

REPORT OF THE INTER-DEPARTMENTAL WORKING GROUP ON THE TRAINING OF AIRCRAFT MAINTENANCE ENGINEERS

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I. Introduction

1. In 1999, the House of Commons Environment, Transport and Regional Affairs Committee (ETRAC) held an inquiry into aviation safety. Amongst the wide range of evidence it considered was the Royal Aeronautical Society's (RAeS) report *The Challenge of the Future in Aircraft Maintenance Engineering* which identified a potential shortage of suitably qualified aircraft engineers.
2. In its own evidence to the inquiry, the then Department of the Environment, Transport and the Regions (DETR) noted that the training of engineers was primarily a matter for the aviation industry itself. However, consistent with the Government's Competitiveness White Paper *Our Competitive Future: Building the Knowledge Driven Economy* (published in December 1998) which highlighted the need for close working relationships to promote workforce development, DETR gave a commitment to establish an inter-departmental working group to consider the potential role of Government more closely.
3. The inter-departmental working group met for the first time on 10 August 1999 and concluded its work with the production of this report. The group's membership is listed in **Annex A**. Its agreed terms of reference are set out in **Annex B**.
4. This report is addressed to both Ministers and the aviation industry at large. It examines the structure of the workforce and the training arrangements and assesses the steps being taken to address present and future shortages of maintenance engineers. There have been a number of significant developments since the group began its work - new arrangements for funding training generally; the impact of 11 September 2001 on the aviation industry; the establishment of the Aero Skills Alliance (ASA). The full effect of these changes cannot yet be assessed. Nevertheless, the Group considers that it is timely now to conclude its work and issue this report¹. The aircraft maintenance industry should be considered in wider contexts: externally it provides an opportunity for UK industry in European and world markets; internally there are regional economic implications, with opportunities to match skills and demand to encourage local and regional growth. The group hopes that this report will provide useful background to the development of wider Government policies, in particular, on airline and airport capacity issues.

¹ The report was finalised in March 2003. Some references may now be out of date. In particular, Commission regulations have been published which introduce new training requirements for maintenance engineers, with the relevant standards coming into force over a period of some years. The new requirements are, however, based very closely on those in JARs 66, 145 and 147 as described in this report. Details can be found in Commission Regulations (EC) No. 2042/2003 of 20 November 2003 and No. 1702/2003 of 24 September 2003. Also, the European Aviation Safety Agency took up its duties on 28 September 2003.

II. Summary of conclusions and recommendations

5. The working group agreed that before considering what, if any, action the Government might take, it was necessary first to establish more clearly the scale of the problem and the action already being taken by the aviation industry. On the recommendation of the group, the Aviation Training Association (ATA) and the Engineering and Marine Training Authority (EMTA) commissioned a comprehensive labour market study of aircraft maintenance engineers in the UK civil air transport industry. The results of the survey were published in July 2001, before the terrorist attacks in the United States, and reflected the position within the industry as it stood at the beginning of that year.
6. The results of the study indicated a significant and escalating shortage of suitably qualified engineers in both aircraft maintenance and component overhaul. The group agreed that it was important to maintain a database of the numbers of maintenance engineers in the sector and to build on the results of the study so as to provide a firm base upon which to address future training requirements. It is recommended that this work should be carried out by the ASA.
7. The working group also sought to establish whether other countries were experiencing similar problems to the UK. Accordingly, the civil aviation authorities in Denmark, France, Germany, Ireland, Italy, Netherlands, Spain and Sweden were contacted and asked to what extent their respective aviation industries faced difficulties in recruiting and retaining suitably qualified maintenance engineering staff. In addition information was sought on what, if any, action was being taken at governmental level to deal with these problems. Responses were mixed. Of those countries responding, Ireland and Italy appeared to face similar problems to the UK, while Denmark felt that although there were few problems at the present time, changes to European regulatory requirements could place increasing pressure on the training system, which in turn could lead to shortages in the future. France and Sweden did not admit to any problems in recruiting and retaining sufficient numbers of maintenance engineers. Indeed Sweden indicated that there was likely to be a surplus of trained engineers in Sweden in the future. None of the countries that responded had specific policies for encouraging the training of aircraft maintenance engineers.
8. The working group agreed that primary responsibility for ensuring that there were sufficient trained aircraft maintenance engineers to meet the needs of the aviation industry rests with industry itself. The group identified various steps being taken by industry.
9. In the preparation of this report the group has taken account of the Civil Aviation Authority's (CAA) effective regulation of the industry. Regulatory oversight ought to prevent a shortage of aircraft maintenance engineers jeopardizing safety. However should this not be the case, the CAA would, if required, take steps to cap the service capacity levels of maintenance organisations. Such action could adversely affect the continued successful growth of the UK aviation industry. It is therefore in the industry's own commercial interest to invest in the training and recruitment of suitably qualified maintenance engineers. The group considers

that if the shortage continues to develop unchecked, some detriment to safety in the longer term cannot be ruled out. An increasing shortfall implies growing pressure on human resources, the long-term effects of which are hard to predict. The group therefore concludes that although the main responsibility lies with the industry, the Government should offer support and advice as appropriate to facilitate industry initiatives.

10. Major developments in Government policies on skills training took place during the group's lifetime (see chapter VI). The group concluded that it was most important that industry made the best use of the opportunities presented by these changes and so focused on identifying ways in which Government Departments might help. The Group did not identify a need for additional Government measures specific to the aviation industry.

11. The following specific conclusions are drawn:

- The group welcomes the efforts being made within the industry to try to address the problem and urges those not currently taking action, to do so (paragraph 59);
- The group welcomes the establishment of the ASA (paragraph 32);
- The group recommends that the ASA and CAA work together to deliver a policy document on aircraft maintenance engineer training leading to the production of an appropriate Workforce Development Plan. This will in turn create a competence framework for future academic and vocational training (paragraphs 33 and 65);
- The group also welcomes the initiatives by Kingston University, Edexcel and City & Guilds to revise their respective qualifications to align with the syllabus of the Joint Aviation Authorities (JAA) Joint Aviation Requirement (JAR) 66. This should give students and employers a wider choice of publicly funded qualifications appropriate to aircraft maintenance (paragraph 56);
- The group acknowledges the various initiatives undertaken by the Association of Licensed Aircraft Engineers (ALAE) to promote the image of the industry and to provide guidance on training and career opportunities. In particular, the group welcomes the development, by the ALAE, of a personal logbook for licensed engineers, which records the experience, training and qualifications of the holder. This is particularly helpful for aircraft maintenance companies seeking to take on contract engineers (paragraph 63);
- The group notes the new arrangements that are being put in place for the funding of training generally. In particular, the group welcomes the decision of the Learning and Skills Council (LSC) to support a review of the training provision for aircraft maintenance engineers that may lead to funding of more industry specific qualifications (paragraph 66);
- Employers need to be clear what funding is, and will be, available to assist the training of aircraft maintenance engineers. The ASA, in conjunction with the

LSCs should seek to develop clear guidance on the funding opportunities available;

- The group notes industry's calls for the re-introduction of some form of statutory training arrangements. The group also notes, however, that Government policy favours voluntary, employer-led sector arrangements. Given the influential position of the CAA (as the industry regulator), the group recommends that the CAA and the ASA, with the support and advice from DfES, should develop appropriate proposals for a suitably focused and funded body as a basis for consultation with the industry. It is important that the ASA works constructively with whatever body establishes the Sector Skills Council (SSC) arrangements covering the sector, to establish itself as the appropriate body within the aviation industry to determine the education and training needs of maintenance engineers. (paragraphs 69 to 73);
- The group recommends that the ASA might be suitable for consideration as the focal point for training co-ordination in the aircraft maintenance engineering sector (paragraph 74);
- The group concludes that VAT is not an issue as far as the training of aircraft maintenance engineers is concerned (paragraph 76);
- The group recognises that aircraft maintenance engineering has a low profile as a potential career and that links between employers and potential employees need to be fostered. The group supports the development of careers promotional material by the RAeS. (paragraphs 62 and 78);
- The group considers that the infrastructure for training aircraft maintenance engineers could be significantly improved by the establishment of further Centres of Excellence at strategically located regional airports. The group therefore recommends an audit of current provision against the predicted demands established by the ATA labour market survey. This could be an initiative led by the ASA and supported by the LSC, involving the higher education and further education provider affinity groups (the Association of Aerospace Universities and the Association of Colleges of Aerospace Technology) (paragraph 81).

