

INNOVATION AS A WAY OF LIFE

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A Case Study of the Marshall Group

Introduction

Some things don't change. In 1909 people still enjoyed a night out clubbing -and they still faced the less inviting prospect of trying to get home afterwards. The vagaries of the English weather and the lack of public transport didn't help much either.



But some things do change – and it was whilst working at the University Pitt Club that David Marshall spotted an opportunity amongst the late-night revellers trying to find their way home. The streets of

Cambridge were beginning to get used to the idea of the motor car as an alternative to the various horse-drawn options or good old Shanks's pony as a means of transportation. Why not offer a chauffeur driven car service? He obtained a couple of cars and drivers and the Marshall company was formed with its first steps into the new world of motor transportation.

The business quickly grew as a service operation and although it was difficult during the period of the First World War, the company was able to develop a new line of business servicing ambulances and other military vehicles – in the process extending their experience and skills in support and maintenance. By the end of the war David saw another emerging opportunity as people embraced the motor car as a form of personal transportation. With the mass production revolution pioneered by Henry Ford in the USA the motor car was becoming a mainstream product. A number of entrepreneurs began establishing car manufacturing in the UK and Marshall saw the opportunity for working in what he felt would become a growth sector. In 1920 he took on the dealership for the Cambridge area for the new Austin company, bringing to this operation the experience and knowledge gained in



running and maintaining his fleet of chauffeur driven cars.



The next step involved what was becoming a familiar pattern – spotting opportunities in unmet needs. Whilst the motor car brought many benefits, Marshall saw that for some people – specifically those who enjoyed horse-riding, feeling the wind in their hair and fresh air on their faces – it had some drawbacks. Because the cabin was enclosed they

were insulated from this open air experience – so why not give them the option to take the top off the car? However, when he approached Austin with the idea, they insisted they only made 'standard' cars. So rather than give up he purchased standard Austin cars and – using the skills and equipment in his workshops where they already knew the Austin car inside out – converted them, making the first Austin sports car.

Innovation by connecting

Understanding and often anticipating user needs and connecting them with a technological capability – is a well-established characteristic of successful innovators and one which runs through the history of the Marshall group of companies. It has grown from its origins in the automotive sector to become a major player in a variety of manufacturing and service fields – but this is not simply a conglomerate. There is a clear and strong underlying link between its businesses and significant use of knowledge acquired in one area to help enter and open up new ones. Today it is one of the UK's most successful privately owned businesses with a turnover of around £650m and with over 4000 employees. Still headquartered in Cambridge, the Marshall Group has interests in the retail motor industry, transport refrigeration, aviation and specialist vehicle engineering.



For more background information on the company see appendix 1 and the associated websites.



Like father, like son

Riding the wave of public interest in motor cars helped Marshall to grow as a business – and by staying close to their principles of working with customers they were able to expand the car retailing business, especially in the after-sales service and maintenance area. But the recipe for their continuing success is as much about diversity as careful stewardship of an established market position.

Arthur Marshall, David's son had graduated from University in 1926 with a strong interest in flying. Just as his father had seen opportunities in the newly emerging field of motor cars, Arthur felt that his hobby might also presage a growing new area of opportunity. The Wright Brothers had flown their aeroplane in 1903, planes had been used extensively in World War One and by the late

1920s flying was beginning to attract the interests of a growing number of people. Being an adventurous young man Arthur decided he would like to learn to fly and having done so purchased his first aeroplane in 1929.



Not long afterwards an opportunity arose from his new hobby. One Monday Sir Alan Cobham, famous for his flying circus, saw Arthur's little aeroplane on a field outside the family home. Over lunch with Cobham a plan was hatched that saw the land becoming Cambridge's first airport, with the condition that its first use was to be for Cobham's flying circus. Through this Arthur found another opportunity and

developed a business out of teaching people to fly in his spare time on the De Havilland Gypsy Moth. The flying training business prospered as local people wanted to learn to fly.

Running an airport and flying school is not a simple matter and it quickly drew the company into a new learning phase as it mastered the skills and technologies which go with flying aeroplanes – for example providing hangars for people to store their planes in and maintenance crew to look after them. And borrowing lessons learned in car retailing there was a fruitful line in providing finance to help people to purchase planes.

As with the car business aviation proved another successful growth area for the company. But in the 1930s it also became clear that some key forces were shaping its development in important new directions. The aeroplanes that Marshall stored were getting bigger and were heavy as they were being made of metal instead of wood so they would have to move. In 1937 Marshall moved to a new and larger site and established Cambridge's second airport.



