care award wins for HM Naval Base Portsmouth, March 2021.



*In 2020 and 2021 the Company trained more than 2,000 apprentices—BAE Systems estimates that a quarter of those who joined in these years came from the most disadvantaged communities in England. BAE Systems' apprentice training programme is recognised as being of a very high quality and was awarded the National Apprenticeship Service Macro Employer of the Year accolade in 2020.*

## CREATING AN INCLUSIVE WORKPLACE



Evidence suggests that diversity and inclusion are beneficial to businesses, with well-rounded workforces creating more innovative products.<sup>32</sup> Conversely, a lack of an inclusive culture can weaken staff performance and retention.<sup>33</sup>

Against that backdrop, BAE Systems has set out an ambition to be recognised as the leading employer in the defence and security sector for valuing diversity and inclusion. It has laid out objectives for attracting and retaining a diverse workforce. This focuses on increasing representation of race and ethnicity, and gender in its workforce across all its locations.

In order to achieve this goal, the Company has pledged support for charters in areas such as gender, race, mental health,

assistance for veterans, and social mobility. For example, it has signed the Mental Health at Work Commitment, Change the Race Ratio and The Valuable 500 campaign, a global movement for putting disability on the business leadership agenda.

Six inclusivity support groups have been established in the UK, run by employees. The Employee Resource Groups (ERGs) enable employees to find their own community within BAE Systems. One of these is ENabled UK, which offers support to employees with both visible and non-visible disabilities. Members of ENabled UK give strategic and practical advice to senior leaders to help the Company meet its commitments as a signatory of The Valuable 500 list, including helping shape the type of support offered to employees.

Another ERG is OutLinkUK, an employee-driven LGBTQ+ group that was established in 2014. OutLinkUK promotes equality through education and strives to provide a safe zone for LGBTQ+ employees and their allies. Its main objectives are to raise awareness and understanding of the issues that LGBTQ+ employees face, and to provide support and advice to employees who may be experiencing issues with sexual orientation and gender identity.

The other ERGs established by employees for employees are: VetNet for veterans and reservists; Pause for Thought, a group for those affected by the menopause; MindSet, which raises awareness about mental health; GEN, which supports gender diversity; and Embrace, a group that promotes the importance of having a diverse workforce from all backgrounds and cultures.

<sup>32</sup> Wall Street Journal, The business case for more diversity, 2019.

<sup>33</sup> 50/50 by 2030 Foundation, Impact of diversity and inclusion within organisations, 2017.

#### 4.5 COMMUNITY IMPACT

BAE Systems is committed to positively impact the communities in which it operates. The Company strengthens and supports communities through financial donations or sponsorships, donations of equipment or employee time, employee payroll giving, and fundraising. In 2020 BAE Systems donated £1.0 million to armed forces charities and an additional £0.9 million to the local communities in which its sites are located. To support the vital work that foodbanks provide, the Company donated £140,000 directly to more than 45 community foodbanks up and down the country.

BAE Systems' employees spend hundreds of hours volunteering every year. As an example, the Company is a partner of Invictus UK, and its employees are supporting wounded UK veterans and service personnel to recover and prepare for the Invictus Games in The Hague in 2022. In 2020, BAE Systems UK employees undertook a total of 7,043 voluntary work hours during their regular working hours, the equivalent of almost 940 working days, to which the Company put an in-kind value of £264,000. Further information about volunteering can be found in the case study on page 32.

As part of its support for the Armed Forces Covenant (see case study on page 51),

BAE Systems has long-standing relationships with armed forces charities. In partnership with ABF The Soldiers' Charity, it provides donations that fund educational and vocational training grants to soldiers and veterans to help them start civilian careers. The Company donates to The Royal Navy and Royal Marines Charity which supports veterans with physical and mental health conditions re-enter employment. It also funds SSAFA, who were able to support a mentoring programme for veterans; The RAF Benevolent Fund, who were able to support service families; and Combat Stress, who had to adapt their support during COVID-19 to enable them to continue to provide vital services in the treatment of mental health for veterans.

As well as financial and time donations, in 2020 the Company worked with its IT services provider, DXC Technology, to donate around 1,000 laptops to school children across the UK. This activity was brought about by school closures across the country during the pandemic, which highlighted a need for greater access to IT.

## COMMITTED TO THE UK'S ARMED FORCES AND VETERANS



Royal Air Force Benevolent Fund, The Royal Navy and Royal Marines Charity and ABF The Soldiers' Charity. As presenting partner of the Invictus Team UK, BAE Systems is proudly supporting the team with their journey to the Invictus Games in The Hague in Spring 2022. As a founder supporter of the Open University Disabled Veterans Scholarship Fund, the Company continues to provide opportunities for veterans who have experienced disability through their service to study for free and start their higher education learning journey. In addition, employees regularly fundraise for these and other armed forces charities.

BAE Systems was one of the first six winners of the MOD's Employer Recognition Scheme Gold Award, which recognises an organisation's commitment to the Armed Forces Covenant. It has retained this status continuously since the scheme began in July 2014.

BAE Systems was the first defence company to sign the UK's Armed Forces Corporate Covenant back in 2013, demonstrating its commitment to supporting the UK's armed forces, veterans, and their families, as well as the Company's employee reservists. On 26 March 2021, the Company re-signed the covenant, reinforcing its pledge to supporting those who serve and have served, and their families.

As a signatory to the Covenant, BAE Systems has made 19 commitments to strive towards achieving a range of outcomes—from recognising the skills and experience service leavers and veterans bring to the Company and promoting the Company as Armed Forces-friendly, to encouraging and supporting suppliers to adopt the principles of the covenant. These commitments include providing

paid time off to employees who are reservists and adult cadet force volunteers, as well as supporting Armed Forces Week.

BAE Systems also works with the Ministry of Defence's (MOD) Career Transition Partnership to promote its vacancies to service leavers looking to find a new civilian career. Another example is the Company working with Recruit for Spouses, an independent social enterprise that focusses on supporting military spouses back into work, whilst providing coaching, mentoring, CV and interview advice. A number of BAE Systems employees have volunteered as coaches to spouses under this scheme and supported them back into work.

The Company has long-standing partnerships with armed forces charities such as SSAFA, Combat Stress, the





# ELECTRIC TECHNOLOGIES SUPPORT DRIVE TOWARDS ZERO EMISSIONS

The demand for low and zero-emission vehicles has soared as air quality and climate change have risen up the global agenda. BAE Systems is working with industry partners, small and medium-sized enterprises and academia in both the defence and commercial sectors to meet this challenge.

One concept is a planned all-electric “heavy lift” uncrewed air system. The T-650 vehicle will have a top speed of 140 kilometres per hour and the ability to carry a class-leading 300 kilogram payload with a range of 30 kilometres. It could be a potential new solution to deliver cost-effective, environmentally sustainable rapid response capability, and deliver ship-to-ship and ship-to-shore movements in support of military, security, or humanitarian operations and logistics.

The project is being developed under a partnership between BAE Systems and Malloy Aeronautics who are based in Berkshire, England. Emitting zero carbon, the uncrewed system could help revolutionise military operations where there is a requirement to carry heavy loads, helping to keep military personnel out of harm’s way in dangerous situations or disaster zones, whilst reducing environmental impact.

Building on 25 years of innovation in developing electric power and propulsion technology, BAE Systems’ Electronic Systems business, supported by its site in Rochester, Kent, has produced electric drive systems to power battery electric, hydrogen fuel cell electric, and hybrid electric commercial vehicles.

The Company’s electric drive solutions now power more than 14,000 buses around the world. In the UK, the Company has collaborated with Alexander Dennis Limited, Britain’s biggest bus builder, to provide propulsion technology operating on more than 1,400 buses on the streets of London and other cities around the country.

The Series-ER (Electric Range) hybrid propulsion solution for buses has a full electric drive range of up to 3 miles. Using “geofencing” technology, transit systems can define sections within the transit route map, specifying where the engine can be turned off to operate as an electric vehicle creating targeted zero emissions zones in high pollution areas. This hybrid technology enables the bus to drive in zero-emission mode, up to 35% of the time, without the need to stop and recharge the batteries.



*The Persistent High Altitude Solar Aircraft (PHASA-35) has the potential to stay airborne for a year. PHASA-35 is powered by the sun during the day and by batteries overnight.*

## 5. TAX CONTRIBUTIONS

Chapters 2 and 3 discuss the employment and GDP contributions of BAE Systems to the UK economy. Associated with these contributions are significant tax contributions which help to fund the UK's public services.

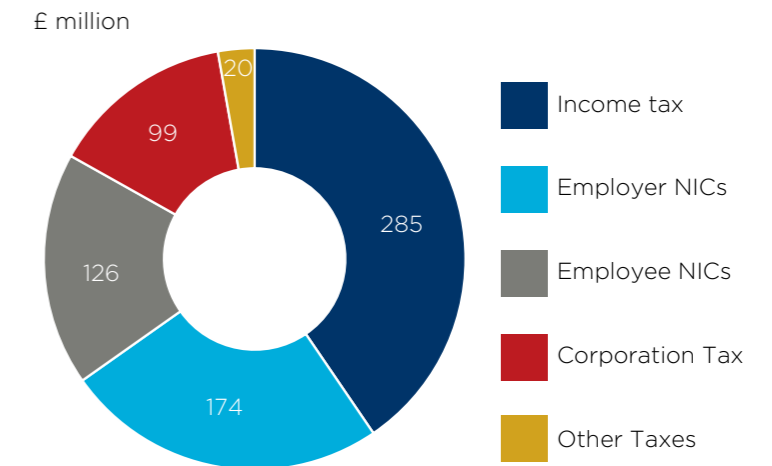
This chapter assesses BAE Systems' total tax contribution to the UK Treasury. The contributions are paid by the Company, by its employees, by the businesses along its supply chain, and by the employees of such businesses.

### 5.1 BAE SYSTEMS' DIRECT TAX CONTRIBUTION

BAE Systems directly contributed over £700 million in tax in the UK in 2020.

Labour taxes made up the majority (83%) of this contribution, with the Company's employees paying nearly £300 million in income tax alone. Employee and employer National Insurance contributions totalled £300m. The Company paid £100 million in Corporation Tax, with the remaining tax contributions coming through the Apprenticeship Levy, the Climate Change Levy, and the Landfill Tax.

**Fig. 12: BAE Systems' direct tax contribution by type, 2020**



Source: Oxford Economics, BAE Systems.

