FUTURE SKILLS ISSUES AFFECTING INDUSTRY SECTORS IN WALES

Aerospace Sector

Futureskills Wales

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INDUSTRY SECTORS IN WALES

Contents

Futureskills Wales

Executive Summary

Introduction

This document is one of a series commissioned by the Future Skills Wales Research Forum. The overall project aims to extend and complement the work begun by the original Future Skills Wales project, which forecast future generic skills needs across Wales using forecasting and survey data. The current project adds studies of future vocational skills needs within key sectors in Wales. Each sector study is based on desk research and qualitative interviews with practitioners and employers, and aims to provide an overview of the sector, the skills issues, and current and potential actions to further strengthen the sector.

Businesses and employees in each of the sectors studied have achieved great successes; that is why these sectors have become important for Wales. Our focus on current skills issues should not obscure these achievements or the determination of all concerned to meet current and future challenges.

Aerospace Sector Profile

Activity and Employment: there are currently around 17,000 people employed in the aerospace sector in Wales and over 70 companies that are involved essentially in the manufacture of, maintenance and overhaul of and equipment supply for aircraft.

Firms: major employers in Wales include BAE Systems, BA Maintenance, GE Systems and DARA. Firms are concentrated around Cardiff in the South-East, and in the North, but there are examples outside these concentrations.

Sources of change: There has been a very rapid consolidation among the US primary companies and major suppliers. A similar process of consolidation is on going in Europe with most notably the creation of EADS (European Aeronautic Defense and Space company). There is a subsequent risk that UK companies could be disadvantaged in terms of scale and by the emergence of a *vertically integrated* customer base.

A continuing peace dividend means that the armed forces are contracting in size and consequently there are fewer highly trained engineers leaving and wanting to continue in civil aviation. This combined with the long term decline of the industrial and manufacturing base has meant that traditional sources for recruitment by the civil aircraft engineering industry are less productive.

Prospects: the Airbus consortium recently announced the launch of the A3XX, a plane that will provide 35% more seats than the 747. It is estimated that of the 22,000 or so jobs that will arise from this project, some 8,000 will be at BAE Systems. This will impact on the plant at Broughton, which is building the wing box and some sub-assemblies for the A3XX.

It is clear that civil air transport is expected to remain a growth industry and so provide many business opportunities. Some forecasts indicate that the industry is set to grow twice as quickly as the rest of the economy over the next 15 years.

The industry DTI Foresight Report notes that the UK's current strong market position is in part based on government and industry R&D investments made in the 1970s and 1980s. As current R&D investment is far below the levels enjoyed back then, the report notes that some analysts believe that the industry is 'living on borrowed time'.

Skills Issues

Cyclical training patterns: historically, the industry has experienced cyclical patterns in demand that have been reflected in the stop-go training activities of those companies affected.

Impact of lean methodologies: the introduction of the lean model of manufacturing, a derivation from an earlier example in the US automotive industry, has had implications for the structure of the workforce. The fundamental principle of decision making at the lowest level has resulted in a flattening in middle management and an emphasis on those with technical skills to take more team leadership roles.

Shortage of engineers and engineering graduates: evidence from a jointly sponsored SBAC/DTI UK-wide survey undertaken in 1998 showed that skills shortages were predominantly in engineering areas. Companies have also noted a shortage in the quality of engineering graduates, in particular their lack of work experience and apparent weaknesses in communication skills.

Managerial Skills: three key challenges for their approach to their managerial employees were identified:

- developing change management skills;
- developing communication skills;
- developing leadership skills.

IT Skills: there is a continued shortage of software engineers and technicians, this despite the increased number of computer studies trainees and an overall rise in the basic IT skills levels of new entrants. One reason for this is the increasing levels of competition from hi-technology firms.

Action on Skills

The sector is working actively on the issues identified as part of an overall strategy to meet current challenges and exploit the potential for the future. The table below sets out recommendations in support of this existing work. A more detailed explanation of the recommendations is provided in the main report.

Recommendations for Future Research

Work needs to be done to identify any 'latent' skill gaps, where a company operates a sub-optimal production strategy to conceal skill deficiencies.

The prospects for employment growth from the A3XX development and manufacture in North Wales need to be tracked, so that sub-regional training provision is kept under review with a view to meeting potential increases in demand.

Research needs to be undertaken to evaluate skills issues around Cardiff International Airport.

Further examination is needed into the extent to which the contraction of the armed forces and industrial and manufacturing base will affect the future supply of appropriately skilled labour.

Key Recommendations

Theme No:	Rec No:	Action	Timescale	Key Partners
1	1a	Facilitate cross-sector working group on lean techniques linking to existing initiatives	From 2000	Various fora
	1b	Review vocational qualifications to check applicability to lean manufacturing	2001/02	NTO/CETW/ Emps
	1c	Review/update assessor training and awareness of lean paradigm	2001/02	NTO/CETW/ Emps
2	2a	Increase the number of training places available to students	2001/02	CETW/WDA
	2b	Address the gap of JAR 66 training courses in North Wales	2001/02	SWAG/CETW
3	3a	Facilitate the expansion of the SWAG to involve more companies including those based in North Wales	2001	SWAG/Emps
4	4a	Support existing programmes promoting sector plans and prospects to schools, young people and communities	2001	Emps/EBPs SWAG/CS
	4b	Proactively seek partnerships with local schools, EBPs, FE and HE	2001	Emps/EBPs/ CETW
	4c	Develop a sector pack and sub-sector packs	2001	Emps/CETW/CS
	4d	Develop sector/sub-sector web pages with links to fora and electronics companies	2001	Emps/CETW/CS
	4e	Review feasibility of a Wales version of the UK Skills Show (NEC 5-9 July 2000)	Now for 2001	NTOs/Assembly/ UK Skills/fora
5	5a	Consider cross-company sector mentoring at management/ team leader level	2001	Emps/CETW
6	6a	Audit NVQs/course curriculum against industry standards	2001/02	Emps/CAA/NTO
	6b	Develop better liaison/more formal links with colleges and universities	Ongoing	Emps/SWAG/ FE/HE
	6c	Proactively offer teacher/pupil/student placements	2001	Emps/SWAG/ FE/HE

1. Introduction

1.1 This document is one of a series commissioned by the Future Skills Wales Research Forum. The overall project aims are to extend and complement the work begun by the original Future Skills Wales project, which forecast future generic skills needs across Wales using forecasting and survey data. The current project aims to add studies of future vocational skills needs within key sectors in Wales.

1.2 Businesses and employees in each of the sectors studied have achieved great successes; that is why these sectors have become important for Wales. Our focus on current skills issues should not obscure these achievements or the determination of all concerned to meet current challenges.

1.3 The FSW Sectoral Skills project takes particular note of the importance of the manufacturing sector for the Welsh economy and for employment in Wales. In particular it covers four manufacturing sub-sectors (although for convenience in individual sub-sector reports we will refer to them as sectors). These are:

- food processing;
- aerospace;
- electronics;
- automotive manufacturing.

1.4 This report covers the aerospace sector. It shares some elements with the other reports, and particularly with the other studies of manufacturing sub-sectors, but deals specifically with vocational and other skills issues in aerospace in Wales and Welsh regions.

1.5 Each of the individual sector reports is complemented by a report on management and information technology skills issues across the sectors studied. This reviews the situation in each sector and draws out common themes and implications.

Method

1.6 The first phase of the study proceeded mainly by desk research and telephone discussions along side some meetings with industry experts.

1.7 In the second stage, further meetings were held with sector representatives, and employer case studies were undertaken to extend and deepen the analysis of vocational skills issues.

1.8 The aim was not to conduct quantitative primary research, but to consult with sector representatives in order to identify perceived skills issues, the actions being taken in response to these, and the potential for further action or policy development. The published reports should therefore provide a clear introduction to the sector, a ‘snapshot’ of sector issues, and pointers to current and potential action.

2. The Aerospace Sector

Definition

2.1 The aerospace sector is primarily concerned with the manufacture of aircraft and spacecraft (see **Table 2.1**), a more detailed breakdown of activity is shown in **Figure 2.1** below:

Table 2.1 Definition of the sector

Description	Standard Industrial Classification Code
Manufacture of aircraft and spacecraft	35.3

Source: Engineering and Marine Training Authority (EMTA)

2.2 The UK's aerospace industry (UKAI) is one of the most successful manufacturing sectors and currently provides about 2.5% of UK manufactured output and 5% of manufactured exports[1]. The industry is characterised by several large companies who are global in their operations, and a large number of small firms.

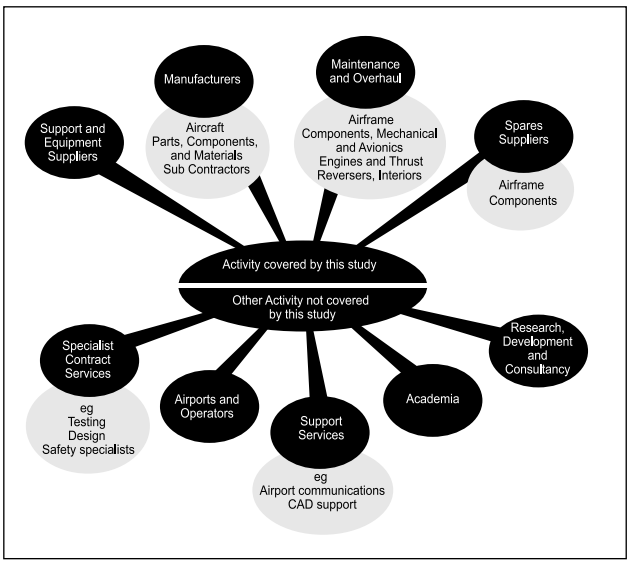
Welsh Development Agency

"There are many types of operations in Wales including state-of-the-art aerospace equipment manufacturing, supply and maintenance, repair and overhaul (MRO) operations."

Society of British Aerospace Companies

"...The UK Aerospace Industry enters the new century as a highly successful and competetive industry, which makes a major contribution to the national economy and to the quality of employment in the United Kingdom."

Figure 2.1: Description of the Sector



Sector Characteristics

Firms

2.3 Over the past 15 years, companies in Wales have invested over £17billion. The Welsh Development Agency (WDA) estimate that the aerospace industry in Wales currently incorporates over 70 companies, this tally rises to over 100 if companies providing support services are included.