With the onset of WWII there became little need to provide services for the flying enthusiast so instead Marshall concentrated on providing services to the RAF. The company strengthened its flying training skills by the establishment in 1938 of an *ab initio* flying instructor training scheme which enabled young men without previous flying experience to learn to fly and become flying instructors within a 14 week period. This scheme, which was an immediate success, was universally adopted by the Royal Air Force in 1941 and continues to this day. Through its flying school Marshall taught 20,000 British pilots to fly, one sixth of the total number trained.

During this time the British Government were under increased pressure, as there was very limited capacity in the RAF or the manufacturing companies to make vital repairs and maintenance to the planes. Consequently Lord Nuffield set up the Civilian Repair Organization, a body which looked for companies that could do maintenance, repair and modification work on aircraft. Marshall fitted neatly into this area and during the wartime period worked on over 5000 aircraft.

Central to the ability to work in this way was an accumulation of learning about operating aircraft – just as motor cars – as a total service operation. Skilled technicians capable of working on airframes and engines, investment in facilities and equipment to deal with a wide range of often-open ended challenges and close feedback from users (such as the thousands of pilots who they trained) helped build on understanding of the particular needs of this demanding market- and the capability to deliver solutions configured to meet those needs. Much of the activity inside a Marshall hangar would involve improvisation and innovation around a particular repair or modification each one of which presented its own challenges and required its own particular blend of knowledge, skill and equipment, With 5000 opportunities for carrying out such learning it was not surprising that by the end of the war the company had a deep understanding and capability in the aircraft support industry.

A different tune, a different dance

Whilst the wartime period had helped Marshall develop deep competencies, the end of the war brought with it a crisis. The military business declined rapidly and the company was too highly geared up to volume work to return to the relatively low demand of the leisure flying business. The result was 3,000 people working for Marshall with very little to do. At this point what Arthur Marshall described as 'another stroke of luck' came their way. Near to their Cambridge base was Bourne airfield on which the British Government were storing over 3,000 vehicles which had been loaned out to industry in support of the war. The government wanted some of them back but wanted them serviced. Others required scrapping but could be used for spare parts and the rest were 'nearly goers' - not good enough for government use but still with potential. Arthur saw the potential in this rusting collection and, using contacts he had made during their wartime work, secured the contract to carry out the repair/recovery work. Whilst there was a good business in repairing or scrapping for spares, the real opportunity came with converting the 'nearly goers' into specialist vehicles for delivery and related work for companies like Chivers Jams and Whitbread Breweries.



It is worth reflecting for a moment on this idea of a 'stroke of luck'. Certainly an opportunity existed but it takes vision to see the possibilities, especially beyond the obvious. And vision is not enough if there is no capability to deliver on it – it was the years of experience and competence-building around repair and

modification of cars and aircraft which enabled Marshall to establish their Specialist Vehicle division. Some luck, perhaps – but as Pasteur notably put it, *'chance favours the prepared mind'*.

Still flying high

Although the immediate post-war period saw a decline in aviation, it picked up again as a market, both in the military sense (with the Cold War putting emphasis on aircraft and missile technology) and in the rapidly growing civilian airline business. With its wartime experience Marshall was in a strong position to play a role as a sub-contractor to the growing number of aircraft manufacturing firms in the UK. It carried out work on a wide range of military and civilian aircraft.

But it didn't achieve this position by accident or by resting on laurels won through their extensive wartime work. Continued investment in skills and technology and an increasing commitment to building a design capability lay at the heart of this growth. By working across a broad spectrum of aircraft and markets they were essentially following a 'lead user' approach, constantly being stretched to acquire and deploy the latest technical capabilities. And by continuing to invest in manufacturing they could make spare parts and offer extensive support to the maintenance operation. The other key ingredient was investment in a *design* capability – *"it's our in-house design and aircraft design that really does set us above all the other jobbing shop and aircraft maintenance companies"*. They have invested heavily in aircraft design (they are the second largest in the UK after BAe Systems) and this gives them a hard to imitated competitive edge. As Terry Holloway put it, *"aircraft design work gives us a skill level above screwing nuts... It provides graduate engineers with design work that is part of the motivation process because they want to stay with the company because of the work that we are doing"*.

In 1960, the Company began its strong links with the North American aircraft industry when it became the first Gulfstream Service Centre outside the USA. These US links were strengthened in 1966 when Marshall began a relationship with Lockheed Martin in introducing the C-130K Hercules aircraft to Royal Air Force.



