



Interior of Bombardier Aerospace's CRJ900 regional aircraft  
Bombardier Aerospace

# Aerospace

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## *Building on Experience and Talent*

Liz Moscrop

**Northern Ireland is establishing itself as a leading centre of excellence for aeronautical engineering. Home to the world's oldest aerospace company, Short Brothers, today the region houses several internationally renowned aviation businesses and research centres.**

Shorts was the first-ever aircraft manufacturer, having bought a licence to produce the Wright Flyer in the 1920s. Bombardier Aerospace acquired the company in 1989 and it is now a subsidiary of the Canadian airframer. Today the facility manufactures aircraft components, engine nacelles and spare parts for its parent company and for Boeing, Rolls-Royce Deutschland, General Electric, and Pratt & Whitney.

Although Bombardier shed 645 jobs in October 2006, chairman Laurent Beaudoin personally assured the Northern Ireland government that the original equipment manufacturer has a long-term commitment to its Northern Ireland operations.

As well as its Shorts plant, it creates advanced composite structures at its Dunmurry and Newtownabbey facilities in Belfast, and sheet metal components in Newtownards.

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**... deep ingrained knowledge ...  
wealth of experience and  
talent ...**

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"We have a very good team; they are passionate and enthusiastic about what we have to do," says Pierre Beaudoin, president and chief operating officer of Bombardier. "They have shown great character. They get the job done, despite there being a tough economic situation with such a strong pound. They constantly question themselves. For example, on one of the Learjet lines there was a business need to lower costs by 20%. It was tough, but they got it done."

He praises the team's imagination.



Pierre Beaudoin

"There's a great deal of progressive thinking, especially around the composite nacelle work. The team has been proactive and they are the most advanced in the world as far as flight control compartments go. This has permitted cost reductions on regional jets and created jobs in Belfast. The labour costs are quite high as it pushes the envelope. But this is how to do it and stay ahead."

Mr Beaudoin believes that Belfast will become a centre of excellence for research work, while high-volume lower labour cost jobs will be outsourced to other regions, such as Mexico.

"We have also collaborated with the universities here and invested in training. We have detailed programmes with both Queen's and the University of Ulster. We see this as part of our research process and it helps us develop our capability, not just in aerospace."

Bombardier had a brief foray into the United Kingdom defence market, when it formed a joint venture under its Shorts banner with Thomson-CSF. The two companies set up Shorts Missile Systems to design and develop very short-range air defence missiles for the Ministry of Defence (MoD) in the UK. In 2000 Thomson bought

Bombardier's 50% share to become the sole owner and renamed the venture Thales Air Defence.

Thales is the UK's second largest defence contractor and has been a supplier to the MoD since the First World War. In 2004 its UK revenues were £1.1bn. There are 500 employees in the Belfast facility, many of whom have been in service for more than 25 years.

Thales' Denise Clarke attributes the company's success to its willingness to change and adapt to a rapidly evolving highly competitive market.

"The environment is constantly changing and it has been exciting working for different companies and cultures as well as in a defence market that has changed radically. To survive in such an environment means constant adaptation."

She cautions that that is not an easy process. "Sometimes it has been difficult to instil the benefits of change so that people embrace it. We try to reinforce these so that people embrace it and adapt. If you don't show the benefits at the start, people look away."

Last year Thales unveiled its vehicle-mounted Thor system, which combines surface-to-air and surface-to-surface capabilities. Its primary missile is the company's high velocity Starstreak – a laser-guided missile, with a speed in excess of Mach 3 and a range greater than 6km. It will remain in service until at least 2020.

Denise Clarke is proud of the links between the universities and the group's research.

"Our Belfast facilities provide a major thrust for the Centre of Excellence at Queen's University Belfast. We are one of the highest technology companies in Northern Ireland and the centre is one of the university's successful engineering faculties. We are also one of the biggest magnets for graduates, as they are really designing and using technology that forces them to think right outside the box. For this reason

we attract the cream.”