III. Background

What aircraft maintenance engineers do

12. Aircraft maintenance engineers ensure that an aircraft is fit to make the flight intended. This involves regular inspection, maintenance and servicing. Most aircraft maintenance engineers work in civil aviation and are employed by airlines or independent specialist aircraft maintenance companies. However, an increasing number of engineers are employed on a contract rather than a permanent basis. Aircraft maintenance engineers usually specialise in either mechanical or avionics engineering.

Mechanical engineers are concerned with the servicing and overhaul of engines, airframes, systems and components.

Avionics engineers maintain a variety of instruments, electrical/electronic equipment, automatic pilot systems, radar and radio navigation/communications systems.

13. Both kinds of engineers are involved in a variety of maintenance operations, which can be divided into two categories;

- Base maintenance is carried out in a hangar and includes regular checks after the aircraft has completed a specified number of flying hours or landings, systems testing and fault diagnosis, modifications, rectification and repair of aircraft, components and systems.
- Line maintenance is usually carried out on the airfield during turnaround, involving minor maintenance tasks and rectification of any reported defects listed in the technical log.

Why maintenance matters

14. There is a close link between standards of maintenance and safety. The International Civil Aviation Organisation has established minimum standards of airworthiness and operational safety for aircraft operating on international routes. Individual States however are free to apply higher standards to aircraft on their own national registers, but these standards do not apply to foreign-registered aircraft operating in their territory. In order to harmonise safety standards within Europe to a uniformly high level, the JAA, a body established under the auspices of the European Civil Aviation Conference and comprised of the civil aviation authorities of 37 European States, have agreed to co-operate in developing and implementing common safety standards and procedures. The JAA publishes its own safety requirements, known as Joint Aviation Requirements (JARs), which JAA member States undertake to implement. The JARs are not legally binding, although JAA members have implemented many in national law. Some JARs have been incorporated into EC law and must be implemented by EC Member States. For maintenance the key JARs are: JAR 66 (certifying staff), JAR 145 (approved maintenance organisations) and JAR 147 (maintenance training schools).

15. In order to strengthen the effective and efficient adoption of common safety rules and certification decisions within Europe, the UK Government has supported the establishment of a new European Aviation Safety Agency (EASA) to replace the existing arrangements based on the JAA. EASA will grant certificates attesting the conformity of types of aeronautical products with the essential requirements and will be charged with drawing up technical codes to guide industry. It will help the European Commission develop proposals for basic principles and essential requirements in other areas. The Agency will also monitor the implementation of regulations in Member States, in particular where Member States, rather than the Agency, continue to issue certificates (for example, Certificates of Airworthiness for individual aircraft), licences and other approvals.

Why aviation is different from other sectors of UK industry

16. The key feature making aviation different from other sectors of UK industry is safety criticality. It is true that safety is also important for other transport sectors, but the failure of a key system during aircraft operation is more likely to lead to catastrophic results. It is widely accepted that human error rather than technical failure is the most likely cause of future accidents, hence the concerns that an unchecked shortage of engineers could see those who are employed expected to work longer hours to compensate, with the possibility of increased commercial pressure to see aircraft depart on schedule, and the risk of maintenance errors.

17. The UK is the largest aviation country in the current JAA system: UK operators account for around one third of all flight operations. The UK also has both the largest number of JAR 145 maintenance organisations (over 500²) and of aircraft operators (just over 200). It is a huge industry, with established high safety standards, but maintaining and improving on the past safety record could be difficult if trained and qualified maintenance personnel are in short supply. The success of the UK aviation industry has been built upon an excellent safety record. Any drop in standards could be detrimental to the success of the industry and hence to the UK economy as a whole, to which the aviation sector is a significant contributor.

Why aviation is important to the UK economy

18. The aviation industry directly employs over 180,000 people in the UK and, in addition, indirectly supports up to three times as many jobs. Many of these are high quality jobs, highly skilled and well paid. Aviation itself is a high productivity industry and it adds to the productivity of the wider UK economy. Value-added per employee in airlines in 1998 was nearly £70,000 at 1995 prices and productivity in the air transport supporting activities almost £80,000, in comparison with the national average of £28,000. The UK attracts a large and growing number of tourists from overseas, many of them travelling by air. Inward tourism is worth about £13 billion to the UK each year, 1.5% of gross domestic product. This is predicted to rise to 2.1% of GDP by 2015.

² As a comparison, France has the second largest maintenance industry, with 383 JAR 145 organizations and Germany is third with 327 (as of January 2000).

19. Aviation's most important contribution to economic growth, however, is its provision of transport infrastructure on which many other parts of the economy depend. The UK has traditionally been one of the world's leading international trading nations, and continuing growth in international trade is likely to be more important in the UK than in many other countries, given the UK's geographical position in relation to mainland Europe. In the 21st century, a lot of our exports are high value, low-weight goods that are transported by air. We also gain nearly 8% of our national income from exports of services, not least financial and consultancy services – aviation's contribution in 2000 was worth £7.4 billion. Transport infrastructure may encourage successful innovation, the formation of clusters of firms and stimulate technology transfer through foreign investment, particularly benefiting areas surrounding airports³. The Oxford Economic Forecasting Report was primarily focused on commercial aviation but it also noted the contribution of non-commercial aviation, which accounted for around 45 per cent of total movements at reporting UK airports in 1998.
20. Any analysis of the aviation industry would not be complete without a consideration of the consequences of the events of 11 September 2001. Prior to the terrorist attacks Government air traffic forecasts had predicted a 4.25% annual growth rate in air traffic at UK airports between 1998 and 2020. These predictions looked at demand over 30 years, a sufficiently long period of time to allow for fluctuations in demand caused by major global events, such as the attacks in the United States, and the usual cycles of the global economy. The events of 11 September have had a major impact on the global aviation industry and it is still not possible to be entirely clear what the long-term effects might be. However, indications are that airlines are beginning to recover and it is anticipated that demand for maintenance, overhaul and repair of aircraft will in time mirror this recovery.
21. One sector of the aviation industry that has continued to expand despite the events of 11 September is the "low cost" or budget airline. Many of Europe's major low cost airlines are based or operate from bases in the UK. This leaves the UK ideally placed, geographically, to challenge for a significant share of the growing maintenance, repair and overhaul market for the narrow body and regional jet aircraft operated by these carriers, provided that the necessary support and training infrastructure is in place.

Licensing of aircraft maintenance engineers

22. Not all aircraft maintenance engineers are licensed, although engineers who issue certificates of release to service (necessary before a commercial aircraft can fly after overhaul, repair, modification, maintenance or inspection of the aircraft or its equipment), must be licensed. Licences for engineers working on large (over 5,700 kg) commercial aircraft are now issued in accordance with JAR 66, which establishes a harmonised European standard. The General Aviation sector (aircraft not used for work involving the transport of passengers or cargo for remuneration or specialised aerial services such as surveying, aerial photography, etc) is not covered by JAR 66, although there are plans to develop

³ data taken from *The Contribution of the Aviation Industry to the UK Economy* - Oxford Economic Forecasting Report, November 1999

appropriate JAA/EASA requirements for this sector in due course. In the meantime, licensing of engineers working in General Aviation will continue according to the well-established UK national system. Further details of UK licensing requirements are set out in **Annex D**.

Training requirements for aircraft maintenance engineers

23. Aircraft maintenance personnel, in general, require three types of training, Basic Training, Advanced Training and Specialised or Specific Training.