Since then, they have provided continuous support on the Hercules conducting over 300 major modifications that have included wing rebuilding and fuselage stretching. Their agility and innovation skills were clearly demonstrated in the installation of air to air refuelling equipment at the time of the Falklands War in 1982 – they were able to complete the entire project including designing, in just 19 days.





More recently, Marshall have helped introduce the new C-130J variant to Royal Air Force service and is also managing the Contractor Run Interim Logistics Support Organisation, on behalf of Lockheed Martin in Swindon, supporting the C-130J fleet at nearby RAF Lyneham.

In 1982, the company further strengthened its relationship with Lockheed Martin when nine civilian TriStar aircraft were converted to Strategic Tanker Freighter Aircraft for the Royal Air Force. Marshall is a Sister Design Authority to Lockheed Martin for both the C-130 Hercules and the Lockheed TriStar, and to Boeing for the RAF fleet of E3 Airborne Early Warning AWACS aircraft which it has been responsible for servicing since 1995.

Driving innovation

Their progress in aviation did not overshadow the motor retailing business which had been the basis of the company since the 1920s. In 1955 Michael Marshall as a third generation family member joined the motor business and began expanding it. His early contribution was to take it from the original Jesus Lane garage site through a major expansion programme. Today the business represents 16 manufacturers and is engaged in a wide range of leasing, financing and other related activities as well as retailing and servicing vehicles. Innovation has been just as evident in this field – the company were the first to install CRM (customer relationship management) software in the UK and pioneered the concept of the multi-franchise car supermarket. Their parts and distribution systems are highly developed and integrated to provide scale economies across different franchises. Above all they have stayed close to their customer base, developing a strong reputation for service and customer loyalty.

A question of balance

Marshall's has used its diverse nature to its advantage and it has been able to balance out the peaks and troughs of business through spreading the risk it takes through different revenue streams. We have already seen this in their ability to switch into different but related areas of technology and market. But it also operates as a principle within business areas, for example, in the motor retailing part of the organisation where they have 16 different franchises. Similarly, part of the rationale behind deciding to maintain a manufacturing operation is that it provides the business with large amounts of cash in arrears but high costs upfront, whereas the advantage of the motor retailing business is that they do not have to pay the manufacturer till much later.

But the ability to operate in business areas with different cycles and cash flow patterns only works if there is integration at a deeper level, around the area of technological and market knowledge. Their consistent investment in building mechanisms to get and stay close to user needs (even in the highly demanding field of aerospace) and in learning-by-doing around key technological areas has





paid off in giving them the flexibility to make such cross-business synergies actually work.

Innovation philosophy

It would be hard to argue with the premise that Marshall are an innovative company – in products and services offered, in processes deployed, in markets and positioning and in their underlying business models. They are well known as early adopters and often pioneers of new fields – a tradition which clearly goes back to the early days of the business.

Yet although they are consistently at the forefront in terms of innovation they don't see themselves as driven by the pursuit of innovation. Rather this is an *output*, a consequence of having positioned themselves to be able to identify and exploit interesting new opportunities. As Terry Holloway puts it,

"Innovation itself is not something that drives our business, what I see driving our business is the opportunity to make profit which sustains growth, growth provides long term which provides long term employment, sustains our workforce and enables us to increase skills if you have a high skills base you can be more flexible you can become more innovative"

Being family owned has enabled Marshall's to have a long-term strategic outlook on its future rather than be driven by short-term gain. This has often seen the company invest in projects that did not always offer a return such as a rocket that Marshall developed with NASA. Whilst this project did not make money, it enhanced their reputation in the field and led to further opportunities. Other projects in the same vein have included work on the fuel cell that was eventually used in all U.S space aircraft, the design of Concorde's dropped nose and auxiliary fuel tanks on the Boeing ER range. The value from these projects is not viewed purely in monetary terms but the fact it offers Marshall's engineering varied and interesting leading edge projects and builds their reputation.