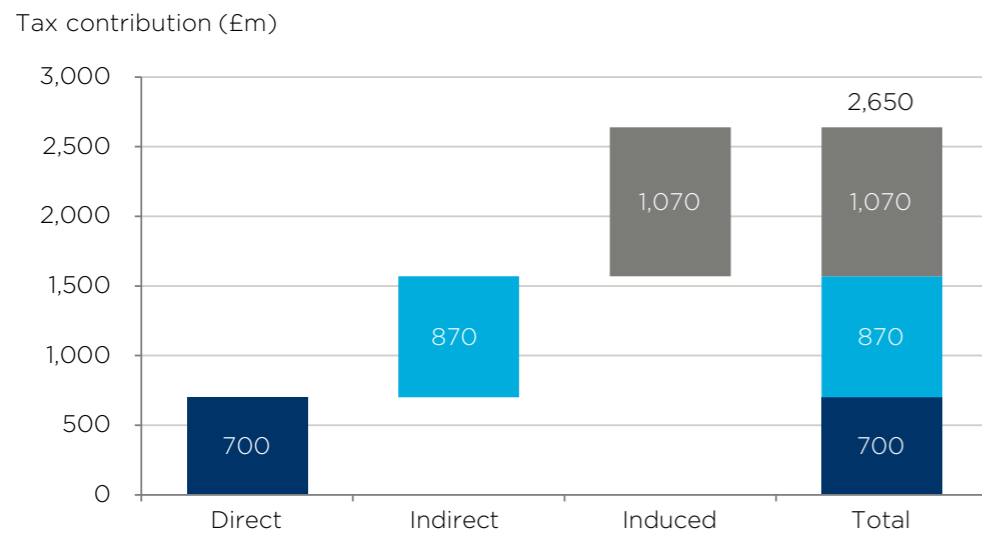
**5.2 TOTAL TAX CONTRIBUTION**

BAE Systems' total operational activities in the UK generated £2.7 billion of tax revenue in 2020, roughly equivalent to the total departmental budget for the Cabinet Office, the Department for International Trade, and HM Treasury in 2020-21.<sup>34</sup>

Induced tax contributions make up the majority of the Company's total tax contribution and are estimated at £1.1 billion. These are taxes paid as a result of BAE Systems workers and supply chain workers spending their wages, and as such, are boosted by the inclusion of the VAT paid by consumers.

A further £870 million in tax contributions come through the indirect economic impact and are paid by the businesses in BAE Systems' supply chains, such as corporation contributions, and Pay-As-You-Earn income tax for employees.

**Fig. 13: BAE Systems' total tax contribution in the UK, 2020**



Source: Oxford Economics. Totals may not sum due to rounding.

# COLLABORATING WITH UNIVERSITIES



BAE Systems' work to develop new technologies while reducing its environmental impact has been strengthened by its strategic partnerships with six UK universities: Birmingham, Cranfield, Manchester, Nottingham, Southampton, and Strathclyde. Each of these institutions has research specialities in technology fields specifically relevant to the Company's UK business. As such, the collaborations are mutually beneficial, helping ensure a greater research impact for the universities and a more significant transfer of technologies from academia to industry.

The Company's relationship with the University of Southampton, for instance, is focused on creating new materials to reduce underwater noise pollution

that can harm fish, dolphins and other marine life. This project also brings together the University of Nottingham and Lloyd's Register in one of four Prosperity Partnerships created by the Government and part-funded by The Engineering and Physical Sciences Research Council. The project aims to develop new materials that integrate elements such as sensors, electronics and materials that can "morph", or change shape or structure. These developments in the maritime sector could also lead to technologies that address more general noise pollution in workplaces and homes.

BAE Systems' partnerships with the six universities also includes working directly with doctoral students on research projects through the Industrial Co-operative Awards

in Science and Technology (iCASE). Every year BAE Systems provides funding for several iCASE projects. The winner of the 2020 prize for an outstanding research project was Charlie House at the University of Southampton for his work on how to stop an object reflecting sound waves in maritime applications.

"The support we get from BAE Systems has been invaluable," said Charlie. "The Company has given me other opportunities, from providing access to full-scale ships to test my research, to inviting me to science events to help inspire the next generation of scientists and engineers."



***BAE Systems supports a 24/7 operation of the Royal Air Force's fast jet fleet of Typhoon fighter aircraft in protecting UK airspace. More information about the Company's work in supporting the Typhoon fleet can be in found in the case study on page 21.***

## 6. WIDER AND LONG-TERM ECONOMIC IMPACTS

Previous chapters have highlighted BAE Systems' contribution to the UK's jobs market, to GDP, and to tax revenue. However, the Company delivers a broader range of benefits to the country which are not all captured in the figures presented so far in this report. It is a major exporter, and a significant driver of research, development, and innovation. In this chapter we consider how BAE Systems contributes to the UK's long-term prosperity through these channels.

### 6.1 TECHNOLOGY AND RESEARCH AND DEVELOPMENT (R&D)

Technology and R&D are major drivers of long-term economic growth. This is often through the development of new production processes which result in new goods and services and a higher quality of output. The knowledge created by particular R&D programmes will often generate "spillover" effects in the wider economy, as other researchers identify new applications, and as workers disseminate knowledge and know-how as they move between organisations. An evidence review of the rate of return on R&D investments found that the mean rate of private return was typically around 30%, but once spillover effects are included, social rates of return were typically found to be two to three times greater than the private returns.<sup>35</sup>

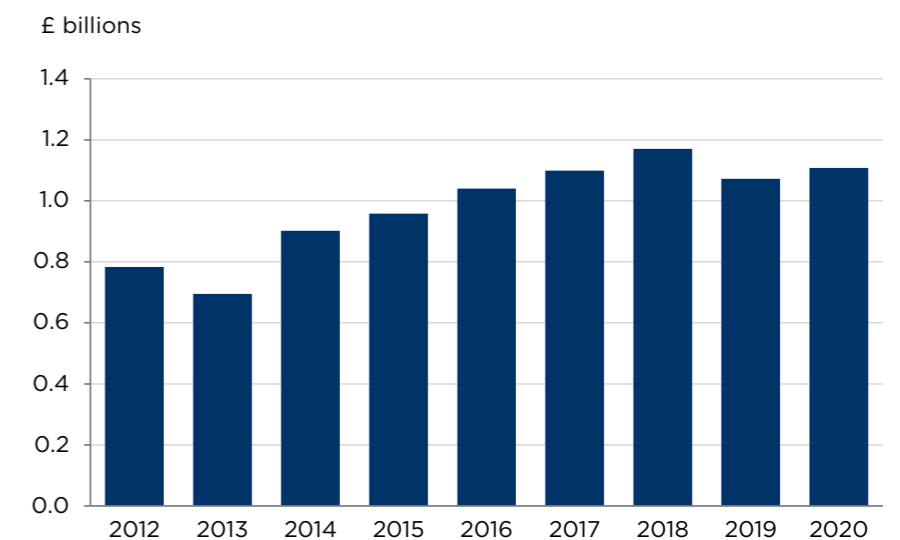
BAE Systems in the UK contributed to total UK R&D with £100 million of self-funded research in 2020, and £500 million in the preceding five years. The figure for 2020 is equivalent to 3.4% of the Company's direct contribution to GDP, helping to boost the country's progress towards the Government's target of growing total UK investment in R&D to 2.4% of GDP by 2027.<sup>36</sup>

As well as funding its own R&D, BAE Systems also conducts a significant amount of research funded by its customers—mostly the UK Government. Including this source of finance, the Company carried out R&D activity in the UK worth a total of £1.1 billion in 2020, and a total of £5.3 billion over the preceding five years.

With all this research activity, BAE Systems was the ninth largest patent applicant in the UK in 2020 under the Patent Cooperation Treaty, with 70 applications.<sup>37</sup> In the three years from 2018 to 2020 it filed 213 applications.<sup>38</sup> The Company's UK portfolio of patents and patent applications covers about 1,300 inventions.

Examples of the innovation that this research spending is funding can be found in case studies throughout this report. These include "digital factories of the future", shape-changing materials to reduce noise pollution, and investments in the space sector as well as unmanned and autonomous technologies.

**Fig. 14: Total annual value of R&D activity carried out by BAE Systems<sup>39</sup>**



Source: BAE Systems.



*Employees at BAE Systems' site in Glascoed in Monmouthshire are pictured manufacturing 155mm munitions. The site employed over 550 workers in 2020 and was built in 1940 to supply munitions for WW2. It is one of three main sites in BAE Systems' Munitions business - with the others located at Radway Green in Cheshire and at Washington in Tyne and Wear.*

<sup>35</sup> Frontier Economics, Rates of return to investment in science and innovation, 2014, pp.135.

<sup>36</sup> BEIS, UK Research and Development Roadmap, 2021.

<sup>37</sup> World Intellectual Property Organisation, Statistical Country Profiles, United Kingdom.

<sup>38</sup> Ibid.

<sup>39</sup> The chart includes self-funded and customer-funded R&D carried out by BAE Systems..



# INVESTING IN MUNITIONS PRODUCTION



In November 2020, BAE Systems was awarded a 15-year contract for the supply of munitions to the UK Ministry of Defence. The Company estimates that the contract, worth £2.4 billion, will sustain approximately 4,000 jobs across the UK. This includes 1,260 employed directly by BAE Systems at five sites across Monmouthshire, Cheshire, Tyne & Wear, Northumberland and the Glasgow area, as well as 1,500 jobs sustained in the UK supply chain and a further 1,300 jobs supported via consumer spending in sites' local economies.

In support of the new contract, BAE Systems has begun investing the first £20 million out of a planned £90 million programme, to update and expand its manufacturing equipment and infrastructure. For instance, the Company has recently invested in a new automated shell machining line at its plant in Washington, Tyne & Wear, which will sustain and increase its capability to manufacture various types of shells.

Similarly, the Company's site in Glascoed, Monmouthshire (Wales), is launching a new manufacturing facility for

its 40mm "cased telescope" suite of ammunition. This investment is in addition to new, cutting-edge "Resonant Acoustic Mixing (RAM)" technology that has led to increased performance as well as allowing explosive formulations to be cured far quicker and at lower temperatures.

## 6.2 CAPITAL INVESTMENT

Capital investments are another source of long-term economic growth for the UK, with spending often being used to expand and improve production facilities, thereby increasing productivity and potential GDP.

BAE Systems made £1.1 billion of capital investments from 2015 to 2019. In particular, investments have been made to develop new skills and training academies at both

Barrow-in-Furness and in Sarnesbury, Lancashire, to meet the requirements of new submarine and military aircraft programmes respectively.

In recent years the business has also invested in the creation of an Industry 4.0 "Factory of the Future" at Warton, a digitally-connected facility which is developing advanced manufacturing technologies alongside more than 50 partners and suppliers. See the case study on page 82 for more details.

In 2020 alone, £174 million of capital investment was made across BAE Systems' UK business in enhancing engineering and manufacturing facilities and logistics capabilities, in addition to developing information management assets.

**More than 50 blue chip and SME companies and academic institutions are collaborating with BAE Systems to develop Industry 4.0 technologies in a Factory of the Future concept at Warton in Lancashire. Read more in the case study on page 82.**



# AT THE FOREFRONT OF AUTOMATED SOLUTIONS



Automated and unmanned systems have increasingly been used in conflicts over the last decade, including unmanned aerial systems for reconnaissance and attack missions. The UK Government believes that the armed forces of the future will increasingly be determined by high-tech innovations such as these.<sup>40</sup> To meet this challenge, BAE Systems is developing cutting-edge autonomous technologies, capabilities, and solutions.