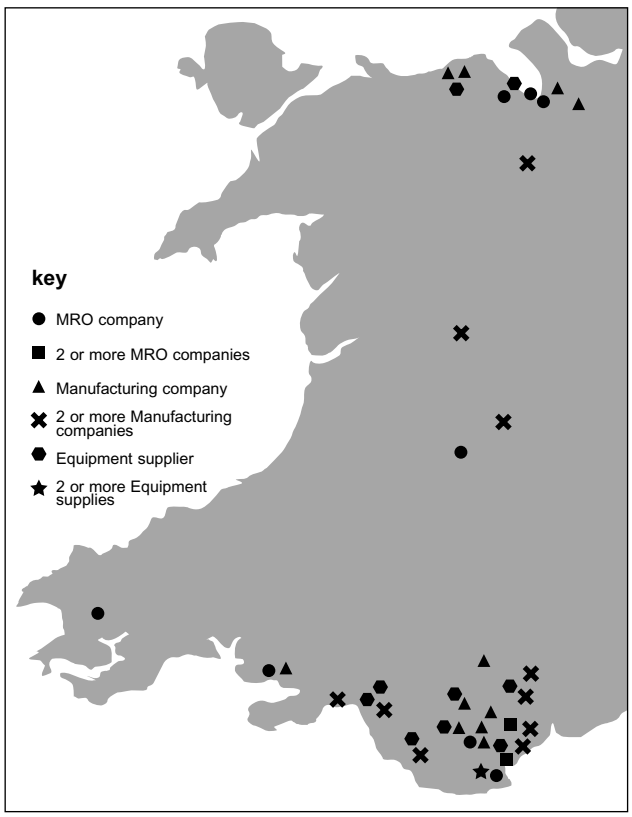
2.4 Descriptions of some major firms in the sector:

- BAE Systems employ approximately 4000 people in Broughton in North Wales, and is involved in the manufacture of wings for the European Airbus;
- GE Aircraft Engine Services Limited employs around 1500 people at Nantgarw near Cardiff, and overhauls and repairs aircraft engines and components at one of the world's largest engine maintenance facilities;
- British Airways Maintenance employs about 800 people at Cardiff International Airport, carrying out airframe maintenance on both the Boeing 747 and 777;
- DARA (Defence Aviation Repair Agency) employs around 3700 personnel at St Athan near Barry and 1700 in Sealand in Flintshire, primarily maintaining defence aircraft;
- Raytheon Aircraft Services Limited maintain corporate jets and is an employer of about 40 people at Broughton;
- British Airways Avionic Engineering based at Talbot Green, involved in the repair of in flight avionic equipment, and British Airways Interiors Engineering based at Blackwood, which is involved in the repair and overhaul of aircraft seating, employ around 300 and 150 people respectively.

Locations

2.5 **Figure 2.2** below shows that the majority of companies are situated in South East Wales, with an additional concentration in the North-East, but with examples of companies in other areas.

Figure 2.2: Location Map of Welsh Aerospace Employers



[1] *Source: DTI OST Defence and Aerospce Systems Panel 'Foresight Contribution to UK Civil Aerospace Sector'.*

2.6 **Table 2.2** below shows that the regional distribution of employment in aircraft manufacturing is set to remain constant over the next ten years. This analysis has been constructed using the core aerospace definition (See Paragraph 2.1) that excludes a number of workers who are involved in non-manufacturing activity e.g. maintenance and overhaul. Employment is predominantly in the North, where just over half of all Welsh aerospace manufacturing employees are based, and in the South-East, which accounts for a further two fifths of employees.

Table 2.2: Location of Aerospace Manufacturing Employees (2000, and forecasts for 2010)

Year	Welsh Regions (%)			
	South East	Mid	West	North
2000	39	0	6	55
2010	37	0	6	57

Source: Business Strategies Ltd.

Employment

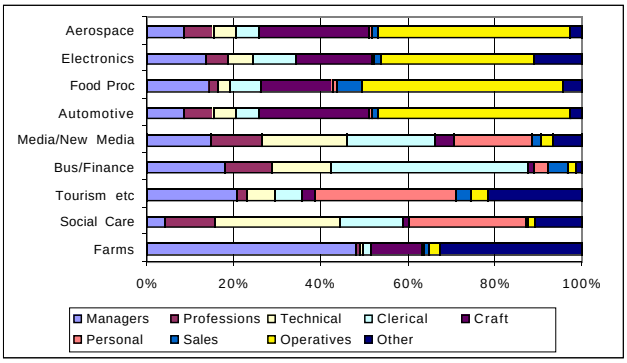
2.7 Estimates from the Welsh Development Agency (WDA) show that there are some 17,000 aerospace workers in Wales. Employment figures for this industry are difficult to ascertain precisely because many firms supplying to the aerospace industry may not necessarily be regarded as aerospace companies.

2.8 On 15 June, BAE Systems announced that they will be cutting 3,800 jobs due to "overlapping product capabilities, duplication of facilities and opportunities to improve efficiency" that have arisen following the merger between its former self British Aerospace and Marconi Electronic Systems. However most of these cuts affect the North-West of England and Humber regions. Conversely, it is envisaged that some 22,000 jobs could be created from the manufacture of the A3XX (See paragraphs 2.26 and 2.27) and that some 8,000 will be at BAE Systems[2].

Sector Profiles

2.9 **Figure 2.3** below, shows a profile of the occupational frequencies in the nine sectors covered by this study that were produced by Business Strategies Ltd. It is clear that the occupational breakdown in aerospace manufacturing, in common with manufacturing in general, is dominated by the operatives and, to a lesser extent, by the craft professions.

Figure 2.3: Sector Occupational Profiles



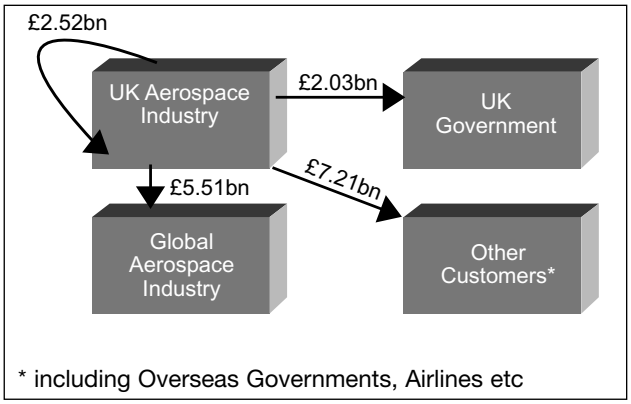
2.10 Aerospace manufacturing is more strongly represented in terms of employment in Wales than in the UK as a whole, a trend that is set to increase over the next ten years. Estimates of employment quotients, that show Welsh aerospace manufacturing employment relative to that in the UK, are 1.36 for the year 2000 and 1.58 for 2010[3].

Markets

2.11 The total UK aerospace order intake in 1998 was £21.02bn[4] and orders were split 49:51 between civil and military respectively. **Figure 2.4** shows that the domestic market, incorporating the UK government and UK aerospace industry, accounts for approximately a quarter of the sector's sales. The largest single category of customers (described as 'Other Customers') includes overseas governments and airlines and contributes over £7 billion to the sector. In total over £8 billion is generated by sales within the industry, both domestically and overseas.

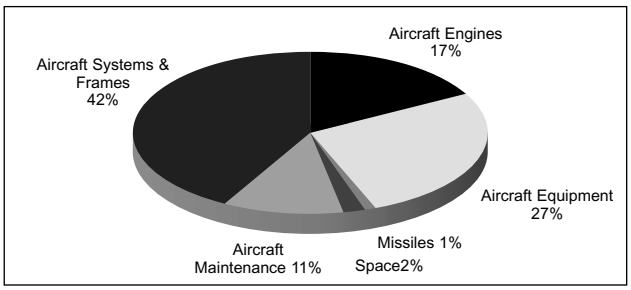
2.12 The industry's main products are aircraft systems and frames, which account for over two fifths of the industry's turnover. Other significant groups of products are aircraft equipment and aircraft engines, which account for 27% and 17% of the industry turnover respectively (See **Figure 2.5** below).

Figure 2.4: 1998 UK Aerospace Turnover by Customer



Source: SBAC UK Aerospace Statistics 1998

Figure 2.5: 1998 UK Turnover by Product Group



Source: SBAC UK Aerospace Statistics 1998

Exports

2.13 The aerospace industry has seen unprecedented change, which has caused the industry to move irrevocably from a national or, in some cases regional basis, to becoming a global industry with many British companies consolidating their presence in North America and Western Europe.

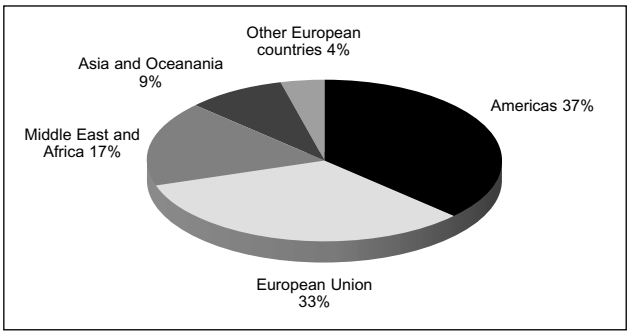
[2] *"BAE Systems website www.bae.co.uk"* [3] *"Derivation of forecast by Business Strategies Ltd"*
[4] *"SBAC UK Aerospace Statistics 1998"*

This is evidenced in the results of the first FSW Report[5], which showed that aerospace industries are more outward looking than average, having 27% of total sales/turnover coming from overseas customers compared to just 4% for all sectors.

2.14 The Department of Trade and Industry's Engineering Industry Directorate (DTI EID) provided the following information regarding the destinations of exports from the sector. Of the £11.7 billion UK exports in 1998:

- 37 per cent went to the Americas;
- 33 per cent to the EU;
- 17 per cent to the Middle East and Africa;
- 9 per cent to Asia and Oceania;
- and other European countries accounted for the remaining 4 per cent.