- Basic training is the first step to becoming an aircraft mechanic. There are several training schemes ranging from national vocational training to international standardised training.
- Advanced training is dedicated as lead-on training. It is focused on the aircraft type to be handled in the future and the training programme involves significant practical tasks on the aircraft type in question.
- Specialised training is meant as a qualification for very specialised tasks such as composite repair, special material treatment or boroscoping. Only a few specialists amongst the maintenance staff require this type of training.

24. The relevant regulations in maintenance training are JAR 66 (Certifying Staff Maintenance), JAR 145 (Maintenance Organisations) and JAR 147 (Approved Maintenance Training/Examination). The basic requirement for training aircraft maintenance engineers is found in JAR 145, which is a requirement to approve maintenance organisations to maintain any aircraft and components used for commercial air transport. JAR 145 is also concerned about training standards and the training of all personnel involved in the maintenance process but specifies in detail only that which is required for certifying staff (licensed aircraft maintenance engineers). Further details of JAR 145 can be found in **Annex E**.

25. The issue of training standards for unlicensed mechanics has been addressed by the ATA (see below) in a variety of ways, including the award of National Vocational Qualifications (NVQs). The training standards for unlicensed maintenance engineers are explained in greater detail in **Annex F**

Training provision

26. JAR 147 prescribes the requirements to be met by organisations seeking approval to conduct approved training for the examination of certifying staff as specified in JAR 66. Further details of JAR 147 can also be found in **Annex E**.

27. Basic practical skills training is provided off-the-job in colleges and training centres and on-the-job by aircraft maintenance organisations. Aircraft Type-related training is provided by aircraft and equipment manufacturers either directly or through maintenance trainers who have been trained by the manufacturer.

28. Apprenticeships and other formal training schemes are provided by some larger companies; although the numbers under training are few compared with 20 years

ago. The General Aviation sector is not resourced to provide or fund much formal training, so relies on experiential learning. Apprenticeships and other experiential learning schemes often fall short of achieving the knowledge levels required for licence issue. This may reflect a lack of commitment within companies to provide appropriate instruction or the mismatch between what is delivered and what is needed.

The role of the Aviation Training Association/Aero Skills Alliance

29. The ATA was established in 1982 as a voluntary membership body to replace the statutory Air Transport & Travel Industry Training Board. Its principal objectives have been to make better provision for the vocational educational and training of persons employed or seeking to be employed in the aviation industry, and to advance the education of the public in relation to aviation industry safety issues. The ATA at first concentrated on issues initiated by the industry, but subsequently functioned as a competence standards setting body and as an awarding body for NVQs and Scottish Vocational Qualifications (SVQs) for a wide range of occupations within the industry. In response to Government initiatives, it developed Advanced and Foundation Modern Apprenticeship frameworks, based on the NVQs/SVQs.
30. Lack of resources to continue the administrative demands of the National Qualifications Framework, together with employers' frustration with the system gradually led to a fall off of industry support for the ATA. As a result the ATA was unable to bid for National Training Organisation (NTO) status in 1997. Without NTO status, the ATA was unable to secure the DfES project funding that it had previously enjoyed.
31. To maintain its national presence in relation to its airline and airport operational interests, the ATA became a member of the Transport Skills Alliance (comprising the NTOs covering air, rail, road passenger transport, road haulage, merchant navy and ports). It also affiliated to EMTA, the NTO for engineering (which embraces the aerospace manufacturing sector), predominantly to protect its aircraft maintenance interests.
32. Responding to recommendations contained in a CAA report on the work of the JAR 145 Quality Assurance Review Team (CAA Paper 97011, [1997]) and the CAA Safety Regulation Group's "Vision on Training" paper [1999], the ATA has now established the Aero Skills Alliance (ASA) to take forward its co-ordinating role in relation to aircraft maintenance engineering. The ASA has been formed from a collection of affinity groups with an interest in the education and training of aircraft maintenance engineers:
 - The British Helicopter Advisory Board (BHAB)
 - European Independent Maintenance Group (EIMG)
 - Federation of Aerospace Support Services (FASS)
 - General Aviation Manufacturers and Traders Association (GAMTA)
 - The Society of British Aerospace Companies (SBAC)
 - UK Operators Technical Group (UKOTG)
 - AMICUS – AEEU (Amalgamated Engineering and Electrical Union)

- The Royal Aeronautical Society (RAeS)

plus

- The Armed Services (currently represented by the RAF).

33. The ASA will be instrumental in developing “Workforce Development Plans”, alongside the CAA, to structure the future education and training of aircraft maintenance engineers to industry skills requirements, within an appropriate Sector Skills Council.

IV. The scale of skills shortages in aircraft maintenance engineering

34. According to CAA figures there are approximately 12,000 engineers holding JAR-66 licenses issued by the UK CAA or British Civil Airworthiness Section L licenses, down from 24,000 in 1979. Of these, a significant proportion, perhaps as many as 30%, are believed to be either based overseas or over the age of 60 and therefore approaching retirement. The number of licensed maintenance engineers has remained fairly static over the past 15 years, but the number of aircraft has more than doubled over the same period. Demand for aircraft maintenance is therefore growing without a corresponding increase in the supply of licensed engineers to carry out or supervise the work.
35. This shortage of engineering manpower is, to a degree, alleviated for the major operators by investment in new aircraft, which need less maintenance in the early years of their life. In addition, the larger established airlines are now consolidating their maintenance operations in-house and cutting back on undertaking third party maintenance. By contrast, the low cost operators rely on independent third party maintenance organisations, which may not be able to cater for all potential customers as their resources are finite and their capability is closely monitored by the CAA.
36. The RAeS evidence to the 1999 ETRAC inquiry argued that the skills shortage situation was worsening and concluded that this was leading to increased poaching of qualified personnel from a reducing pool of talent. Also wages in the engineering sector were being driven upwards as demand exceeded supply, with consequent effects on operating costs. It further concluded that whilst the rate of serious accidents attributable to maintenance was not increasing, it was not slowing down either - implying that the absolute number of accidents could increase as the number of flights continues to grow. The Executive Summary, Conclusions and Recommendations contained in the RAeS's report into the future of aircraft maintenance engineering are reproduced at **Annex C**. Evidence submitted by GAMTA at the same time raised similar concerns.

Labour market study

37. The RAeS report contained significant anecdotal evidence that there was an increasing problem due to a shortage of aircraft maintenance engineers. The Inter-departmental working group therefore agreed that before considering what, if any, action the Government might take, it was necessary to establish more clearly the scale of the problem and the action already being taken by the aviation industry. On the recommendation of the working group, ATA and EMTA commissioned a comprehensive labour market study of aircraft maintenance engineers in the UK civil air transport industry. The study involved a postal and telephone survey of aircraft maintenance organisations across the UK, representatives from businesses involved in the civil air transport sector, the armed forces, education and training providers and specialist recruitment agencies. The aim was to gather quantitative data on numbers of maintenance engineers employed, age of workforce, occupational structure, size and location of companies and similar information. Although a number of companies

approached declined to contribute to the study, the final report represented the position of the industry as it stood at the beginning of 2001.

38. The study identified a number of areas of concern to the industry, including problems with recruitment and retention of suitably qualified staff and growing skills gaps in the existing workforce. 87% of all respondents to the study reported that they had recruited staff over the preceding 12 months. On average, respondents had recruited 11 engineers over this period, but only an average of 4 new posts had been created, suggesting that recruitment tended to be driven by staff turnover rather than expansion. Of the companies recruiting staff over the study period, 57% reported difficulties in filling vacancies, particularly for licensed mechanical engineers.
39. In addition to recruitment and retention problems, respondents also expressed concern about a growing skills gap amongst their existing workforce, ranging from basic engineering know-how and rudimentary aircraft engineering knowledge through to managerial capabilities. The problem appeared to be most pronounced amongst original equipment manufacturers and General Aviation companies. Furthermore, nearly two thirds of those organisations identifying skills gaps also reported problems in filling vacancies. This suggests that the majority of companies experiencing skills shortages have difficulties in solving this problem through external recruitment. The problem is exacerbated by the fact that whilst graduates of apprenticeship schemes achieve a good grounding in theoretical knowledge, practical experience is often limited, resulting in a shortfall in basic engineering skills.

