

# The Future for Women in Aviation and Aerospace



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## A Specialist Report by the Royal Aeronautical Society's Women in Aviation and Aerospace Committee

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This Report was prepared by the RAeS Women in Aviation and Aerospace Committee. The analysis and views expressed in the paper are those of the Committee and do not necessarily represent those of the Society as a whole.

## EXECUTIVE SUMMARY

Britain's aviation, aerospace and defence industries are of vital importance to the economy, both in terms of contribution to GDP and employment. If the data on aviation and aerospace are combined, taking into account the probability of some degree of overlap, these sectors directly employ up to 300,000 people, while as many as 700,000 other jobs are dependent on the success of these industries.

The major challenges these sectors face are to remain competitive and at the forefront of technological innovation to meet future market opportunities, as well as satisfying the increasing demands from society for more environmentally friendly and quieter aircraft. The expansion of Heathrow Airport, which gained Government approval in January 2009, is seen as critical to the growth of aviation in the UK.

To achieve the desired growth and meet these challenges, the industry is heavily dependent on ensuring that the appropriate skills and workforce are in place. However, experts in the UK believe the problem of skills shortages has not disappeared and will once again pose a threat to the industry when the UK economy recovers from the current recession. Many organisations — such as the Engineering and Technology Board and UK Resource Centre for Women in Science Engineering and Technology (UKRC for Women in SET) — argue that if industry were to address the issue of the under-representation of women in the workforce, this would help to address the problem.

In addition, there is increasing evidence of a strong business case for employing more women. International management consultants, McKinsey & Company, found that companies where women are most strongly represented at board or top management level are also the companies that perform the best<sup>1</sup>. In short, what is good for women is also good for business.

Yet progress on encouraging women into Science, Technology, Engineering and Mathematics (STEM) careers has been painfully slow despite a number of good initiatives, most notably the WISE Campaign, which celebrated its 25th anniversary in 2009, and the UK Resource Centre for Women in Science, Engineering and Technology, founded in 2004.

The Royal Academy of Engineering estimates that fewer than 6% of engineering professionals are female. Government data also shows that the number of women in aerospace engineering is lower than average for engineering as a whole, while the number of women commercial pilots stubbornly remains below 4%. The RAF identified that while many women work for the service, they are poorly represented in its two biggest job categories — pilots and engineers.

The difficulty in attracting women into aviation and aerospace is a complex issue which begins early in life with girls' perception of their role, as exemplified by their toys, and continues with poor parental, teacher and peer group understanding of the benefits of an aviation/aerospace career.

The engineering and aerospace industries continue to suffer from the 'oily rag' image which has little in common with the reality of today's aerospace businesses. Even when the industry succeeds in recruiting girls, the lack of senior women to act as role models, problems retaining women and the general inability of businesses to encourage women to return to their former jobs after career breaks all contribute to the problem.

The establishment of the RAeS Women in Aviation and Aerospace Committee in June 2009, with the key remit to encourage more women into the industry and into Society membership, presents a timely opportunity to help to tackle these issues.

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<sup>1</sup>Women Matter report August 2008.

## 1.0 INTRODUCTION

### 1.1 The General Situation

There are plenty of women working in all sectors of aviation and aerospace. The problem is that the vast majority are employed in the same functions that can be found in any other industry: clerical, administrative, human resources, marketing, public relations, sales, etc. The picture, however, is very different when it comes to the major, industry-critical jobs such as pilots, engineers and senior management/directors.

Why are so few women working in these roles? Would the industry benefit from having more women in these pivotal roles? Is it missing out on a wealth of talent as many experts have argued? If so, how does the sector encourage more women to consider aviation and aerospace as a worthwhile career and, as importantly, how does it ensure that, once women choose to work in this industry, it retains and nurtures their skills and expertise?

This report sets out to address these questions and provide a comprehensive insight into the current status of women within the aviation and aerospace industry. It also highlights the challenges the industry faces with respect to increasing the participation of women in the sector.

### 1.2 RAeS Advisory Group on Women in Aviation and Aerospace

This report is the result of the work of a Royal Aeronautical Society Advisory Group, set up in January 2009 after the Society's signing of the CEO's Charter, established by the UK Resource Centre for Women in Science, Engineering and Technology.

The Advisory Group was given three terms of reference:

- To inform the Society of the current situation regarding women in all areas of aviation and aerospace.
- To identify the challenges and tasks ahead to improve the current situation and encourage new entrants/young women.
- To recommend how the Society could proceed to:
  - Help the situation for women within the industry.
  - Improve the involvement and representation of women in the Society and encourage women to join so it better represents the 'whole' industry.

Following the presentation of the Advisory Group's report to the Society's Council in June 2009, the Women in Aviation and Aerospace Committee was established with the key remit to work to encourage more women into the industry and into Society membership.

This significant step by the Society marks the first time an industry body in the aviation and aerospace sector has committed itself to support the increased participation of women in the industry at all levels.

As the only organisation in the world representing professionals working in all job functions across the entire breadth of aviation, aerospace and defence manufacturing, space, and the military, the Society is in a unique position to play a major role in helping to tackle the critical issues of diversity and skills shortages within the industry.