Figur 2.6: 1998 UK Exports

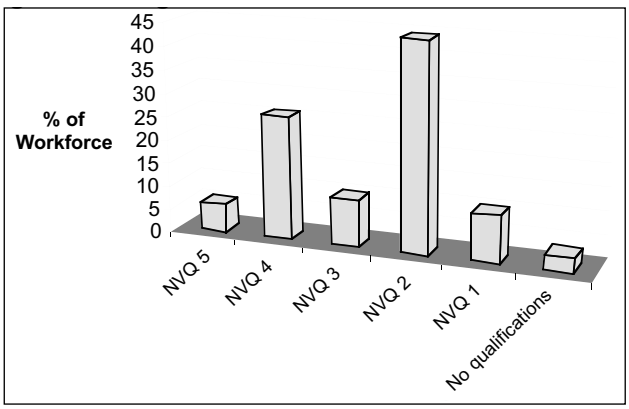


Source: SBAC UK Aerospace Statistics 1998

Workforce Qualifications

2.15 Information from the Labour Force Survey shows that around a quarter of the Aerospace workforce in Wales hold degree level qualifications (See **Figure 2.7** below). Over half of the workforce holds qualifications up to NVQ level 2 or equivalent (e.g. five or more GCSE grades A*-C, RSA Diplomas, City and Guilds Craft, BTEC Firsts or trade apprenticeships and other professional or vocational qualifications). Due to low sample sizes some of the data may be statistically unreliable. These figures show that the Aerospace workforce in Wales is more highly qualified than the manufacturing workforce as a whole.

Figure 2.7: Highest Qualification Held



Source: Labour Force Survey

2.16 The new Joint Aviation Requirement Part 66, (JAR 66) is a harmonised set of requirements for the international qualification of aircraft maintenance staff. The licence may be considered as providing a qualification in aircraft maintenance that demonstrates the achievement of an underpinning level of knowledge and competence. The licence structure is divided between Mechanical and Avionic trade disciplines and there are various levels within the licence which allow the holder to perform certain roles:

- Category A Line Maintenance Certifying Mechanic;
- Category B1 Line Maintenance Certifying Technician (Mechanical);
- Category B2 Line Maintenance Certifying Technician (Avionic);
- Category C Base Maintenance Certifying Engineer.

2.17 The new licence is being phased in from June 1998 until June 2011. Holders of the old JAA/NAA licence have until the latter date to obtain a **limited** JAR 66 that reflects their existing licence or authorisation privileges. Holders of the JAA/NAA who wish to obtain an **unlimited** (full) JAR 66 must undertake conversion training before 2011, after this they would have to sit all relevant examinations.

2.18 As shown in **Table 2.3** below, the largest area of training takes place in South East Wales (40.5%) but Mid Wales only accounts for one in twenty student qualification aims. In addition to the training offered by FE providers a number of training and development initiatives have been undertaken in the sector, the details of which are described in 'Section 4: Current Action on Skills'.

Table 2.3: Distribution of Manufacturing and Engineering FE Students

	Welsh Regions (%)			
	South East	**Mid**	**West**	**North**
Percentage of of student qualification aims	40.5%	5.0%	29.3%	25.6%

Source: 1997/98 Individual Student Records and HESA Student Record

Sources of Change

2.19 There has been a very rapid consolidation among the US primary companies and major suppliers. A similar process of consolidation is on-going in Europe with most notably the creation of EADS (European Aeronautic Defense and Space company) by the merger of much of the German, Spanish and French aerospace industries. The recently renamed BAE Systems, formally British Aerospace, represents the merger with GEC Marconi Electronic Systems. There is a subsequent risk that UK companies could be disadvantaged in terms of scale and by the emergence of a vertically integrated customer base. One potential threat could come from France's Thompson CSF which has just acquired Racal Electronics[6] in the UK, thus establishing itself as an alternative UK supplier to BAE Systems in the UK market.

[5] *"Details of the project reports can be found on www.futureskillswales.com"* [6] *"Financial Times supplement 'Aerospace' 24 july 2000"*

2.20 The Royal Aeronautical Society Seminar on 22 February 2000 noted that a continuing peace dividend means that the armed forces are contracting in size and consequently there are fewer highly trained engineers leaving and wanting to continue in civil aviation. This, combined with the long-term decline of the industrial and manufacturing base, has meant that the traditional sources for recruitment by the civil aircraft engineering industry are less productive. John Sawyer, General Secretary of the Association of Licensed Aircraft Engineers (ALAE), noted that this problem is being compounded by the widening gap between the higher pay of engineers in the armed services and the lower pay in civil aviation. The implications of this are clear, for example in South Wales the supply of people from RAF St Athan is declining.

2.21 There are currently over a dozen internet procurement sites either operating or in preparation. Boeing, Lockhead Martin, BAE Systems and Raytheon announced their plans for a business-to-business marketplace this March. The aerospace sector is coming to the idea that a single e-marketplace can sharpen efficiency and reduce costs of doing business, a concept which has been long embraced by the automotive and other sectors.

2.22 The *UK Lean Aerospace Initiative* (UK LAI) has impacted on the structure of the workforce in the sector (See paragraphs 3.22 and 3.23). John Rex, co-ordinator of the People Management component for the Society of British Aerospace Companies' (SBAC's) Competitiveness Challenge, notes that one result of this is that jobs in the industry are changing in response to the efficiency drive in business processes. One common effect has been that increasingly there are fewer 'middle-management' roles and instead, there is an emphasis on the technically skilled occupations to take team leadership roles and increase their awareness of managerial/strategic issues.

2.23 The Skills Task Force noted in their Research Paper 7, that in the past Britain has offset relatively lower labour productivity, compared to the Continent, with low labour costs (See **Table 2.4** below) and an environment of lighter labour regulation[7]. In addition, it should be noted that in terms of industrial productivity, the UK achieved the highest Value Added at each stage of the manufacturing process of any European country in 1999[8]. However in recent years this advantage has proven to be vulnerable to exchange rate movements. As Sterling's value appreciates relative to the Euro this cost advantage is lessened.

Figure 2.4: Total Hourly Compensation Costs in US$ for Production Workers in Manufacturing

Ireland	13.33
UK	16.43
France	18.28
Germany	27.20
Netherlands	20.57
Spain	12.14
USA	18.56
Japan	18.05

Source: US Department of Labour

2.24 The Skills Task Force note that the reaction of many companies in order to remain competitive has been to contract and further cut their costs. This has impacted on the training budgets available for staff development. Should this pattern continue then trade with the Euro-zone is likely to be less fruitful for British companies. Furthermore, if Britain is at some point down the line to join the Euro, then the size of the potential benefits of pursuing a similar policy are dependent upon the exchange rate parity at which Britain decides to enter.

Prospects for the Future

2.25 There is strong evidence to indicate that there will be a sustained increase in demand for air transport over the next ten to twenty years. The Royal Aeronautical Society (RAeS) Task Force published a paper in May 1999 stating:

'Market trends indicate a strong and continuing increase in the demand for air transport at minimum cost, but high safety standards'.

2.26 This is corroborated by evidence from market forecasts by some of the sectors leading companies. Airbus UK's Global Market Forecast estimates that passenger traffic will grow by around 6% a year and that in response the number of seats in passenger service will more than double over the next 20 years. Should the A3XX and A400M begin production as planned then the company is set for further expansion. On 16 May 2000, the UK government announced that the A400M is the long-term choice to replace its remaining fleet of C -130 Hercules military transport aircraft, with the programme set to be launched in the near future. In total, the A400M programme is expected to create 10,000 jobs of which around 3,400 will be at BAE Systems sites, the number of jobs that may be created in Wales is currently unknown.

2.27 The A3XX is currently under development at Airbus Industrie and will offer 15-20% lower seat operating costs compared to the 747 while providing 35% more seats and 650km more range[9]. To date eight companies have already expressed an interest in the A3XX. BAE Systems at Broughton is home to a main manufacturing site for Airbus and is involved in the construction of wings for the A320 and A330/340 family. The plant is also hoping to build the wing box and some sub-assemblies for the A3XX when launched. It is estimated that of the 22,000 or so jobs that will arise from this project, some 8,000 will be at BAE Systems, albeit the proportion that will be based at Broughton is not known at present.

2.28 World Tourism Organisation statistics forecast that there will be a 4.1% increase in the number of tourist trips taken world-wide every year until 2020. It is clear that civil air transport is expected to remain a growth industry and so provide many business opportunities. The West of England Aerospace Forum newsletter has quoted forecasts that the industry is set to grow twice as quickly as the rest of the economy over the next 15 years.

[7] *"Source: Max Munday of the Welsh Economic Research Unit, University of Wales Cardiff"*
[8] *"Source: SBAC UK Aerospace Facts and Figures 1999"*
[9] *"Source: Airbus website www.airbus.com"*

2.29 If the aerospace industry is to grow in response to this increased demand, this will present a considerable challenge to the sector's resources and airport and air traffic management infrastructure. Factors which might constrain the sector's growth include:

- increased competition for people from other technically orientated sectors;
- over-stretching of maintenance resources;
- shortages of appropriately skilled labour becoming available from the armed forces, manufacturing sectors and airline apprenticeship schemes;
- airports and air traffic management systems would have to accommodate about double the current number of passenger flights;
- competition from Europe and the United States;
- increasing competition in the maintenance sector from lower waged countries such as Hungary and China;
- strength of the pound, in particular relative to the Euro and the US dollar which might adversely affect the price competitiveness of British workers and British products.

2.30 The industry is important to the UK science and technology base with a total industry R&D expenditure of approximately £1.7bn during the last 10 years. The industry DTI Foresight Report notes that the UK's current strong market position is based on government and industry R&D investments made in the 1970s and 1980s. As current R&D investment is far below the levels enjoyed back then, the report notes that some analysts believe that the industry is 'living on borrowed time'. Already, Rolls Royce has chosen to develop some variants of its successful Trent engine in Canada rather than in the UK after R&D funding was made available by the Canadian government.

2.31 The performance of many aerospace companies in Wales has historically been closely linked to the boom and bust cycle in the economy. At present the Welsh economy has sustained a relatively stable growth path for a number of years. Furthermore, there is no clear evidence of warning signs that economists might look for to indicate that the economy is reaching over-capacity or that investment levels are unsustainable, signs that might signify an economic downturn. Forecasts for the Welsh manufacturing sector estimate that it will grow at an average annual rate of 2.5% over the next five years[10].