V.The causes of the skills shortages

Main factors

Pre-trained engineers and apprentices

40. A number of factors appear to be contributing to the shortage of maintenance engineers in the civil aviation sector. Apart from increased competition from other technically oriented sectors, the supply of engineers from traditional sources such as the Armed Services, manufacturing sectors, company apprentice training schemes and further education have slowed.
41. Traditionally, a significant number of aircraft maintenance engineers employed in the civilian sector have been ex-service personnel. However, between 1996 and 2001 the number of ready trained service personnel available to the civil aviation labour market dropped from around 2400 per annum to approximately 1500 per annum. It is anticipated that this reduced level of ex-service personnel entering the civil aviation sector will be maintained over the next 5 years. At the same time the slowing down of the global economy has forced the industry to examine ways of reducing costs and unfortunately training programmes, particularly in-house apprenticeship training schemes, often bear the brunt of these cutbacks. With demand for aircraft maintenance engineers predicted to grow, but the supply of ex-service personnel curtailed, this approach by some maintenance organisations is likely to affect their ability to meet future demand.

Further Education

42. In order to address the shortfall in ready trained ex-service personnel or traditional apprentices, employers are increasingly looking to further education colleges to provide both the vocational education and the technical training to support aircraft maintenance modern apprenticeships, NVQs and licence training. However, both employers and the CAA regard traditional aerospace vocational education qualifications as a poor fit to their requirements. Among employers responding to the labour market study, many felt that the general system of education in the UK is contributing to the problems of the sector. The expansion of university education has led to a reduction in the number of sixteen-year old school leavers with the necessary skills and interest in aircraft engineering to enter into apprenticeships. Furthermore employers expressed concern that the training provided in further and higher education does not meet the skills required by industry. Indeed, the CAA's early experience with applicants under JAR 66 suggested that GCSE standards might not be adequate to achieve a JAR 66 licence, although more success was achieved with 'A' level entrants. This suggests there will be a drift up in the entry standards required for those aspiring to licensed engineer status.

Recruitment and retention of staff

43. Another major contribution to the skills gap in aircraft maintenance engineering sector stems from the difficulties experienced by maintenance organisations in recruiting and retaining suitably qualified staff. Many employees approaching

retirement are not being replaced with new recruits because of the growing competition from the more lucrative contract market and other industry sectors. Competitive pressures within the industry, together with changes in the regulatory system and post-16 education, have all contributed to the recruitment and retention problems. Companies have been slow to respond to long-term changes in education by targeting recruitment and salaries at a higher level. In the General Aviation sector, low pay is a constraint on companies' ability to recruit or retain staff. Low levels of pay result from the labour rates that companies feel that they can charge. A benchmarking survey carried out in 1998 revealed a figure of £28 per hour in the UK, compared with £35 per hour and £40 per hour in the US and Germany respectively. Labour rates charged in the motor industry are frequently higher and accordingly are more likely to attract new entrants.

44. Career structure is also an important recruitment problem. Because General Aviation maintenance organisations are generally small there is only a limited scope for career development. As a result, engineers often migrate to larger organisations in order to further their careers. As such, the General Aviation sector might be considered a nursery for the majors to recruit from, but there has been criticism that larger commercial companies do not provide any encouragement, training or sponsorship to support maintenance in the General Aviation sector. The loss of trained engineers by the smaller organisations with no compensation for the time and expense incurred in providing the necessary hands-on training experience is a big disincentive to future investment in training by smaller firms.

Other factors that might exacerbate the shortage

45. GAMTA has expressed concern over the complexity of meeting the future light aircraft JAR 66 requirements for licensed engineers. GAMTA is worried that proposed requirements for smaller aircraft not covered by JAR 66 would remove the "self improver" route. The CAA has recognised this danger and has pointed out to the JAA that not only must the knowledge and experience requirements reflect those appropriate to maintain these relatively simple aircraft, but the provision for the self-starter route to licence issue must be maintained. The CAA is concerned that the lack of structured training by the UK industry for licensed aircraft engineers has meant that it has had to press for acceptance of the self-starter route in the large aircraft requirements in JAR 66, despite the preference elsewhere in Europe for mandatory training.
46. Transport sectors, including air transport, were originally excluded from the scope of the Working Time Directive⁴. However, in June 2000, the European Council adopted a Directive to extend working time provisions to those sectors originally excluded. The Working Time Directive as amended therefore applies fully to non-mobile transport workers such as aircraft maintenance engineers. Amongst other things, the Directive provides that the average working time for each seven-day period, including overtime, must not exceed 48 hours. Workers can exceed this limit if they wish, provided that they agree this in writing with their employer. This

⁴ Council Directive 93/104/EC concerning certain aspects of the organization of working time.

is known as an opt-out agreement. Employers cannot require workers to sign opt-out agreements. Member States must implement the Directive by 1 August 2003 and the UK is currently working towards this (the Department of Trade and Industry leads on implementation). This has clear implications for the aircraft maintenance industry where there is much anecdotal evidence to suggest that shortfalls in staffing are already being covered through extensive use of overtime.

VI. Government policies on skills training

Co-ordination of Strategic Skills Training

47. The promotion of sector skills training has until recently been carried out by NTOs through which government funding for training initiatives was generally channelled. The NTOs were organised along industry lines, although no NTO specifically catered to the aviation sector. The ATA's affiliation with EMTA however, provided it with significant benefits for aircraft maintenance engineering as EMTA was able to draw upon a wide range of expertise and experience within the aerospace manufacturing sector, backed up by sound resources.
48. Following the DfES review of NTOs, a new network of Sector Skills Councils (SSCs) was announced in the policy document "Meeting the Sector Skills and Productivity Challenge". The policy was jointly sponsored by the Lifelong Learning Ministers in the four administrations in the UK (DfES, the Scottish Executive, the National Assembly for Wales and the Northern Ireland Executive). In December 2001, following the announcement DfES wrote, on behalf of the four administrations, to employers and other relevant bodies providing them with a copy of the guide and standard for becoming a SSC. Essentially, this offered a "promise of influence" to prospective SSCs, giving them an opportunity to help shape skills policy and the public supply of training across the UK.
49. SSCs will form a smaller network of stronger, more strategic bodies than the former network of 73 NTOs. They will be influential employer bodies, licensed by Government, able to lead the drive to significantly improve skills and productivity in industry and business sectors throughout the UK. As experts on their sectors they will understand the key drivers influencing sector development and the implications for the demand, supply and use of skills. SSCs will work in partnership with employers, trades unions, Government departments and agencies including the Regional Development Agencies, the LSC at local and national level and Connexions Service to ensure a coherent approach to tackling skills shortages.
50. In May 2002, responsibility for formally developing and supporting the emerging network of SSCs passed from the DfES to the Sector Skills Development Agency (SSDA). The SSDA will actively support SSCs to help them develop their own capacity to shape and influence change on behalf of their sectors.
51. The SSC initiative should provide the aviation industry with an opportunity to address skills and training shortages in a wide range of occupations within the aviation. However, the fragmented response from the "transport" sector to the formation of one or more SSCs to cover the whole sector leaves the aviation industry with no appropriate body to represent its interests. The ATA Trustees accordingly decided to join an EMTA led bid, which in June 2002 was awarded a development contract on behalf of the Technology, Engineering and Science Sectors, to work towards full SSC status. (Subsequently, a proposal for full SSC licence has been submitted by the Science, Engineering and Manufacturing

Technology Alliance – SEMTA). Within this arrangement it is anticipated that the ASA will form the strategic Sector Group for Aviation Operations. Initially it will focus on aircraft maintenance but will have the remit to embrace all the other functions previously in the scope of the ATA.