An example of the Company's work in the field is the development of a crewless version of the BAE Systems Pacific 24 (P24), a rigid inflatable boat used by the Ministry of Defence (MOD) and UK police forces. In 2020, the Royal Navy placed a £3.2 million contract to purchase and trial the

autonomous boat as part of its NavyX Autonomy and Lethality Accelerator programme, which trials advanced technologies.

Further development of the crewless P24's capabilities in 2020 and 2021 included adding a 0.50 calibre weapon and integrating the boat with the Royal Navy's Type 23 frigate class warships. The P24 will be able to position itself autonomously for firing, assisting a human controller who remains in control. Future trials will demonstrate a combination of scenarios, all under the command of the warship combat system and crew, with the ultimate aim of allowing the Royal Navy to perform tasks such as intercepting fast incoming attack craft without putting sailors or Royal Marines at risk.

BAE Systems has also been exploring how Augmented Reality can enhance performance in a battlefield scenario. One example is a demonstration during a research and development programme led by the MOD. In this simulation, the Company's technology was used by the armed forces personnel responsible for calling in air support, to digitally connect to all allied assets in the simulation, using AR glasses displaying geo-spatial data. The digital aid was reported to significantly enhance situational awareness and reduce both cognitive load and the chance of human error under extreme pressure.

## 6.3 EXPORTS

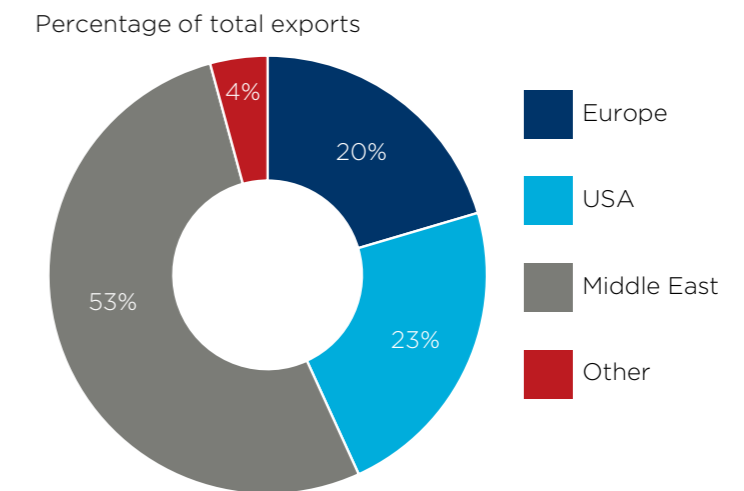
Exports can boost the UK's economic growth by providing new avenues for UK producers to sell their products and services. They can also foster international cooperation between countries, particularly in the defence industry, and stimulate innovation and the development of a knowledge economy as UK firms compete in the global market.

BAE Systems' UK operations contributed £3.9 billion to the nation's exports in 2020. This is equivalent to 0.7% of total UK exports of goods and services in the same year. It is also equivalent to 133% of the Company's direct contribution to GDP, providing a considerable boost to the UK Government's target of increasing the share of GDP consisting of exports from 30% to 35%.<sup>41</sup>

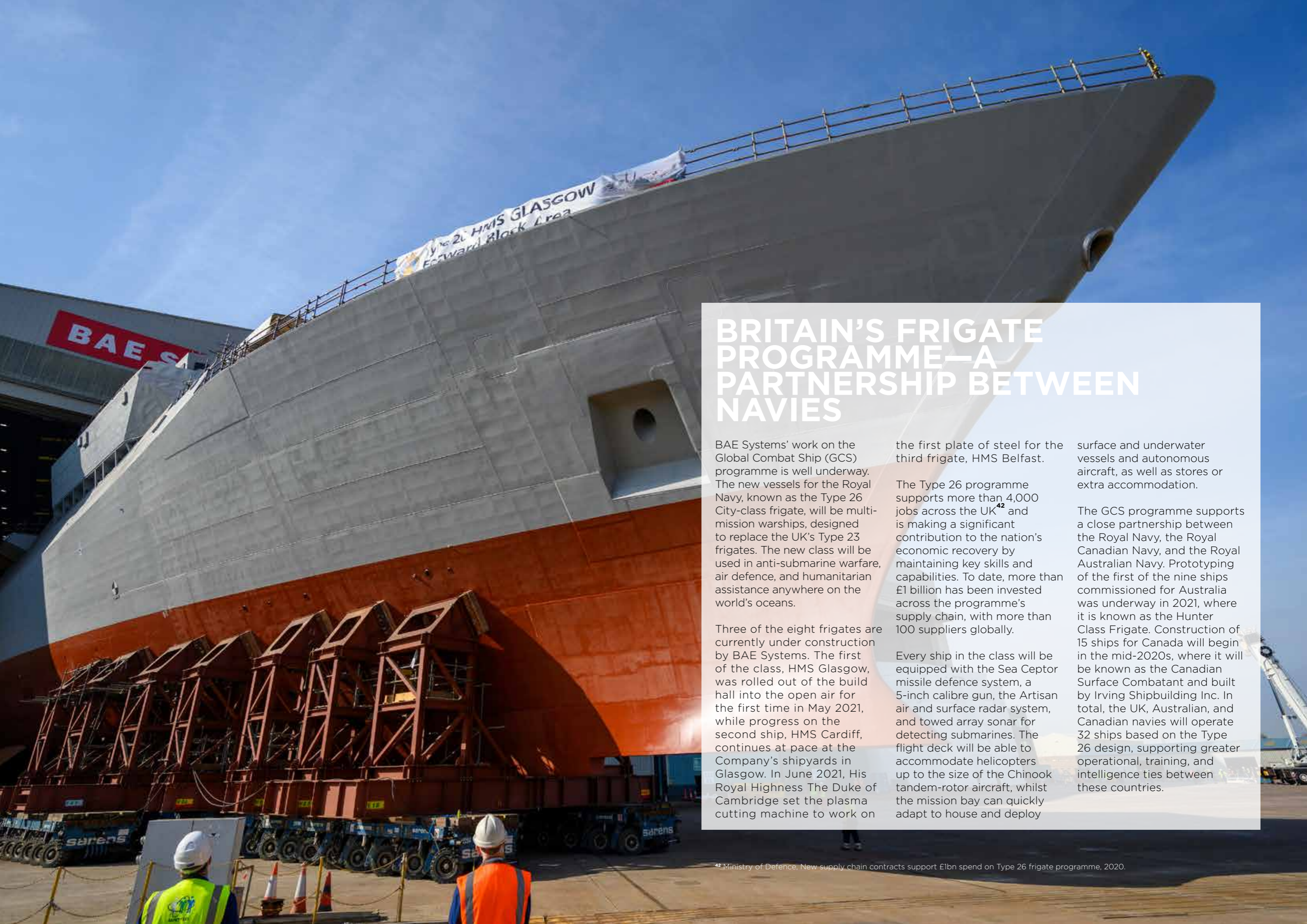
Just over half of the Company's exports in 2020 were destined for the Middle East. Almost a quarter of exports were bound for the US, while one-fifth of exports were purchased by EU countries.

The Company's imports, including those from its non-UK BAE Systems suppliers, totalled £1.3 billion in 2020. Therefore, the Company contributed £2.6 billion in net exports to the country's balance of payments.

Fig. 15: BAE Systems' UK exports by destination, 2020



Source: BAE Systems.



## BRITAIN'S FRIGATE PROGRAMME—A PARTNERSHIP BETWEEN NAVIES

BAE Systems' work on the Global Combat Ship (GCS) programme is well underway. The new vessels for the Royal Navy, known as the Type 26 City-class frigate, will be multi-mission warships, designed to replace the UK's Type 23 frigates. The new class will be used in anti-submarine warfare, air defence, and humanitarian assistance anywhere on the world's oceans.

Three of the eight frigates are currently under construction by BAE Systems. The first of the class, HMS Glasgow, was rolled out of the build hall into the open air for the first time in May 2021, while progress on the second ship, HMS Cardiff, continues at pace at the Company's shipyards in Glasgow. In June 2021, His Royal Highness The Duke of Cambridge set the plasma cutting machine to work on

the first plate of steel for the third frigate, HMS Belfast.

The Type 26 programme supports more than 4,000 jobs across the UK<sup>42</sup> and is making a significant contribution to the nation's economic recovery by maintaining key skills and capabilities. To date, more than £1 billion has been invested across the programme's supply chain, with more than 100 suppliers globally.

Every ship in the class will be equipped with the Sea Ceptor missile defence system, a 5-inch calibre gun, the Artisan air and surface radar system, and towed array sonar for detecting submarines. The flight deck will be able to accommodate helicopters up to the size of the Chinook tandem-rotor aircraft, whilst the mission bay can quickly adapt to house and deploy

surface and underwater vessels and autonomous aircraft, as well as stores or extra accommodation.

The GCS programme supports a close partnership between the Royal Navy, the Royal Canadian Navy, and the Royal Australian Navy. Prototyping of the first of the nine ships commissioned for Australia was underway in 2021, where it is known as the Hunter Class Frigate. Construction of 15 ships for Canada will begin in the mid-2020s, where it will be known as the Canadian Surface Combatant and built by Irving Shipbuilding Inc. In total, the UK, Australian, and Canadian navies will operate 32 ships based on the Type 26 design, supporting greater operational, training, and intelligence ties between these countries.

<sup>42</sup> Ministry of Defence, New supply chain contracts support £1bn spend on Type 26 frigate programme, 2020.



**BAE Systems brings its expertise to the advanced manufacture, integration and sustainment of the global F-35 programme. Employees at RAF Marham trained aircrew and enabled the availability and readiness of F-35 aircraft in support of the UK Carrier Strike Group's first operational deployment in 2021.**

## 7. REGIONAL CONTRIBUTION

In this chapter we consider BAE Systems' contributions in four specific areas around Britain in 2020. These areas cover the Company's largest facilities and concentrations of activity for:

- The central belt of Scotland, which has a significant focus on shipbuilding;
- Cumbria, around the Company's submarine-building facilities;
- Lancashire, with a focus on the air business;
- The south of England, which has significant operations in naval support in addition to defence information and cyber security expertise, and BAE Systems' Head Office at Farnborough.

For each of these four areas we have identified a group of local authority districts (LAD) where the Company's sites, employees, and suppliers are concentrated. The selected LADs are the geographic areas on which the analysis presented in this chapter is based.

