JANUARY 2013

SPACE & AEROSPACE TECHNICIANS

REPORT OF A SEMINAR EXPLORING HOW TO IMPROVE APPRENTICESHIP TRAINING IN THE SPACE & AEROSPACE SECTORS

GATSBY

INTRODUCTION

Gatsby is a Trust set up in 1967 by David Sainsbury (now Lord Sainsbury of Turville) to realise his charitable objectives. We focus our support on the following areas:

- Plant science research
- Neuroscience research
- Science and engineering education
- Economic development in Africa
- Public policy research and advice
- The Arts

One of Gatsby's primary aims in education is to increase the proportion of young people with skills in science, technology, engineering and mathematics (STEM), especially at technician level (Level 3+). We recognise the critical importance of apprenticeships and career guidance in helping to achieve this goal.

This paper summarises the discussions from a seminar held by the Gatsby Charitable Foundation on 30 November 2012 to explore how the supply and quality of apprenticeship training in the space and aerospace sectors could be improved. The seminar was convened in response to the publication of two research reports[1] by Dr Paul Lewis, King's College London, which sought to characterise the duties, skills and training of technicians in the space and aerospace sectors.

BACKGROUND

According to the Technician Council, technicians are 'highly productive people who apply proven techniques and procedures to the solution of practical problems'. The Technician Council analysis of UKCES data suggests that by 2020 the UK will need to have trained 450,000 technicians to meet economic demand. The UK Government has also expressed serious concerns about technical skills shortages in UK industry and the increasing age profile of the technician workforce. According to Business Secretary, Vince Cable:

> "If we are to deliver the skills needed to return the economy to sustainable growth we must tackle the shortage of technicians in this country."[2]

WHAT ARE THE KEY CHALLENGES?

The provision of specialist training that meets employers' specific needs

FE colleges were seen as all too often being unable or unwilling to offer the right kind of training, this applied to both practical skills and theoretical knowledge. Trainers often lacked recent industrial experience and had insufficient access to subject specific professional development. Problems with staying up to date with current industry practice were exacerbated by poor availability of industry standard equipment. The quality of support provided by FE colleges for the space and aerospace sectors, did not match that provided by those companies that still have their own in-house training facilities/schools - notably in relation to practical training in workshops and in the development of hand-skills.

Administrative obstacles

The level of bureaucracy in administering apprenticeships and the split in funding through various agencies were seen as obstacles to effective training. For smaller employers the only way to navigate this complexity was to work

[1] Annex 1
[2] Secretary of State for Business, Innovation & Skills at the award of the first Registered Science Technician certificates, 29th May 2012

through an intermediary but, critically, this approach broke the vital link between employer need and the training provided. Employers identified how poor administrative practice resulted in inadequate support by course assessors, and instances of apprentices being placed on the wrong courses.

Economies of scale

It is easier to deliver apprenticeships to a larger number of trainees developing similar skills, than to a smaller more diverse cohort. In sectors such as space manufacturing, where scale is smaller and specialisation often greater, individual employers are not well placed to develop apprenticeships to meet training needs.

Where trainees lived and where training took place

The distance that apprentices have to travel in order to access high quality training is sometimes an issue. There is a need for clearer evidence to establish whether this is the case, and, if it is, to identify what can be done to make it less onerous for young people to travel for training.

Maintaining training provision to meet changing demand

Once the local short-term need for specific skills in a particular sector has been met, there is a risk that demand for apprenticeships will dry up and training courses will no longer be offered. Mechanisms need to be devised that make it financially viable for training providers and employers to run a smaller number of apprenticeships in a particular locality. This will help to meet the longer-term national strategic need for the continued supply of technicians.

Attitudes to apprenticeships in schools and the discriminatory nature of funding

It is within schools that young people first consider career options, yet they seldom have access to high quality information, advice and guidance about technical training, whilst teachers and parents tend to view apprenticeships as suitable only for less academically able students. Despite being seen as a major source of prospective level 4 technicians, A-level students were felt to be disadvantaged, in terms of access to apprenticeships, by a funding system that discriminated against those over the age of 19.

HOW MIGHT THESE CHALLENGES BE ADDRESSED?

The development of a successful and sustained training strategy that meets the UK's demand for skilled technicians must address the incentives for key players. The current system of funding does not adequately support the provision of quality technical training and education in FE colleges, since it is more economical for colleges to run non-technical courses than to offer training that requires a high level of technical expertise, up-to-date skills and equipment. The Government should consider how features of FE funding may be undermining the UK's future growth, and explore alternative funding models that recognise the pivotal role that skilled technicians will play in the UK's future prosperity. Greater financial transparency would help employers comprehend how funding is being used by training providers and would present opportunities to reduce red-tape and increase efficiency.

Creative collaborative approaches to training provision, both within and across sectors, will help industry obtain a better return for its training investment, especially amongst SMEs, where costs of training provision per trainee are often markedly higher. Government and industry should consider how individual employers might be encouraged to collaborate in providing the critical mass of apprenticeship places that would make the process more cost effective. Larger companies can play a role in increasing the number of apprenticeship places by training more apprentices than they themselves require to meet their own anticipated business needs, with the extra apprentices being employed by other firms in their sector and/or supply chain (often, though not always, SMEs).