Further Education - The Learning and Skills Council

52. Responsibility for funding further education provision now lies with the LSC, which has taken over funding and planning duties from the Further Education Funding Council and the Training and Enterprise Councils in England. The LSC has responsibility for funding and planning all post – 16 learning provision, except in higher education, and does so through its network of 47 local LSCs. The simplified funding structure allows more flexibility for the LSC in deciding funding priorities. The LSC as the appropriate funding and planning body will decide on the basis of local and national labour market needs, and the needs of learners, whether to fund provision in an area where skills shortages might exist.

Modern Apprenticeship Advisory Committee

53. In March 2001, David Blunkett, then Secretary of State for Education and Employment established the Modern Apprenticeship Advisory Committee to advise on a three-year action plan for developing, promoting and delivering Modern Apprenticeships. It was chaired by Sir John Cassels (former Director-General of the National Economic Development Office and former Chair of UK SKILLS) and reported to the Secretary of State and LSC at the end of September 2001. The report endorsed the Government's reforms to Modern Apprenticeships and focused on implementation.

54. The Secretary of State and the LSC welcomed the broad thrust of the report's four main recommendations;

- A target for 2004 of 28% of young people entering Modern Apprenticeships before they are 22. This can be achieved within existing resources.
- A basic entitlement to a Modern Apprenticeship place for 16 or 17 year olds who have five GCSEs at grades A* to G including maths and English, to be introduced from September 2004.
- A major three year marketing campaign, costing £16 million, to promote Modern Apprenticeships and boost take-up by young people and employers.
- A national framework for apprenticeship setting out basic standards (e.g. minimum durations), with Apprenticeship Agents to support employers.

VII. What is industry doing to tackle the skills shortage in aircraft maintenance engineering?

55. The ATA has previously worked with the Occupational Standards Council for Engineering, the NTO National Council, the Further Education Development Agency, the Qualifications and Curriculum Authority (QCA) and awarding bodies to produce appropriate vocational qualifications within the National Education and Training Framework. It has also supported Government initiatives by developing appropriate Vocational Qualifications and a Modern Apprenticeship Framework. In future this work will be carried on by the ASA in association with one of the new SSCs.
56. Paragraph 42 describes the increasing reliance by industry on further education to provide basic and licence level vocational education. In terms of national training provision for aircraft maintenance engineering, there are currently around 30 organisations providing specific maintenance courses. By March 2001 seven organisations had received JAR-147 approval and a further two were progressing towards that approval. Approximately 2400 aerospace students were studying in the 2000/2001 academic year, with around 800 expected to qualify with a recognised aerospace engineering qualification. It was however not known if these graduates were already employed within the industry - gaining new qualifications/skills - or whether they were new recruits to the industry. In the same academic year, students studying for City & Guilds 201/259 and JAR-66 accounted for a third of all students on aircraft maintenance courses. This may reflect the shift in the industry towards training to fulfil JAR-66 requirements. Since the formation of the working group, Kingston University, Edexcel and City & Guilds have aligned their syllabi for particular engineering awards to the JAR 66 syllabus, which increases the opportunities for employers and individuals. Such awards do not, however, give exemption from the JAA licence examinations.
57. All further and higher education institutions regularly update the content of aircraft maintenance courses to reflect industry regulations, requirements by accredited bodies, and further/higher education quality standards. Several institutions have worked closely with major manufacturers, such as GKN Westland, BAe Systems, and aircraft operators including British Airways, KLM uk and Bristow Helicopters in order to ensure appropriate course curricula. Institutions also regularly assess course content in order to ensure that training courses reflect the skills needed to maintain aircraft. The LSC provides funding for colleges to provide training that leads to industry qualifications accepted by the industry regulator provided that a Workforce Development Plan is in place. Further education training leading to a JAR 66 licence has now been confirmed as eligible for LSC funding. In addition, the LSC has agreed to support a review of the training provision for aircraft maintenance engineers that may lead to funding of more industry specific qualifications.
58. The Armed Services are also working closely with industry to use vocational qualifications and modern apprenticeships in their own training schemes. This will, in due course, assist engineers leaving the services who are seeking second

careers in aircraft maintenance to transfer their practical experience working on military aircraft to the civilian sector. Many servicemen are currently put off moving into civil aviation by the perceived difficulty in maintaining status and gaining the necessary JAR licences.

59. Despite recruitment and retention difficulties, 93% of respondents to the labour market study indicated that they were actively undertaking training for their aircraft maintenance engineers, ranging from hands-on experience, type training, continuation and licence training to personal development and management training. Many stated that they were either extending their apprenticeship schemes, or had recently set such schemes up. One company, in addition to its Apprenticeship programme, reported that it had set up a “mature” Apprenticeship programme for semi-skilled employees between the ages of 19 and 25. This uses EC funding which was secured through a joint funding initiative with a local Council and further education college. Only a quarter of third party maintenance companies at the time of the study reported that they were involved in the Modern Apprenticeship scheme as it was felt that the funding regime at the time was difficult to understand and the requirement to train in key skills was too rigid, not reflecting the needs of the job or the industry. To overcome such obstacles, the ASA, supported by the Learning and Skills Council and the Occupational Standards Council for Engineering (OSCEng) is developing a new NVQ in aircraft maintenance engineering that will meet the criteria for the National Qualifications Framework (NQF) whilst being geared closely to JAA requirements. This, combined with recognition of Edexcel and City & Guilds JAR 66 related awards as “technical certificates” should make the Modern Apprenticeship more “user friendly”.
60. In General Aviation, GAMTA supported by the ATA and EMTA, have launched a pilot scheme under which 10 young individuals trained towards NVQ Level 2 at a further education college (the Mechanic Training Scheme). However, even though the scheme is heavily subsidised by EMTA, it has been difficult to get employers to commit to sponsoring students who could readily be poached by companies able to offer higher salaries and better prospects.
61. In September 1998, an Aircraft Maintenance Engineering Steering Group was set up under the auspices of the RAeS to consider how to improve the support that the RAeS gives to maintenance engineering as a profession. That group has now achieved or helped to achieve its main goals of:
- playing an active role in establishing the ASA and ensuring that it becomes the focal point for maintenance engineer training,
 - worked with the ALAE to develop a common log book for engineers, and
 - successfully lobbied within the RAeS to ensure that appropriate licenses remain a qualification for Incorporated Engineer (I Eng) status and also that the Society changed its rules to allow holders of I Eng with suitable experience to become full corporate members.

62. The RAeS has also been working with the Society of British Aerospace Companies (SBAC) to develop promotional material for aviation more generally. The RAeS/SBAC engineering careers promotional material was launched in time for Farnborough 2000. This comprised a CD and printed material, including a section on aircraft maintenance. Other commercially published careers advisory material including references to aircraft maintenance engineering is also now available. The RAeS has undertaken to be the voice of the industry with regards to careers promotion and will therefore take a leading role in producing future promotional material. The ASA will advise the RAeS on what needs to be included in such material from the viewpoint of training aircraft maintenance engineers.
63. In addition, the ALAE has undertaken a number of initiatives to promote the image of the industry and to provide guidance on training and career opportunities. It has produced a comprehensive personal logbook for licensed engineers and mechanics that records the experience, training and qualifications of the holder. This will be of particular value to maintenance organisations when employing contract engineers who are not permanently employed by any one company. The CAA, following consultation with the ALAE and ATA, is developing its own logbook for aircraft maintenance engineers in order to provide a personal record of experience, qualifications and competence, which could be used to support a licence application. The logbook, which will be offered as the minimum “industry standard”, is expected to be launched in 2003.

VIII. Discussion of possible options for Government action

64. The group has taken account of the CAA's effective regulation of the industry when analysing options for Government action. The CAA will not grant the essential approvals allowing companies to operate if the required technical staff, with the necessary skills and experience, are not in place. This ought to prevent a shortage of aircraft maintenance engineers jeopardizing safety and suggests instead a reduction in the capacity of the sector to service operations, which could undermine the continued successful growth of the UK aviation industry. It is therefore in the industry's own commercial interest to invest in training and recruitment. However, the group also feels that if the shortage develops unchecked, some detriment to safety in the longer term cannot be ruled out. An increasing shortfall implies growing pressure on human resources, the long-term effects of which are hard to predict. The following issues have been considered against that background.

