

The Economics of the UK Defence Industrial Strategy

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In 2005, in anticipation of major gaps in development and production work for British defence suppliers, the UK Government released its most comprehensive statement of policy for British defence industry to date. At issue is which defence industrial capabilities the UK wishes to retain, how to do so, and at what cost. This article analyses the new policy's approach to competition, the weight given to non-defence issues in procurement choices, the price of UK independence, and managing BAE's dominance of British defence industry.

Introduction

The UK Ministry of Defence (MoD) is a major buyer of defence equipment and services, spending some £16 billion on defence Research and Development (R&D), equipment and support in 2005. Such buying power forms a major component of the demand side of the UK defence equipment market. Exports of defence equipment and services valued at some £7.1 billion in 2005 are a further component of market demand. For some equipment, MoD is the only (monopsony) buyer purchasing from a UK monopoly supplier (e.g. nuclear-powered submarines). Where MoD is a major or the monopsony buyer, it can use its buying power to determine the size, structure, behaviour, performance and ownership of the UK defence industrial base (See Table 1). MoD buying power forms the context for the Defence Industrial Strategy (DIS).

The UK's 2005 Defence Industrial Strategy White Paper is the most comprehensive statement of defence industrial policy ever published by a UK Government.¹ It provides data on the UK Defence Industrial Base (DIB); it provides guiding principles for the Strategy; it outlines the problems facing the defence industries; and it identifies the key industrial capabilities which will be retained in the UK. An associated Defence Technology Strategy (DTS) was published by MoD in 2006.² This article evaluates the DIS in terms of two questions. First, what is known about the UK DIB and its problems; and second, what are the key questions which need to be addressed in any critical evaluation of the DIS?

¹ Ministry of Defence, *Defence Industrial Strategy*, London, The Stationery Office, 2005.

² Ministry of Defence, *Defence Technology Strategy*, London, The Stationery Office, 2006.

The UK Defence Industrial Base

The DIS contains a substantial amount of data about the UK DIB and the key features are summarised in Table 1. Some data are newly-available in the public domain, especially on specific defence markets. The Table shows annual MoD spending and its allocation between R&D, equipment and support services. Support services accounted for over 50% of MoD spending. Indeed, the DIS forecasts a significant growth in future support business. For example, on the new UK aircraft carriers, initial acquisition will account for about one-third of total life-cycle costs. More emphasis on support business provides further opportunities for military outsourcing. The UK has already achieved significant outsourcing under its Private Finance Initiatives and Public Private Partnerships (e.g. outsourcing of aircrew training; plans for outsourcing military flying training and the UK's air-to-air refuelling capability).

The broad planned spending figures also show the aerospace industry (aircraft, helicopters and missiles) accounting for almost 50% of indicative spending, followed by the maritime and C4ISTAR³ sectors. Interestingly, a comparison of the *actual* MoD equipment spending in 2006/07 with the *indicative planned* equipment expenditure (at some £5.8 billion in 2006/07) shows the pressures on the equipment budget and the difficult management problem facing MoD. However, indicative planning assumptions are not firm spending commitments with only about 40% of planned spending being contractually committed in 2006/07, and this share declining to under 20% in 2014/15.⁴ As a result, budget pressures can always be handled by 'shifting the new equipment programme to the right', reflected in delays in major programmes.

The DIS confirms the relative openness of the UK defence market, where 32% of MoD industrial spending was with foreign-owned companies, collaborative programmes and imports. In contrast, 81% of US defence industrial outlays were with US-owned companies and 9% with foreign-owned companies. There is also extensive foreign inward and outward investment involving the UK DIB, the USA and Europe. UK defence companies (e.g. BAE Systems; Rolls-Royce; VT; QinetiQ) have acquired US firms; similarly, US and European firms have made acquisitions in the UK (e.g. GEC; Raytheon; Finmeccanica; Thales). Overall, about 25% of the UK DIB is foreign-owned. This feature is recognised in the DIS definition of the UK DIB to comprise all defence suppliers that create value, employment, technology or intellectual assets in the UK, including UK and foreign-owned firms. Employment in the UK DIB has declined substantially from 740,000 employees in 1980/81 to 550,000 in 1990/91 at the end of the Cold War and

³ C4ISTAR is short for Command, Control, Communications and Computers, Intelligence, Surveillance, Target Acquisition and Reconnaissance.