Many local aerospace companies draw on the expertise of the university’s Centre of Excellence for Integrated Aircraft Technology (CEIAT) and that of the University of Ulster. CEIAT is a partnership between Queen’s RAE 5\* rated schools of aeronautical engineering and mechanical & manufacturing engineering, its virtual engineering centre, Bombardier, and the Northern Ireland aerospace consortium. A major focus is the integration of engineering disciplines into an overall systems framework.

### ... innovation and imagination ... throughout Northern Ireland’s aerospace sector ...

Research forms an essential part of its work and it has developed close links with research councils, with government, and with industry, both nationally and internationally, and attracts more than £2.5m in research grants each year. The research carried out is mainly in the fields of computer-aided engineering, internal combustion engines, robotics and control, biomechanics and materials (metals, plastics, and composites), and manufacturing, and has a strong practical flavour.

The University of Ulster’s specialists work on composite technology and sheet metal forming. Carbon fibre composites technology uses 3D woven textiles to make components for the next generation of aircraft structures and aeroplane engines. Two of the most recent headline-grabbing aircraft – the 555-seat super-jumbo Airbus A380 and the Boeing Dreamliner 787 – both make extensive use of composites.

The project team also devises computer systems on which the woven materials can be created and tested in a virtual environment, thereby reducing manufacturing times and costs.

“We are taking textile weaving techniques and applying them to aerospace engineering technology to develop the potential to weave components for the next generation of aircraft and aircraft engines,” says Dr Justin Quinn, director of the university’s Engineering Composites Research Centre.

“We are some of a very small number of people in the UK who can weave these complex woven architectures on traditional weaving machinery. By transferring this technology into the aerospace industry we will create a productive relationship between the textile and aerospace industries.”

Dr Alan Leacock works in the metal forming group, which works almost exclusively with Bombardier.

“Many machines have not changed since the 1950s,” he explains. “We are trying to alter the production process using mathematical models and

techniques to produce parts.”

The research centre has been working to develop a stretched metal technique for aircraft nacelles, primarily by looking at the mathematical relationship between the form in which the material arrives on the shop floor and the impact it can take during the cutting process before it shatters.

Researchers have worked out a way of cutting the metal in the form in which it arrives, eliminating the need for heat and storage and cutting down scrap rates and production time considerably. Bombardier has used the technique successfully on its regional and business jet airframes, particularly on its CRJ700 and CRJ900 regional jets and its Challenger 850 business jet. The airframer has now invested £100,000 in equipment to get the machinery onto its shop floor.

“We have removed a great deal of the skill element in this process in an

Thales Air Defence’s Starstreak laser-guided missile



Thales Air Defence

industry where skills are disappearing rapidly. We have another way of looking at things in the industrial process,” says Dr Leacock.

The team is also looking at using CATIA (a type of computer aided design software) to reduce production times and costs. Additionally, the department is looking at using its innovative metal forming process in ‘confetti’ parts in aircraft – the myriad small components that are part of the vast machine.

Another key regional employer in the aerospace sector is RLC Langford, which comprises Ronaldsway Aircraft Company in the Isle of Man, Langford Lodge Engineering in Northern Ireland, and Callender Aeropart in Lancashire, England.

The privately-owned group provides first-tier supply and integration services to original equipment manufacturers. With nearly 700 employees and sales in excess of £55m a year, the group has the critical mass

to become a leading first tier supplier.

Antrim-based Langford Lodge Engineering was formed in 1960 as a dedicated supplier to ejector seat manufacturer Martin Baker. The company has developed specific manufacturing cells including turning and milling, a fabric assembly shop, and a sheet metal fabrication cell, all supported by a metal treatment line and assembly and test facilities. Its client list includes BAe Systems, Goodrich, and Shorts for whom it offers supply chain management and integration services as well as component manufacture.

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### ... universities are a strong feeder of talent ...

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While the structure of the airframe is vital, equally important are the engines that keep it in the air.

Goodrich is one of the world’s

leading independent engine control suppliers and has a base in Belfast. The company has extensive experience of developing high-reliability electronic engine controls with safety critical software on civil and military aircraft. It provides the engine control system for the EJ200 engine on the Eurofighter Typhoon.