Summary Sector SWOT

Strengths	**Weaknesses**
Global industry - substantial presence of large companies in North America and Western Europe	Levels of performance and operational efficiency behind best practice elsewhere
Value added by SMEs, equipment suppliers and system integrators very strong	Perceived image of engineering jobs hinder recruitment
Large world class companies	Industry faces uncertainty as there is a dependence on one-off contractual decisions
South Wales Aerospace Group	Decline in the supply of appropriately skilled labour from traditional sources
Financial buoyancy	
The SBAC's Competitiveness Challenge and Youth in UK Aerospace programmes	
Strong increase in demand for air transport	
Opportunities	**Threats**
Growing market demand	Increasing integration of supply chains means new competition and demands on SMEs
Lean Aircraft Initiative	
A3XX and other large contracts	Competing against US where government support has been much higher
Foresight Action	
Supply Chain Relationships in Aerospace (SCRIA)	Impacts of the Peace dividend
'Women into Aerospace and Engineering' programme	
Joint Aviation Requirement Part 66, Maintenance Personnel Licensing (JAR 66) and the related 'JAR 66 Human Factors' programme.	

[10]*Cambridge Economics Regional Economic Prospects February 1999*

3. Sectoral Skills Issues

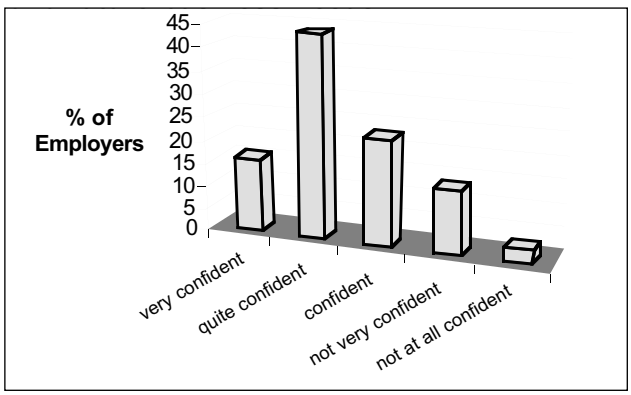
Current Vocational Skills

3.1 The sector's main vocational skills are within the following occupations (See Paragraph 2.9 for an occupational breakdown of the numbers employed):
- professional engineers (incl. maintenance, electrical etc.);
- software designers;
- technicians;
- craftsmen and women;
- plant and machine operatives.

Future Skills Demand

3.2 It is clear that the current level of skills in aerospace companies falls short of the establishment's projected requirements. **Figure 3.1** from the DTI/SBAC survey of UK aerospace companies (1997) shows that 17% of businesses are not confident about the fit between current skill levels and future business needs.

Figure 3.1: Coincidence in fit between current skills and future business needs



Source: SBAC People Management Report

3.3 Around three quarters of employers believe that the skills levels of their employees need to rise to keep pace with changes in technology, work organisation and the changing basis of competitive advantage. The SBAC's People Management Report 1998 notes that another important trend is indicated by the claim by some employers that increasing levels of skill are required to perform new jobs. It is clear from our consultations that the focus of increasing expectations will increasingly fall on graduate engineers who must be able to perform a wider variety of tasks.

3.4 The introduction of the Joint Aviation Requirement Part 66, Maintenance Personnel Licensing (JAR 66) is seen as setting a new standard for engineering licences (See paragraphs 2.16 and 2.17). Concern was expressed by a member of the Royal Aeronautical Society that the mathematical component of the examination might be too complicated, particularly with mind of current licence holders wishing to transfer from the JAA to the unlimited JAR 66.

3.5 Following our consultations with employers and sector representatives it is clear that the A3XX project will have a significant positive impact on the output of the sector and that the effects will knock-on through the supply chain. The emergence of a long-term market in the larger aircraft arena, once dominated by Boeing, will have a positive impact on the number people required with skills in this area.

Vocational Skills - Future Supply

3.6 The aerospace sector has traditionally faced cyclical skill supply and demand problems. On the whole these have been due to the boom and bust nature of its business environment and the lack of a consistent history of established training practice. Furthermore, there is evidence that this trend is not changing. In a survey conducted by EMTA (1998 Labour Market Survey of the Engineering Industry - Report for Wales), 40% of establishments facing recruitment difficulties would respond by improving job advertising and related activities. Only 14% of firms would re-train existing staff or increase internal training.

3.7 As noted in the Skills Task Force Research Paper 7, the main occupational areas in which engineering recruitment difficulties periodically recur - technicians, graduate engineers and craftspeople - are those which require relatively long periods of time for trainees or students to acquire the necessary skills and knowledge. During periods of recession there are strong cost pressures on employers to reduce expensive long term training programmes, which has long lasting consequences for the future availability of skilled labour. In periods of rapid growth the time taken to train new staff is too long to alleviate shortages of skilled labour.

3.8 In line with this pattern, the current growth in the global aerospace market has been paralleled by an increase in perceived skill shortages in the sector. Evidence from the EMTA survey found that 54% of engineering establishments in Wales were experiencing current recruitment difficulties. From our consultations with sector representatives and employers it is clear that there is concern that companies are tending to respond to their shortages by 'poaching' staff. For example, it was noted in our consultation with the South Wales Aerospace Group that there is a pattern of movement of staff from RAF St Athan to British Airways Maintenance Centre, and then on to G.E. Systems. The primary concern raised was that this movement results in escalating wages and doesn't address strategically the 'grass roots' problem of a shortage in the overall supply of qualified people.

3.9 The experience of periodic recessions may also have lasting effects on labour supply to the extent that young people may be reluctant to seek training opportunities or consider taking engineering degrees because of negative perceptions regarding their employment prospects in the industry. This issue may be compounded by the less than competitive pay on offer to civil aviation engineers that was noted by John Sawyer (ALAE). In contrast, military pay notwithstanding, the SWAG felt that current levels of pay were comparable with other engineering industries, although it is clear that the rates of progression in pay lag behind some high technology industries.

3.10 A primary reason for what he felt to be the lower pay was highlighted by John Sawyer as the lack of a militant union to voice the engineers' concerns, a situation which it was felt was unlikely to change in

the near future. In a recent study of seven aerospace companies it was found that relationships with trade unions varied considerably and that in some of the firms an aggressive anti-union stance had been adopted with the result that unions had been either marginalised or de-recognised[11]. It is clear that unions in the aerospace sector have less of an impact than in some others. Conversely, there is clear evidence of good practice in effective employee relations that is consistent with firms production arrangements, with some firms for example establishing union-management joint problem solving groups to look at specific efficiency and waste reduction issues.

3.11 A breakdown of employment in the Welsh aerospace manufacturing industry shows that in 1998, 91.9% of workers were male, which compares to a similar figure of 93% in 1993. Furthermore, in the FE Institutions in Wales the number of females aiming to obtain qualifications in Engineering courses was 1711 in 1998, just 8% of the total. It is clear from our consultations that one reason for lower female participation is that the perceptions of the engineering profession as being a male job still persist, and as a result a large pool of potential talent is being left untapped.

Skills Issues

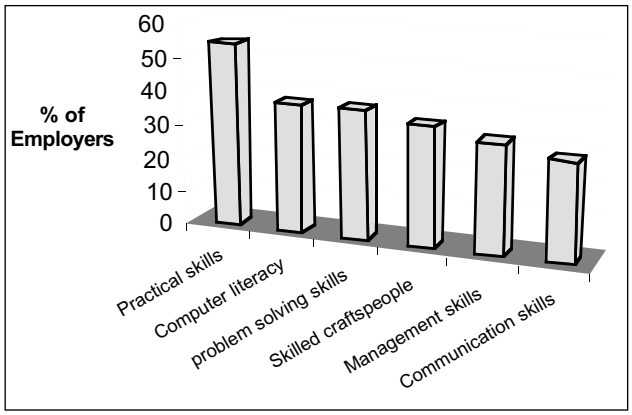
3.12 Evidence from the DTI/SBAC survey of aerospace companies showed that just over 30% of establishments believe that the skills levels of their employees are 'medium to low'. It also found that skill shortages are predominantly in the engineering area, with the following four job titles being the most frequently mentioned:

- CNC machinists;
- Software engineers;
- Skilled technicians;
- Design engineers.

3.13 It is clear that many of these jobs take a considerable amount of time to develop people into and some are in areas, particularly technically orientated occupations, where there is considerable inter-industry competition.

3.14 EMTA's UK survey (1998 Labour Market Survey of the Engineering Industry - Main UK Report) has found that the main areas of skill deficiency reported in the aerospace sector are embraced by a wide range of 'practical skills' (defined as 'the ability to carry out job related tasks'). This problem was identified by 54% of establishments surveyed. Also important in the survey were a number of generic skills including computer literacy (38%), problem solving skills (38%) and communication skills (29%).

Fig 3.2: Areas of Skills Deficiency



Source: EMTA Labour Market Survey of the Engineering Industry 1998

3.15 The Skills Task Force Research Paper 7 noted that the skill deficiencies identified in this survey could conceivably underestimate the problem. International comparisons of matched samples of engineering establishments indicate that firms may operate product strategies that conceal 'latent' skill gaps, although this effect has yet to be quantified.

3.16 The DTI/SBAC aerospace survey found that the four main causes of skill problems in the aerospace industry were identified as follows:

- not enough suitably skilled people (approximately 80% of establishments);
- lack of practical skills (approximately 50% of establishments);
- too much competition from other employers (approximately 30% of establishments);
- not enough people interested in doing this sort of job (approximately 30% of establishments).

3.17 It is clear from our consultations to date that the shortage of appropriately skilled labour is primarily due to a contraction in the supply of skilled personnel from the armed services, manufacturing sectors and the traditional airline apprenticeship schemes. Furthermore, there is a significant issue in the negative perceptions of the industry that are held by some potential entrants.

3.18 Brian McCarthy, EMTA National Manager for Wales noted that the recruitment of engineering graduates continues to be a problem, especially for SMEs. The Skills Task Force elaborate on this issue noting that "most engineering recruitment difficulties in 1998 were found to have far more to do with perceived shortcomings in the quality of graduates (for example, their lack of work experience and apparent weaknesses in communication skills) than any shortfall in their quantity."

Management Skills

3.19 Evidence from EMTA's survey revealed that 32% of Welsh engineering companies reported deficiencies in management compared to 25% in the UK. Given that more than three out of ten establishments do not think that they have sufficient managerial talent for their future business needs, recruitment and development of managerial talent will be an important issue for aerospace establishments in the years ahead.

[11] *"Marc Thompson 'People Management in UK Aerospace: Case Study Findings' 1999"*

3.20 Evidence from the DTI/SBAC survey showed that although 87% of aerospace companies see training their managers as critical to future business success, only 47% 'strongly agreed' or 'agreed' that they invest heavily in the skills of their managers. On average those who agreed that they invested heavily in their managers skills provided 5.8 days of off-the-job training (compared with an average of 4.3 days across all establishments). This is broadly on a par with the manufacturing sector as a whole.