### 1.3 Methodology

In addition to the contributions of Advisory Group members, the report draws on expert contributions from a wide range of key companies and organisations in the industry, including British

Airways, Rolls-Royce, Airbus, the Society of British Aerospace Companies, Airport Operators Association and BALPA to name just a few and we thank them all for their valuable input. We are also indebted to many other organisations outside the industry for their help and to representatives from the South West Regional Development Agency, UK Resource Centre for Women in Science, Engineering and Technology and the WISE Campaign for their participation in this task and for their expertise and advice.

Interviews were conducted with dozens of experts across a large number of businesses, organisations and Government departments. Analysis was conducted to ascertain the number of women board directors in aviation and aerospace companies. Furthermore, a thorough, in-depth study of publicly available material has been reviewed including aviation and aerospace market reports and expert reports on women in Science Engineering and Technology, such as Baroness Greenfield's milestone report, *SET Fair* (2002). In addition, information was gathered from numerous company and organisations' websites and a number of conferences attended, such as the Royal Academy of Engineering's *Getting Girls into Engineering*, the UK Resource Centre for Women in Science, Engineering and Technology annual conference and the RAeS Handley Page Training Conference.

### 1.4 Shortage of data or out-of-date statistics

It soon became evident that lack of research or out-of-date statistics makes it harder to analyse the problem within the aviation and aerospace industry. There is considerable information and facts on engineering in general and on the role of women in business in general. But there is clearly a need for more specific sector research on the subject of women in aviation and aerospace.

### 1.5 Feedback

The newly formed RAeS Women in Aviation and Aerospace Committee hopes this report will launch constructive discussions on this important subject — to the benefit of the industry, its workforce and the Society. Accordingly, the Committee welcomes all comments and suggestions.

## 2.0 THE BACKGROUND TO THE CURRENT SITUATION

Before outlining the current situation regarding women in the industry, it is important first to set the scene by defining the scope of the sector, the key facts that contribute to its success and the challenges it faces.

### 2.1 What is the aviation industry?

*"The aviation industry is defined as activities that are directly dependent upon transporting people and goods by air to, from or within the UK. This covers airline and airport operations and includes scheduled and charter flights for passengers and freight, general aviation, airport maintenance, air traffic control and regulation, and activities directly serving air passengers, such as check-in, baggage-handling, on-site retailing and catering facilities."*<sup>2</sup>

### 2.2 Key Facts

The aviation industry contributes approximately £15bn to the UK's annual gross domestic product (around 1.2% of total GDP)

<sup>2</sup>Airport Operators Association (AOA).



**A student pilot with her instructor.**

and directly employs 186,000 people in the UK. Many of these jobs are high-quality, highly skilled and well paid. In total, more than 520,000 jobs in the UK depend on the success of the aviation industry<sup>3</sup>.

As an indication of the size of the sector, Airport Operators Association member airports handled more than 200 million passengers in 2007, nearly 2.5 million tonnes of freight and over 2.3 million air transport movements. It is estimated that visitors arriving by air contribute over £12bn a year to the UK tourism industry, generating a further 170,000 jobs.

### 2.3 What is Aerospace/Defence Manufacturing?

*"The Aerospace Industry researches, designs, manufactures, operates, and maintains vehicles moving through air and space."*<sup>4</sup>

### 2.4 Key Facts

The UK aerospace industry is the most significant aerospace sector in the world outside the USA. In 2003, the UK accounted for 13% of the world's aerospace market, which was forecast to grow by at least 25% in real terms by 2023 to \$250bn per year. In 2006, it generated turnover in the UK in excess of £19.8bn in 2006<sup>5</sup>.

The industry is also one of the UK's largest exporters — over £12bn of export sales in 2006, contributing £2.25bn to the balance of trade. It comprises more than 2,500 companies employing 125,000 directly and 150,000 indirectly in the UK and a further 50,000 overseas.

However, it is heavily dominated by a few very large businesses such as Rolls-Royce, Airbus and BAE Systems.

Statistics show that 26% of all aerospace jobs in the EU are within the UK — 4% higher than France — and that it is a highly-skilled

workforce with 34% of all employees having university degrees or their equivalent and a further 31% being classified as technicians. Productivity is high — for example it increased by 5.5% in real terms in 2005/06 to £160,000 per employee in line with average annual growth over 25 years. In addition, the average wage at £35,000 is 44% higher than overall UK average and 31% above manufacturing average.

Finally, the aerospace industry is a major investor in Research & Development (£2.54bn in 2006), placing it at the forefront of innovation and technological development.

### 2.5 Main Issues/Challenges Facing Aviation

The perceived adverse effects of aviation on the environment — air pollution, energy consumption and noise pollution — present both the aviation and the aerospace sectors with considerable challenges, including the need to emphasise the positive impact on the UK economy of aviation and aerospace.

To add to this, there are increased safety and security concerns, leading towards tighter regulation regarding corporate responsibility, compensation and the public interest.

As competition increases, particularly from the continuing expansion of existing low-cost carriers and the emergence of new operators, the industry expects to see further significant airline restructuring and increased rationalisation/mergers. Although the current global recession has led to a drop in passenger traffic, the aviation industry needs further airport expansion to cope with the predicted future increase in air traffic. The industry also faces periodic threats from wars, terrorism, rising oil prices and avian/swine influenza.