It has also helped them follow through and grow with emerging opportunities. For example, in the aerospace field *"we saw the advantage of putting our design office equipment right alongside our maintenance people in the hangars so they could interact and work together. We recognised that aircraft maintenance was a complete service package, and by being able to offer post design support we now manage people's fleets of aircraft "*

But their approach to innovation is not simply picking up on opportunities – they are adept at getting close to users and working with them to develop new directions – essentially employing their version of what Eric von Hippel calls the 'user active' approach to innovation. A good example comes from the Specialist Vehicle division where through a contract with the British Army developing Land Rover ambulances another project arose. When talking to the doctors about the ambulances, they also started complaining about how terrible the tents were





that they used as operating theatres. Through this conversation Marshall's were able to link their existing competences of making mobile units such as bakeries to being able to create an expandable mobile theatre. The resulting mobile theatre is ISO container size in transit but expands to three times the size. It has been designed as a modular unit to transport, yet with surgical facilities that looked exactly the same as an NHS operating theatre from inside but in miniature. These were highly successful in the Gulf War and sold to other governments.

But the same doctors highlighted the shortage of NHS operating theatres, which take years to build new hospitals. From this came the idea of designing modular full size operating theatres that were built by Marshall in 25/26 weeks, fully equipped and tested. Then they were broken down and transported over a weekend and installed on a pre-prepared site. From specialist vehicle to providing the health sector with increased capacity that is cheaper and easier to install shows the Marshall innovation philosophy in action.

The importance of human capital

Underlying the Marshall Group's success is a strong commitment to its employees, one indicator of which is the number of long service awards achieved in the company. Three awards have been awarded for 60 years of service, 23 for 50 years, 194 for 40 years and 545 for 30 years of service! This is not simply the result of paternalistic employment practices but rather recognition of the high dependence the business has on its workforce. Being able to offer highly customised solutions to emerging market needs requires a combination of technical expertise, creativity and flexibility which is delivered through motivated and well-trained people. The commitment which the company has to training goes well beyond simply upgrading skills to include significant opportunities for personal and career development – but it is also based on sound business logic around securing a long-term return on this investment. *"We have an ethos in the business of giving people the greatest skills possible as well as initial training and continuous professional development and you can't afford to do this if you don't keep your people for a very long time because if not they become a drain on your overheads which means that you are not competitive".*

A good example of this philosophy has been their approach to apprenticeships. Whilst this form of training lapsed during the second half of the 20th century some companies recognised that without investment in developing the combination of technical knowledge and its practice future growth prospects would be damaged. The aerospace sector is a good example which explains why Marshall continued to invest in this activity; 23% of the Modern apprentices for the Aerospace Industry in the UK in 2004 were trained by Marshall Aerospace confirming its commitment to 'good' people in its businesses.



Innovation as a dynamic capability

Any organization can get lucky once – someone comes up with a new idea, someone spots a great unexploited opportunity, the firm finds itself in the right place at the right time, or some other combination of circumstances leads to some success with something new. Using innovation to enable long-term survival and growth is much more difficult – it depends on building the capability to repeat the trick. Research on innovation consistently supports the view that successful firms *learn* how to do this – not always an easy process and with problems as well as successes - but a process which builds capability and also makes it harder for others to simply copy them. The trouble with innovation, of course, is that it is unpredictable – the challenges of new markets, technologies, the business and political environment and a host of other elements don't stay conveniently static. So effective innovation management involves learning and continuing to learn – building what is often called *dynamic capability*.

Marshall offers a good example of this process – on the surface it appears to have had a number of 'lucky' breaks – being in the right place and equipped with the capabilities to exploit new opportunities as they emerge. But if we look closer we can see that their ability to take advantage of new circumstances depends enormously on investments and commitments they have made in the past and capabilities which they have built up. They faced a number of crises – for example, the downturn in demand following the end of the Second World War could have finished the company but instead they were able to diversify into specialist vehicle building and conversion. But they could only do this because of a long-standing commitment to developing the technology and skills base around vehicle repair and maintenance – something which went right back to the earliest days of the chauffeur cars business. Similarly their ability to play a key role in aerospace is not simply the fact that they have a long history of being linked to aviation but because they have invested consistently in building the knowledge and skill base (as shown in their commitment, for example, to design capabilities) to move forward with that industry.

Innovation tends to move in two modes – long periods of 'doing what we do, but better' punctuated by occasional radical shifts into completely new territory. Marshall demonstrate an ability to deal with the former through systematic incremental innovation and in particular working closely with users. But they are also able to deal with 'discontinuous' innovation and move into radically different areas of activity. This is not a matter of size or asset base but rather the ability to combine a deep knowledge base with emerging opportunities in the technological and business environment. Their private status may help create the conditions for taking riskier bets than a publicly quoted firm might be comfortable with – but their internal decision-making is still firmly grounded in responsible business development. It is rather a case that they are able to preserve some of the agility, which they had when first starting out as a small business – being able to spot an opportunity early on and then do something about it. Increasingly the 'doing something about it' requires deeper knowledge



resources (in skills, technologies, market understanding, etc) but these have been systematically and proactively developed over many years – as their investment in human capital demonstrates.