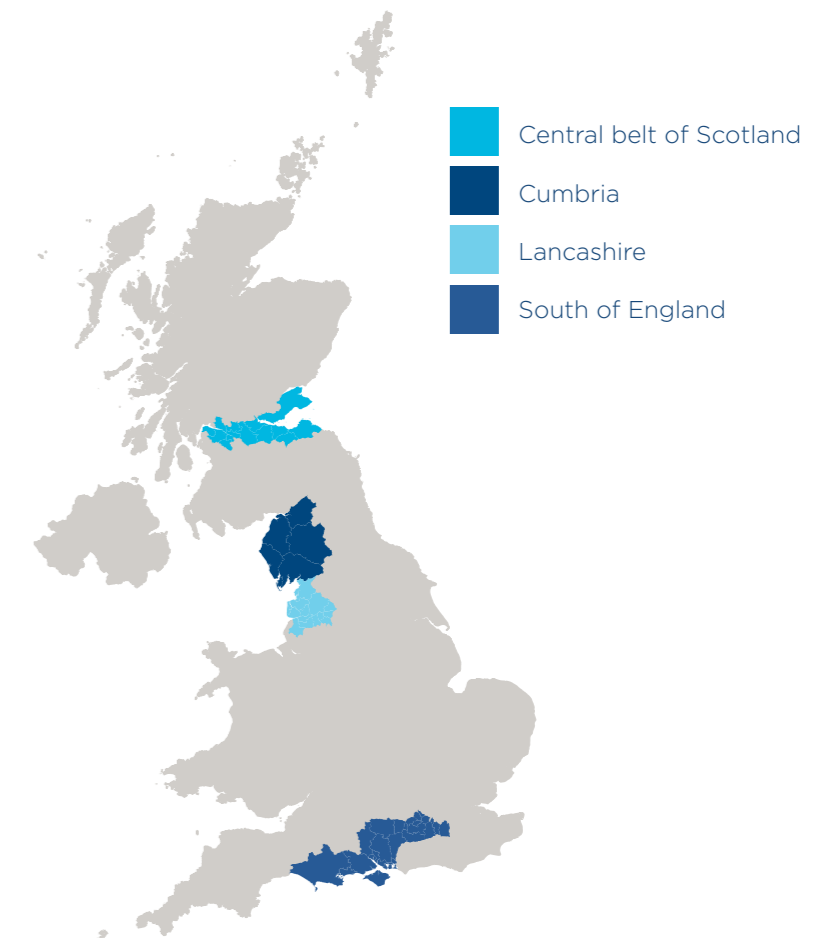
Outside of these four areas under assessment, the Company operates an electronics systems engineering and manufacturing business at Rochester in Kent, and a munitions business with sites located at Radway Green, Cheshire, Washington in Tyne and Wear, and Glascoed in Monmouthshire. In addition,

staff employed by the military aircraft business work from sites in Brough, Yorkshire, in Yeovil, Somerset, and on Royal Air Force (RAF) bases throughout the UK. Additional sites at Guildford, London, Gloucester, Leeds and Manchester employ staff working in digital analysis and cyber security. A significant naval engineering capability is also located at New Malden in Surrey. A fuller list of the Company's

sites in the UK can be found in Appendix A on page 85.

The largest joint ventures the Company is involved with in the UK are: MBDA, the missiles manufacturer, which is a joint venture company with Airbus and Leonardo; and Rheinmetall Landsysteme, which will produce half of the British Army's Boxer vehicles from its facility in Shropshire.

**Fig. 16: The four regions assessed in this chapter**



Source: Oxford Economics.

## CYBER SOLUTIONS IN LAW ENFORCEMENT AND DEFENCE



BAE Systems' Applied Intelligence business helps governments and commercial customers collect, analyse, and manage data across activities including cyber security, risk management, and business strategy.

One example of this work is a collaboration with the UK Home Office and a number of private companies to create a National Automatic Number Plate Recognition (ANPR) Service. At the start of 2020 the resulting ANPR system became the most used by law enforcement agencies in the UK. Teams in BAE Systems have contributed expertise to the design, testing, and building of the system.

ANPR allows vehicle registration plates to be identified immediately on

the road. It is used for the detection of many offences, such as car thefts, cloned vehicles, cases of terrorism, organised crime, and kidnappings.<sup>43</sup> Existing ANPR capabilities relied on more than 40 unconnected systems across police forces and law enforcement agencies. This made quickly analysing across police force boundaries difficult given the scale of the data involved—with over 50 million ANPR records submitted on average by more than 10,000 cameras around the UK.

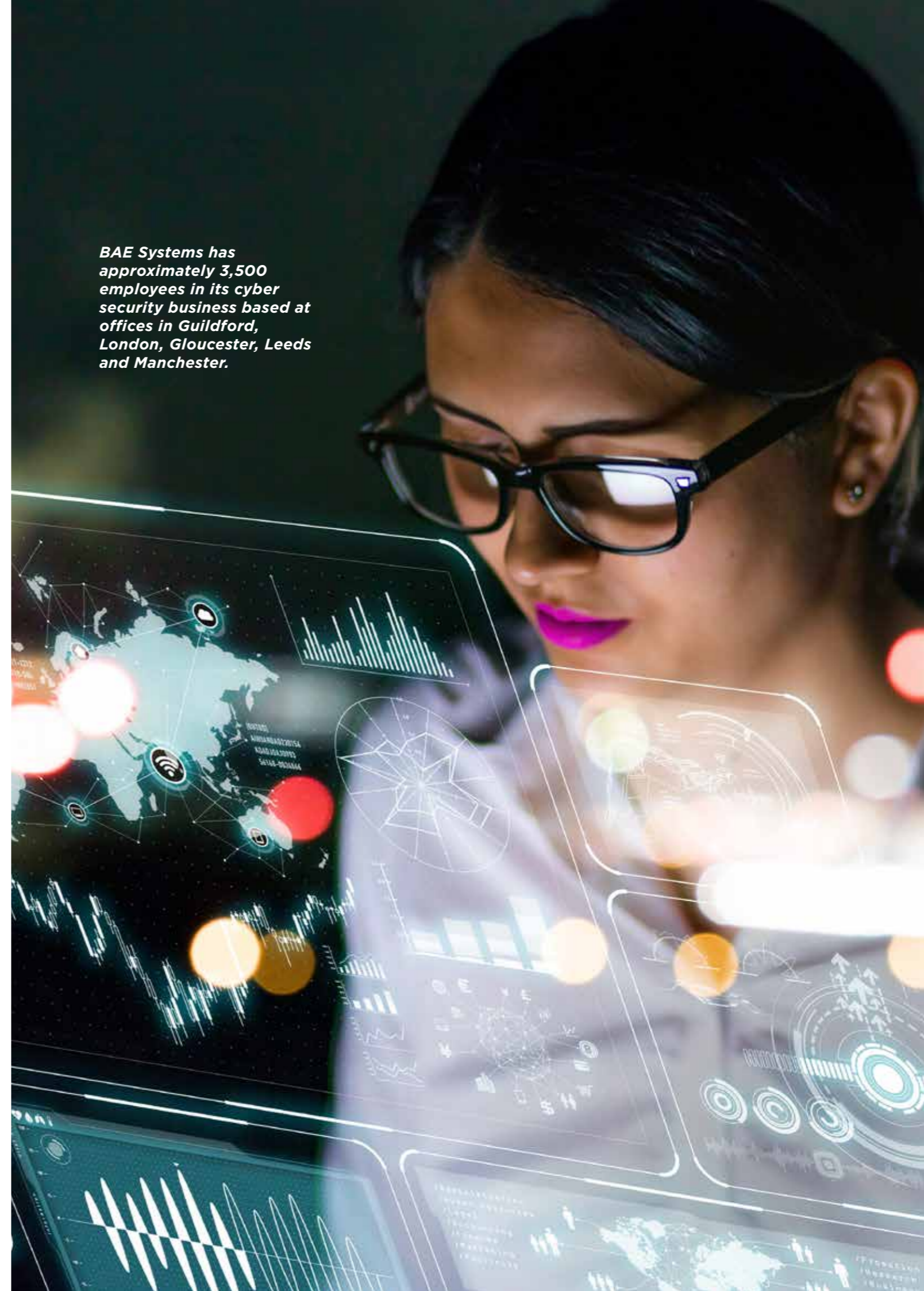
The new technology can be used by police in real-time to help locate offenders' movements following a violent crime, and ANPR evidence often establishes an offender's presence at a location. Other law enforcement organisations

have also exploited the technology, such as the Driver and Vehicle Standards Agency which has trialled the system for enforcing roadworthiness compliance and dangerous driving offences.

Another example is Programme NELSON, a Royal Navy digital transformation programme developed in 2017 and designed to make better use of the Navy's data following the recognition that the exploitation of data would heavily influence future performance in armed conflict.<sup>44</sup> BAE Systems was the lead contractor creating the data platform,<sup>45</sup> and provided expertise in disciplines ranging from data engineers, testers, and security experts. The NELSON programme has evolved into Navy Digital Services and the software will be used both at naval headquarters and onboard warships. It uses artificial intelligence (AI) to alert users to operational aspects such as suspicious shipping behaviour, patterns of fuel usage across the fleet, and when to undertake preventative ship maintenance.

The programme was recognised by the Management Consultancies Association, winning the award for Data and Innovation in the Public Sector in 2020 for its drive to accelerate the exploitation of advanced data analytics and AI in the Royal Navy.<sup>46</sup>

**BAE Systems has approximately 3,500 employees in its cyber security business based at offices in Guildford, London, Gloucester, Leeds and Manchester.**



<sup>43</sup> Management Consultancies Association, BAE Applied Intelligence with the Home Office, 2020. For more information on ANPR and NAS also visit <https://www.npcc.police.uk/FreedomofInformation/ANPR.aspx>.

<sup>44</sup> UK Government, About the Royal Navy's NELSON, 2019.

<sup>45</sup> Management Consultancies Association, BAE Systems Applied Intelligence with Royal Navy, 2019.

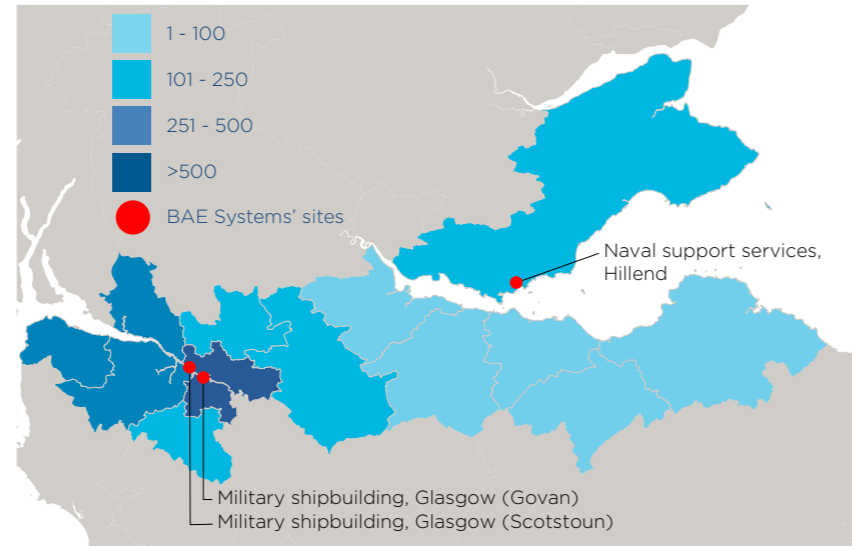
<sup>46</sup> Ibid.

**7.1 CENTRAL BELT OF SCOTLAND**

The central belt of Scotland has two major BAE Systems shipyards at Govan and Scotstoun, which together directly employed 2,700 workers in 2020. The shipyards have a long military history and are currently involved in building the new Type 26 frigate for the Royal Navy. In recent years they have worked on sections of the UK's two Queen Elizabeth-class aircraft carriers as well as assembling all the ships in the Type 45 Class of warship and Offshore Patrol Vessels.