The creation of a more clearly defined technician career pathway for apprentices would make apprenticeships more attractive. As well as signposting this pathway, professional registration could play a role by improving the mobility of technicians and thus freeing up places for new apprentices.

Group Training Associations (GTAs) offer a useful model of how employers can work together. GTAs are not-for-profit social enterprises that draw their membership from employers and provide training and other business support to meet the needs of these employers. As a result the training provided by GTAs is employer driven. Some 30 GTAs currently exist, comprising 25,000 SME members, and offer training at level 3 and above to 8,000 apprentices. According to Neil Bates of the Prospects Learning Foundation, the aims of the GTAs include reducing the UK's reliance on contractors and overseas workers, helping to restore wide-scale company training (including apprenticeships) and addressing what he described as a skills system with graduates who were overqualified and under-skilled.

WHAT APPROACHES COULD BE TAKEN?

1 Government and industry should act to sharpen the incentives for FE colleges to offer the training that is required by employers.

2 More higher apprenticeships should be offered that are tailored to the requirements of industry in highly skilled and high growth sectors, such as space.

3 Government should act to ensure that resources are not spread too thinly, and encourage more specialised provision amongst training providers, following extensive consultation with employers.

4 Industry could provide FE college lecturers with opportunities for training secondments and provide FE colleges with old, but still current equipment for training.

5 Industry should play a greater role in supporting schools' careers education. Enhanced involvement by employers could improve quality, while helping young people to have greater awareness of the broad range of career pathways – including technical and vocational routes, and help to smooth the transition from education to employment.

6 Greater mobility in the system may be brought about through adoption of registered technician schemes. Active support for registration by professional bodies would create clear technical training paths and better work-based routes into the professions. As an example, EngTech professional registration for engineering technicians is seen as a signal of professional competence, a mechanism for raising professional status and for establishing a broader professional community, all of which are thought to increase employment opportunities.

7 Mechanisms that may help overcome challenges presented by the geographical location of training by employers and training providers include:

- providing two levels of training, with generic skills developed locally and more specialist training being provided through short national specialist courses
- offering apprentices a maintenance loan if they have to train away from home and supporting colleges to provide accommodation for apprentices
- supporting training providers to develop e-learning, with a particular emphasis on the use of haptic devices[3]

[3] Tactile feedback technology that offers a virtual experience with a simulated but realistic sense of touch and feel

SUMMARY OF THE RESEARCH

The research sought to identify for each sector: (i) the number of technicians, the nature of their roles and their principal duties (ii) qualifications that technicians typically possessed (iii) how organisations acquired their technicians (iv) the balance between recruitment and training; and (v) current skills shortages. Technicians were defined as people who occupy technical roles that require level 3 or level 4-5 skills, incorporating both 'craft' or 'skilled trades' and 'associate professional/technical' roles.

Apprenticeships were thought to be increasingly important in providing a continuous stream of skilled labour. They also contributed in succession planning, exposure at an early stage to the specific cultural and practice expectations of the sector, and the building of loyalty to organisations and the sector.

TECHNICIANS IN THE UK SPACE SECTOR[4]

The sector is defined as all those (public and private) involved in the production of goods and services related to the exploration, understanding and utilisation of space. In 2008-09, turnover of the sector was £7.5 billion, with 25,000 people directly employed by the industry. This figure is small in relation to aerospace but is growing significantly at 8-10 percent per annum in real terms.

Size, roles and qualifications of technician workforce

- Based on 25 case studies, 95 percent of the total number of technicians employed were engaged in 'upstream' manufacture – a term applied to production of satellites or the components and sub-systems from which satellites are made
- Technicians typically account for 20 percent of the total workforce in upstream organisations
- The majority of the remaining technicians were employed by 'downstream' organisations, who use satellites to provide services such as telecommunications, broadcasting, weather-forecasting and navigational services
- Technician roles in upstream manufacturing include, machinist: mechanical assembly technician, production/manufacturing engineer, electronics assembly and integration (printed circuit board) technician, electronic/component engineer, test technician and test engineer
- A typical qualification for technicians within the sector is a Higher National Certificate (Level 4)

The current source of technicians in the UK space sector

- Most organisations involved in space manufacturing obtained their technicians through:
  - hiring technicians who already work in the industry
  - recruiting technicians from other industries and training them to work in the very exacting tolerances and stringent quality assurance essential in space manufacturing

The future technician workforce

- Apprenticeships made a significant contribution (between 15-90 percent) to the technician workforce in five case study upstream organisations. Two more had recently embarked on training apprentices and a further five were planning to commence recruitment
- Numbers of apprentices tended to be low in this sector, reflecting the fact that most space manufacturers were small, but growth within the sector made apprentice training increasingly economically justifiable
- Space manufacturers are making greater use of apprenticeships to address greater difficulty in recruiting experienced space technicians or technicians from other sectors, suitable for upgrade training
- Most apprentices train towards a level 4 qualification in mechanical, electrical and electronic engineering under the Government's Advanced Apprenticeship programme

[4] http://www.gatsby.org.uk/~/media/Files/Education/Gatsby%20%20Space%20for%20Technicians.ashx

TECHNICIANS IN THE UK AEROSPACE INDUSTRY[5]

With an annual turnover of £24 billion, the UK aerospace industry is the second largest in the world, employing some 96,000 people, including 2,500 apprentices. The industry is made up of (i) companies that design and manufacture civil and military aircraft or aircraft parts; and (ii) those that maintain, repair and overhaul aircraft (known as MROs).