Provision of additional funding assistance for training

65. Unsurprisingly, many respondents to the labour market study felt that the Government should provide more funding to assist training. The Group noted that the changes in Government policies for skills training (chapter VI) provided considerable opportunities, as well as challenges, for the aviation industry. The Government is now committed to the establishment of business led SSCs which will be provided with up to £1 million per annum towards strategic funding. The SSCs in England will work in partnership with other organizations such as the Regional Development Agencies, the LSC and the Conexions Service to ensure a coherent approach to tackling skills shortages. As noted in paragraph 33 the ASA and the CAA will work together to develop a Workforce Development Plan to present to DfES and the LSC with a view to influencing funding for aviation specific education and training given the unlikelihood of an aviation SSC. The LSC will be supported by a number of local offices, which will have responsibility for funding training provision locally, in consultation with key partners, such as SSCs, Regional Development Agencies and the Government's Small Business Service.

66. The Group noted and welcomed the fact that further education training leading to a JAR 66 licence has now been confirmed as eligible for LSC funding. In addition, the group welcomed LSC agreement to support a review of the training provision for aircraft maintenance engineers that may lead to funding of more industry specific qualifications.

67. In view of the many changes that have taken place over the last two years the Group considered that the ASA, in conjunction with the LSCs, should develop clear guidance to enable employers and potential trainees to make the best use of the funding opportunities available.

68. The group also notes that Government policy favours voluntary, employer-led sector arrangements. Given the influential position of the CAA (as the industry regulator), the group recommends that the CAA and the ASA, with support and advice from DfES, should develop, as a basis for consultation with the industry,

appropriate proposals for a suitable focused and funded sector body. It is important that the ASA works constructively with whatever body establishes the Sector Skills Council (SSC) arrangements covering the sector, as the appropriate body within the aviation industry to determine the education and training needs of maintenance engineers.

A training levy

69. It has been suggested by employers that a return to a statutory Industrial Training Board (ITB) for the aviation sector would relieve the burden on those few companies which some believe are currently providing training for the whole sector. ITBs were first established following the Industrial Training Act 1964, but all except two have now been dissolved under the Industrial Training Act 1982 to be replaced by voluntary arrangements. ITBs used a levy/grant system to encourage commitment to training.

70. However, the re-establishment of an ITB for the aviation sector would be inconsistent with the Government's policy that voluntary, employer-led sector arrangements should be the norm. In addition, a separate statutory order detailing which employers would be levied and at what rate, would normally be required to be renewed by Parliament annually.

71. The group inferred from the support for the reintroduction for the aviation sector ITB that employers were seeking some form of incentive system rather than the reinstatement of the levy itself. A suggestion considered by the group was that the CAA might be able to allot some of its charges on the industry to support the ASA. Factors supporting this form of funding for the ASA include: the CAA's role in overseeing implementation of the JARs; CAA's acknowledgement of the ASA's competence in the fields of standard setting and performance; and DfES's and QCA's recognition of the ASA as the aviation industry's Competence Standards Setting Body. However, legal advice suggests that the allocation of CAA charges in this way would be beyond the CAA's statutory powers.

Encouraging development of the ASA as a focal point for training

72. Following on from the RAeS report⁵, the CAA prepared a paper entitled Civil Aviation Authority - Vision of Training, which looked at the need to develop a focal point for training for the aviation industry. The CAA recommended that the focal point should also, in conjunction with the industry, seek to establish means of determining the likely training needs of the industry and anticipate the effects of changes in practices and external factors upon those future needs. According to the CAA, the focal point should promote the training schemes available within the industry through the most effective means to ensure that the industry is seen as attractive to potential employees and supportive of training at all levels.

73. The CAA paper also recommended that the focal point should, with assistance from industry and regulators, evaluate the existing structure of qualification paths and training opportunities to determine their continued acceptability. A training

⁵ Royal Aeronautical Society's report *The Challenge of the Future in Aircraft Maintenance Engineering*

strategy should be prepared from this analysis that matches the needs of the various industry sectors to the development of further programmes which can be agreed with the regulatory bodies. The training solutions offered should clearly focus on competency assurance criteria acceptable to all parties as a means of ensuring the effectiveness of the programmes. The focal point should act as an industry wide facilitator between the regulators (CAA and DfES and the QCA) and representative industry bodies or organisations (across all industry sectors).

74. The group recommends that, in the absence of an aviation SSC, the ASA should be suitable for consideration as the focal point. In so doing, the working group would stress that aircraft maintenance engineering should be given priority within this work, within the scope of the ASA's objects and should engage with any SSC/SSDA as appropriate.

Relief from VAT

75. The report of the 1999 ETRAC Inquiry specifically recommended that, in line with its recommendation in relation to pilots, VAT should not be charged for appropriate training courses.
76. The group has concluded that VAT is not an issue as far as training of aircraft maintenance engineers is concerned. The vast majority of vocational training of aircraft engineers is undertaken in public training institutions and is already exempt from VAT when supplied to companies or individuals. If similar training is provided to the employees of an aviation company by a commercial training body, any VAT charged can be reclaimed by the company as part of its business activity.

Raising the profile of the industry and improving links between employers and potential employees

77. It seems to be generally acknowledged that the links between industry and educational establishments, particularly secondary schools, are weak. More can be done in schools to make students aware of the industry and its benefits. Both teachers and pupils, particularly in aviation industry catchment areas, could be encouraged to spend a day, or perhaps longer, visiting a company to learn what aviation has to offer and what skills are required. GAMTA has in the past proposed that the Government should fund strong PR campaigns to improve the attractiveness of maintenance engineering to young people, publicise the shortage of maintenance engineers and persuade aircraft owners that higher labour rates are needed to retain high-calibre experienced staff and maintain satisfactory maintenance standards.
78. The group agrees that aircraft maintenance engineering does not have a high profile as a career. Companies have particular problems recruiting talented school-leavers and awareness of aircraft maintenance engineering in schools seems limited. Even those who are aware of the trade seem to regard it as a "hands dirty" job offering less attractive prospects than other, more glamorous occupations. The links between employers and prospective employees need to be improved. The RAeS now has a Career Development Section (CDS), which

seeks to develop local links with schools and other youth forums and national initiatives that have been developed by EMTA to promote engineering careers. The CDS has its own website and, as mentioned earlier, is working with the SBAC to produce a dedicated CD-ROM on careers in aircraft maintenance.

79. Whilst recognising that aircraft maintenance is no longer perceived as the attractive career it once was, the group is encouraged by the RAeS's efforts in establishing an industry wide careers service.

Encouraging the development of “Centres of Excellence” for training

80. A £100 million programme to establish Centres of Vocational Excellence (CoVE) in Further Education was announced (by the Secretary of State for Education and Skills) in November 2000. CoVEs will enhance existing, and invest in the development of new, excellent vocational provision that is focused on meeting the craft and technical skills needs of employers. A further £40 million has been made available from the Capital Modernisation Fund to support Centres of Vocational Excellence. In addition to the creation of additional Centres based in further education, it will also support the extension of the programme to providers from beyond the further education sector (like private and voluntary training providers and, in some circumstances, the training arms of large firms).

81. If further education related to aircraft maintenance is to be cost effective and efficient, it requires a high level of expertise, together with significant resources at the point(s) of delivery. The group recognises the importance of providing students with access to the necessary equipment for practical “hands on” training, and to experienced lecturers and trainers. At the time of the labour market study only three colleges provided JAR-66 courses, and only one university – Kingston University in partnership with KLM uk. These education establishments compete vigorously in a relatively small market. The group considers that a way forward is through the development of further regional “Centres of Excellence”, collaborative initiatives between Aerospace Universities or further education colleges and industry such as that between Kingston University and KLM uk, which has launched a combined education and training programme based in Norwich. This course will lead to a foundation degree (based on the JAR-66 syllabus) and a JAA licence. The establishment of similar centres could be financially assisted through Regional Development Agency or similar grants. Initiatives have already been proposed at strategic regional centres around the country, at Newcastle, St Athan/Cardiff, and Prestwick/Glasgow.