The region also includes a smaller BAE Systems facility in Hillend, outside Dunfermline. Focussed on activities such as electronics development and manufacturing, it houses 160 workers. A further 40 employees are based in Bishopton, outside Glasgow, where the Company has an environmental test facility. This location is situated on an old Royal Ordnance Factory of 2,400 acres, which the Company is currently developing into a community of 4,000 homes with supporting local infrastructure, due to be complete in 2034. Dargavel Village is one of the largest, privately funded, brownfield regeneration projects in the UK and is a key strategic objective for the Glasgow City region.

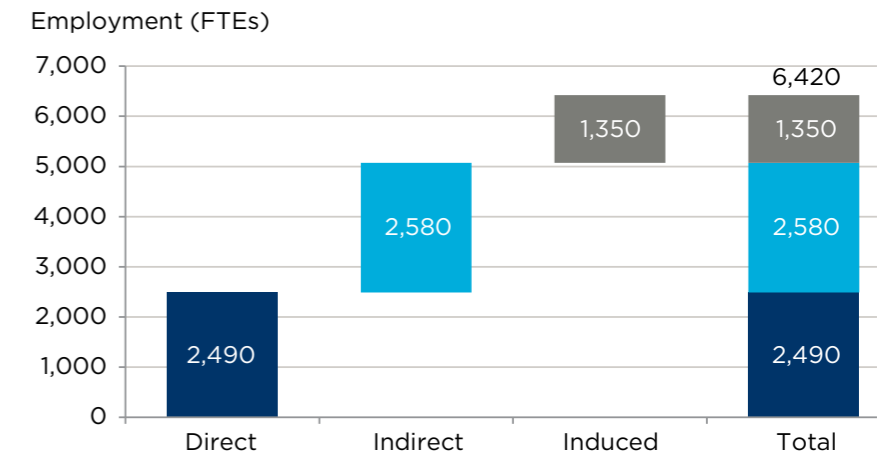
**Fig. 17: BAE Systems' employees by local authority of residence in the central belt of Scotland, and major Company sites (more than 100 workers), 2020**



Source: BAE Systems.

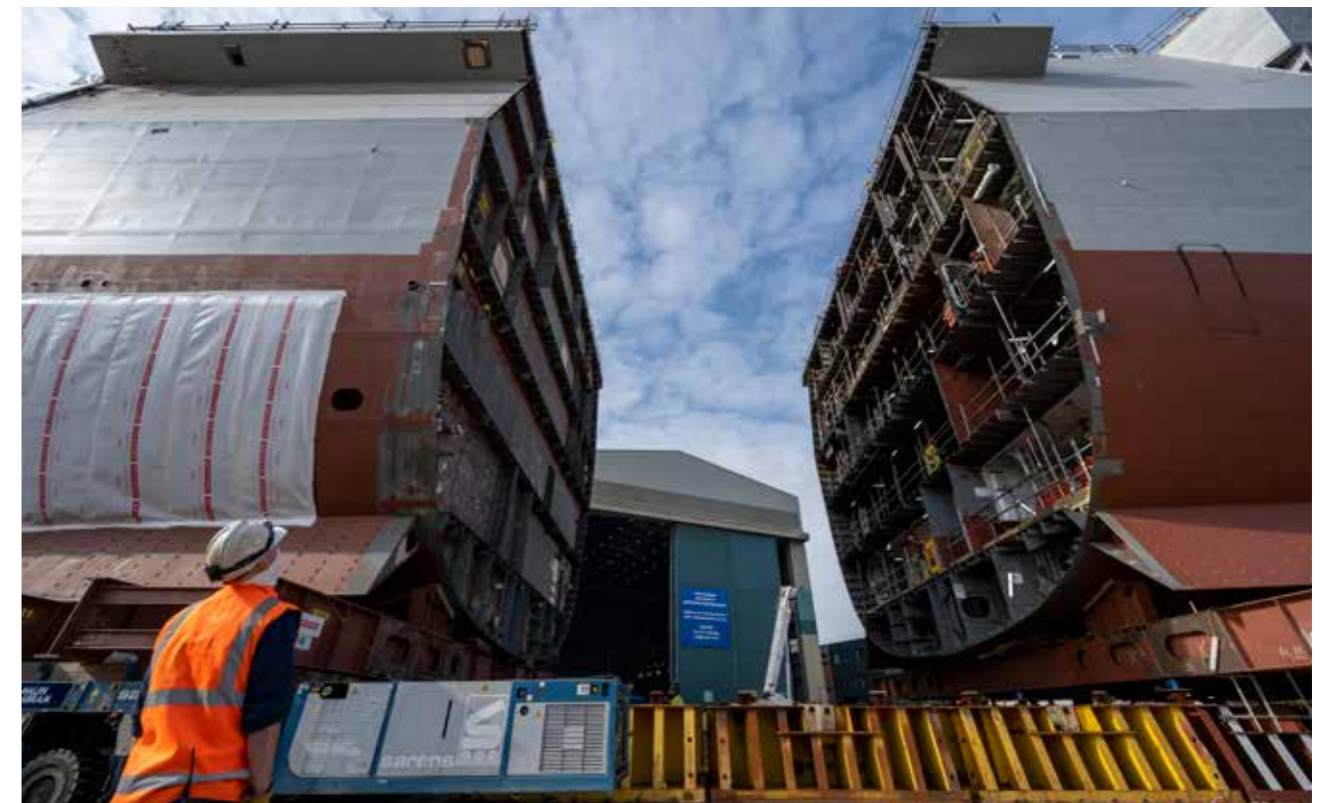
In 2020, BAE Systems spent over £270 million with more than 250 suppliers in the central belt of Scotland region.<sup>47</sup> We estimate that the Company supported a total of 6,420 jobs in the region. This includes the employees that live in the area, who make up 3% of the area's total manufacturing workforce, as well as 2,580 jobs supported by the supply chain spend in the area from across the Company's UK operations. The total figure also includes employment of 1,350 supported by workers spending their wages in the region.

**Fig. 18: BAE Systems' contribution to employment in the central belt of Scotland, 2020**



Source: Oxford Economics. Totals may not sum due to rounding

**The aft block of HMS Glasgow, the first City Class Type 26 frigate being built for the Royal Navy, was joined with the forward block at BAE Systems shipyard on the River Clyde in May 2021.**



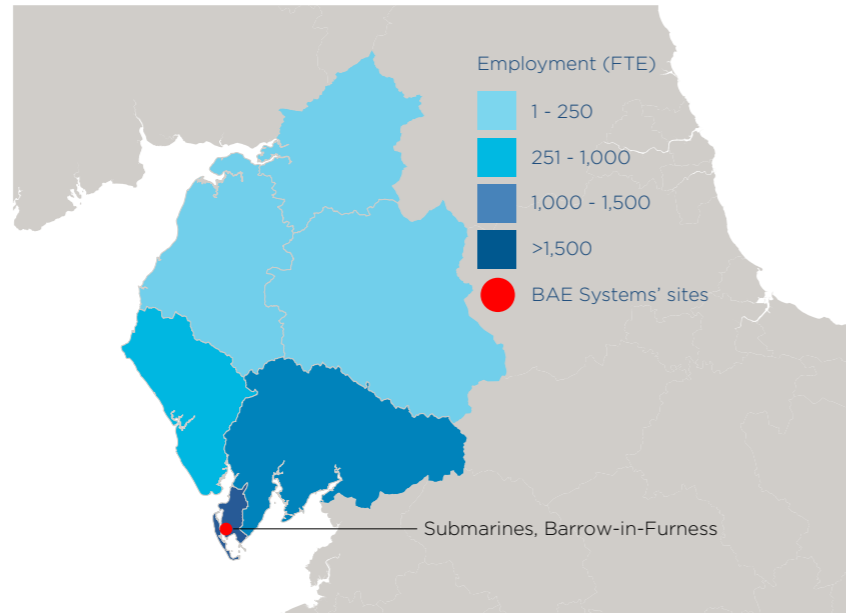
<sup>47</sup> Comprising the following council areas: City of Edinburgh, East Dunbartonshire, East Lothian, East Renfrewshire, Falkirk, Fife, Glasgow City, Inverclyde, Midlothian, North Lanarkshire, Renfrewshire, West Dunbartonshire, West Lothian.

**7.2 CUMBRIA**

Cumbria is home to BAE Systems' single largest site, with over 8,460 workers employed at its submarine-building facility at Barrow-in-Furness in 2020. The Barrow workforce is currently involved in two major manufacturing programmes. This includes construction of the Royal Navy's new Astute-class attack submarines, the first of which was begun in 2001 and commissioned for active service in 2010. The seventh and final of these boats is expected to be commissioned by 2026.

The other major manufacturing programme currently underway is the new Dreadnought-class ballistic missile submarine, which will be part of the UK's nuclear deterrent. The steel was cut for the first and second of these boats in 2016 and 2019 respectively and they are expected to enter service in the early 2030s. In addition to the Dreadnought and Astute programmes, in September 2021, the Ministry of Defence (MOD) awarded BAE Systems a £85 million contract to support early design and concept work to deliver a replacement for the Astute class.

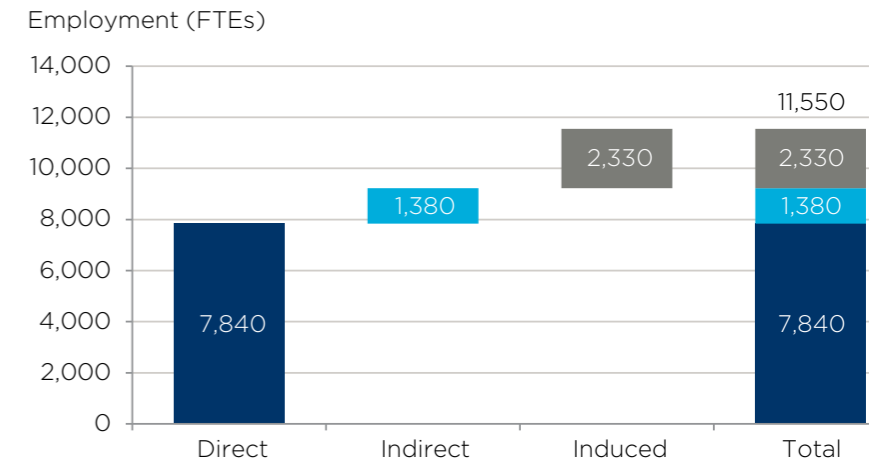
**Fig. 19: BAE Systems' employees by local authority of residence in Cumbria, and major Company sites (more than 100 workers), 2020**



Source: Oxford Economics.

In 2020, BAE Systems spent over £80 million with more than 100 suppliers in Cumbria. We estimate that the Company supported a total of 11,550 jobs in the region.<sup>48</sup> Of this total, 7,840 were workers directly employed at the Company's sites and living in Cumbria—approximately a quarter of all manufacturing jobs in the county. The jobs of a further 1,380 workers were indirectly supported through the Company's supply chain spending. Consumer spending supported an additional 2,330 jobs.