3.21 Aerospace companies tend to develop their own managerial talent with around a third of companies recruiting from the external labour market (DTI/SBAC survey). Those companies recruiting outside the business indicate that they have greater problems recruiting effective managers. This problem was especially prominent in larger companies (over 1,000 people).

3.22 The introduction of lean methodologies has five principles which have direct Human Resource implications[12]:

- optimise capability and utilisation of people;
- make decisions at the lowest possible level;
- develop relationships based on mutual trust and commitment;
- promote lean leadership at all levels;
- nurture a learning environment.

3.23 In a study of seven UK aerospace firms, Marc Thompson Research Fellow at Templeton College Oxford University found that one of the defining characteristics of the lean model is the devolution of decision-making to the lowest level. In practice this means that middle management is flattened, and that subsequent discussions with the remaining middle managers in the restructured firms found that "they felt ill prepared, unskilled and often confused in their new roles"[13]. This feeling was also reflected by some of the new 'cell-leaders', who complained about the lack of clear roles and the fact that many felt as though they had been left to sink or swim in their new roles.

3.24 In the DTI/SBAC survey three key challenges for their approach to their managerial employees were identified as either 'very important' or 'vital' by establishments. These findings were supported by the consultations we had with employers. They were:

- improving communication skills (76% of establishments);
- developing leadership skills (75% of establishments);
- developing change management skills (60% of establishments).

IT Skills

3.25 The Skills Task Force Research Paper 7 notes that in the mid-late 1980's there was a particular scarcity of software engineers and technicians in engineering industries. However, that since then there has been considerable growth in the numbers of people qualifying at different levels in computer science and software engineering and much employment based training has covered the use of microelectronics-based equipment. Furthermore, many firms in the sector point to the fact that changes in the prevalence of computers at home most new recruits are more IT literate than their predecessors.

3.25 These developments may have helped reduce the gap between supply and demand for software and IT related skills during the most recent economic upswing in the sector. It is clear however that demand still exceeds the supply of people in these occupations, an increasingly significant reason for this being that the competition for software engineers from other technically orientated industries is becoming more intense. In line with the UK average, 38% of Welsh engineering establishments surveyed identified an IT skill deficiency in the existing workforce.

Case Studies

3.27 The case studies below provide current illustrations of the issues discussed here.

Employer Case Study 1 (Interiors Maintenance and Overhaul):

British Airways Interiors Engineering

B.A.I.E. is a wholly owned subsidiary of British Airways based in Blackwood and has won the Best New Entrant in the 1999 Wales Quality Awards. Formed in 1996, it is a one-stop shop for aircraft interior repair and refurbishment. Over the last four years the company has grown rapidly from 50 to 200 people.

Current training

As the company continues to grow and because of a forthcoming change from the traditional working hours to shift work, there will be a need to recruit more people. In the past the company has not struggled to get reasonable applicants and are optimistic about filling any gaps that might arise. Over a two and a half week period the new recruits will be trained jointly by BAIE and Ystrad Mynach college, areas of study will include the development of general tool handling competencies and time with the seats themselves. It is expected that the recruits will be able to produce a reasonable output after three months. Additional in-house training is offered where more advanced development is required such as for work on Captain's seats, it is felt that this can be a fairly time consuming and expensive process.

Attracting young people into the Industry

Mike Edwards, General Manger of B.A.I.E., a SWAG member and school governor of a local school, is well aware of the challenge of attracting young people into the industry. He believes that the solution must involve a change in the culture of schools to make the pupils aware of what opportunities are available to them if they don't automatically go on to higher education, which isn't the best option for all pupils. Changes that can have an impact on this would be to encourage pupils to think about continuing Design and Technology past GCSE age and to involve more pupils, at an earlier age, in work placements and Young Enterprise programmes. B.A.I.E. for example, would be prepared to take on more work experience students.

[12] *"Marc Thompson 'People Management in UK Aerospace: Case Study Findings' 1999."*
[13] *"ibid."*

Employer Case Study 2 (Components, Mechanical and Avionics Maintenance and Overhaul):

Defence Aviation Repair Agency (DARA)

Formed in April 1999 from the RAF and RN aircraft repair and maintenance organisations, DARA is Europe's largest government owned facility of its kind. The target market is the UK, NATO and other military armed forces but the Agency now has the capacity to offer its facilities to the wider aviation market, providing a 'one-stop shop' for aerospace maintenance, repair and overhaul. There are three business units on four sites across Great Britain, two of which are in Wales.

DARA St Athan employs around 750 service personnel and 2200 civilian personnel; expertise is in the repair,

maintenance and modification of mainly military aircraft and aerosystems. DARA Sealand employs 200 service personnel and 1000 civilian personnel; they are primarily concerned with the repair, modification and calibration services for electrical systems, flight control systems, instrumentation etc.

Becoming more commercially minded

Steve Hill the Chief Executive at DARA, is aware of the demands that a changing market will have on the skills of their employees. Where in the past there was a guarantee of work, the market is now open to wider competition.

For the business to perform effectively in a more competitive environment DARA relies on its people, and as part of the continual development of staff, the Agency is introducing a behavioural competency framework. Examples include (for Directors and Senior Teams) 'Driving Commercial Focus' that includes learning about internal and external customers through people at all levels at DARA; and 'Commercial Problem Solving' for Product Managers that includes acting to define and meet customer needs.

JAR 66

As a member of the Welsh Aerospace Training Advisory Group, Peter Kennedy, DARA Training and Development, has been involved in the 'JAR 66 Human Factors' initiative. He says that DARA is particularly conscious of the need for its maintenance staff to gain civilian recognition. This is part of the process to develop the client base.

Profile of Trainees

DARA St Athan currently offer 86 trainee places a year in Wales. Whilst the ages of applicants varied, there was a continuing trend of predominantly male applicants, and in fact no women were selected this year. DARA are aware of the need to attract more female applicants and to this end, amongst other things, the Agency is committed to the 'Women into Aerospace and Engineering' programme.

In addition, the emphasis is on softer people skills, such as leadership and teambuilding.

Employer Case Study 3 (Manufacturer):

Doncaster's Blaenavon Ltd

Doncaster's Blaenavon has 40 years experience of forging and is a leading supplier of Nickel, Titanium, Aluminium and special steel casting and ring forging for the aerospace and industrial gas turbine industry. The Doncaster's name has 220 years of forging history being established in 1778 and at present employs around 150 people.

Impact of the '5 year business cycle'

Historically company performance, as is typical of many in the aerospace industry, has been linked very closely to the five-year business cycle. During the periods of downturn, because of the need to maintain slim margins, the company has had no other feasible option but to delay taking on any new apprentices. This has not impacted significantly on the skills of the workforce as during an economic upturn, as a new machine operator for example, can be trained to a proficient level within 6-12 months.

Implications of 'Lean manufacturing'

The introduction of the Lean ideology has cut down on any waste in manufacturing areas. The primary implications for the workforce at Doncaster's has been the increasing importance of 'multi-skilling', it is no longer felt that there is one man-one job. Furthermore, there is a more streamlined role for administrative and middle-management positions.

Shortage of Graduate Engineers

Nigel Tutton, Site Manger at Doncaster's, is aware that the most notable skill deficit in the current workforce was of metallurgical engineers. In the past, the company has recruited at graduate entry level from Swansea University, but feels that at present there is a shortage. Implicit in this problem is perhaps the higher expectations of the range of skills required of graduates such as a greater awareness of the business environment.

Employer Case Study 4 (Airframe Maintenance and Overhaul):

Raytheon Aircraft Services Ltd

Raytheon based in Broughton is an authorised service centre for Hawker, Beechjet and King Air in the UK, Continental Europe, Middle East, CIS and Northern Africa. Formed in 1993 the company currently employs around 120 people in Wales and has recently won a major contract to repair a range of corporate aircraft.

Management Skills

The Raytheon workforce incorporates 30-40 year old mechanical engineers that have around 15 years' experience of the job. There is a feeling that whilst the technical skills were invariably very strong, the business acumen and awareness of the bigger picture in the middle managers is in need of some development.

Training Provision

There has been a difficulty in finding training related to the J.A.R. 66 maintenance licence locally, and in the past the company has sent its trainees to Oxford and Perth. This has proven to be an expensive process and the company has called for local provision tailored towards licensed engineers. It was recognised that pooling resources with a consortium of companies based in North Wales would be the most effective way of spearheading an initiative to satisfy the requirements.

Attracting young people into the Industry

Roger Smith, Personnel Director at Raytheon, is also a school governor at a local school and is mindful of the problem of attracting young people into the industry. At present, it is felt that there is an intention by schools to encourage pupils to stay on, which is felt to be at times misguided. It was felt that the role for Education-Business Partnerships was becoming increasingly important through the provision of work experience for pupils and ultimately encouraging them to enter the sector.

4. Action on skills

Current Actions

4.1 As noted by John Rex (SBAC) larger companies conduct much of the training within the industry and it might be argued that they are less in need of any assistance in this area. In fact, some of the companies are including staff in their in-house training from the smaller companies in the supply chain. In addition to this the smaller companies are able to and have tended to recruit from the bigger companies after their staff has received appropriate training.

4.2 Increasingly, the aerospace industry is introducing outsourcing as a new method of recruiting people, particularly for activities such as finance, distribution and computing. In a recent Aerospace Forum Recruitment Seminar, it was noted that greater flexibility and improved cost effectiveness through a system of payments on results are two of the most compelling reasons for outsourcing recruitment.

4.3 The introduction by the UK Civil Aviation Authority (CAA) of the JAR 66 will give engineers qualifying under that regime an international standard. The introduction of category 'A' licence within the JAR 66 clearly allows a greater recognition of individuals' incremental progression in their job. We are aware of at least one course provider in Wales, Barry College, which has integrated the new licence requirements into the curricula offered.

4.4 The South Wales Aerospace Group (SWAG) consists of British Airways Maintenance Centre, DARA, British Airways Interiors Engineering, Nordam Europe Ltd, GE Aircraft and British Airways Avionic Engineering. The group is fully active in promoting aerospace engineering as a career in schools and colleges, addressing the skills gap and representing the needs of industry to industry.