⁴ Ministry of Defence, *Defence Industrial Strategy*, p. 24.

Table 1: The UK Defence Industrial Base, 2005

Indicative MoD spending: 2006/07, in £ billions	
Fixed wing aircraft	3.25
Maritime	2.80
C4ISTAR	2.25
Missiles	1.10
Helicopters	0.75
Armoured Fighting Vehicles	0.30
CBRN	0.12
Counter Terrorism	0.11
Munitions	0.07
Total	10.75
Total MoD spending: in £ billions	
Support services (e.g. maintenance; spares)	9.00
Equipment	4.70
Research and technology	2.30
Total	16.00
Country-ownership allocation of MoD spending:	
UK-owned and based companies	68%
Foreign-owned UK-based companies	14%
Collaborative projects	13%
Imports	5%
UK defence exports (annual deliveries), in £ billions	7.10
Productivity : value added per employee, in £000s	
UK defence industry	55.00
All UK industries	48.10
Total employment in UK defence industries, in 000s	310
Including employment on defence exports	65
Regional distribution of <u>direct</u> employment	
England	124
East	10
Midlands	8
London	13
North East	2
North West	15
South East	37
South West	35
Yorkshire & Humberside	3
Scotland	9
Wales	2
Northern Ireland	2
UK	135

Notes: (i) C4ISTAR is Command, Control, Communications and Computers, Intelligence, Surveillance, Target Acquisition and Reconnaissance. (ii) CBRN is Chemical, Biological, Radiological and Nuclear protection. Indicative spending figures are indicative planning assumptions and are approximations. (iii) Regional employment estimates are for direct employment only based on equipment and non-equipment spending: they exclude both indirect and export employment numbers. Also, they are provisional estimates based on 2004/05 and the numbers are rounded.

Sources: Ministry of Defence, *Defence Industrial Strategy*, London, The Stationery Office, 2005; Ministry of Defence, *UK Defence Statistics 2006*, London, The Stationery Office, 2006; *Value Added Scoreboard*, London, Department of Trade and Industry, 2005; A.J. Turner, N.J. Bennett, and B.L. Nolan, 'Estimated UK Regional Employment Dependent on Ministry of Defence Expenditure,' *DASA, Defence Statistics Bulletin*, no. 7, London, Ministry of Defence, March 2007.

the current level of 310,000 personnel. The DIS forecasts further employment reductions. Table 1 shows which UK regions are dependent on defence industry employment, namely, south and north-west England (including London).

The UK defence industry has experienced major mergers and is dominated by domestic monopolies in air, land and sea systems (BAE Systems; Rolls-Royce; AgustaWestland helicopters). BAE Systems is the dominant UK defence contractor with domestic monopolies in armoured fighting vehicles (reduced from five prime contractors in 1995), ammunition, fixed wing aircraft and nuclear-powered submarines. The UK industry is mostly privately-owned, with the Defence Science and Technology Laboratory being the exception as a state-owned enterprise (an agency of MoD). The Government also retains special shares in BAE Systems and Rolls-Royce. In assessing the performance of the UK DIB, its labour productivity compares favourably with the average for UK industry, with defence productivity almost 15% greater than the UK average. This suggests that UK defence industries are more productive than the average alternative uses of the resources (i.e. the UK DIB makes a net contribution to UK national output).⁵

Defence R&D spending is recognised as critical to the delivery of battle-winning capability. The DIS presents evidence of the relationship between equipment capability and R&D investment over the past 10 to 25 years. The relationship shows that 'you get what you pay for' with a time and equipment capability advantage from R&D spending, although the relationship is subject to diminishing returns. The high levels of US R&D spending has bought it a time advantage of about 5 years over the UK, but at a cost of some ten times the level of UK R&D spending. However, the UK's current position in relation to the USA is due to its R&D spending in the 1980s. If UK defence R&D spending continues to decline, the technology gap with the USA will increase, and this will lead to a decline in the UK's export performance. In 2001, the UK's defence R&D spending gave it a time advantage over France, Germany and Sweden.⁶ The DTS aims to identify those areas of defence science and technology essential to maintain national sovereignty, provide maximum leverage in strategic terms and provide the maximum technology benefits to the UK.⁷

The Policy Problem and the DIS Solution

The MoD is a major buyer and for some equipment it is the only buyer. For example, in sea systems, MoD is the UK shipbuilding industry's biggest

⁵ Ibid., p. 34.