The Belfast plant’s software engineering centre designs and develops critical engine control systems and works closely with the hardware division in Birmingham.

Paul Madden was instrumental in setting up the office, which employs 36 people.

“We have had a presence here since 1998. At that time the business was growing rapidly and there was a need for the company to expand its engineering capability. Goodrich chose Belfast because of its UK location, which was necessary for export control and employment issues on sensitive programmes. Also, the universities are

Thales Air Defence's vehicle-mounted Thor missile system



Thales Air Defence

a strong feeder of talent as they offer the right sort of degrees, giving us access to a pool of highly qualified graduates.”

As is the case with many of the companies in the sector, employees tend to stay. Many of the original staff are still there.

“We lost a lot of entrants during 1998-2000 because of the dot com boom; telecoms plundered younger people,” says Mr Madden. “However, that is changing now. Starting from scratch was not easy. The company decided it wanted a local person with good contacts with universities and government officers, which I had, and still do have. We have made a success of the venture so far and will increase our engineering staff in line with business growth.”

Finding good engineers has always been tricky. To counter the outflow of talent and enable people to work on their home turf, in 2000 Ian Kelly and Peter Hinds established Belfast Aircraft Stress Engineers (BASE 2000). The company offers stress engineering and design consultancy services.

### ... a centre of excellence for research work ...

“We recognised that there were reduced numbers of stress and design engineers locally, and they had all been repatriated to Europe and the UK and were working away from home. We were in the same boat ourselves, so set up the company,” says Mr Kelly.

“It is difficult to get our heads around how fast it has grown. There were four of us in year one and now we have 20 engineers and last year we turned over £3m, so we have seen a steady upward trend.”

Base 2000 is cautious about expansion.

“We want to stay on top of and manage our growth. People come to us for our engineering integrity and we



Amber Graham and Stuart McClean from Acorn Integrated Primary School, Carrickfergus, show their model aircraft designs to Tony Monaghan, educational liaison officer with Bombardier Aerospace, at the launch of Bombardier Aerospace's Flight Experience Challenge for schools.

work with top-level clients such as Airbus, Smiths Aerospace, and Dowty. Our flagship product is the engineering work we did for Martin Baker ejector seats on the Joint Strike Fighter programme.”

Working via remote access, BASE engineers visit a client site and glean the information they need. They then work offsite via e-mail and phone, which cuts costs and time.

The approach of Base 2000 typifies

the innovation and imagination shown throughout Northern Ireland's aerospace sector.

“There is a deep ingrained knowledge in this region,” says Pierre Beaudoin. “People made aircraft under the Wright Brothers. We need to benefit from – and add to – this wealth of experience and talent.”

*Liz Moscrop is a specialist aerospace journalist*

## *Pursuing Performance and Excellence*

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**Belfast's Centre of Excellence for Integrated Aircraft Technology, (CEIAT, pronounced 'seat') is largely the brainchild of Professor Srinivasan Raghunathan and represents a feat of political as well as physical engineering.**

The centre draws from the combined strengths of Queen's University Belfast's RAE 5-star rated Schools of Aeronautical Engineering and Mechanical & Manufacturing Engineering, Bombardier Aerospace, the Northern Ireland Aerospace Consortium, and the Queen's University Virtual Engineering Centre. It is funded by Invest Northern Ireland under the PEACE II initiative, Bombardier, the Northern Ireland Aerospace Consortium, and the Northern Ireland government's Department for Employment and Learning.

Set up to support the international aerospace industry, the centre researches industry processes and constantly seeks to improve costs and performance. It is one of only three schools in the UK to have obtained the prestigious 5-star rating, awarded every five years.

Although the centre produces innovative research into traditional

disciplines, such as aerodynamics, structures and materials, its major focus is the integration of engineering disciplines into overall systems frameworks. To this end there are three main strands to its work:

- developing new aerodynamic and structural technologies;
- understanding the links and developing models for a systematic approach to design; and
- integrated cost models for aircraft system engineering.