As a result of the difficult trading conditions in 2009 and the October 2006 change in age legislation allowing pilots to work until 65, there is a glut of pilots. There is also a drop in the number of trainee pilots at UK flying schools owing to the shortage of jobs and the difficulties faced by students and their families in raising bank funding for training.

British Airways, the UK's biggest airline operator, believes the dramatic improvement in aircraft and system reliability in the recent generation of transport aircraft, which has significantly reduced the engineering load in the hangars and the back workshops, has negated the predicted shortage of aircraft maintenance engineers. The company also argues that improved productivity, derived from better support systems and elimination of antiquated and restrictive work practices, has also reduced the demand for maintenance engineers.

However, other experts are convinced the problem remains a key concern for an industry where the need for MRO (Maintenance, Repair and Overhaul) engineers far outweighs the demand for engineers in other aerospace disciplines. This concern was clearly voiced at the RAeS Training Conference in June 2009 where speakers from the UK, Germany and France agreed that the shortage of maintenance engineers would return to haunt the industry in the near future. The fact that a large proportion of engineers are due to retire in the next decade, coupled with a drop in the birth rate, underlines these concerns.

### 2.6 Main Issues/Challenges Facing Aerospace/Defence Manufacturing

The globalisation of the aerospace sector and the emergence of trans-national companies could result in aerospace manufacturing increasingly moving out of the UK. At the same time, the emergence of aerospace industries in developing

<sup>3</sup>Oxford Economic Forecasting; DfT; Airport Operators Association.

<sup>4</sup>Wikipedia.

<sup>5</sup>SBC; *Future of UK Aerospace Industry* report.

economies such as China and India could challenge the UK's pre-eminent position as the leading aerospace industry outside the USA<sup>6</sup>.

As a result, the sector must remain one of the leaders in technology development. But while customers continue to demand faster, more efficient aircraft, aerospace engineers also need to respond to environmental issues such as reduced carbon emissions and reduced noise.

Skills shortages remain a critical issue, despite the effects of the recession, as the aerospace sector is in competition with its suppliers and other engineering industries for a shrinking pool of potential employees. The Aerospace Industries Association in the USA reported in December 2008<sup>7</sup> that America faced the threat of losing its pre-eminent position in aerospace, not because of the challenges from competitor countries and emerging economies, but due to its failure to nurture the skills it needs to ensure the industry thrives.

Part of the reason for the skills shortage is the continuing negative image of engineering as a white male with an oily rag and tool box. There is also a proven lack of understanding among young people, parents and teachers about what an engineer actually does in today's high-tech engineering companies<sup>8</sup>.

### 3.0 WOMEN IN AVIATION AND AEROSPACE — WHAT THE STATISTICS SHOW

This section summarises the available data on women working in the industry, although there is a paucity of information in some areas — notably aerospace engineering — and out-of-date statistics in others. This indicates a need for further, more detailed research focusing on this sector.

The figures presented in this section prove beyond reasonable doubt that although women represent at least 50% of the UK workforce, they are severely under-represented in most sectors of aviation, aerospace, defence and the military. With the exception of cabin crew, ticketing/sales personnel and administrative staff, the percentage of women working in the various sectors that make up aviation, aerospace and the military seldom exceeds 10% and is often 5% or lower.

#### 3.1 Women in Civil Air Transport

It is obvious to any air traveller that the majority of cabin crew and ticketing/sales staff are female. This is borne out by the statistics which show that 73.6% of cabin attendants and 67.8% of ticketing and sales personnel are female<sup>9</sup>. In total there are 43,479 male airline personnel, of whom 4,936 (11.35%) work part-time, while 39,537 are women, of whom 10,921 (26.72%) are part-time<sup>10</sup>.

But behind the locked door of the cockpit, the picture is quite different. Only 3.3% of licensed Air Transport Pilots are female<sup>11</sup>, a figure that is almost exactly replicated in other westernised countries such as USA, Australia, New Zealand, Holland, etc. British Airways has the highest number of female pilots in the UK — 176 out of around 3,200 (approximately 5.5%). BA has a part-



**Fit Lt Michelle Goodman, the first woman to be awarded the Distinguished Flying Cross after rescuing a casualty in Basra, Iraq, while under fire in her Merlin helicopter.**

time scheme for those who have families, which is evenly taken up by both men and women after being extended to all pilots<sup>12</sup>.

There are even fewer female licensed Air Transport helicopter pilots — just 1.18% of the total<sup>13</sup>. However, more women are employed as maintenance, repair and overhaul engineers (8.2%)<sup>14</sup> but less than 1% of members of the Association of Licensed Aircraft Engineers are female<sup>15</sup>.

#### 3.2 Women in Air Traffic Control

Data provided by NATS shows that women are fairly well represented in the organisation, accounting for 23.83% of the 5,024 strong workforce. Almost half of female staff works in Air Traffic Control, representing almost a quarter of all air traffic controllers, while 107 women work as engineers, representing 2.13% of the total workforce or 8.94% of all NATS engineers<sup>16</sup>.

#### 3.3 Women in the RAF/Army/Navv

Statistics from the Defence Analytical Services and Advice (DASA)<sup>17</sup> show that, of the three services, the Royal Air Force has the highest percentage of female officers as well as the highest number of women employed in other ranks.