⁶ Ibid., p.39; A. Middleton, S. Bowns, K. Hartley, and J. Reid, 'The effect of defence R&D on equipment quality,' *Defence and Peace Economics*, vol. 17, no. 2 (April 2006), pp. 117–139.

⁷ K. Hayward, *Aerospace and the UK Defence Industry and Technology Strategy*, London, Royal Aeronautical Society, 2007.

customer, accounting for some 85% of the ships being built in UK shipyards, and it is the monopsony buyer of nuclear-powered submarines. The DIS announced that in such sectors as maritime, fixed wing aircraft and missiles there is expected to be substantial over-capacity in UK production facilities. For example, MoD's requirements for new missiles will decline by some 50% over the next five years; and after a period of increased demand the number of UK shipyard workers could decline from over 12,000 in 2005 to around 4,600 in 2020.⁸ The UK DIB will have to adjust to a future comprising major gaps in development and production work, raising questions as to which defence industrial capabilities the UK wishes to retain, how such capabilities will be retained and at what cost?

The DIS outlines six guiding principles used in selecting the defence industrial capabilities which are to be retained in the UK.⁹ These guiding principles are:

- 1) *Appropriate sovereignty* over industrial skills, capacities, capabilities and technologies to ensure operational independence in military operations (security of supply). An example of 'appropriate sovereignty' arose over the UK's involvement in the US Joint Strike Fighter programme (F-35). The UK demanded access to the technology required for the independent operation and upgrade of the aircraft during its life-cycle against the US efforts to restrict UK access to F-35 technology.
- 2) *Through-life capability management* based on support, sustainability and the incremental technical enhancement of existing capabilities. This new paradigm offers industry longer, more assured revenue streams based on long-term support and continued development rather than a series of 'must win' procurements.
- 3) *Maintaining key and rapid industrial capabilities and skills* where UK and export markets no longer provide a sustainable production profile (but 'key' industrial capabilities are not defined).
- 4) *Intelligent customers-intelligent suppliers: the importance of systems engineering.*

We need to preserve the capacity for sensible industry-MoD conversations when a capability is in the concept phase and a number of important technologies to deliver it are being considered...¹⁰

⁸ RAND, 'Can the UK Rebuild its Naval Fleet?', *Research Brief*, Santa Monica: Rand Corporation, 2005.

⁹ Ministry of Defence, *Defence Industrial Strategy*, p. 17.

¹⁰ *Ibid.*, p. 17.

Systems engineering is regarded as critical for the successful acquisition of complex projects and for in-life upgrades and urgent operational requirements.

- 5) *Value for defence* reflected in an acquisition policy based on achieving long-term best value for money.
- 6) *Change on both sides*. Government recognises the need for change. It has outlined more clearly its future plans and indicated how in non-competitive situations, it will encourage innovation and investment at a fair price: it has shown how "value for money is scutinised, incentivised and protected".¹¹ Government has also set out the improvement in performance expected from industry.

On the basis of these guiding principles, the DIS specifies the UK defence industrial capabilities which it plans to retain in the future, using support and up-grading work to retain these capabilities. Sectors to be retained in the UK include submarines, core work-load warship building, small arms ammunition and cryptography, together with support capabilities for fixed wing aircraft, helicopters and armoured fighting vehicles (including the retention of the Army Base Repair Organisation (ABRO), but with no strategic need for state-ownership of ABRO suggesting that, eventually, the capability might be outsourced to private industry).¹² Some industrial capabilities will not necessarily be retained in the UK with MoD reserving the option of buying from overseas. These include large aircraft, trainer aircraft, helicopters, missiles and torpedoes. It is not expected that there will be a future requirement for a new manned fixed wing combat aircraft, so that there will cease to be a need for a UK industrial capability in this area. This has implications for the future of four plants at BAE Air Systems (Warton and Samlesbury in Lancashire; Brough in Yorkshire; and Woodford in Cheshire).¹³