The thinking behind CEIAT's approach is to introduce best cost and performance from the outset of a project. This type of research demands a high degree of specialist knowledge and close links between academia and industry.

### **... high level of research ... a successful venture ...**

The usual process for aircraft design is to design structures for maximum lift and minimum drag (the most effective means by which an aircraft travels through the air) and then pass the designs on to a team to see how much weight the structures can bear. Mechanics then build the structures and any errors are discovered and ironed out at the testing stage.

"This process is done sequentially and no one is talking to each other," says Professor Raghunathan. "Minimum drag saves fuel, but this is affected by the fact that these structures cost more to manufacture. There is a trade-off between shapes and costs to build. Integration optimises design at every stage of the process.

"We start with the customer specification and look at the design concept. We address the functional architecture and subject the whole process to risk analysis from womb to tomb. We look at manufacturing, maintenance, repairs, testing and recycling – ie the complete lifecycle. We also analyse the effect on the

Bombardier CRJ700 assembly



Bombardier Aerospace



Bombardier CRJ1000 regional jet

environment, noise, and, of course, safety.

"There are significant savings for the customer in taking this approach. Boeing has started to adopt this strategy. We also apply the ideas to management."

Integration research is still in its infancy and the university is working on individual elements of aircraft design. The team is working with Bombardier to adopt the process on aircraft wings and engine nacelles, and with Airbus on aircraft wings.

According to Professor Raghunathan, the university was already working with Bombardier on aircraft lifecycle costs before he had the idea to set up the centre. It took two years to obtain £2m in funding from the airframer and Invest Northern Ireland. The university matched the cash with £2m worth of its teaching time, equating to a couple of hours a day for three years.

CEIAT has a director, a manager, ten academic staff, seven Bombardier staff, seven postdoctoral researchers, and two technicians and is linked by a network of workstations within an e-grid. There is a maximum of four researchers per teacher; any more and the centre believes the quality of teaching supervision is eroded.

Queen's University Technology Centre works in tandem with the CEIAT team and acts as a bridge

between the research teams and industry.

"We are the link between the sometimes three to five years of research time and industry's need for a solution in a shorter time frame," says director Tom Edgar.

"For instance, we have worked with Bombardier on digital mock-ups and digital manufacturing. Digital mock-ups facilitate the design, whereas digital manufacturing speeds up the production process. You can work everything out in a virtual environment without the costs and risks of experimenting in a real place first."

To complement its industry-bridging programme, the university has also initiated a knowledge transfer scheme funded by the United Kingdom government's Department of Trade and Industry. A graduate associate works closely for two years on a Bombardier project to develop industry competitiveness, and then brings this advanced knowledge to an industry cluster of local suppliers, ensuring that the suppliers are at the same level as the in-house engineers.

"At the outset, Invest Northern Ireland advised us to create an international world-class research advisory board," reports Professor Raghunathan. "So we had people from NASA, from Lockheed Martin, and from Boeing, and other aeronautical technical advisors. These people

visited us once a year, which ensured that our work is world class. This gave us more contact with companies such as Thales, BAe Systems, and Airbus."

The school also has strong links with industry and with other academic institutions within Northern Ireland, elsewhere in Europe, the United States, Canada, Japan, and Korea through collaborative research and student exchange programmes.

Professor Raghunathan is appreciative of that first round of funding.

"It gave us great industry links with people like Airbus, QinetiQ, Thales, and others, and gave us money to expand the number of people on our team to focus on aircraft integration. I believe we are the only centre in the world to focus purely on this aspect of the process."

CEIAT has worked so closely with Bombardier that the Canadian company now funds the Bombardier Aerospace Chair in Integrated Aerospace Engineering at Queen's University Belfast.

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**... a high degree of specialist knowledge and close links between academia and industry ...**

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The link between academia and industry has paved the way for the high level of research required to make the centre a successful venture, says Srinivasan Raghunathan.