	Females	%	Officers	%	Other Ranks	%
Navy	3,560	9.5	710	9.6	2,940	9.5
Army	7,240	7.7	1,480	10.8	5,760	7.1
RAF	5,150	13.0	1,290	13.3	3,860	12.9
Total	16,040	9.3	3,480	11.5	12,560	8.9

**Table 1**

However, a study undertaken by Sqn Ldr Glyn Dean found that although there was plenty of women employed in the RAF, most were working in support jobs rather than as pilots or engineers, the two largest job categories in the service. Only 2% of Squadron Leaders (Flying Branch) are women (20 women in total), 4% of

<sup>6</sup>RAeS Strategic Plan 2009-2013; Society of British Aerospace Companies.

<sup>7</sup>Launching the 21st Century American Aerospace Workforce, Aerospace Industries Association, December 2008.

<sup>8</sup>ETB/Royal Academy of Engineering research.

<sup>9</sup>Airline Personnel Costs 2007 for UK airline operators.

<sup>10</sup>UK Airline Personnel Employed in GB at end of 2007.

<sup>11</sup>CAA data 2005.

<sup>12</sup>British Airways data.

<sup>13</sup>CAA data 2005.

<sup>14</sup>Airline Personnel Costs 2007 for UK airline operators.

<sup>15</sup>ALEA.

<sup>16</sup>NATS data, May 2009.

<sup>17</sup>Source: DASA — January 2009.

Junior Officer Pilots (50 in total), 9% of Junior Officer Navigators (40 in total) and 8% of Engineering Branch (90 in total). But, on the brighter side, the first female Red Arrows pilot, Flt Lt Kirsty Moore, has recently been appointed.

Engineering & Aviation Officer Ranks RAF 2009 <sup>18</sup>	Total	Male	Female	% Female
Pilots	1,300	1,250	50	3.84%
Flying Branch	2,520	2,410	110	4.36%
Engineering	1,130	1,060	90	7.96%

**Table 2**

% of number of females in Service in RAF <sup>19</sup>	Total	Male	Female	% Female
Total Officers	9,660	8,370	1,290	13.35%
Total Ground Trades	29,710	25,850	3,860	12.99%
Total	39,370	34,220	5,150	13.08%

**Table 3**

Although the Royal Air Force did not accept women as pilots until 1991, it has now embarked on a five-year diversity programme to encourage more females to join the service, focusing on a road show — undertaken in conjunction with BAE Systems — which targets pre-teen girls.

#### *Women in the Royal Navy*

As shown in Table 1 there are 3,560 women in the Royal Navy, representing 9.5% of the total. The number of women in the Royal Navy Air Engineering Specialisation is 32 (10%) out of a total of 325, including those under training<sup>20</sup>.

### 3.4 Women in Engineering

Much energy and investment has been made in recent years to encourage more women into engineering in general through initiatives such as the WISE Campaign and the UK Resource Centre for Women in Science, Engineering and Technology (SET). Yet only 13% of engineering undergraduates are women<sup>21</sup> and, of the women who do graduate with a SET first degree, only 27% actually pursue a SET career compared with 54% of men<sup>22</sup>.

Fewer than 6% of engineering professionals are female<sup>23</sup> and only 13% of new Chartered Engineer registrants in 2007 were women<sup>24</sup>, the lowest figure since 1998<sup>25</sup>. A lower proportion of women work in aerospace than engineering in general (11% compared 19%)<sup>26</sup>.

The situation is even worse when considering apprenticeships. Only 2% of apprentice starts in engineering in England and 3% of Advanced Apprentice starts in engineering are female<sup>27</sup>.

<sup>18</sup>Source: DASA Air: RAF Pocket Brief January 2009.

<sup>19</sup>Source: DASA Air: RAF Pocket Brief January 2009.

<sup>20</sup>Data supplied by member of RN Air Engineering Specialisation, May 2009.

<sup>21</sup>HESA 2008, Students in HE Institutions 2006/07.

<sup>22</sup>SET Women, ETB.

<sup>23</sup>Royal Academy of Engineering.

<sup>24</sup>SET Women, ETB.

<sup>25</sup>Engineering Council (ECUK).

<sup>26</sup>Labour Force Survey 2004.

<sup>27</sup>Apprenticeships Data Report 2007/8.



**Rolls-Royce engineer.**

### 3.5 Women in senior management

The problem of too few women working in key job functions within aviation and aerospace is further exacerbated as women progress through senior management towards the boardroom or senior command. Research by the RAeS Advisory Group on Women in Aviation and Aerospace found few women main board directors in UK aviation or aerospace companies. However, there were several female non-executive directors brought in for their expertise in other markets and other disciplines. The company with the highest female board representation is British Airways which has three female non-executive directors — all high-profile women — but none of whom, it is believed, have worked in the industry.

However, several women are, or have been, managers of Britain's leading airports or head of airlines, most notably Janis Kong, former Managing Director of Heathrow Airport; Barbara Cassani, founder and Managing Director of BA's low-cost airline, Go; Chris Browne, Managing Director the UK's third largest airline, Thomson Airlines; and Liz Savage, Managing Director of Monarch scheduled services.

Those who have succeeded in working their way through companies to executive director level usually work in personnel, marketing and PR/communications — the so-called 'velvet ghetto' jobs — or finance. The chances of women engineers or pilots being promoted to director of a company board seem, at this stage, to be remote.