Having identified which key parts of the UK DIB will be retained, there remains the question of how. The selected parts of the UK DIB will be retained through offering protected and guaranteed markets to the preferred suppliers through the negotiation of partnering agreements. Such agreements aim to form a gainsharing partnership between the preferred supplier and MoD (claimed to be a 'win-win' situation) offering long-term security of supply to MoD and providing the contractor with efficiency incentives. The DIS will introduce a new procurement model based on long-term partnerships which provide efficiency incentives to industry to reduce costs whilst allowing increased profits for good performance and delivery.¹⁴

¹¹ *Ibid.*, p. 18.

¹² *Ibid.*, p. 82.

¹³ *Ibid.*, p. 88.

¹⁴ *Ibid.*, p. 37.

A Critical Evaluation of the DIS

Three questions can be addressed to the DIS:

First, what is known about the UK DIB? The answer is that much is known about its size and structure, but that governments know less about its performance and little about the 'best' size of firm and the most appropriate industry structure. Governments are not good at 'picking the winners' and these are issues best left to be resolved by capital markets.

Second, what is not known about the UK DIB? Little is known about industry supply chains, namely, their dependence on defence business, their location and importance in local economies. Indeed, there are general issues about the definition of the UK defence industrial base and whether there are adequate statistical data at the industry and company levels.¹⁵ Nor is much known about the future, which is characterised by uncertainty.

Third, what does society need to know for sensible debates and policies on the UK DIB? Here, more information is needed on the costs of supporting different UK defence industrial capabilities. For example, what are the extra (marginal) costs of industrial capabilities which are smaller or larger than the present size and how does society determine which is the least-cost solution (who makes the choices using which criteria)?

Nor can the DIS ignore the defence economics problem. This is the standard economic scarcity and choice problem. Falling or broadly constant UK defence budgets in real terms are subject to rising input costs for both equipment and an all-volunteer military force. The result is the need for difficult defence policy choices in a world of uncertainty. A DIS which adds to equipment costs simply accentuates the need for difficult choices. There are other related problems for the DIS, including issues of competition versus monopoly, partnering agreements, non-competitive contracts, procurement choice criteria, the price of UK independence and the dominant position of BAE.¹⁶

COMPETITION VERSUS MONOPOLY AND THE IMPACT OF PARTNERING

The DIS means that the future UK DIB will be smaller with protected and guaranteed work for 'key' industrial capabilities, and these will be dominated by domestic monopolies. Concerns arise about the economic impact of the shift from competition to monopoly and partnering. The MoD has always argued that its competitive procurement policy and market openness have exposed UK defence firms to the rigours of competition, leading to high

¹⁵ K. Hartley, 'The arms industry, procurement and industrial policies,' in T. Sandler and K. Hartley (eds.), *The Handbook of Defense Economics*, vol. 2, Amsterdam, Elsevier, 2007.

¹⁶ K. Hartley, oral and written evidence to the Defence Committee, *The Defence Industrial Strategy*, House of Commons Defence Committee, HC 824, London, The Stationery Office, 2006.

quality equipment for the UK's Armed Forces, to lower prices, increased productivity and international competitiveness for UK defence contractors.¹⁷

The DIS announced a shift from competition to alternative approaches, especially partnering arrangements with key UK suppliers. There are partnering agreements with AgustaWestland for helicopter support and with BAE Systems for ammunition, armoured fighting vehicles and fixed wing aircraft.¹⁸ Without competition, partnering raises concerns about the possible monopoly behaviour of defence contractors. Standard economic theory predicts that partnering will lead to monopoly behaviour resulting in higher prices, inefficiency, monopoly profits and a poor record on innovation. The DIS outlines some of the benefits and costs of competition (e.g. benefits of lower prices; innovation; and competitively-determined profits; but at a cost in terms of bidding costs, unrealistic time-scales for projects and over-optimistic assessments of risk and cost).¹⁹ A similar analysis of the benefits and costs of partnering is needed and was not presented in the DIS.