"We have established a strong reputation internationally and Bombardier is continuing to fund the professorial chair, as well as providing teaching staff who offer the kind of industry-specific teaching you cannot get anywhere else. I am confident that the school will continue to thrive and flourish."

*Liz Moscrop is a specialist aerospace journalist*



## Building a Solid Engineering Base

Liz Moscrop



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**In 2000, fed up with the demands of travelling and working away from home, Peter Hinds and Ian Kelly set up Belfast Aircraft Stress Engineers (Base). The company offers stress engineering and design consultancy services to the aircraft, petro-chemical, and automotive industries.**

The venture has been an outstanding success, and in 2006 won Invest Northern Ireland's 'Exporter of the Year' award.

"We spotted the opportunity in Northern Ireland to use engineering skills, which were migrating to the UK and Europe," says Mr Kelly.

"Locally Bombardier had been the major employer and had reduced its team of engineers it needed over 10-15 years, so the stress and design engineers went away. We recognised that there was a good local resource and so repatriated people. We were in the same boat ourselves and wanted to work closer to home."

Base's working methods are simple. Engineers visit a client on site for a week or so, take project specifications and then do the work from their Belfast base.

"We work closely with our customers, but remotely," explains Mr Hinds. "We visit them and package the job upmap out the design structure, then liaise via e-mail, internet, and virtual tools, as well as by telephone and fax. We take away the substructure of the engineering and some of the design work. We create project plans and deliverables and draw models 'fit for purpose' etc. We have a remote direct link into their engineering database. We then telephone or fax or e-mail periodically for design reviews and ultimately prepare a final report."

In order to deliver such a strong remote service the company has invested heavily in software and equipment. Realising that it was essential to match clients' in-house capabilities, Base has equipped its Belfast office with state-of-the-art industry-standard technology.

"We have made fairly heavy investment in IT and in replacing systems," says Mr Hinds, "and we are strong on analysis and design software." The packages used include MSC Nastran and Patran and CATIA V4/V5.

The company's engineers are very experienced in most of the major aircraft companies' procedures and can pick up work easily.

To keep the talent pool fresh, Base offers extensive training on programmes supported by local government and is happy to look locally.

"We draw on local skills from the universities, and are already working

Airbus A380 wing



with Queen's University Belfast and we are in discussions with the University of Ulster."

The two founders are delighted with Base's achievements.

"It is difficult sometimes to get our heads around the growth," says Mr Kelly. He attributes the company's expansion to the strong background skills and experience of each staff member and says that he has "continuing optimism" for the company's future.

The export achievement award did not come about by chance, says Mr Hinds.

"We were exporting out of Britain and part of our push has been into mainland Europe and the United States. For instance, we have been working with Terma in Denmark and have recently worked with advanced composites in Austria. We have also worked with Eaton Aerospace in the US and have an ongoing relationship with Spain's Gamesa, for whom we performed analysis and support of composite structures on the Sikorsky S92.

"We have made big inroads into the European marketplace, mostly in the manufacturing and maintenance, repair, and overhaul (MRO) sectors. We also do a bit with interiors."

Since Base is not able to award Federal Aviation Administration (FAA) Supplemental Type Certificate (STC) approvals, it partners with other providers to deliver, although Hinds suggests that it would not be a 'huge leap' from the quality systems it already has in place.

The firm has worked with several major partners, notably Smiths Aerospace in the UK, for which it has worked on the B767 tanker and the A380. The firm has also assisted Eaton Aerospace in the United States, where, amongst other projects, it helped develop certification plans and certification test plans on aircraft engine systems. This led ultimately to the successful first flight of the Gulfstream G-IVX in 2003.



Roof structure assembly at Terma Aerostructure, Grenaa, Denmark

In Denmark, Base supplies Terma, providing certification analysis and documentation, fatigue and damage tolerance analysis, acoustic fatigue, vibration, and shock analysis in support of several programmes.

The company's flagship project is for Martin Baker for ejector seats on the Joint Strike Fighter programme.