## 4.0 THE CHALLENGES IN ATTRACTING MORE WOMEN INTO THE INDUSTRY

### 4.1 The STEM Agenda

*"By 2017, as many as 2.9m UK jobs will be created in sectors such as engineering, medicine, and in the biological and chemical sciences. We need scientists and engineers to fill these roles."*

Lord Drayson, Minister of State for Science and Innovation, launching the Science: So What? So Everything campaign, January 2009

The debate about how the UK could increase the number of

young people studying STEM subjects and encourage them to choose STEM careers began several decades ago and has intensified as concerns about skills shortages in engineering have concentrated minds on the issue.

The Leitch Review of Skills report in 2006 highlighted the fact that where skills were once a key driver of prosperity and fairness, they are now the key driver<sup>28</sup>. It concluded that achieving world class skills was the key to economic success and social justice in the new global economy. However, an OECD comparison of 30 countries reported that the UK was 17th on low skills, 20th on intermediate skills and 11th on high skills<sup>29</sup>.

A worrying trend is the prediction by the Office for National Statistics that by 2011 only 20% of the workforce will be white, able-bodied men under 45 years old<sup>30</sup>. The Royal Academy of Engineering added its voice to the debate, saying: "This group has been the traditional source of engineers, so in order for the UK to maintain a skilled workforce, the engineering community must attract engineers from different backgrounds."<sup>31</sup> In addition, there will be a 16% decline in the UK annual school-leaver cohort over the next decade<sup>32</sup>. This, coupled with a widening choice of alternative career options, presents further challenges to engineering and technology in an increasingly competitive employment market.

The Women and Work Commission estimated in 2008 that 12 million jobs will change hands as workers leave the labour market over the next decade while there are likely to be a further 1.3 million new jobs<sup>33</sup>, creating considerable pressure on business's workforces.

#### 4.2 The challenges attracting young people into engineering and aerospace

The main challenge facing engineering and aerospace is image and the fact that many young people have little understanding of what engineers actually do<sup>34</sup>. Although the aviation and aerospace industries have changed dramatically over recent decades, the image of the engineer continues to be that of a white man with overalls, a tool box and an oily rag. Yet the role of today's engineers encompasses a wide range of different jobs and skills from design, software and systems to hardware and production. Despite the image the public has of engineers, the majority of adults agreed that engineering is essential for all human development and that it is a well-respected profession<sup>35</sup>.

Ironically, research also shows that the more developed a nation, the less relevant engineering and technology careers are seen to be, which partly explains the relative perceived unattractiveness of engineering for many young people<sup>36</sup>.

In its *Engineering UK 2008* report, the Engineering and Technology Board found that just over half of engineering graduates subsequently chose to enter the profession. In addition, this report also noted a significant shortage of technician-level engineers in more junior occupational groups — the bedrock upon which engineering depends. It also found that although more women were joining the sector, the rate of



**Jenny Body, RAeS Council member, Engineer and Head of Business Development at Airbus UK, whose role includes lobbying government for support for technological development.**

increase is slow with the proportion of female registered engineers remaining in the low single figures. The gender imbalance at Further Education level is even more pronounced than in Higher Education.

However, despite the current recession, the ETB expects that demand for skilled engineers across a range of disciplines will remain high.

The Royal Academy of Engineering noted in its report, *Educating Engineers for the 21st Century*<sup>37</sup>, that while total university admissions rose by 40% from 1994 to 2004, the annual number of students starting engineering degrees in that period remained static.

On a more positive note, aerospace companies have recognised the problems and the need to put resources and effort into Strategic Workforce Planning, according to skills expert Ged Leahy, former Director of Strategic Workforce and Skills Planning for Rolls-Royce. The Society of British Aerospace Companies is also tackling the problem through the work of its People Management Board and its Skills Roadmapping exercise.

<sup>37</sup>*Educating Engineers for the 21st Century*, The Royal Academy of Engineering, 2007.

<sup>28</sup>Leitch Review of Skills report, December 2006.

<sup>29</sup>*Education at a Glance*, OECD 2006.

<sup>30</sup>Quarterly Labour Force Survey, Office for National Statistics, Jan-Dec 2007.

<sup>31</sup>*Inspiring Women Engineers*, Royal Academy of Engineering 2009.

<sup>32</sup>*Engineering UK 2008*, ETB.

<sup>33</sup>*Shaping a Fairer Future*, Women and Work Commission, 2008.

<sup>34</sup>ETB/Royal Academy of Engineering research.

<sup>35</sup>ETB/Royal Academy of Engineering research.

<sup>36</sup>Relevance of Science Education (ROSE) research.





**Captain Lynn Barton, the first woman employed to fly for British Airways and its most senior female pilot. Lynn's 747 was the first aircraft to arrive at Heathrow's new Terminal 5 on its opening day.**

### 4.3 The challenges attracting young people into civil air transport

Where the image of engineers has tended to be a negative one, that of pilots has been more akin to the dashing image portrayed in the film *Catch Me if You Can*. However, since the terrorist attacks of 9/11, pilots have been locked into their cockpits and are no longer as visible to the public, in particular to the young. Advances in automation technology have also cultivated the idea that pilots are little more than button-pushers doing a mundane job. As a result, only 8% of young people aged 16-24 ranked pilots as the most respected professionals, according to a Mori poll, commissioned by BALPA.