82. The strong growth in the low cost airline market in this country means that the UK is ideally placed to capture a significant share of the maintenance, repair and overhaul market for the narrow-body and regional jet aircraft operated by these airlines, provided that the necessary support and training infrastructure is established.

83. In the Armed Forces, the MOD Defence Training Review report – Modernising Defence Training – proposed the establishment of a Defence School of Aeronautical Engineering as a joint school to enhance operational capability and improve training quality and estate utilisation. This will build upon the anticipated

convergence in military trade structures, regulations and policy. It is planned that the new establishment will open in the spring of 2004. In parallel, the RAF Training Group has entered a partnering arrangement with a consortium that includes BAe Systems, Rolls Royce and Augusta-Westland to market, both nationally and internationally, the irreducible spare capacity in military aircraft maintenance training. Together these compatible initiatives position the Defence School as an important, large national Centre of Excellence demonstrating joined-up Government support to both military and civil aviation.

Annex A

INTER-DEPARTMENTAL WORKING GROUP ON THE TRAINING OF AIRCRAFT MAINTENANCE ENGINEERS

MEMBERSHIP

Department for Transport

Department for Education and Skills

Department of Trade and Industry

Training Group Defence Agency, Royal Air Force

Civil Aviation Authority, Safety Regulation Group

Aviation Training Association

Royal Aeronautical Society

Annex B

INTER-DEPARTMENTAL WORKING GROUP ON THE TRAINING OF AIRCRAFT MAINTENANCE ENGINEERS

AGREED TERMS OF REFERENCE

- to establish as clearly as possible the present numbers of aircraft maintenance engineers, the present and potential future scale of the shortage and the reasons for it.
- to establish what are the present arrangements for the training of aircraft maintenance engineers including any support, which the Government already provides.
- to identify any special features which make this sector different from other sectors of industry.
- to find out what policies governments in other key European states have towards the training of aircraft maintenance engineers.
- to find out what steps the industry is taking to tackle the problem.
- to identify measures which the Government could take to support industry's efforts to prevent a serious shortfall in the number of qualified aircraft maintenance engineers.
- to assess as far as possible the likely costs and benefits of such Government measures.
- to prepare a report to Ministers setting out the options for Government action.

The challenge of the future in aircraft maintenance engineering

Report of the Royal Aeronautical Society Aircraft Maintenance Engineering Task Force

EXECUTIVE SUMMARY

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

If the aviation industry in the United Kingdom continues to expand to meet this increased demand, it is at risk of becoming a victim of its own success unless prompt and well co-ordinated action is taken by corporate management to address the following: -

increased competition from other technically orientated sectors in the recruitment of personnel;

evidence of existing maintenance resources being over-stretched with little capacity for growth;

a significant shortage of appropriately skilled labour due to a contraction of the supply of skilled personnel from the armed services, manufacturing sectors, and the traditional airline apprenticeship schemes;

This will lead to:

significantly higher future unit labour costs in the near-term future;

and, more significantly,

the likelihood that airline growth potential will be severely limited by the restricted capacity to undertake maintenance.

Furthermore, it is widely accepted by the operating, regulatory, and manufacturing sectors of the industry, and the learned societies, that there is a need to reduce the absolute number of serious incidents and accidents, which can only be achieved through a steady reduction in rates - "good safety is good business."

These concurrent challenges must be successfully addressed through the implementation of measures to ensure cost- and quality-efficient aircraft maintenance. Airline business plans must ensure the provision of appropriate numbers of suitably qualified staff working within a fully engineered production process.

Resolution of this problem would create a 'win-win' scenario of safety standards, reliability, utilisation and value.

CONCLUSIONS

If the industry fails to address the key points raised in this paper the following will almost inevitably result:

- a worsening skills shortage situation leading to increased poaching of qualified personnel from a reducing pool of talent.
- a self-induced limit on the growth of the industry.
- UK airline maintenance work being contracted abroad, and an inability to win valuable contracts from overseas operators.
- wage rates of UK maintenance engineering personnel being driven up by demand exceeding supply, with a consequent adverse impact on unit costs.
- no improvement, end even a possible deterioration, in the rate of serious incidents or accidents attributable to maintenance, which when coupled with growth in flights would result in a higher undesirable increase in absolute numbers.

RECOMMENDATIONS

The Aircraft Maintenance Engineering Task Force recommends:-

- That this Report be circulated to the Chief Executives of all UK airlines, air taxi operators, maintenance personnel agencies, maintenance organizations, and the heads of department in higher and further education, with a strong invitation to support action on the remainder of the recommendations.
- That the existing careers literature be developed in a coordinated manner to fully inform and attract young people into the industry.
- That airline Chief Executives include engineering and maintenance manpower, training and process planning within the corporate business plan, in the same way as for aircrew.
- That a standard means of recording maintenance personnel's training and work history be developed and adopted across the whole industry.
- That any CAA recommendations for an industry focal point for training be aggressively pursued with full industry support.
- That a seminar on these issues be arranged to generate momentum in finding and implementing solutions.
- That the Task Force re-convene in 12 months time to review feedback received from industry, and assess the success industry has had in recruiting youth into the aviation business.

Annex D

QUALIFICATION REQUIREMENTS FOR LICENSED ENGINEERS

1. The licensing of aircraft maintenance engineers working on larger (over 5,700 kg) commercial aircraft is now done in accordance with JAR-66. Under JAR-66, the licence is divided broadly between Mechanical and Avionic trade disciplines, although in view of the various technologies and combinations applicable to certain aircraft, the Mechanical licence category is further subdivided. In addition, there are several levels within the licence, which allow the holder to be authorised to perform certain roles within line and/or base maintenance. These reflect different levels of task complexity and are supported by different standards of experience and knowledge. An individual can hold a combination of licences. The three levels within the licence are: Category A - Line Maintenance Mechanic; Category B - Line Maintenance Certifying Technician; and Category C - Base Maintenance Certifying Engineer.
2. Category A is intended to be the basis for Limited Authorisations, allowing an experienced and knowledgeable mechanic to be authorised to certify certain simple inspections and routine tasks. It is not intended that the Category A licence is used alone to support line maintenance activities. The experience requirements vary according to the amount and type of training received but must be relevant to the sub-category (e.g. aeroplanes piston) of licence and sufficiently recent. The experience required to gain a Category A licence is: three years, where no previous experience or formal training has been achieved; two years, where the applicant has already qualified in another accepted profession as a "skilled worker"; and one year, where the applicant has successfully completed a JAR-147 approved course of basic training.
3. Category B, which is available in both mechanical (B1) and avionic (B2) disciplines, is the mainstay licence qualification. Although primarily for line maintenance use at Technician level, it is intended that certain base maintenance staff who do not issue a Certificate of Release to Service (CRS), but who contribute to the final CRS issue by the Category C engineer, will also be required to hold an appropriate Category B licence. The experience required for Category B is: five years, where no previous experience or formal training has been achieved; four years, where the applicant has only completed a JAR-147 approved course of training at Category A level or where the applicant has already qualified in another accepted profession as a "skilled worker"; two years, where the applicant has satisfactorily completed a JAR-147 approved course of basic training at Category B1 or B2 level. The experience required must be maintenance experience of operating aircraft appropriate to the licence category or sub-category applied for. A Category B1 or B2 licence is issued in the appropriate category or sub-category for which the applicant has met the relevant requirements. The licence may be endorsed with type ratings when additional training, examination and experience requirements have been satisfied.