Base diversified recently into business improvement consultancy and hired an experienced Six Sigma master black belt consultant to augment its Lean Production offering. Six Sigma and Lean Production methods are recognised and in use worldwide. The Six Sigma Define, Measure, Analyse, Improve, Control (DMAIC) technique was developed by Motorola to examine and tailor business processes to meet customer requirements.

The company also offers Six Sigma Define, Measure, Analyse, Design, Verify (DMADV) techniques, translating customers' needs back into the business to design new processes.

Mr Hinds adds that the firm also uses Lean Production methods, originally developed by Toyota. Lean Production visualises business information and materials flow, then systematically reduces waste and non-valued-added activities to create 'lean' efficient processes.

Base also offers Six Sigma training

at green and yellow belt levels, project delivery using the DMAIC and DMADV methodologies, and coaching and mentoring on projects up to black belt level.

The engineering firm is also assessed as complying with AS9100 standards, which define additional areas within aerospace quality management that must be addressed when implementing an ISO 9001:2000-based quality system.

The business has come a long way since its founders first thought about working nearer to their homes.

In addition to the contracts and new hires, the training courses and quality standards represent a great deal of hard work. So what lies in store for the ambitious and successful young firm?

"We look to consolidate the business we have here and our place in the market," says Peter Hinds. "We will look to expand that business organically, with a major emphasis on the design side. We are introducing new top-level skill sets. We can find niche work. We are competing on value and skills, rather than on low cost."

With Base's record to date, it looks as if those goals will be achieved.

*Liz Moscrop is a specialist aerospace journalist*

## *Prospering through Skill and Investment*

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**Londonderry-based Moyola Precision Engineering's founder and managing director Raymond Semple is one of nature's true teachers. This innate skill, coupled with a knack for identifying key industry trends and a desire to learn, ensures that his company prospers in a highly competitive marketplace.**

**H**e started his working life as a trainer and he has not stopped passing on his knowledge since. "I have spent my entire career training people," he says. That much is evident as he passes through his facility, where he not only knows everybody by name, but also keeps abreast of their training and progress.

Moyola opened its doors for business in 1976 to supply production parts to the manufacturing, medical, automotive, and precision engineered production industries. The manufacturer also creates specialist tooling and fixtures, sub-assemblies, and complete assemblies for the civil aerospace, defence, information technology, and other engineering sectors. Today it turns over £5.4m each year and employs 76 people.

In 2001 Moyola added aerospace components to its capabilities – with a prescient eye to the future. The company now manufactures large (up to 3.8m) complex aluminium and hard metal five-axis fuselage, nacelle, and bulkhead components for the largest global aerospace companies.

Additionally, it produces wing ribs, wing reinforcers, gear rigs, and electrical tray assemblies. The firm also offers full logistical management of material and treatment purchasing for most of its aerospace parts, plus services such as assembly and kitting.

Revenues from its aerospace division have been steadily increasing since 2004 and now account for the largest slice across the board.

The company is hot on training and innovation. Each employee on its apprenticeship scheme is carefully monitored and progress is mapped out

on large wallcharts in a room set aside for learning. Mr Semple is keen to hire locally and foster a community spirit. He recently placed a recruitment advertisement in a local paper outlining pay rates and possible career progression. This transparency typifies the company ethos: once hired, everyone's contribution is valued.

There are regular strategy meetings where the management team works out the manufacturer's next move. The policy of listening and learning has translated into investment in the latest machining and engineering technologies.

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**... workforce is highly trained ...  
accredited four-year modern  
apprenticeship programme ...**