In many ways their innovation success is not down to a formal innovation plan or even a specific innovation structure such as we might find in the pharmaceutical industry. Instead it is embedded in the culture of the company – ‘the way we do things around here’. Their success comes from learning and building this culture up over the long-term and might be captured in the phrase attributed to Gary Player, the famous golfer. He used to explain his consistent success by saying ‘its’ funny – the more I practice, the luckier I get!



Appendix 1: Background information on the Marshall group of companies

Founded in 1909 with little capital as a chauffeur drive company in Cambridge, Marshall moved into the retail motor business in 1911, obtained the Austin Distributorship for Cambridgeshire in 1920 and entered the aviation business in 1929. With all its growth funded by ploughed-back profits, the Marshall Group, which is still a privately owned family Company and chaired by the third generation of the Marshall family, now has a turnover approaching £650M per annum. The Group currently has an employment of approximately 4,000 working in the fields of Aerospace engineering; design and manufacture of specialist vehicle applications, military mobility shelters and hospital surgical units; Motor Vehicle sales and after sales support; Refrigerated Transport sales and support; and Airport Property Ownership and Management. (www.marshallgroup.co.uk)

The Group looks forward to building on its strengths for the future prosperity of the shareholders and the community, based on the reputation it has earned during many years for stability, quality of workmanship, value for money and service to its many customers throughout the world.

Each of the main companies of the Group is largely autonomous and self-accountable.

1. MARSHALL MOTOR HOLDINGS

The largest and founding company of the Marshall Group, with a turnover of around £500M per annum and just over 2,000 employees is Marshall Motor Holdings, which itself comprises four principal businesses:

MARSHALL MOTOR GROUP (www.marshallweb.co.uk)

With 42 showrooms representing 16 different manufacturers, a turnover approaching £450M per annum and almost 1,700 employees, Marshall Motor Group is one of the largest privately owned motor dealer groups in Great Britain. Although the dealerships are largely concentrated in the Cambridge/Peterborough/Bedford area of East Anglia, Marshall Motor Group also has operations in Ipswich, Reading, Leicester, Bury St Edmunds, Melton Mowbray, King's Lynn, Lincoln, Grantham and Spalding.

The Marshall Motor Group is widely recognised as a leader in the development of large multi-franchise sites. The most impressive example of this is the Marshall Car Centre, which was opened on Marshall-owned land opposite the Airport on Newmarket Road in Cambridge by HRH The Prince Michael of Kent in 1995. The Marshall Car Centre occupies nearly half a mile of prime retail land on this important entry route into Cambridge and remains unique in scale and concept in Great Britain. With eleven different vehicle manufacturers represented, together with a substantial dedicated used car sales operation and a 60,000ft² parts warehouse, Marshall Car Centre customers enjoy unrivalled choice and levels of customer service.

Marshall also operates a similar multi-franchise operation in the Boongate area of Peterborough, where seven dealerships are situated side-by-side.

MARSHALL THERMO KING (www.marshallthermoking.co.uk)

Founded in 1972, Marshall Thermo King now has 12 depots covering England, a turnover of around £35M per annum and 270 employees. Marshall Thermo King specialises in the sales and after sales support of advanced, vehicle-mounted, temperature control units. With nearly 130 fully equipped mobile engineers on call 24 hours-a-day, 365 days-a-year, Marshall Thermo King offers unrivalled support to transport fleet operations across the country, including those for many of the country's largest retailers.

MARSHALL LEASING (www.marshallleasing.co.uk)

With 25 employees, a turnover of around £20 million per annum, and a fleet of about 3,000 cars, Marshall Leasing fills a specialist niche sector in the vehicle leasing and fleet management market. Through its offices in Huntingdon and London, Marshall Leasing has built up a portfolio of household name customer companies which value the personal attention, flexible service and the range of tailored packages available from Marshall.

VTR GROUP (www.vtrgroup.co.uk)

The VTR Group, with 30 employees and a turnover of £3M per annum, is a Midlands-based company specialising in the service and maintenance of commercial vehicle tail lifts. The company has branches in Walsall, Atherstone, Worcester, Stoke and Didcot. This, along with its fleet of mobile engineers, provides a service "around the clock" to customers from Manchester in the North to the Thames Valley in the South.