The fact that there is currently a glut of pilots, as a result of the recession and pilots being able to work until 65, has led to fewer people signing up for pilot training. The cost of flying training can be prohibitively high — as much as £100,000 if type-rating training is included. Parents are finding it harder to fund this level of investment and banks are less willing to lend in the current monetary climate<sup>38</sup>.

<sup>38</sup>BALPA (British Air Line Pilots Association).

To make matters worse, there is almost no airline-sponsored flying training and there is huge competition for the few places that are available. There is also a negative perception of aviation as a polluter, through both emissions and noise, and a view from some members of the public that flying is a dangerous occupation, particularly for a girl.

The shortage of visible female role models, the unsocial hours and stop-overs on long-haul flights are also seen as not being compatible with family life, particularly for women. The industry also suffered from the controversy over part-time working for mothers who are pilots.

### 4.4 Demographic and social changes

As SEMTA, the Sector Skills Council for Science, Engineering and Manufacturing Technologies, points out in its Diversity document: "Demographic and social changes will mean that science, engineering, and manufacturing technologies are increasingly having to look beyond their usual recruitment sources in future."

The main demographic and social changes impacting on business's ability to recruit and retain a skilled workforce are:

- Fewer younger people entering the workforce. The percentage of the population aged under 16 has been declining since 1995<sup>39</sup>
- Rapid growth in the over 50s workforce e.g. Rolls-Royce found that 50% of its works staff were 45 plus
- Whatever growth there is in the UK workforce is coming from women and ethnic minorities<sup>40</sup>

Another factor affecting businesses is the fact that professional women are leaving childbearing until later, so more expertise, experience and skills are lost to companies if they choose not to return to their employer. One of the reasons leading to many young mothers opting not to return to work is the British culture of long working hours, which, ironically, has not made Britain more efficient than other European countries. Apart from discouraging women with children from returning to their former employer, working long hours can have damaging effects on individuals' health and family life, leading to family breakdown, nervous breakdown, poor staff retention, alcoholism, dementia etc.

It is clear that work-life balance is becoming a critical issue in employee retention with four out of five employees stating that work-life balance considerations play a crucial role in deciding whether to stay with or leave their employer while 87% of executive candidates reject a job due to work-life balance considerations<sup>41</sup>.

Research on the attitudes of today's young people, known as Generation X and Generation Y, shows that one of the big drivers is personal time — they do not want to work long hours like their parents, the so-called 'baby boomers', and, because they are less materialistic, they don't need to.

The demands from today's parents for a better balance between work and home life take on even greater significance when both parents are in employment. The trend towards 'dual careers' is one that is already having an impact on businesses across all industries<sup>42</sup>.

<sup>39</sup>Office for National Statistics.

<sup>40</sup>Ged Leahy, former Director of Strategic Workforce and Skills Planning for Rolls-Royce.

<sup>41</sup>Association of Executive Search Consultants' survey of 1,311 senior executives world-wide, 2006.

<sup>42</sup>*Women in Science and Technology: the Business Perspective*, European Commission Directorate General for Research Science and Society 2006.

#### 4.5 The difficulties attracting women and the 'leaking pipe'

In the light of these social and demographic changes, attracting more women into the industry, becoming more skilled at retaining them and encouraging them to return after career breaks are important strategies to offset skills shortages and retain valuable expertise and experience.

But the difficulties encountered by industry in its efforts to attract and retain women can be attributed to what is known by experts as the 'leaking pipe', which begins from an early age and continues throughout education and into careers.

Research by Siemens in Germany identified a serious lack of science and technology related teaching materials specifically for the pre-school age group, leading the company to launch its Generation 21 initiative, which has now been adopted by Siemens UK<sup>43</sup>. Such projects introduce girls and boys early on to SET ideas.

It is interesting to note that, as judged by the numbers achieving GCSE awards in STEM<sup>44</sup> subjects, girls reach 16 on a fairly even footing with boys<sup>45</sup>. But even though 62% of girls achieved GCSE grade A\*-C in Design & Technology subjects (2002), they only represented 11% of students in Engineering, Manufacture and Technology (EMT) in Further Education, a figure that increased slightly to 14% in 2004/05<sup>46</sup>. By A-level, only 22% of girls study A-level physics, traditionally a requirement for engineering<sup>47</sup>.

A report by the European Commission on Women in Science and Technology noted that sometimes as many as two thirds of female students with a good track record and strong interest in maths and physics are lost between high school and college<sup>48</sup>. For example, the Institute of Physics highlights the fact that approximately 20% of physics undergraduates in the UK are women compared to 33% in France and 37% in Turkey<sup>49</sup>.

But the most disturbing statistic comes from the UKRC for Women in SET which estimates that 90% of women qualified scientists and engineers are not working in SET sectors<sup>50</sup>.

The issue of employee retention and attrition also contributes to the leaking pipe. An overwhelmingly male environment can lead to women leaving the industry altogether for a more female friendly workplace or transferring from engineering into 'softer' jobs such as PR, Marketing and Human Resources.