4. Category C is considered more of a qualification related to the management of maintenance during base maintenance. It is not a licence that allows the holder to perform detailed inspections, diagnosis and replacements that collectively make up base maintenance input. The Category C certifier will be supported by the appropriately qualified Category B technicians who carry out these tasks and who verify and sign that they have been completed properly. The Category C licence is intended to be used to certify the process of maintenance, built upon the experience and knowledge of the individual and their ability to manage the input. The experience requirements for Category C are: for B1 or B2 licence holders - three years experience in line maintenance certification or supporting the Category C certifier in base maintenance; for graduates in recognised disciplines - three years experience in a civil aircraft maintenance environment, including one year's observation of or participation in base maintenance tasks (such applicants must also satisfy either the B1 or B2 knowledge requirements).
5. The General Aviation sector is not covered by JAR-66, although there are plans to extend the application of JAR-66 by developing an appropriate Category B licence. In the meantime, licensing of engineers in this sector will continue according to the existing UK system. Under this, licenses are issued and extended in various Airframe, Engine, Avionic and Radio Categories and are divided into two parts: Licence Without Type Rating (LWTR) which shows basic knowledge in the Category but does not grant certification privileges; to this may be added Type Ratings (TR) which include certification privileges in respect of certain aircraft and their systems. Applicants for both types of licence must meet age and communication skills requirements.
6. To apply for an LWTR, an applicant must have three years operational experience, of which two years must include the maintenance of systems appropriate to the category applied for, of which one year must be recent experience, of which six months must be relevant to the category of licence applied for. Relevant experience with UK armed forces counts. Training is not a specific requirement for the grant of a LWTR, but appropriate training may allow the above experience requirements to be reduced. An applicant who meets the basic requirements must pass a written and an oral examination to gain a licence. The appropriate LWTR must be held before a TR can be applied for. For smaller types, an oral examination is conducted. For the more complex types of aircraft, attendance at a CAA recognised course is required instead.

JAR 145 and JAR 147 requirements

1. JAR 145 states that: “The competence of personnel involved in maintenance must be established in accordance with a procedure and to a standard acceptable to the national authority (in UK the CAA)”. Amongst other things, a JAR 145 approved maintenance organisation must ensure that all certifying staff receive sufficient continuation training in each two year period to ensure that they have up-to-date knowledge of relevant technology, organisation procedures and human factor issues, plus, if applicable, a procedure to ensure compliance with JAR 66. Prospective certifying staff must be assessed by the JAR 145 approved maintenance organisation for their compliance, qualification and capability to carry out their intended certifying duties in accordance with a procedure acceptable to the CAA before the issue or re-issue of a JAR 145 certification authorisation. For other personnel, it states that: “The referred procedure requires, amongst others, that planners, mechanics, supervisors and certifying staff are assessed for competence by ‘on-the-job’ evaluation or by examination relevant to their particular job role within the organisation before unsupervised work is permitted.”
2. With regard to competence assessment, it advises that the means should demonstrate that: “Mechanics are able to carry out maintenance tasks to any standard specified in the [approved data]” and that “certifying staff are able to determine when the aircraft or aircraft component is ready to “release to service” and when it should not be released to service. JAR 145 then goes on to advise on the training of certifying staff. It does not include the other categories referred to above. The advice concludes with the statement “... it is acknowledged that training standards are difficult to define and therefore examinations should be set at the end of each training course.” Thus the JAA Requirement and the CAA are concerned about training standards and the training of all personnel involved in the maintenance process but specify in detail only that which is required for certifying staff (licensed aircraft maintenance engineers).
3. While JAR 66 regulates the training requirements for certifying staff, JAR 147 rules the training organisation itself in terms of personnel requirements, facilities and training material, procedures and standards. JAR 147 prescribes the requirements for issuing approvals to maintenance training organisations, to conduct the approved training courses and/or examinations required by JAR 66. Licence candidates who train elsewhere are required to sit the examination administered by the CAA. Such training is provided by companies, further education colleges, independent providers and through self-study, using distance learning material.

Training standards for unlicensed maintenance engineers

1. In 1985, the ATA launched its Aeronautical Engineering Basic Skills Certification Scheme. Initially, many larger aircraft maintenance organisations used this as a basis for apprenticeships and adult training schemes. Even though the scheme was ideally suited to the General Aviation sector, there was little take up at the time. Over 600 maintenance engineers were certificated as competent mechanics under this scheme. Under the old Youth Training Scheme (funded by the Manpower Services Commission) employers received training grants for apprenticeships, based on the “Basic Skills Scheme”. Unfortunately, the introduction of NVQs removed this funding source and the scheme fell into disuse. More recently two General Aviation organisations have revived interest in the “Basic Skills Scheme”.
2. The ATA produced a “first generation” level 3 NVQ for aircraft maintenance engineers, which it awarded jointly with City & Guilds. Working within the DfES/QCA Engineering Reformation Project, the ATA produced a specification for the assessment of competence of maintenance engineers employed in aircraft maintenance and component overhaul. This is used by City & Guilds and EMTA Awards Ltd to deliver NVQs in aircraft maintenance at levels 2 and 3. Unfortunately, these NVQs have not enjoyed support or recognition by the CAA, due to the rigidity of the generic approach required by DfES and QCA, which has suppressed interest by engineering employers. The CAA believed it was beneficial to all concerned to align the NVQ within the industry as a stepping stone to licence issue that companies could use.
3. Licensed aircraft maintenance engineers are considered to be at level 4 in the National Qualification Framework. Given the relatively small numbers and the fact that the Licence is a “qualification” in its own right, the ATA has not developed occupational standards, nor sought NVQs, for this occupational group. The ASA will undertake the development of vocational qualifications for aircraft maintenance support functions (e.g. planning, quality assurance, etc) at appropriate levels.

Annex G

Recommendations contained in a Civil Aviation Authority paper entitled “Vision on Training – a paper outlining the need for an aviation industry focal point for the co-ordination of training and education issues in the United Kingdom.” (1999)

1. The CAA recommends that a focal point for training and education issues be established for the aviation industry. This reflects the importance in establishing standards of competence as a supporting element of safety management philosophies that the CAA believes is necessary.
2. The focal point should also, in conjunction with industry, seek to establish means of determining the likely training needs of the industry and anticipate the effects of changes in industry practices and external factors upon those future needs.
3. The focal point should promote the training schemes available within the industry through the most effective means to ensure that the industry is seen as attractive to potential employees and supportive of training entrants at all levels.
4. The focal point will, with the assistance of the regulators and industry bodies, evaluate the existing structure of qualification paths and training opportunities to determine their continued acceptability. A training strategy should be prepared from this analysis that matches the needs of the various industry sectors to the development of further programmes which can be agreed with the regulatory bodies. The training solutions offered should clearly focus on competency assurance criteria acceptable to all parties as a means of ensuring the effectiveness of the programmes.
5. The focal point should act as a hub in a co-ordinating manner, an industry wide facilitator, between the regulator (CAA and DfES and QCA) and representative industry bodies or organisations (across all industry sectors).
6. The focal point will likely consist of one body with alliances or arrangements with other interested parties. The historical background to the ATA suggests that it may be suitable for consideration as the focal point with alliances to bodies such as the RAeS and EMTA.

Glossary of abbreviations

ALAE	Association of Licensed Aircraft Engineers
ASA	Aero Skills Alliance
ATA	Aviation Training Association
CAA	Civil Aviation Authority
CDS	Career Development Service (of the RAeS)
CoVE	Centre of Vocational Excellence
DfES	Department for Education and Skills
DETR	Department of the Environment, Transport and the Regions
EASA	European Aviation Safety Agency
EMTA	Engineering and Marine Training Authority
ETRAC	House of Commons Environment, Transport and Regional Affairs Committee
GAMTA	General Aviation Manufacturers and Traders Association
ITB	Industrial Training Board
JAA	Joint Aviation Authorities
JAR	Joint Aviation Requirement
LSC	Learning and Skills Council
LWTR	Licence Without Type Rating
NTO	National Training Organisation
NVQs	National Vocational Qualifications
QCA	Qualifications and Curriculum Authority
RAeS	Royal Aeronautical Society
SBAC	Society of British Aerospace Companies
SSC	Sector Skills Council
SSDA	Sector Skills Development Agency
SVQs	Scottish Vocational Qualifications