Size, roles and qualifications of technician workforce

- Technicians typically account for between 45 and 55 percent of the workforce.
- Those with skilled trade roles typically have level 3 qualifications in aerospace or aeronautical engineering, whilst those who occupy associate professional and technical roles most often are qualified at levels 4-5, with HNC, HND or foundation degrees.
- Level 3 roles include machinist, aircraft fitter and unlicensed aircraft mechanic, whereas levels 4-5 incorporate licensed production/manufacturing engineer, draughtsman and junior design engineer
- Licensed status confers at different levels the authority to sign off tasks through issuing certificates of release.

The current source of technicians in the UK aerospace sector

- Of the 21 case study organisations, some 20 currently trained apprentices.
- Over half of the current technician workforce in six of the seven manufacturers of components, systems and large aircraft structures, was accounted for through apprenticeship training, supplemented by upgrade training of semi-skilled employees.
- Half of MROs estimated that they had been responsible for training between 40-60 percent of the technicians they currently employed, the remaining MROs - comprising most of the smaller firms - tended to recruit technicians 'ready-made' from the external labour market.
- The industry preferred apprentice routes into licensed engineer status, over entry from those taking university foundation degrees, because apprenticeship trained technicians had better practical skills and experience.

The future technician workforce

- Aerospace manufacturers were placing greater emphasis on in-house training, with five employers restarting apprenticeships within the past five years. Their rationale was both to address the difficulty in hiring technicians from the external labour market and the implications of an ageing workforce.
- Manufacturers were relying less on graduates and more on Higher Apprenticeships to fill associate professional and technical roles, reflecting both the lack of practical skills amongst graduates and the skills and loyalty of vocationally educated workers.
- There are two distinct categories of apprentices in aerospace manufacturing: (i) craft apprentices aiming to achieve level 3 qualifications and occupying skilled trade roles; and (ii) technical apprentices aiming to occupy associate professional/technical roles and studying for qualifications in engineering at level 4[6] or level 5[7].
- An apprentice trained by an MRO would typically take a 3-year, level 3 qualification in aerospace engineering and maintenance, becoming an unlicensed aircraft mechanic. A further year of training, success in passing the European Aviation Safety Agency (EASA) examinations, and necessary practical experience enables them to become a category A licensed engineer. A fifth training year, further relevant experience and passing further EASA examinations would lead to the acquisition of a category B license.

[5] http://www.gatsby.org.uk/~/media/Files/Education/Gatsby%20%20Flying%20High.ashx
[6] Such as Higher National Certificate (HNC)
[7] Including Higher National Diploma (HND) and Foundation Degree

SEMINAR ATTENDEES

Neil Bates	Prospects Learning Foundation
Kathie Bowden	Environmental Systems Science Centre
Jeff Brewer	Monarch Aircraft Engineering
Steve Buckingham	Inflite Engineering Services Ltd
Rob Butler	Marshall Aerospace
Ian Carnell	SEMTA
Stuart Carter	Aircelle Limited
Allan Clements	ESERO-UK
Tony Collins	Department for Business, Innovation and Skills
Jeremy Curtis	UK Space Agency
Owen Davis	The Institution of Engineering and Technology
James Dawkins	Education & Employers Taskforce
Kevin Dinnage	Engineering Council
Andy Edelsten	Avanti Communications Group plc
James Epps	Gatsby
Peter Finegold	Isinglass Consultancy Ltd
James Hobbs	Institution of Mechanical Engineers
Liam Izod	Department for Business, Innovation and Skills
Jonathan Jones	Department for Business, Innovation and Skills
Paul Lewis	King's College London
Dave Linder	Mullard Space Science Laboratory
Carolyn Mason	SEMTA
David McNicoll	Gatsby
Anu Ojha	National Space Centre
Naomi Page	Royal Aeronautical Society
Tom Preece	Composites Skills Alliance
John Pye	Space Research Centre, University of Leicester
Faye Riley	Gatsby
Daniel Sandford Smith	Gatsby
Bob Selway	Eurocopter
Paul Shakspeare	National Composites Centre
Rob Shribbs	Aircraft Research Association Ltd
Tammy Simmons	Engineering Council
Faye Smith	Royal Aeronautical Society
Alex Underwood	Eurocopter
Marie Wallace	Surrey Satellite Technology Limited