Research in the USA shows that only 6% of women leave their job because it is too demanding. Yet, while 93% of professional women want to return to their careers, only 5% want to rejoin the companies they left<sup>51</sup>.

There is no doubt that discrimination — overt and covert — plays a part in women's general lack of progression. The latest research into the subject attracted newspaper headlines proclaiming that most women do not even reach the glass ceiling, but slither down glass walls<sup>52</sup>.



**Dr Sima Adhya currently works for Siemens advising satellite insurers on the risk they are taking on.**

Another piece of on-going research by Exeter University into 'The Glass Cliff' extends the metaphor of the glass ceiling to describe the phenomenon whereby individuals belonging to particular groups, such as women, are more likely to be found in leadership positions that are associated with a greater risk of failure and criticism<sup>53</sup>.

Unequal pay is another issue of concern with women in the UK experiencing one of the worst pay gaps in the EU. The Government's latest estimates show that the average pay gap experienced by all women is 23%<sup>54</sup>. The gap is wider in the private sector than in the public (a full-time gap of 21.7% as compared to 13.8%) and far fewer private than public sector employers are taking action to close the gender pay gap by carrying out equal pay reviews (23% as compared to 43%)<sup>55</sup>. However, under the new Equality Bill, it will be compulsory by 2013 for companies employing more than 250 people to carry out gender pay audits.

Unfortunately, neither the Equal Pay Act 1970 nor the Sex Discrimination Act 1975 have been wholly effective at preventing discrimination.

It is also true that even when managers want to mentor talented young women in their careers, they are often reluctant to do so in case the office rumour machine begins working over-time with stories of an affair.

Sometimes, for the right reasons, managers protect young women from difficult clients or tough jobs, thereby allowing young men to gain more experience and be better prepared for the rough and tumble of senior management roles.

It can also be argued that a shortage of visible role models discourages many young women from considering aviation and aerospace as a worthwhile career. But it must also be acknowledged that the industry is simply not of any interest to many young women, although how much of this is purely down to ignorance about the opportunities available is difficult to assess.

<sup>43</sup>[www.generation21.siemens.uk](http://www.generation21.siemens.uk).

<sup>44</sup>Science, Technology, Engineering and Mathematics.

<sup>45</sup>SET Women, ETB.

<sup>46</sup>SET Women, ETB.

<sup>47</sup>Joint Council, AQA 2007/QCA.

<sup>48</sup>*Women in Science and Technology: the Business Perspective*, European Commission Directorate General for Research Science and Society 2006.

<sup>49</sup>Institute of Physics website.

<sup>50</sup>Annette Williams, Director, UKRC for Women in SET, March 2009.

<sup>51</sup>*Off-Ramps and On-Ramps*, Harvard Business Review, March 2005.

<sup>52</sup>Survey by management consultancy DDI, May 2009.

<sup>53</sup><http://psy.ex.ac.uk/seorg/glasscliff/>.

<sup>54</sup>The Facts, The Fawcett Society.

<sup>55</sup>Equalities and Human Rights Commission.



**Barbara Harmer, left, the only British woman to pilot Concorde and Flt Lt Jo Salter, the first British woman to fly a jet fighter as a combat pilot.**

#### 4.6 The benefits women bring: the Business Case

Attracting more women into business has many more advantages than simply addressing the issue of skills shortages. The UK Commission for Employment and Skills has estimated that unleashing women's potential in the workplace could add some £23bn to the economy<sup>56</sup>.

Other research shows that diverse teams produce better results: the worst performing teams are men only, the second worst are women only, while the best performing teams are 50% men and 50% women<sup>57</sup>.

As more research is conducted into the benefits of employing women, the Business Case continues to strengthen. American company Catalyst found that businesses with the highest representation of women on their top management teams delivered 35.1% higher return on equity and 34% higher total return to shareholders than companies with the lowest representation<sup>58</sup>.

The Norwegian government was so convinced of the importance of having more women as company directors that it introduced legislation in January 2008 forcing businesses to ensure that 40% of their board directors were female. Spain has also introduced legislation, giving businesses ten years to comply and Belgium, France and The Netherlands are set to follow<sup>59</sup>. It may, therefore, be a matter of time before the UK government also decides to legislate if industry does not show more willingness to appoint female board directors.

A further concern for businesses is equality legislation such as the Gender Equality Duty. The Engineering Employers Federation (EEF) found that discrimination and equal opportunities now rank fourth in their top ten 'Burning Issues' barometer<sup>60</sup>. As the annual

<sup>56</sup>Women & Work Sector Pathways Initiative, UK Commission for Employment and Skills March 2009.

<sup>57</sup>London Business School 2008.

<sup>58</sup>The Bottom Line: Connecting Corporate Performance and Gender Diversity, Catalyst USA 2004.

<sup>59</sup>BBC Radio 4 In Business programme.

<sup>60</sup>UKRC for Women in SET website.

spend of the public sector on procuring goods and services amounts to £100bn, the Gender Equality Duty is particularly important as it relates to procurement. All companies that supply goods and services to the public sector will have to show that they don't discriminate against women<sup>61</sup>.