2. **MARSHALL AEROSPACE LTD (www.marshallaerospace.com)**

Marshall Aerospace, with employment which averages around 1,700 and sales approaching £120m per annum, has a wide range of international approvals and certifications, including ISO 9001 (BS5750), JAR 145 and FAA Maintenance and Repair Station, and has specialised in recent years in design, modification and maintenance support for aircraft such as:

- C-130 Hercules, for which Marshall Aerospace has been the UK Designated Company for the RAF aircraft since 1966 and Sister Design Authority since 1988. The Company has carried out a number of major modifications including fuselage stretching and wing rebuilding, and designing and implementing the installation of a wide variety of specialised equipment, including the provision of air-to-air refueling and electronic self defense capability. The company is a global leader for C-130 work, and in addition to its work for the RAF, the Company performs work on C-130s for a wide range of other air forces and civilian operators. This has recently included a major avionics upgrade for the South African Air Force, the conversion of aircraft for Austria, and ongoing maintenance work in Australia. It has received over 1,500 inputs and has carried out work for over 30 international operators of the aircraft. The Company provided support for Lockheed Martin to help with the introduction of the C-130J into RAF service and is managing, on behalf of

Lockheed Martin, the Contractor Run Interim Logistics Support (CRILS) arrangements supporting RAF C-130J operations at RAF Lyneham.

- Lockheed L10-11 TriStar, for which the Company is the Design Authority for the Royal Air Force fleet of TriStar Tanker/Freighter aircraft which Marshall converted to these roles in 1983/92. The Company has also converted 10 passenger TriStar aircraft for use as civil freighters in the United States. Marshall Aerospace enjoys a world-wide reputation for maintenance, repair and modification of a large number of civilian operated TriStars. The Company has also designed and installed the modification of an aircraft for carriage and launch of 50,000 lb Pegasus rockets to place satellites into orbit and, subsequently, modified the same aircraft to carry X-34 a NASA Hypersonic Space Research Vehicle.
- Boeing E-3D Sentry AEW, for which Marshall is the appointed Sister Design Authority for the RAF and is currently contracted to carry out major servicing (Depot Level Maintenance) on the RAF fleet of seven aircraft.
- Marshall Aerospace's Corporate Division has been approved by Cessna since 1974 and is the only Cessna approved Citation Service Station in the UK approved on all Citation Models. From the original Citation 500 and 650 models to the advanced Citation VII, the Company is fully equipped to offer the full range of scheduled maintenance and AOG support. A large inventory of spares is held in stock at Cambridge, to allow immediate response on maintenance work.

Marshall Aerospace is fully conversant with the CESCO computerised maintenance system and maintains CESCO records on the customer's behalf.

All Cessna Service Bulletins can be incorporated and engine work undertaken, including HIS and Overhaul, on all JT15D series engines.

Airworthiness and flight test staff are experts in the Citation, with several test pilots having long association with the type.

- Airbus A320 on which Marshall Aerospace carries out maintenance for a number of airlines and currently includes major servicing for KLM.
- Boeing 747-400 on which the Company has conducted modification work on over 130 aircraft on behalf of British Airways. The Company has also undertaken maintenance work for Lufthansa.
- Boeing 777 on which the Company has conducted modification and maintenance work on new aircraft for a number of airlines.
- MD-11 which has included a major interior modification programme for Delta Airlines and servicing for KLM.
- Boeing 767
- A range of other aircraft, including DC10, BAE 125, Dominie, and numerous light aircraft.

- Marshall Aerospace is also working closely with BAE Systems, providing design and maintenance work to underwrite the airworthiness of the sole flyable AVRO Vulcan, which it hopes to be able to return to flight.

A major strength of the Company's aerospace business is its Aircraft Design Office. Notable past achievements have included the design and build of the Concorde droop nose and visor in 1967, and a space sled for medical research which flew 121 orbits in the Space Shuttle "Challenger" in 1985. The Design Office also undertakes considerable work associated with modification and maintenance programmes, which has recently included an avionics update for the RAF fleet of navigation training Dominie aircraft. Recent programmes include a major avionics update and integration programme on C-130 Hercules aircraft for the South African Air Force. The Company's Aircraft Design Office is equipped with the latest Sun CAD stations with a variety of software programs, including Mentor Graphics for avionics and wiring, MEDUSA and CADAM for two-dimensional structure design, and NASTRAN advanced finite stress analysis. The Company introduced CATIA in 1998 to provide three-dimensional structural design and this was updated to CATIA series 5 in 2000. The Design Office also uses desk-top publishing programs for technical publications.