Partnering means an expansion of non-competitive contracting with its challenge of estimating and agreeing costs, profits and prices. In recent years, about 75% of MoD contracts by value were awarded on a competitive basis with the remainder being non-competitive. With non-competitive contracts, there is always an inequality of information between the MoD's procurement agency and the contractor who is an expert on its firm's production costs and its willingness to allocate effort to a contract. Partnering aims to solve this problem through an emphasis on greater trust between MoD and industry, with more sharing of information on both sides, including suppliers increasing the transparency of their future plans and business information. Admirable though these aims might be, they raise the possibility of a 'cosy relationship' emerging between MoD and parts of the UK DIB. For example, a report on the UK warship building industry concluded that "[a] UK shipbuilding industry ... relying on a single customer will have limited motivation to improve its efficiency or advance the state of the art".²⁰ In these circumstances, there is a need to evaluate the contracting and profit arrangements for non-competitive contracts associated with partnering.

NON-COMPETITIVE CONTRACTS

The DIS means more emphasis on non-competitive contracts and all their problems. There will be a shift from fixed price contracts based on competition to target cost incentive fee contracts based on partnering (gainsharing). This shift will be a challenge for MoD's procurement agency.

¹⁷ Ministry of Defence, *Defence Industrial Strategy*, p. 15.

¹⁸ K. Hayward, and M. Codner, 'Avionics and Missions Systems: A Key Element in Delivering Through-Life Capability,' *Whitehall Report*, no 2, London, Royal United Services Institute, 2006.

¹⁹ Ministry of Defence, *Defence Industrial Strategy*, p. 48.

²⁰ RAND Europe, 'Diversifying the Customer Base for Shipbuilding in the UK,' *Research Brief*, Santa Monica, Rand Corporation, 2005, p. 1.

Over the period 2003 to 2006, incentive contracts represented 3% to 7% of the total value of MoD contracts so that these are not contracts where MoD has considerable estimating experience.²¹

The DIS recognises that industry requires adequate rewards to induce firms to remain in the market. The challenge for the MoD's procurement agencies is to undertake accurate cost-estimating which reflects efficiency and provides incentives for efficient behaviour in the absence of competition; to provide adequate profit incentives which reward risk and innovation in non-competitive markets; and to formulate these into an appropriate type of contract. The DIS solution is outlined in terms of a joint MoD/industry willingness to share cost data; to provide estimates of the full cost of ownership (reliable estimates of life-cycle costs are difficult to obtain); an increased use of target cost incentive fee contracts; and the use of risk-adjusted profit related to the type of work. With target cost contracts, MoD and contractors have to reach agreements on efficient cost estimates, on cost sharing arrangements, on a maximum price and on an agreed profit rate. Such bargaining offers extensive opportunities for 'playing games' involving 'bluff, tit-for-tat and brinksmanship.' Questions arise as to whether such behaviour will deliver good value for money for the UK Armed Forces and taxpayers.

There are also profitability issues. A greater use of non-competitive contracting means increased reliance on the Government Profit Formula for determining the profitability of such contracts. This Formula aims to provide defence firms with a profit return equal on average to the return earned by British industry (related to both capital employed and cost of production). Currently, the Formula allows a baseline profit rate of 5.67% on cost of production with further adjustments for contract risks. More non-competitive contracting as part of both the DIS and DTS will be a challenge for the Profit Formula. Does it provide adequate efficiency incentives; will it provide sufficient reward for risk; and will government and society regard profit rates as 'too generous' where preferred UK defence contractors are provided with guaranteed and protected markets?

PROCUREMENT CHOICE CRITERIA AND THE ROLE OF WIDER FACTORS

The role of 'wider factors' in procurement choices represents another unknown in the DIS. There is a clear statement that defence criteria will determine the choice of key UK industries for retention (e.g. appropriate sovereignty through independence and security of supply). However, the DIS also states that 'wider factors' will be taken into account where these are relevant. These include support for some UK industrial capabilities which do not meet strict defence criteria but which offer 'high value-added economic activity,' possible technology spill-overs and the number and quality of UK-

²¹ Ministry of Defence, *UK Defence Statistics 2006*, London, The Stationary Office, 2006.

based jobs that are supported.²² These 'wider factors' leave many unanswered questions: what precisely are they; how important are they in procurement choices (i.e. their weighting in procurement decisions); and do they give Ministers opportunities for 'distorting' procurement choices and intervening on a specific case-by-case basis (e.g. for electoral advantage)? An economic evaluation would also need to identify the economic logic of including such 'wider factors.' For example, is intervention based on clear market failures; which markets are failing to work properly (e.g. labour; technology; export markets); what are the causes of such market failures; and are defence procurement choices the most efficient method of 'correcting' such market failures?