There are three further arguments in favour of employing more women:

- The under-representation of women in SET threatens the UK's global competitiveness — an issue for society, for organisations, for employers and for the individual<sup>62</sup>
- Employing a more diverse workforce helps improve a company's image and credibility<sup>63</sup>
- Employers who sit on the sidelines regarding diversity will quickly become less attractive to existing and prospective employees<sup>64</sup>

*"In the competitive world of the 21st century, the UK — with its science and technology based economy — cannot afford to continue to trash 50% of its intellectual capacity."*

Sir Peter Williams, Chair of the first Athena SWAN Charter Assessment Panel

## 5.0 CONCLUSIONS

### 5.1 The under-representation of women

The main conclusion of this report is that women are significantly under-represented in many of the key sectors of the aviation and aerospace industry, a situation that needs to be addressed to provide a more representative and creative workforce. In addition, it is clear that major challenges exist with respect to attracting women into the sector.

However, the drivers for increasing the numbers of women in the industry — plugging skills shortages and gaps, increasing diversity and regulatory proposals — are gaining momentum, presenting a clear business case for companies and the Society to proactively address this issue. It is also clear that, despite legislation dating back to 1970, many good initiatives, many detailed reports and much debate, the issue is proving a hard nut to crack.

Skills shortages are clearly a critical issue, particularly for the aerospace sector. Driving this shortage are the demographic and social changes that affect companies' abilities to attract the right calibre workforce in a fast-changing, technologically-driven industry.

While many believe employing more women would help address the issue of skills shortages, the shortage of women in almost all areas of aviation and aerospace is not just an issue of recruitment, critical though that is. Other factors include industry's ability to retain women, to help them progress through to senior management and on to director level, and how successful, or otherwise, companies are at helping women to return after career breaks. If industry wishes to attract and retain women in its workforce, it needs to address the issues of discrimination and its long-hours culture, which also affect men as well as women's ability to return to work after having a family.

<sup>61</sup>Office of Government and Commerce.

<sup>62</sup>Women in Science, Engineering and Technology report by Baroness Greenfield 2002.

<sup>63</sup>Women in Science and Technology: the Business Perspective, European Commission Directorate General for Research Science and Society 2006.

<sup>64</sup>Sex discrimination, sexual orientation, gender reassignment and employment, Chartered Institute of Personnel and Development.

The rewards for businesses that succeed in encouraging more women into aviation and aerospace are underlined in the Business Case, which clearly spells out the benefits women bring to industry, not least the fact that the more women there are at senior level, the more successful the company.

## 5.2 The attractiveness of the aviation and aerospace industry

The earlier sections, which outline the key characteristics of the aviation and aerospace sectors, paint a picture of a vibrant industry that is a major contributor to the UK economy and a major employer of people, although the current recession is undeniably taking its toll. However, from the point of view of potential employees, the fact that, in a stable economy, these are growing, cutting-edge industries with a wide variety of interesting and challenging jobs emphasises the attractiveness of the industry. Both aviation and aerospace can boast that many of the jobs on offer are high-quality, highly skilled and well paid.

## 5.3 The role of the Royal Aeronautical Society

During the past decade, the Royal Aeronautical Society has made a substantial investment in helping to promote careers in aviation and aerospace through its Careers Centre and through its recent incorporation of the Launchpad for Learning Board to oversee these activities.

Excellent examples of the many initiatives undertaken include its new *Careers Flightpath* magazine, careers literature, the Build-a-Plane Challenge and Cool Aeronautics targeting primary school children aged 9-10. In addition, the Careers Centre provides a unique one-to-one careers advice service for members wanting to advance their career or find employment, as well as launching the Women in Aviation and Aerospace Conference.

The Young Members Board also plays its part in promoting the industry to young people through its attendance at air shows, a competition for graduates and student members, its annual conference and numerous visits to universities.

## 5.4 The goals of the Women in Aviation and Aerospace Committee

The Royal Aeronautical Society's decision to set up an Advisory Group to look into the issue of women working in the industry is a clear acknowledgement that the aviation and aerospace sectors are aware that the skills and expertise of women are being under-utilised in the most important jobs.

The Women in Aviation and Aerospace Committee, which was established following the presentation of the Advisory Group's report, has one major objective: to encourage more young women to consider aviation and aerospace as a challenging and interesting career and to persuade more women to join and play an active role in the Society and its many activities.

The committee is already working with a number of leading organisations whose job it is to promote STEM careers to young women and young people in general. Part of its role will be to publicise the Business Case for why having more women at senior



**Flt Lt Charlotte Fenn, the RAF engineer responsible for maintaining the aircraft flown by the Red Arrows' leader, Red 1.**

levels in engineering and aviation is good for industry, including helping to address the issue of skills shortages.

The committee is also addressing the problem of too few role models visible to inspire young women by sourcing and creating a database of women who are willing to speak at conferences, to the media, to schools, and to mentor and support other women to help them achieve their career ambitions.

The committee is already helping to organise the third RAeS Women in Aviation and Aerospace Conference (16 October), working on proposals for in-depth research into women working in aviation and aerospace and discussing ideas to celebrate the centenary of British women licensed pilots.

Its recommendation that female members should be encouraged to play a more active role in the Society's organisation and activities is already being fulfilled with several committee members becoming *ex officio* members of the Society's Boards.

The publication of this report and the widening of the debate on the role of women in aviation and aerospace sets the bar high and gives a clear indication of the committee's enthusiasm for its key tasks and its determination to achieve its goals.

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