The Company's extensive Manufacturing facilities comprise state-of-the-art CNC milling machines, automatic lathes, a 35 ft bed sculpture milling machine, specialist pipe bending equipment including of double skin pipes, and 5-axis CNC inspection equipment. Recent products include the manufacture of Marshall designed lightweight long-range fuel tanks for Boeing MD-11 aircraft, the manufacture of freight doors for Gulfstream IV aircraft, and a range of non-aircraft precision work including airport signs, military bridge components, high-technology windows for the House of Commons' new administrative building, and railway carriages. The Company is currently engaged in a major manufacturing project, producing Marshall designed revolutionary lightweight fuel tanks for Boeing 747 -400 aircraft, and Boeing 777 aircraft.

The Company also provides extensive engineering support for a number of customers on a worldwide basis, including Post Design Service work, management of rotables and maintenance support.

The Company has hangar space sufficient to accommodate, at the same time in full flying trim, up to three Boeing 747-400 aircraft, or up to six wide-bodied aircraft (TriStar or MD-11 etc) and up to 12 C-130 aircraft, eight Gulfstream aircraft (or BAe 146) plus over 50 assorted smaller aircraft ranging from Citation down to Cessna 152s.

A Marshall Aerospace subsidiary company, **Aeropeople** (www.aeropeople.com) provides trained manpower to a wide range of international customers.

Marshall **Aerospares**, with an inventory of over 55,000 parts and a dedicated team of spares and rotables controllers, is one of the leading businesses in its field providing 24 hours a day, seven days a week service.

3. **MARSHALL SPECIALIST VEHICLES LTD (www.marshallsv.com)**

Established in 1946, Marshall Specialist Vehicles (MSV) is, today, a world leader in the design and supply of Mobile Military Equipment, Medical Systems, and Homeland Security Vehicles. Marshall SV is an ISO 9000/2000 company with an annual turnover in excess of £25M and an employment close to 150.

Historically, MSV has supplied the MoD with more than 80,000 vehicle bodies and more than 5,000 tactical shelters in over 200 different configurations. Additionally, the company designed, manufactured and delivered 9,500 DROPS Flatracks which are currently in service with the British Army. MSV went on to design and supply 43 DROPS Fuel Racks as 'mobile filling stations' and 830 field ambulances on Land Rover chassis to the British Army.

With the British Forces' change from a Cold War emphasis to a Rapid Reaction Expeditionary Force, MSV's military business has changed from being an equipment manufacturer to a Systems Integrator. MSV's Military business is centred around providing deployable Systems for the UK MoD and Military customers world-wide. Currently, MSV is a Prime contractor for the supply of mobile Field Hospitals, Power Pack Repair Facilities, and Mobile Bakeries. MSV also designs and integrates Ground Stations for the Stand-off Radar (ASTOR) project and the Battlefield Communication (Cormorant) project.

Very recently, MSV has branched into the provision of vehicle systems for use by the Emergency Services in the event of terrorist attacks on the homeland. MSV is a major player in providing solutions to deploy various countermeasures equipment to satisfy the Homeland Security measures being put into place by the UK Government.

MSV also provides Modular Surgical Facilities to the NHS. Indications are that MSV's Modular Medical Systems Group is set to become an important part of the business as NHS hospitals rush to modernise their infrastructures.

4. **MARSHALL OF CAMBRIDGE AIRPORT PROPERTIES LTD**

The Group owns the 475 acres to the South of Newmarket Road which comprises the Airport itself and its 50 acre industrial area, as well as 70 acres of industrial land on its North Works. A total of 1.25 million square feet of hangars, industrial buildings, showrooms and offices are occupied by Marshall Aerospace, Marshall Specialist Vehicles and the Marshall Motor Group's unique Marshall Car Centre and Airport Garage. The Group also owns 250 acres of farmland to the North and East of the airfield and in its property portfolio in Cambridge are included two investment properties, The Quorum and the Greenhouse Park Innovation Centre.

5. **CAMBRIDGE CITY AIRPORT (www.cambridgecityairport.com)**

Marshall owns and operates Cambridge City Airport. The airport maintains a full Public Use Licence which, among other requirements, includes a team of licensed Air Traffic Control Officers and supporting staff, as well as fully qualified Fire and Rescue Service staff, dedicated security staffs and some of the most up-to-date major fire appliances. The Airport has an Instrument Landing System, a digitised colour radar approach facility, an NDB and a DME. A new Control Tower was commissioned early in 2000, and an area radar was commissioned in 2002.