4.5 The implications of the need to attract new entrants to the engineering trades is reflected in the SBAC initiative to promote the industry more effectively to school and university leavers through its *Youth in UK Aerospace* programme. A similar campaign, launched at the beginning of 2000 by the SWAG aims to enlighten pupils on what a career in aerospace could involve. Part of the solution is to tackle the old stereotype of engineers as the 'oily rag brigade'. They say the industry provides exciting new technology, excellent job opportunities, modern work environments, a good salary, excellent training, career advancement prospects, and scope for travel[14]. As part of this process the SWAG has recently produced a video-pack designed to communicate this message to pupils.

4.6 In addition, a number of promotional and training and development initiatives are currently emerging in the sector, including 'Aerospace Wales', 'JAR 66 Human Factors' and 'Women into Aerospace and Engineering'. It is too early to forecast what the potential impact of these might be, but it is a clear indication of aerospace companies and organisations' commitment to address sectoral skills issues.

[14] *"Gina Groom 'get ready for ...take off' actionetwork issue 19 June 2000"*

4.7 The *Supply Chain Relationships in Aerospace* (SCRIA) programme gives support, services and training to participating companies. SCRIA aims to develop the right behaviour, culture and skills to promote healthy working partnerships. The primary tool that SCRIA uses is training workshops that address the issue of how to manage supply chain relationships - at least 3800 people have received this training. This is one of the programmes under the umbrella of the SBAC/DTI's *Competitiveness Challenge initiative*.

4.8 The *UK Lean Aerospace Initiative* (UK LAI) is a collaborative programme between the SBAC, the Engineering and Physical Sciences Research Council (EPSRC) and a consortium of four universities that has been running since April 1998. The impetus for the program was the US Lean Enterprise Model (LEM) of best practice in manufacturing. The programme's initiatives have included the establishment of 'in factory' change implementation by using Master classes and 29 best practice case studies have been collected and shared with participants.

Key Themes for Action

4.9 The various players in the public and private sectors need to agree an integrated approach to skills issues in the aerospace sector. There is a need for:

- a collective and agreed statement of the key issues;
- developing a closer dialogue and partnership between SWAG employers, employers not represented in the SWAG, providers (both current and potential), and national or regional public sector bodies;
- based on this partnership and dialogue, an agreed strategy to address the skills issues via a specific schedule of activities by each partner.

4.10 This Skills Strategy for the Aerospace sector in Wales should dovetail with more general skills strategies for each region and for the manufacturing sector as a whole. These in turn should form part of the national skills action plan which will be developed as an aspect of the national economic development strategy.

4.11 Terry Davies of South East Wales TEC (SEWTEC) noted that the appointment of an aerospace skills co-ordinator, a position that would be fully resourced by the TEC, would be an effective way of managing a regional strategy, a suggestion that has been supported in the employer consultations. Clearly in an extended Welsh aerospace group, a co-ordinator would provide a natural driver and focus of policy.

4.12 Based on our desk research and fieldwork, there are a number of key themes for action. Many of these themes also appear in our reports on other manufacturing sectors, particularly automotive and electronics. They are as follows:

4.13 **Theme 1: supporting the changeover to lean manufacturing at management and professional levels and supporting the development of skills for lean manufacturing**. To reflect what is becoming increasingly recognised as best practice, the emphasis is on training provision that is attuned to team working, waste minimisation, problem-solving, and competitive advantage via manufacturing flexibility and efficiency (recommendations **1a**, **1b** and **1c**).

4.14 **Theme 2: widen coverage of JAR 66 course provision where gaps exist.** The continuing shortage of qualified engineers can be targeted, in part, by a general increase in the provision of courses tailored to the new JAR 66 requirements (recommendation **2a**). Furthermore, it is clear that in North Wales, as is illustrated by Case Study 4, there is significantly less training available for maintenance engineers locally, a gap that we feel needs addressing (recommendation **2b**).

4.15 **Theme 3: the South Wales Aerospace Group is successfully active in addressing the multitude of issues affecting the sector. It is recommended that this group be widened to incorporate companies across the whole of Wales** (recommendation **3a**). The group currently consists of British Airways Maintenance Centre, DARA, British Airways Interiors Engineering, Nordam Europe Ltd, GE Aircraft and British Airways Avionic Engineering. Key players that would undoubtedly add strength to the group from North Wales include BAE Systems and Raytheon.

4.16 **Theme 4: attracting new recruits into the sector by supporting and building on existing programmes.** A number of the misconceptions about the engineering and manufacturing industries are formed at an early age and these negative perceptions of the engineering industry are a barrier to potential entrants. This includes students at school who are deciding not to choose maths and science subjects as well as graduates who are choosing IT-related rather than manufacturing careers. In addition to ensuring that current actions to address this problem (See Paragraphs 4.4, 4.5 and 4.6) are fully supported (recommendation **4a**), we recommend that the following actions be initiated. Developing links with schools/ Education Business Partnerships (recommendation **4b**), promoting the aerospace sector as a legitimate (and exciting) career option via sector packs (recommendation **4c**) web pages (recommendation **4d**) and skills shows (recommendation **4e**) can be effective ways of generating interest with the younger age group.

4.17 **Theme 5: developing team leaders and in particular raising their awareness of the range of skills necessary in the industry**. From our consultations with companies it is clear that they are aware of the need to develop their team leaders and useful lessons can be learned from the experience of those companies, throughout the manufacturing sectors, that are already upskilling their supervisors and team leaders (recommendation **5a**).

4.18 **Theme 6: improving the work-readiness of intermediate and higher level entrants to the workforce, particularly graduate engineers**. Ensuring a good match between the commercial and technical skills being taught at Universities and Colleges and industry requirements can be achieved by having a closer dialogue with National Training Organisations and periodically auditing the curriculum against industry standards (recommendation **6a**). In addition to this the industry needs to consider developing more formal links with academic and learning institutions (recommendation **6b**) and pro-actively offering more sandwich placements (recommendation **6c**).

Key Recommendations

Theme No:	Rec No:	Action	Timescale	Key Partners
1	1a	Facilitate cross-sector working group on lean techniques linking to existing initiatives	From 2000	Various fora
	1b	Review vocational qualifications to check applicability to lean manufacturing	2001/02	NTO/CETW/ Emps
	1c	Review/update assessor training and awareness of lean paradigm	2001/02	NTO/CETW/ Emps
2	2a	Increase the number of training places available to students	2001/02	CETW/WDA
	2b	Address the gap of JAR 66 training courses in North Wales	2001/02	SWAG/CETW
3	3a	Facilitate the expansion of the SWAG to involve more companies including those based in North Wales	2001	SWAG/Emps
4	4a	Support existing programmes promoting sector plans and prospects to schools, young people and communities	2001	Emps/EBPs SWAG/CS
	4b	Proactively seek partnerships with local schools, EBPs, FE and HE	2001	Emps/EBPs/ CETW
	4c	Develop a sector pack and sub-sector packs	2001	Emps/CETW/CS
	4d	Develop sector/sub-sector web pages with links to fora and electronics companies	2001	Emps/CETW/CS
	4e	Review feasibility of a Wales version of the UK Skills Show (NEC 5-9 July 2000)	Now for 2001	NTOs/Assembly/ UK Skills/fora
5	5a	Consider cross-company sector mentoring at management/ team leader level	2001	Emps/CETW
6	6a	Audit NVQs/course curriculum against industry standards	2001/02	Emps/CAA/NTO
	6b	Develop better liaison/more formal links with colleges and universities	Ongoing	Emps/SWAG/ FE/HE
	6c	Proactively offer teacher/pupil/student placements	2001	Emps/SWAG/ FE/HE

Potential Impacts of Action

4.19 ***"The availability of top class people - more than anything else is what has led to Wales' emergence as a centre for world-class aerospace operations"*** - Prime Minister, the Rt. Hon Tony Blair MP (April 6 2000, opening the new Aircraft Seating Centre in Cwmbran).

4.20 It is clear that to ensure the continued success of the industry the following key challenges exist which our recommendations are designed to address:

- breaking the cyclical training strategy. There is a need to break away from the history of training that responds to a boom and bust cycle. It is unfeasible to have a radical restructuring of company training patterns but it is felt that in consortium, companies and educational organisations could effectively spearhead initiatives to provide the industry as a whole with a consistent supply of new talent.
- Addressing the shortfall of skilled staff from traditional sources. By undertaking a consolidation of the training and qualifications available and by marketing career opportunities directly to schools, colleges and universities the sector should aim to create a sustainable supply of new skilled labour.

Recommendations for Future Research

4.21 Work needs to be done to identify any 'latent' skill gaps, where a company operates a sub-optimal production strategy to conceal skill deficiencies.

4.22 The prospects for employment growth from the A3XX development and manufacture in North Wales need to be tracked, so that sub-regional training provision is kept under review with a view to meeting potential increases in demand.

4.23 Research needs to be undertaken to evaluate skills issues around Cardiff International Airport.

4.24 Further examination is needed into the extent to which the contraction of the armed forces and industrial and manufacturing base will affect the future supply of appropriately skilled labour.

Annex A: References

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Annex B: Sectors in Context

A Brief Overview of the Relative Size and Importance of Welsh Sectors

The following information relating to the Aerospace sector is calculated using the BSL definition which differs from the WDA definition (See Paragraph 2.1) used earlier in the report. The implication of this is that these figures understate those previously quoted in the report.

This paper presents an overview of the sectors selected for study within the Future Skills Wales Sectoral Skills project. It aims to give the relative scale of the sectors involved and some idea of their relative importance in Wales.

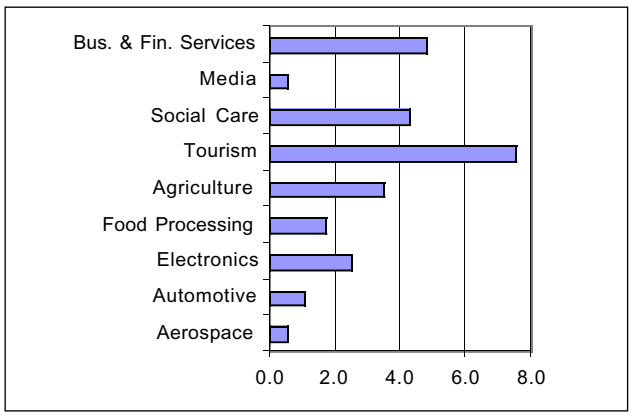
The data on employment used in this section is taken from the latest estimates from Business Strategies Limited (August 2000). Data on business units are taken from NOMIS. Some of the values given (for example for the number of businesses within Wales, or the size of the workforce, for a given sector) will not agree with estimates or calculations from other sources. This is due to differences in the detailed definitions of sectors, or in methods of estimation. However by using one source in this discussion, consistency in measurement or estimation is established, and better comparability is ensured. This is appropriate since here we are concerned with the relative sizes of sectors and their workforces, as much as with absolute numbers.