**Fig. 20: BAE Systems' contribution to employment in Cumbria, 2020**



Source: Oxford Economics. Totals may not sum due to rounding.

***BAE Systems' Academy for Skills and Knowledge at Barrow-in-Furness is equipping employees with engineering skills to design, build and deliver complex submarine programmes for the Royal Navy.***



<sup>48</sup> Comprising the following local authority districts: Allerdale, Barrow-in-Furness, Carlisle, Copeland, Eden, South Lakeland.

**7.3 LANCASHIRE**

Lancashire is home to BAE Systems' next two largest sites after Barrow-in-Furness: the military aircraft facilities at Samlesbury and at Warton, each employing almost 5,000 workers.

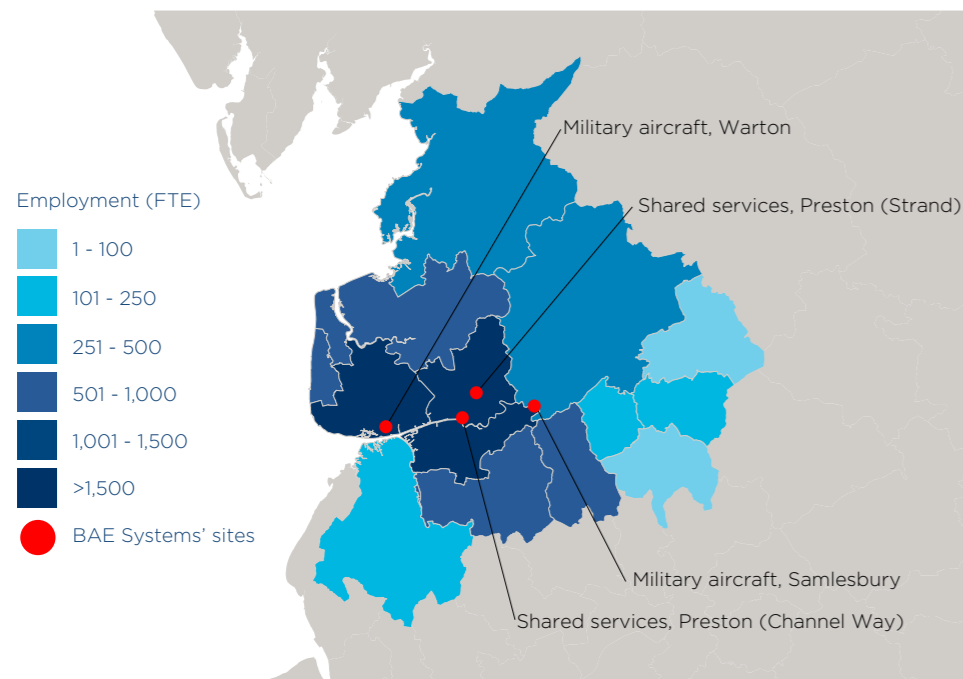
As part of BAE Systems' Air sector, both sites are increasingly focussed on collaboration with suppliers and partners across the UK, including SMEs, academia and companies from other sectors, as well as using innovative digital techniques and technologies to drive efficiency.

They will benefit from a £1.3 billion contract to produce 38 Typhoons for the German Air Force, awarded in November 2020. The Warton facility also manages upgrade work for the Royal Air Force's Typhoon fleet, delivering against a £135 million contract, awarded to BAE Systems in August 2021.

At Samlesbury, in addition to manufacturing major components for Typhoon, the site builds the aft fuselage and the horizontal and vertical tail planes for every F-35 military aircraft under contract to the prime contractor, Lockheed Martin.

In recent years significant capital investments have also been made to develop capabilities and future skills. This includes a £20 million investment in an aerospace skills and training academy which opened at Samlesbury in 2016, and a multi-million pound investment to create an Industry 4.0 "Factory of the Future" at Warton. This digitally-connected facility is developing advanced manufacturing technologies alongside more than 50 partners and suppliers.

**Fig. 21: BAE Systems' employees by local authority of residence in Lancashire, and major Company sites (more than 100 workers), 2020**



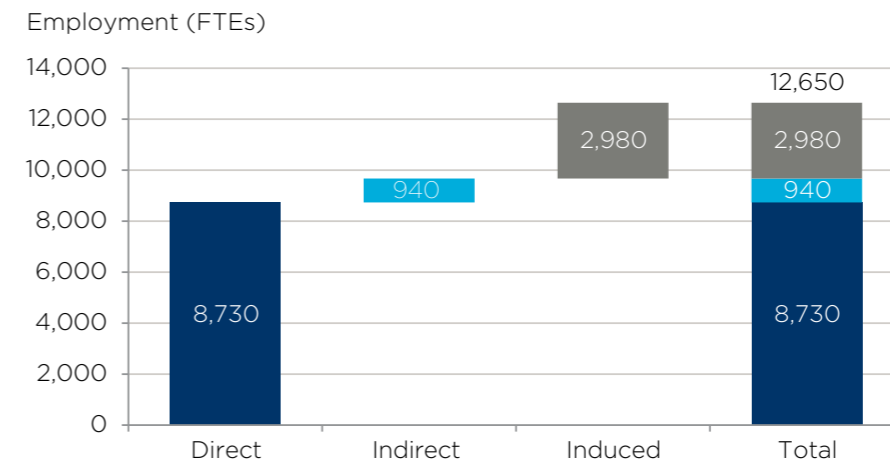
Source: Oxford Economics.

Aside from the military aircraft sites, BAE Systems has two smaller facilities in Preston employing 700 workers with a focus on central business support activities.

BAE Systems spent more than £70 million with over 220 suppliers in Lancashire in 2020. Taken together, the Company's operations in the region supported 12,650 jobs.

Of these, 8,730 were workers directly employed at the Company's sites and living in Lancashire, about 11% of the area's total manufacturing workforce;<sup>49</sup> 940 were indirectly supported through the Company's supply chain spending; and 2,980 were supported through the consumer spending of direct and supply chain workers.

**Fig. 22: BAE Systems' contribution to employment in Lancashire, 2020**



Source: Oxford Economics. Totals may not sum due to rounding.

<sup>49</sup> Comprising the following local authorities: Blackburn with Darwen, Blackpool, Burnley, Chorley, Fylde, Hyndburn, Lancaster, Pendle, Preston, Ribble Valley, Rossendale, South Ribble, West Lancashire, Wyre.





*HMS Queen Elizabeth departing Portsmouth Naval Base in May 2021. BAE Systems led the consortium which built both of the UK's Queen Elizabeth Class Aircraft Carriers and delivers support and maintenance services.*

**7.4 SOUTH OF ENGLAND**

BAE Systems has eight sites in the south of England<sup>50</sup> that have at least 100 workers, as well as five smaller locations. The largest of these facilities is Portsmouth Naval Base, which, with partners, the Company manages on behalf of the Royal Navy, and where 70% of Royal Navy surface ships are based—including the two Queen Elizabeth-class aircraft carriers. The Company had 2,400 workers at this location in 2020, delivering upgrades and maintenance to warships, as well as other services and support to the Royal Navy. This is in addition

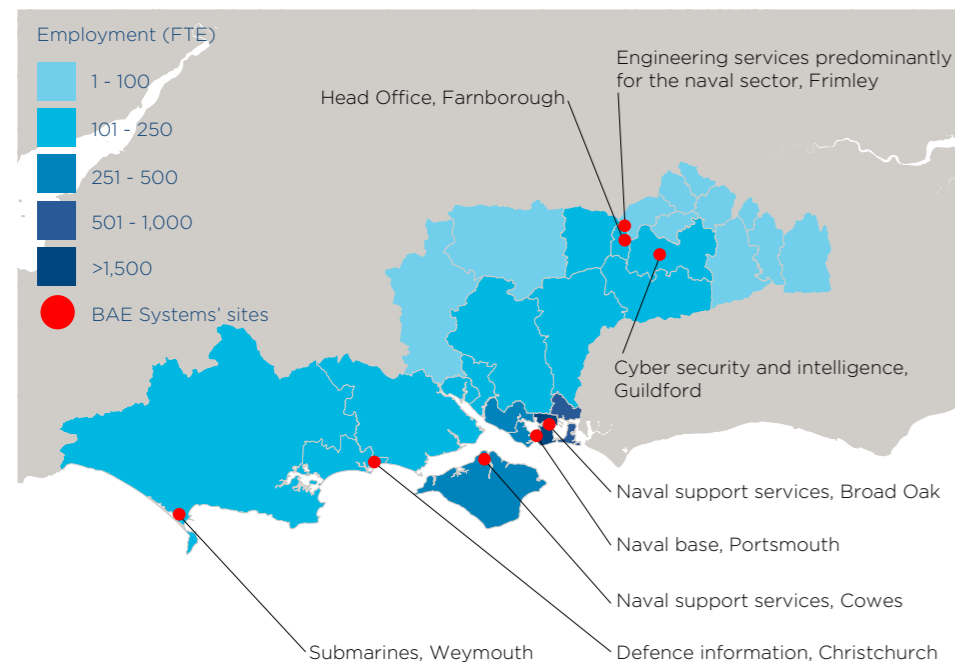
to a small boats factory, producing vessels such as the Pacific 24 rigid inflatable boat, used in fast rescue and anti-piracy operations. A further 900 workers are based at nearby Broad Oak, a specialised site for the design and manufacture of naval electronics and other equipment for aerospace and defence. In addition, nearly 70 employees work in combat systems at the neighbouring Maritime Integration Support Centre.

Outside of Portsmouth, the Company's largest locations in the region are its headquarters in Farnborough, with over 470 staff, and a further 560

workers in nearby Frimley. The Frimley office, built in 2005, houses employees developing and supporting major programmes such as the UK's aircraft carriers, Type 26 frigates, and Astute and Dreadnought-class submarines.

Other large BAE Systems sites in the south of England include a cyber security business at Guildford; a site in Weymouth working on the Company's submarine programmes; and its facility in Cowes, on the Isle of Wight, which focusses on technologies such as radar.

**Fig. 23: BAE Systems' employees by local authority of residence in the south region, and major Company sites (more than 100 workers), 2020**

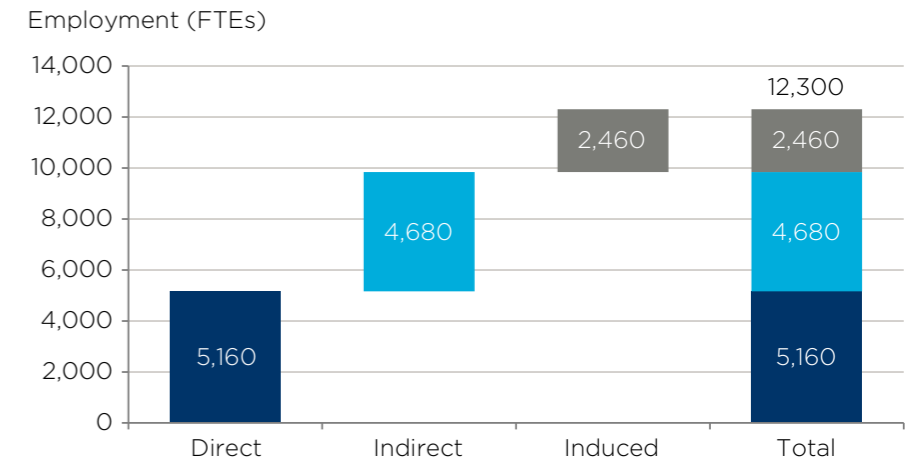


Source: Oxford Economics.