The first part of the main runway was built in 1953 and progressively extended to its current 1,965 metre length. The runway is capable of accepting most aircraft types, including wide-bodied jets, which includes Boeing 747-400 aircraft.

The extensively equipped and up-to-date modern International Airport provides excellent facilities for business travel through the Marshall Executive Air Centre, together with holiday and recreational flights to and from Cambridge. As a particularly well equipped Regional Airport, Cambridge City Airport is available to make an important contribution to the future development of air transport in the region. The Airport is of particular importance to Cambridge University for conferences, the support of horse racing at Newmarket, and the bloodstock trade in general. The Airport also supports a wide variety of military test flying, flying training and business flights.

6. **MARSHALL EXECUTIVE AVIATION (www.marshallexecair.com)**

Based at Cambridge City Airport, Marshall Executive Aviation utilises the company's very modern Citation Bravo aircraft offering a variety of aircraft charter operations through Europe and Northern Africa.

7. **MARSHALL CHAUFFEUR DRIVE (www.marshalldrive.co.uk)**

Marshall Chauffeur Drive is the founding business of Marshall which started in 1909. Today, the company offers a fleet of luxury high class chauffeur drive Jaguar, Rover and Chrysler vehicles for its many customers.

8. **COMMUNITY MATTERS AND EMPLOYEE DEVELOPMENT**

The Marshall Group of Companies takes a pro-active environmental stance, and works closely with local Councils, the Environment Agency and the Government Offices of the Eastern Region on a wide range of topics.

Marshall of Cambridge, as the major engineering employer in the region, maintains particularly strong links with Cambridge University, local colleges, the Training & Enterprise Council and Business Link, The Cambridgeshire Chamber of Commerce and Industry, The Science and Technology Regional Office (SATRO), EEDA (East of England Development Agency), the new Learning & Skills Council, Connexions, the County, City and District Councils, as well as with a variety of Residents' Associations and Parish Councils. The airport has an active Consultative Committee which acts as an important interface with the local community. The Company also provides strong support to the Cambridge Air Training Corps Squadron. All of these relationships help maintain the harmonious relationship between the Company and the communities where its businesses are located.

The Group of Companies and its employees participate in a wide range of community projects including: wildlife, the arts, sport, healthcare, education and charities. There is also a diverse programme of visits to the Company's Airport Works premises. The Company supports a number of local schools and has "sponsored" three Cambridge Schools, Teversham Church of England Primary School, Bottisham Village College and Coleridge Community College, where dedicated members of staff assist with Science, Engineering and Mathematics



projects. The Company also takes interest in a wide number of other schools where employees assist with school management as Governors. Strong leadership is demonstrated by senior directors and executives who take on a number of non-executive roles in a wide range of community projects. National projects which benefit from the encouragement and help of the Group of Companies include: The Air League Educational Trust, the Air Training Corps, the RAF Benevolent Fund, the Duke of Edinburgh's Award Scheme and BEN, the charity of the Motor Industry.

The Company has strong links with the University of Cambridge which particularly includes Cambridge University Engineering Department through the "Sir Arthur Marshall Institute for Aeronautics" (SAMIA) (www.samia.org.uk) which encourages a wide range of aeronautical engineering disciplines.

The Marshall Group of Companies is a Member of the Engineering Employers' Federation, The Society of British Aerospace Companies and The Institute of the Motor Industry and the Eastern Aerospace Alliance. The advancement of employee skills is maintained through a robust training and development programme. The Marshall Group Training School maintains a regular apprentice intake each year and provides surplus training capacity to other local companies. Currently, 23% of the Modern apprentices for the Aerospace Industry in the UK are trained by Marshall Aerospace. Marshall was also one of the first companies to introduce the Modern Apprentice Scheme to the Aerospace Industry, and has pioneered the development of its very successful re-skilling programme to enable adults over 25 years of age to upgrade their capabilities and to become skilled aircraft fitters at an NVQ 3 level. The company takes in around 12 graduate trainees each year, and participates in "The Year of Industry" scheme for undergraduates.

Marshall Aerospace holds the national "Investors in People" Award and takes huge pride in the large numbers of employees who have achieved long service with the company. Three awards have been awarded for 60 years of service, 23 for 50 years, 194 for 40 years and 545 for 30 years of service.