Sector Size: Workforce Numbers

Figure B.1 shows the employment figures for each of the sectors (employees and self employed) as a percentage of the total for Wales. By this measure Tourism, Leisure and Hospitality is the largest of the selected sectors, followed by Business and Financial Services, Social Care, and Agriculture and Farm Enterprises.

Together, the nine sectors selected for study in this project provide work (either as employees or in self employment) for around 26% of people working in Wales. This indicates the scope and potential importance of the exercise for the understanding of skills issues in Wales and the formulation of policy responses. (The rest of employment in Wales is accounted for by a large public sector, including government, education and public sector healthcare, and by the primary, construction, transport and distribution sectors, including retail).

Figure B.1: Employment as a percentage of Welsh Employment: by Sector

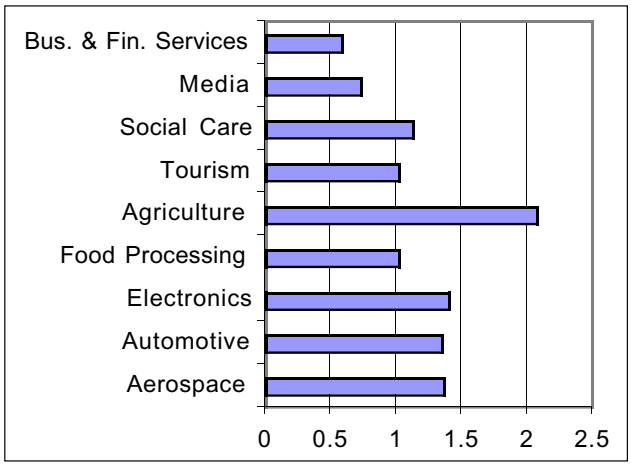


Source: BSL FSW Sector Forecast

Employment Location Quotients

Figure B.2 provides a different view of the sectors, in terms of their importance within Wales relative to the UK as a whole. It does this by comparing the employment location quotients for the sectors. Employment location quotients are used to express the degree to which employment in a given sector is located in a selected region. To calculate a location quotient, an average percentage is first calculated for all employment in the region. Using the BSL estimates, for example, one finds that 4.3% of all employment in the UK is located in Wales.

Figure B.2: Employment Location Quotients for Wales: by Sector



Source: BSL FSW Sector Forecast

Therefore, if employment in a given sector is distributed evenly over all regions of the UK, one would expect 4.3% of its employment to be in Wales. The sector's Welsh employment percentage, at 4.3%, will be equivalent to the average employment percentage for Wales.

To calculate the employment location quotient, the sector's percentage is expressed as a ratio of the Welsh average percentage. For example if a sector has 5.2% of UK employment, the employment location quotient will be the ratio of 5.2 to 4.3, or 1.2. Quotients of more than 1 therefore indicate over-representation of employment in the Welsh sector relative to the UK as a whole. Quotients of around 1 indicate that employment in the sector in Wales is much as one would expect given the overall distribution of employment across the UK; and quotients below 1 indicates that the sector in Wales is relatively under-represented in terms of employment.

Figure B.2 shows that the strongest Welsh sectors, in these terms, are Agriculture, plus three of the manufacturing subsectors - Automotive, Aerospace and Electronics Manufacturing. UK employment is relatively concentrated in Wales for these sectors, despite the fact that some of them are small in relation to Welsh employment as a whole (Figure B.1). The Social Care sector also shows employment strength, while Food Processing and Tourism, Leisure and Hospitality are approximately in line with the Welsh share of UK employment.

Media and New Media, and the Business and Financial Services sector, are both under-represented in Wales in employment terms, with employment location quotients well below 1.

Sector Size: Number of Businesses

An alternative method of comparing sectors is by the number of business units in each sector. This can be less straightforward than the employment location quotient method used above. Here we are using data on business units in Wales and for Great Britain as a whole, provided in NOMIS. The main difficulty is the definition of a business unit within the published figures. This does not make a distinction between separate businesses, and locations representing branches or sites within one business. It also omits small 'one-person' business sites without formal employees.

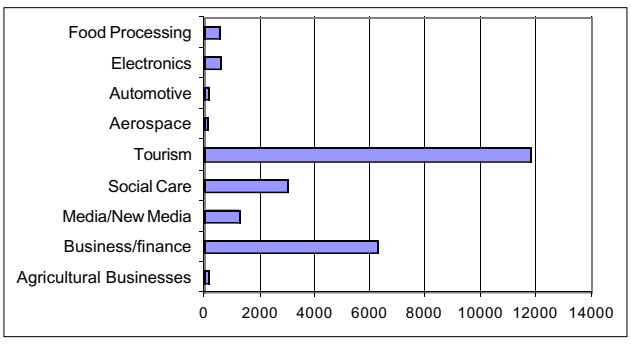
This means, in particular, that these figures are apt to be misleading as applied to the agricultural sector, since they represent agricultural businesses with employees, rather than all farms. They therefore greatly under-represent the number of agricultural enterprises in Wales. Although the business unit figures for agriculture have been included in the following analysis, they are therefore **not a reliable guide to agricultural sites in Wales.**

Figure B.3 shows the sectors studied in terms of the number of business units in Wales. It shows that, by this measure, the Tourism, Leisure and Hospitality sector is by some way the largest. According to the NOMIS figures, this sector contains 12.4% of all Welsh business units, - around 1 in every 8.

A further 6.6% of Welsh business units are in the Business and Finance sector, and 3.2% in Social Care. The next largest sector, Media and New Media, includes a large number of businesses classified under 'Other computer related services'. Many of these may be 'New Media' businesses within our study definition. Others, however, may be providing services which are not relevant within this definition. As explained above, the figures for agriculture do not represent the farming sector accurately.

In total the sectors covered by the study account for over 25% of business units located in Wales.

Figure B.3: Number of Business Units - Selected Sectors



Source: NOMIS

Site Location Quotients of Welsh Sectors

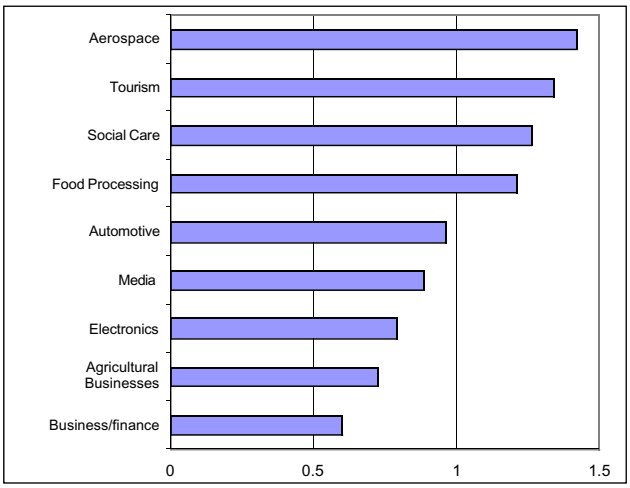
Figure B.4 shows the site location quotients calculated for the sectors covered by this study. These are calculated as for the employment location quotients used earlier, but using business unit figures instead of employment numbers. Four of the sectors have quotients greater than 1. In other words, these sectors are 'over-represented' in Wales relative to what one might expect taking Great Britain as a whole. These quotients represent a degree of concentration of business units in

these sectors within Wales. These sectors are Aerospace, Tourism, Hospitality and Leisure, Social Care, and Food Processing.

The Automotive Manufacturing sector in Wales, with a location quotient of 0.96, is close to the size one might expect (in terms of numbers of business units). In other words, Wales has 'a fair share' of business units in this sector, according to these NOMIS figures. At the other end of the scale, the Business and Finance sector, with a site location quotient of only 0.6, is under-represented within Wales - confirming the findings of the first Future Skills Wales study in 1998.

Again, the quotient for 'Agricultural Businesses' reflects the limitations of the method, although it may indicate that Welsh farms and agricultural businesses tend to be smaller than the average for Great Britain, inasmuch as fewer of them are large enough to be included as business units.

Figure B.4: Site Location Quotients



Source: NOMIS

Selection of Sectors for the Study
The above discussion sheds light on the reasons for selecting this set of nine sectors. The reasons vary, but can be simply expressed as follows (some sectors are selected for more than one reason):

- sectors with significant proportions of Welsh businesses and/or workforce (Tourism, Business and Finance, Social Care);
- sectors which are important components of manufacturing industry within Wales (Aerospace, Electronics, Automotive, Food Processing);
- sectors which are relatively strong in Wales (Aerospace, Tourism, Social Care, Food Processing);
- sectors which are relatively weak in Wales, but are important for future growth (Business and Finance, Media/New Media);
- sectors with particular significance for Welsh culture and communities (Agriculture, Media/New Media).

The Manufacturing Sector

Manufacturing has been more important in the Welsh economy than for the UK as a whole. In 1998 employment in manufacturing (including but not limited to the sectors studied in this project) accounted for 19.7% of Welsh employment. This contrasted with 16.6% for the UK - a difference of 3.4 percentage points. Projections for 2004 show manufacturing employment as a lower percentage of employment in both cases - 17.3% in Wales, against 14% for the UK. Although the percentages are smaller, the difference between Wales and the UK, at 3.3 percentage points, remains almost unaffected. (DfEE, Skillsbase/IER, June 2000).

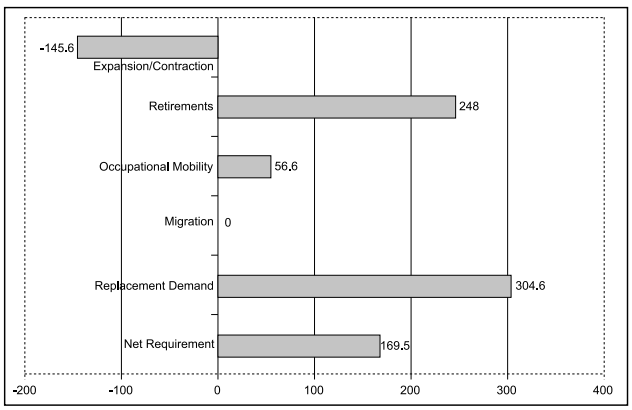
Although these projections show a fairly significant decline in the size of the manufacturing sector as a percentage of overall Welsh employment, the absolute numbers involved change less significantly. This is due to a projected rise in the total numbers employed in Wales over the period 1998-2004. Thus, the figure of 227,000 for those employed in manufacturing in 1998, becomes 205,000 in 2004 - a decline of 22,000, or just under ten percent.