<sup>50</sup> Comprising the following local authorities: Basingstoke and Deane, Bournemouth, Christchurch and Poole, East Hampshire, Eastleigh, Elmbridge, Epsom and Ewell, Fareham, Gosport, Guildford, Hart, Havant, Isle of Wight, Mole Valley, New Forest, Portsmouth, Reigate and Banstead, Runnymede, Rushmoor, Southampton, Spelthorne, Surrey Heath, Tandridge, Test Valley, Waverley, Winchester, Woking.

In 2020, BAE Systems spent almost £590 million with nearly 750 suppliers in the south of England. In total, the Company's operations in the region supported 12,300 jobs. Almost 5,160 of these were employed directly at its sites and lived in the region—about 3% of all manufacturing jobs in the area. More than 4,680 of the total consist of jobs indirectly supported through the Company's procurement spending. The remaining 2,460 are jobs supported through the consumer spending stimulus of the Company's employees and the employees of the businesses which make up its supply chain.

**Fig. 24: BAE Systems' contribution to employment in the South, 2020**



Source: Oxford Economics. Totals may not sum due to rounding.

## DEVELOPING THE DATA-DRIVEN FACTORIES OF THE FUTURE



The factory demonstrates a new approach to the way humans and machines can operate together. Flexible robotic and “cobotic” technologies—collaboration between a person and a robot—remove the need for heavy, fixed machinery, and can quickly switch from the production of one item to another. Intelligent machines and off-the-shelf robotic technology from the automotive industry have been modified to operate at the precise tolerances required for military aircraft.

BAE Systems is also testing the use of robots for inspecting welds on submarines at Barrow-in-Furness. Checking for defects below the surface of each weld demands a manual and time-consuming scan of all the joints in a boat’s hull. In 2020, the Company began a study with the University of Strathclyde to combine robotics and machine learning to automate elements of this scanning process. An inspection robot systematically navigates a specific area of a flat metal panel, capturing ultrasound data, identifying and mapping any defects for an engineer to check and assess. Once proven on relatively flat steel surfaces, the potential to use robots to scan harder-to-reach welds will be explored.

A fourth industrial revolution is underway, with machine learning and autonomous technologies building on previous system changes that were centred around automation, electricity, and steam power. This trend has been termed Industry 4.0, and BAE Systems is investing in research in this area to develop the factory of the future.

By far the biggest enabler of new factory designs is the collection and exploitation of data. In 2020, BAE Systems secured a £9.5 million investment from the Department of Culture, Media and Sport to develop and test 5G-enabled technologies. This “internet of things” approach is essential to deliver accurate data into the hands of

engineers and to drive factory robotics.

This process has been accelerated by the Tempest Future Combat Air System programme in a highly collaborative effort—involving members of the High Value Manufacturing Catapult, Siemens, IBM, the University of Nottingham and Sheffield University’s Advanced Manufacturing Research Centre. The Company is applying an Industry 4.0 approach at a new facility at Warton, Lancashire, bringing together advanced manufacturing technologies to transform traditional processes. Automated robots and virtual and augmented reality will increase speed and precision, and reduce the cost of manufacturing complex military aircraft.

## 8. CONCLUSION

Among the 10 biggest manufacturing companies in the country and the largest supplier to the Ministry of Defence (MOD), BAE Systems made a substantial contribution to the UK economy in 2020.

Measured through the lens of contribution to UK GDP, the Company had an impact of £10.1 billion in 2020, equivalent to 0.5% of the domestic economy. In employment terms, BAE Systems’ business activity supported employment of 143,000. It also generated £2.7 billion of tax revenues for the Exchequer. These estimates include impacts generated through the Company’s own operations, its purchases of goods and services from domestic suppliers, and the spending of its own workers and those employed in the supply chain.

These estimates reflect the impact of BAE Systems during 2020. However, as highlighted in this study, the Company influences the UK economy through a number of wider and longer-term channels. For instance, the Company exported £3.9 billion of goods and services in 2020. This

is equivalent to 133% of the Company’s direct contribution to GDP, contributing significantly towards the UK Government’s target to boost exports to 35% of GDP. The Company also contributes to building the UK’s human capital through its training schemes, employing more than 2,000 apprentices and nearly 600 graduates on training schemes in 2020.

BAE Systems’ business activities help to support the Government’s levelling up agenda by directly employing 14,700 workers and spending nearly £700 million on supply chain purchases in Britain’s most deprived local authorities—areas that rank in the bottom fifth of the Government’s Indices of Deprivation for each of England, Scotland, and Wales.

As reflected by its extensive investments in technology and R&D, BAE Systems is also at the forefront of technological innovation. Between 2016 and 2020, total R&D activity carried out by the Company amounted to £5.5 billion, £1.1 billion of which came in 2020 alone. This investment is

vital for continuing to deliver technologically advanced products to BAE Systems’ clients and ensuring that the MOD retains an edge over potential adversaries. However, R&D also creates wider spillover benefits as new commercial applications are found for innovations.

# APPENDIX A: DETAILED LOCAL FINDINGS

## ECONOMIC IMPACT OF BAE SYSTEMS ON LOCAL AREAS

**Fig. 25: BAE Systems' procurement spending by parliamentary constituency, 2020, top 50 constituencies**

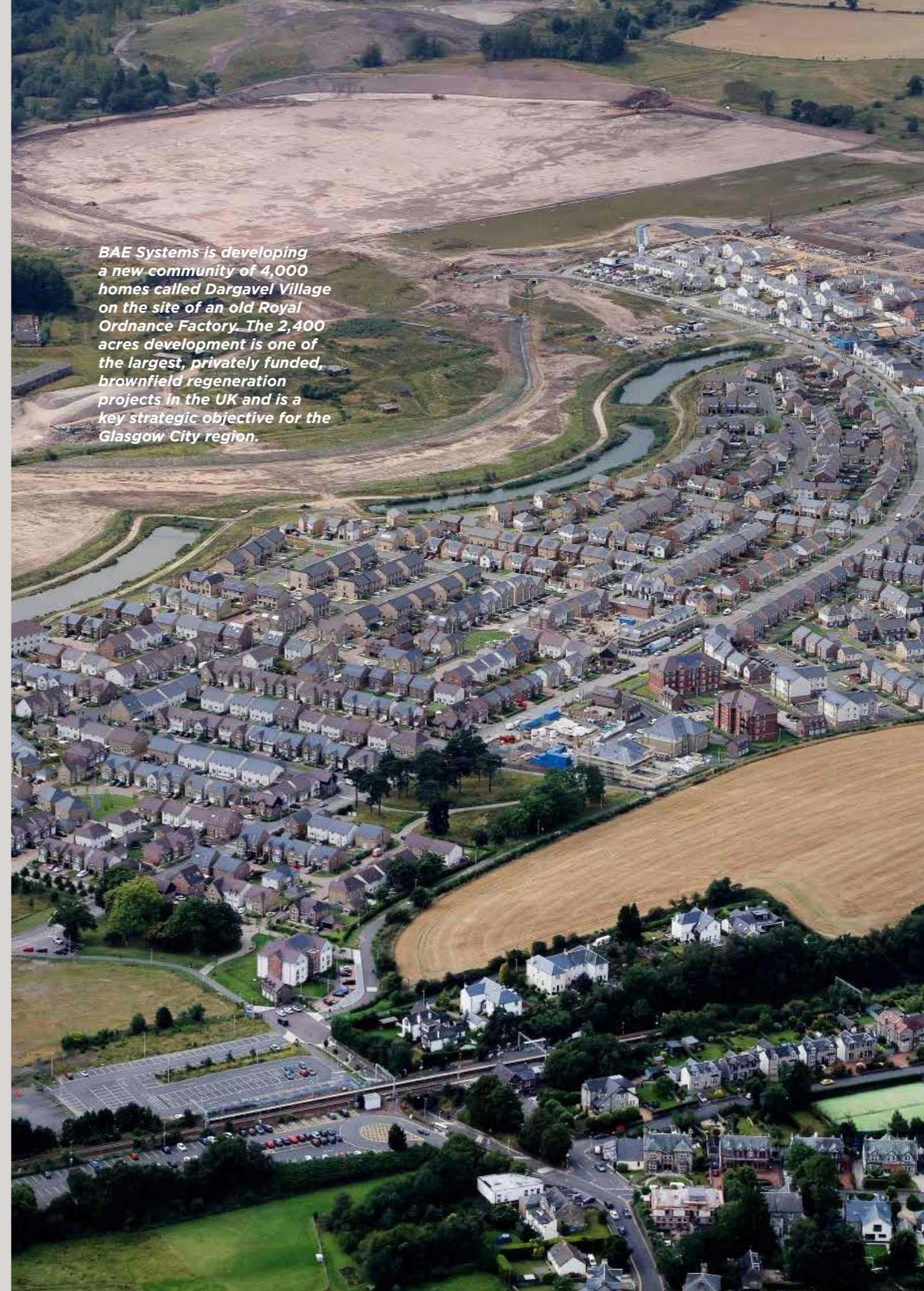
Rank by spend	Parliamentary constituency	Procurement spend, £m	Count of suppliers
1	Stevenage	330	16
2	Cities of London and Westminster	210	284
3	Edinburgh North and Leith	180	12
4	Salford and Eccles	140	20
5	Aldershot	130	52
6	Luton South	110	12
7	Basildon and Billericay	100	9
8	Mid Derbyshire	80	3
9	Filton and Bradley Stoke	70	24
10	Woking	70	17
11	Barrow and Furness	70	67
12	Portsmouth North	70	44
13	Beaconsfield	60	17
14	Tewkesbury	60	24
15	Yeovil	50	16
16	Meon Valley	50	42
17	Sheffield Central	50	13
18	Rugby	40	9
19	Birmingham, Ladywood	40	33
20	Bristol South	40	4
21	Cheadle	40	14
22	Ribble Valley	40	28
23	Wantage	40	21
24	Havant	40	20
25	Wythenshawe and Sale East	30	20
26	Plymouth, Moor View	30	8
27	Harlow	30	11
28	Colne Valley	30	3
29	North Swindon	30	11
30	Birkenhead	30	6
31	Mid Dorset and North Poole	30	8
32	Glasgow South West	30	10
33	Poplar and Limehouse	20	30
34	Cannock Chase	20	9
35	Fareham	20	43
36	Romsey and Southampton North	20	18
37	Basingstoke	20	38
38	North East Hampshire	20	24
39	Crawley	20	20
40	Eastleigh	20	26
41	Halesowen and Rowley Regis	20	13
42	Derby South	20	4
43	Normanton, Pontefract and Castleford	20	4
44	Dewsbury	20	6
45	Feltham and Heston	20	16
46	Elmet and Rothwell	20	4
47	Surrey Heath	20	29
48	Christchurch	20	33
49	Kingston and Surbiton	20	11
50	Bermondsey and Old Southwark	20	41