THE PRICE OF UK INDEPENDENCE AND THE WILLINGNESS TO PAY

Supporting key UK defence industrial capabilities involves the MoD in a willingness to pay for such capacity. Various parts of the DIS refer to the need to avoid paying a 'UK premium'; of the need to retain ammunition manufacture in the UK "but not at any cost"; and a willingness to pay a premium for retaining core UK capacity in warship building. How highly does the UK value its DIB and how much is MoD willing to pay for retaining various UK defence industrial capabilities (e.g. an extra 5%, 10% or more)? Any premium for 'buying British' has to be financed from a limited defence budget, so that alternative defence expenditures have to be sacrificed.

THE DOMINANT POSITION OF BAE SYSTEMS

The DIS confirms BAE System's dominant position in the UK defence market with its domestic monopolies in air, land and sea systems (e.g. combat aircraft; ammunition; armoured fighting vehicles; submarines). BAE's dominant position raises three policy issues.

First, BAE will be a large and powerful producer group. Literature on the economics of politics suggests that such producer groups have substantial lobbying power and might focus on lobbying at the expense of efficiency, preferring a 'quiet life,' organisational slack and monopoly profits.

Second, BAE will be the subject of various partnering agreements raising prospects of a 'cosy' relationship between the contractor and MoD. The Framework Partnering Agreement (FPA) between MoD and BAE is an interesting example of the efficiency of partnering. Under the FPA, BAE supplies the majority of MoD's repeat buys of general munitions (about 80% of the total value). Whilst the FPA secures products at fixed prices, MoD admits that there are weaknesses: it fails to "adequately incentivise BAE Land Systems to reduce its cost base and encourages the manufacture of product rather than the provision of service".²³

²² Ministry of Defence, *Defence Industrial Strategy*, Chapter A9.

²³ *Ibid.*, p. 99.

Third, in view of its dominant position and concerns about its efficiency and profitability, consideration might be given to treating BAE as a regulated firm in the same way as the UK regulates its privatised utilities. There might be lessons from the wider UK experience with regulation, especially of high technology firms such as British Telecom (e.g. price cap rules such as RPI-X; profitability rules; efficiency incentives; use of cost of capital techniques). Other options for assessing BAE's efficiency and profitability might include periodic efficiency audits by the UK Competition Commission and the specific monitoring of its profits by the Review Board for Non-Competitive Government Contracts.

Conclusion

The DIS raises other unanswered questions. These include the economic impact of the UK becoming more dependent on foreign equipment (e.g. whether the USA will be willing to supply its latest high technology equipment if the UK lacks a rival defence industrial capability); the UK's views on the future development of a Single European Market for defence equipment; and the role and importance of supply chains in the UK DIB.

In terms of where next, there are at least two policy options for the UK. First, Government could be more selective about the UK DIB. For example, can the UK afford to retain a costly submarine industrial base supplying one product to one customer in small numbers? It might be more cost-effective to focus on the UK aerospace industry as a successful defence industrial sector. Second, the UK could support the creation of a Single European Market for defence equipment with various scenarios offering equipment cost savings of 10% to 20%.²⁴

The DIS also fails to address another key question: does the defence firm have a future and what might the future defence firm look like? Unless there is an outbreak of sustained world peace, the defence firm will have a future that will continue to be determined by threats, new technology, economics (budgets) and politics (willingness to pay for a UK DIB). But the defence firm of 2050 is likely to be radically different from today's defence firm just as today's defence firm is different from those of 1945 and 1900 (e.g. Boeing, Lockheed Martin, BAE and EADS did not exist in 1900).

One feature is clear. The DIS will be an evolving policy requiring further modifications as UK Governments continue to struggle with the need for difficult choices in a world of uncertainty about future threats, new technology, future defence budgets and rising equipment costs.

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²⁴ Hartley, 'The arms industry, procurement and industrial policies.'

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