When considering the future demand for skills it is important to keep in mind that, as illustrated above, relative decline in the manufacturing sector does not imply lack of future demand for manufacturing skills. This was one of the insights behind the original Future Skills Wales project methodology.

This point is further illustrated by the replacement demand projections for occupations associated with manufacturing. **Figure B.5** shows the replacement demand projection for skilled metal and electrical trades (SOC 52) for the period 1998-2004, across the UK. In this period, 145,600 jobs in these trades are expected to disappear - part of the overall decline in employment in manufacturing noted above. However, losses from these trades are projected consisting of 248,000 from retirement, and 56,600 from occupational mobility (movement into other jobs), a total of 304,600 workers to be replaced. This more than offsets the effects of declining employment, leaving a net requirement figure of 169,500. This represents the requirement for new, trained entrants to these trades in these six years. These may be new entrants to the workforce, or existing workers who have upgraded or added to their skills and qualifications.

Based on the assumption that Wales would require about 4.5% of this number (this being the approximate size of the Welsh workforce relative to that of the UK), this implies a net requirement for some 7,600 skilled metal and electrical tradespeople over this period for Wales.

Figure B.5: Replacement Demand: Skilled Metal and Electrical Trades, 1998-2004 (UK)



Source: DfEE Skillsbase/IER

Annex C: Supply and demand of manufacturing skills

The Supply of Manufacturing and Engineering Qualifications in Wales

It is far from straightforward to produce meaningful figures on the provision of skills in relation to sector skills needs. However it is at least possible to look at the provision of qualifications in the Welsh FE and HE sectors, and to examine the profile of these in relation to overall demand in the manufacturing sector in Wales.

The latest comprehensive figures on Welsh provision are published by the Wales Funding Councils and relate to the academic year 1997/98. In other words they describe provision which will generate skills and qualifications which typically became available to the labour market from late 1998 and (in the case of students in the earlier years of three year courses) in 1999 and 2000. Figures for 1998/99 should be published in late 2000.

The 1997/98 figures for all of Wales show that within Further Education, around one per cent of students were pursuing qualifications relating to Manufacturing. This represents some 5,441 students from a total of 398,044 enrolled at Welsh FE institutions. (These figures and those below are based on both full and part-time student enrolments).

In addition to this, approximately 4 per cent of FE students (16,543) aimed for Engineering qualifications.

These proportions are broadly reflected in the figures for the Welsh regions **(Table C.1).** There are slight variations: Manufacturing qualifications, for example, are more strongly represented in West Wales, and Engineering in the North, perhaps reflecting the emphasis of local demand.

As for the rest of the UK, Wales displays a **strong gender bias** to this enrolment pattern. Of those aiming for Manufacturing qualifications, 83% were male (4,529). Of those seeking Engineering qualifications, almost 94% (15,506) were male. This contrasts, for example, with the case of IT qualifications, where males represented just under 43% of the students enrolled.

For 1997/98 and the succeeding years, this total of 21,984 students enrolled will form the main input (from Further Education) of new skills and qualifications that are specific to the manufacturing sectors. This input will be complemented by entries to manufacturing of FE students with less sector specific qualifications and skills in, for example, sales and marketing, science and mathematics, or IT.

In Higher Education, there are no comparable figures for Manufacturing related subjects, but student enrolments are recorded for Engineering and Technology. The total enrolled for these qualifications in Welsh Higher Education Institutions in 1997/98 was 7,800. These enrolments are concentrated in institutions in the South-East and South-West of Wales **(Table C.2)**. The main exception is North East Wales Institute, with 857 enrolments, though Bangor also has 233 enrolments in these subject areas.

Again, there is a very pronounced gender bias in terms of enrolments - 92% of students in this subject area are male. Only 1.6% of female students are enrolled in these subjects, as against 15% of male students.

In 1997/98 a total of 990 first degrees were awarded in Engineering and Technology by Welsh Higher Education Institutions (HEIs), mostly by full time and sandwich study. A further 776 other undergraduate qualifications were awarded, the majority via part-time study, giving a total of **1,766** awards at undergraduate level. Postgraduate qualifications were awarded in **256** cases.

There are no comparable published figures for **awards** by subject area from FE. Estimation of qualifications awarded per annum in Manufacturing and Engineering would need to take account of the average length of courses and the retention and attainment rates for these subjects. From the 22,000 students enrolled, for example,

Table C.2: Engineering & Technology Enrolments, 1997/98

Institution	Enrolled in Engineering & Technology	Total Enrolled at HEI
University of Glamorgan	2,014	15,148
University of Wales Aberystwyth	0	9,743
University of Wales Bangor	233	10,017
Cardiff University	1,394	20,294
University of Wales Lampeter	0	2,313
University of Wales Swansea	1,323	13,085
Univ. Wales Coll. Of Medicine	0	3,208
Univ. Wales Institute Cardiff	415	7,853
Univ. Wales College Newport	976	7,757
North East Wales Institute	857	4,952
Swansea Inst. . of Higher Ed	588	4,272
Trinity College Carmarthen	0	1,590
Welsh Coll. of Music & Drama	0	599
Total for Welsh HEIs	**7,800**	**100,831**

Table C.1: FE Enrolments in Manufacturing/Engineering by Region 1997/98

	SE	W	Mid	N	Totals
Manufacturing	1,697 1%	2,721 3%	174 1%	849 1%	5,441 1%
Engineering	7,204 4%	3,728 4%	824 3%	4,787 5%	16,543 4%
Totals	**8,901**	**6,449**	**998**	**5,636**	**21,984**

assuming two year courses, a retention rate of 83% (the average for all subjects), and an attainment rate of 60% (actual rates vary between 49% and 70% by qualification type), we can construct a rule-of-thumb estimate for annual output of these qualifications by FE. This would be 11,000 x 0.83 x 0.6, or 5,480 awards.

Taken with the 2,000 outputs from HE, this gives a figure of around **7,500** qualifications in manufacturing, engineering and technology subjects per annum at all levels. A complication is the relative lack of data on student destinations. Especially for Higher Education awards, students receiving the relevant qualifications may leave Wales before entering employment. This may be partly balanced by inflows of Welsh students who have completed studies at other UK universities. Therefore this is in many ways a rough estimate, but it does provide some basis for comparison with the size of the manufacturing sectors now and in future.

To this figure we also need to add qualifications obtained via non FEFCW funded provision - primarily vocational qualifications gained in sixth forms, and those gained via study with employers and private sector training providers, funded by the Welsh TECs. The yearly cohort size for pupils aged 18 or over leaving Welsh schools is around 12,000 (*Digest of Welsh Statistics*, 1999, National Assembly for Wales/Government Statistical Service, Table B.3). However most of these will leave with non-vocational qualifications and skills; no figures for vocational awards were available at the time of reporting.

We do not have a comprehensive set of figures for qualifications gained, by vocational subject area, via TEC funded provision. Figures provided by Mid Wales TEC and South East Wales TEC suggest that a total of around 1,000 students per annum enter manufacturing related vocational courses in these two regions (at Modern Apprentice and National Traineeship level: adult training not included). Given the preponderance of the population in the South-East, one might assume that not more than another 1,000 per annum enter across West and North Wales. This gives a maximum estimate of **2,000** per annum for possible outputs of learners with manufacturing specific vocational skills and awards from TEC provision.

Taking all the key sources of supply, therefore, we arrive at a rough estimate of **9,500** for the annual supply of new people with manufacturing specific skills and qualifications.

Manufacturing Sector Employment Demand

We can compare these estimates for annual supply with the BSL forecast for job opportunities in Wales, included in the original Future Skills Wales report. **Table C.3** shows gross job opportunities per annum in occupations that are closely related to the qualification subject areas analysed above (The Future Skills Needs of Wales, All Wales Report, Table 6.8). These figures take into account the effects of expansion or contraction in these occupations as well as retirement or movement out of the occupations due to occupational mobility.

The table shows that the forecast for new entrants needed in these largely manufacturing-specific occupations was 18,200 per annum - almost double our estimate of the annual supply of people with directly relevant and newly acquired training and qualifications.

Table C.3: Forecast of Who Will Take Up Job Opportunities in Wales,1997-2007
(000s per annum)

Occupation	Gross Job Opportunities p.a.	People already working in Wales	Others (new entrants)
Skilled Engineering	3.7	1.8	1.9
Other Skilled Trades	7.9	3.7	4.3
Industrial Operatives	14.4	6.8	7.5
Drivers/ Machine Operatives	5.6	1.1	4.5
Total	**31.6**	**13.4**	**18.2**

Source: FSW All Wales Report, BSL 1998 (ONS and LFS data)

Manufacturing Specific Skills/Qualifications: Supply versus Demand

Given that our estimate of an annual supply of 9,500 is roughly correct, this implies that the remaining 8,700 new entrants to these occupations per annum will fall into one of the following categories:

- people with no training or qualifications;
- people with training or qualifications not in relevant vocational areas;
- people with relevant training and qualifications from outside Wales.

To this extent, one might speak of a **mismatch between supply and demand** for vocational manufacturing skills in Wales. However, more qualitative evidence from employers suggests that they are often concerned about the quality of skills on offer, rather than the numbers of people applying with qualifications in the right area and at the right level. We must be cautious, therefore, in drawing conclusions about the need to change the balance of provision, based on the estimates presented here.

There is little in the analysis to suggest that the relationship between supply and demand will be significantly different in different Welsh regions. It does suggest, however, that the supply of people with manufacturing qualifications is strongly biased towards males - a situation which is unlikely to assist in the elimination of existing gender imbalances in the manufacturing sector workforce as a whole. In particular it would seem that workers with relevant qualifications - and therefore a better chance of progressing within the workforce - are much more likely to be male.

This attempt to analyse the fit between supply and demand has indicated some of the difficulties arising from limited current availability of provision data, and some of the complexity inherent in this task. While such an analysis can probably not provide a complete and accurate basis for provision planning (which, anyway, will be strongly affected by student demand), it does serve to indicate the relative scales of provision and occupational and sector needs. In the case of manufacturing, it provides food for thought about the balance of provision.

Notes

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Matthew Lawless, August 2000.