**Fig. 26: BAE Systems' employees by worksite, 2020, top 50 Company and customer worksites**

Rank by FTEs	Worksite	FTEs
1	Barrow	8,464
2	Warton	4,916
3	Samlesbury	4,799
4	Portsmouth	2,411
5	Scotstoun	1,827
6	Rochester	1,468
7	Broad Oak	913
8	Govan	883
9	Southwark	761
10	Guildford	680
11	RAF Coningsby	651
12	Brough	594
13	Gascoed	577
14	Frimley	557
15	Farnborough	473
16	Brockworth	414
17	Filton	392
18	Radway Green	283
19	New Malden	270
20	Leeds	257
21	Yeovil	240
22	Christchurch	232
23	Cowes	219
24	Washington	213
25	Strand	198
26	Great Baddow	197
27	Prestwick	178
28	Preston Channel Way	174
29	Hillend	164
30	Portway - Preston	137
31	Weymouth	133
32	Fulwood	129
33	RAF Marham	106
34	RAF Valley	104
35	Portsmouth Technology Park	70
36	Humberside Airport	63
37	Stirling Square, St James's	54
38	Dorchester	47
39	RAF Lossiemouth	43
40	Bishopton	38
41	Burwood House, St James's	36
42	Towcester	31
43	Milton Keynes	29
44	Manchester	24
45	Coventry	22
46	Westcott	19
47	Ash Vale	17
48	Preston	17
49	Great Baddow	16
50	Ridsdale	14

**Fig. 27: BAE Systems' employees by parliamentary constituency of residence, 2020, top 50 constituencies**

Rank by FTEs	Parliamentary constituency	FTEs
1	Barrow and Furness	7,288
2	Fylde	1,667
3	Ribble Valley	1,149
4	Wyre and Preston North	1,045
5	Preston	1,013
6	South Ribble	967
7	Portsmouth South	614
8	Chorley	612
9	Portsmouth North	542
10	Blackburn	481
11	Fareham	405
12	Gosport	386
13	Blackpool South	376
14	Meon Valley	344
15	West Dunbartonshire	340
16	Havant	328
17	Sleaford and North Hykeham	320
18	Lancaster and Fleetwood	317
19	Chatham and Aylesford	312
20	Inverclyde	297
21	Isle of Wight	281
22	Blackpool North and Cleveleys	276
23	Rochester and Strood	274
24	Haltemprice and Howden	265
25	Copeland	257
26	Paisley and Renfrewshire North	252
27	Westmorland and Lonsdale	248
28	Glasgow North West	233
29	Gillingham and Rainham	225
30	Aldershot	218
31	Guildford	185
32	Wigan	184
33	Hyndburn	182
34	North East Hampshire	179
35	Rosendale and Darwen	163
36	Torfaen	158
37	Glasgow South West	157
38	Morecambe and Lunesdale	156
39	East Dunbartonshire	146
40	Paisley and Renfrewshire South	144
41	Yeovil	136
42	Eastleigh	132
43	South West Surrey	130
44	Sittingbourne and Sheppey	122
45	Surrey Heath	119
46	Bolton West	119
47	Burnley	116
48	West Lancashire	116
49	Monmouth	116
50	East Hampshire	116



*BAE Systems is developing a new community of 4,000 homes called Dargavel Village on the site of an old Royal Ordnance Factory. The 2,400 acres development is one of the largest, privately funded, brownfield regeneration projects in the UK and is a key strategic objective for the Glasgow City region.*

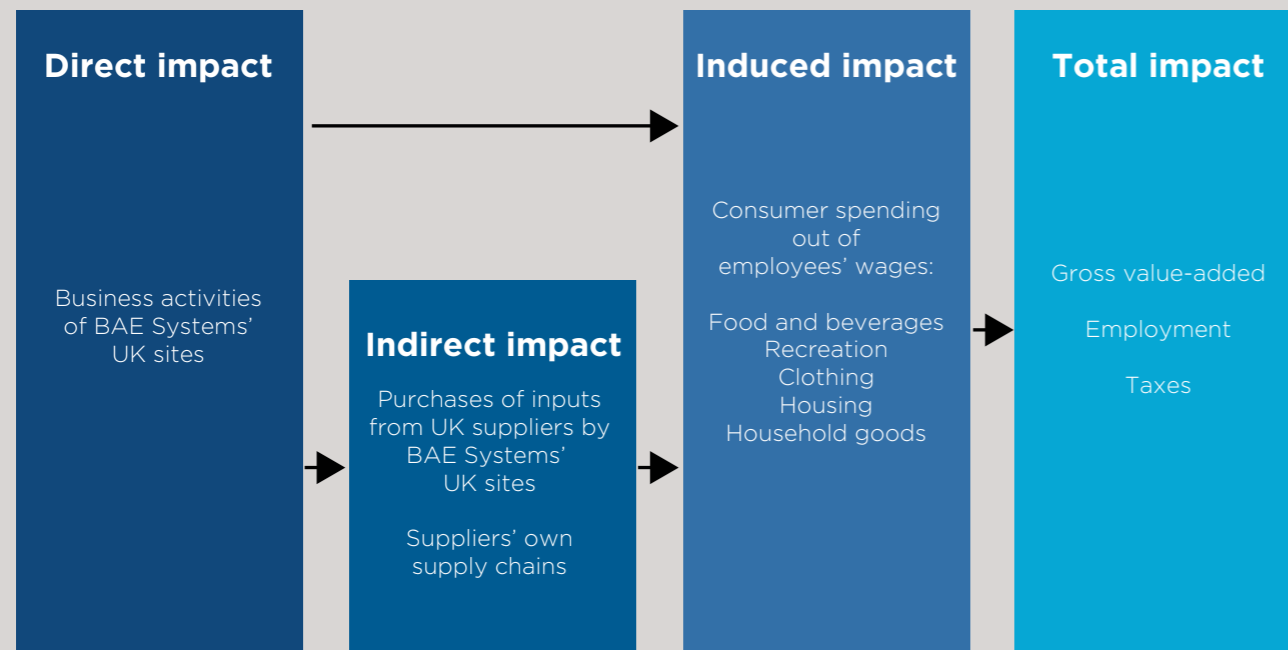
# APPENDIX B: ECONOMIC IMPACT METHODOLOGY

## ECONOMIC IMPACT MODELLING

Economic impact modelling is a standard tool used to quantify the economic contribution of an investment or a company. Impact analysis traces the economic contribution of an investment through three separate channels:

- **Direct impact** – refers to activity conducted directly by BAE Systems in the UK.
- **Indirect impact** – consists of activity that is supported as a result of the procurement of goods and services by BAE Systems in the UK, purchases by those companies in turn, and so on.
- **Induced impact** – reflects activity supported by the spending of wage income by direct and indirect employees.

**Fig. 28: Direct, indirect, induced and total economic impacts**



### Direct impacts

The direct value added of BAE Systems is calculated as revenues minus the cost of goods brought in. Value added per employee, a measure of productivity, is a figure derived from dividing direct value added by the number of FTE employees.

### Indirect and induced impacts

Indirect and induced impacts are estimated using an input-output model. An input-output model gives a snapshot of an economy at any point in time. The model shows the major spending flows from “final demand” (i.e. consumer spending, government spending, investment and exports to the rest of the world); intermediate spending patterns (i.e. what each sector buys from every other sector—the supply chain, in other words); how much of that spending stays within the

economy; and the distribution of income between employment and other forms such as corporate profits. As these models measure activity within an economy, the direct impact figures will often not match company annual accounts, which follow accounting standards and rules.

An input-output model uses a matrix representation of a nation’s interconnected economy to calculate the effect of changes by consumers, by an industry, or by others, on other industries and therefore on the economy as a whole. These input-output tables ultimately measure “multiplier effects” of an industry by tracing the effects of its inter-industry transactions—that is, the value of goods and services that are needed (inputs) to produce each pound of output for the individual sector being studied. These models can be used to measure the relationship between an economic change or “shock” and the final outcome across the whole of the economy.

In essence, an input-output model is a table which shows who buys what from whom in the economy.

Oxford Economics used the input-output table for the United Kingdom for 2017, published by the ONS in 2021, for this analysis. This is the most recent input-output table for the United Kingdom.

Direct, indirect, and induced employment figures in this report have been rounded to the nearest 100 FTE jobs in chapter 2, and the nearest 10 FTE jobs in chapter 7. The multipliers quoted in the report represent the multiple of direct impacts that account for total impacts. For instance, if 20 FTE jobs were direct impacts and the total impact multiplier was 2, then the total impact would be 40 FTE jobs. These multipliers are calculated from the input-output model results. Indirect jobs are presented including the contingent labour or contractors that BAE Systems hires. Data on these workers are obtained from the Company’s HR systems, and spending on these workers from the Company’s procurement systems. We assume that 10% of the spending on these workers is retained by employment agencies, while the rest is added to the Company’s indirect GVA contribution.

### Industry breakdowns

The UK 2017 input-output table is divided into 105 different industry sectors, and the table shows how each sector interacts with the 104 other sectors. For purposes of illustration to show value added and employment supported across different sectors, the 105 different industries have been pooled into broad industry categories in this report. For example, the professional services industry amalgamates the following sectors:

- Legal services
- Accounting, bookkeeping and auditing services; tax consulting services
- Services of head offices; management consulting services
- Architectural and engineering services; technical testing and analysis services
- Scientific research and development services
- Advertising and market research services
- Other professional, scientific and technical services

### Regional models

Input-output models can also be made to measure regional impacts. In this case, ratios of local economic activity to national economic activity known as “location quotients” are calculated, in order to calibrate the national input-output model to describe each region in terms of the employment impact and to calculate employment multipliers per region.

This process was adopted in order to develop employment contributions for the central belt of Scotland, Cumbria, Lancashire, and the south of England.

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Headquartered in Oxford, England, with regional centres in London, New York, and Singapore, Oxford Economics has offices across the globe in Belfast, Boston, Cape Town, Chicago, Dubai, Frankfurt, Hong Kong, Los Angeles, Melbourne, Mexico City, Milan, Paris, Philadelphia, Stockholm, Sydney, Tokyo, and Toronto. We employ 400 full-time staff, including more than 250 professional economists, industry experts and business editors—one of the largest teams of macroeconomists and thought leadership specialists. Our global team is highly skilled in a full range of research techniques and thought leadership capabilities, from econometric modelling, scenario framing, and economic impact analysis to market surveys, case studies, expert panels, and web analytics.

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### 2022

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*BAE Systems has 25 years of experience in developing electric drive technology. The Company's Electronic Systems business based at Rochester has produced an electric drive system that powers more than 14,000 buses around the world. See the case study on pages 52 and 53 for further information about the Company's electric technologies.*





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