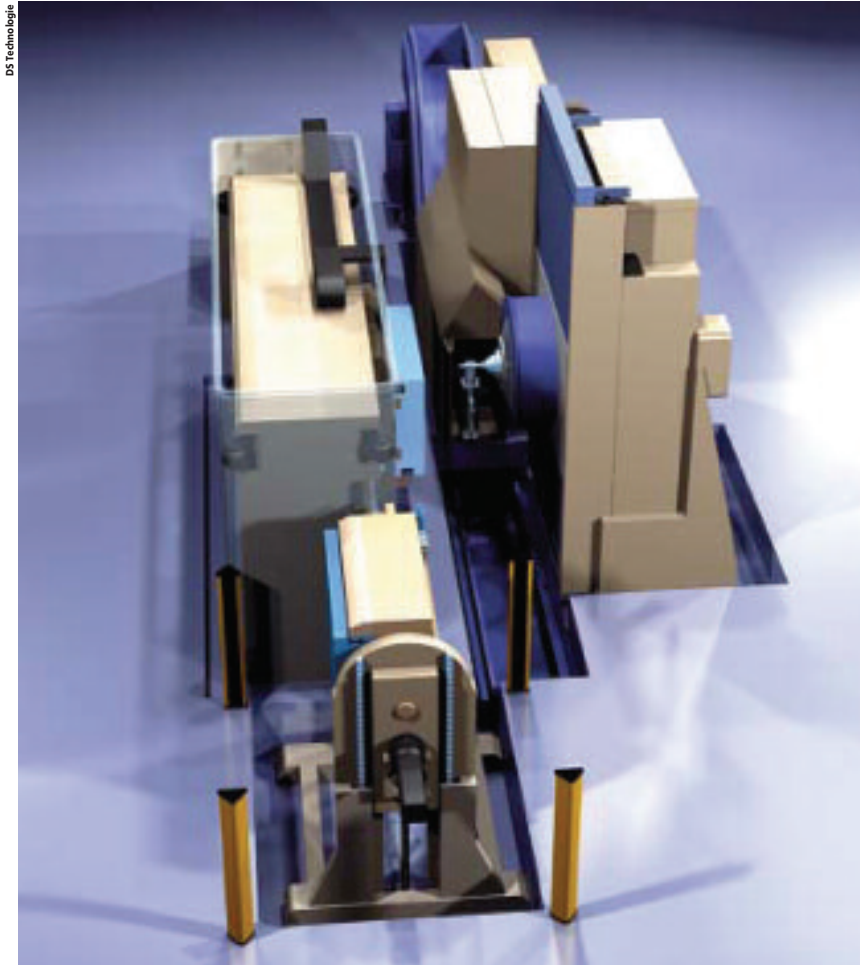
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Moyola now offers a modern machine shop with state-of-the-art bespoke machinery and extensive CAD/CAM and CMM facilities. This is a precision engineering firm, so naturally there is sophisticated real-time management information and scheduling system (Impact Factory) installed to support the hardware. Moyola also offers a flexible round-the-clock shift pattern, so there is usually someone on the premises no matter at all times.

The firm's list of customers reads like a 'Who's Who' of modern aerospace companies: Bombardier, Magellan, Thales, Airbus, and Eclipse Aviation are among its best known end-users. Additionally, Moyola also numbers global giants Du-Pont and Michelin among its clients.

One of Mr Semple's major passions is to learn from other people. To this end, he frequently scours the globe looking for the best technology to bring back to Northern Ireland. Not only does he travel himself, he generally brings his staff with him, thus increasing the in-house knowledge base. "It is my aim," he says, "to nurture young people and their talent."





DS Technologie

DS Technologie Ecospeed F

Two of his most important acquisitions dominate the end of the facility. SNK HPS-120B, the 5-axis horizontal machining centre, is the size of a small caravan and is equipped with a 15,000rpm 37kW spindle. The machine is highly sensitive and is programmed to alert operators if there is a tool breakage. The engineers have taken this one step further and the machine will call their mobiles if they are off site or it is out of hours. The twin pallet behemoth is capable of working unassisted and runs through the weekends or night hours, even if nobody is about.

However, the company's pride and joy is its DS Technologie Ecospeed F machine. Moyola was the first customer in the world to take delivery

of the equipment, which is built with an integral c axis and angular milling head. The Ecospeed F supports full 6-axis face machining of complex aerospace components at the rate of 8,000 cubic centimetres per minute – a claimed world record and the benchmark for machining aerospace aluminium.

When he bought the Ecospeed, Mr Semple anticipated that productivity levels would increase by at least 150%. The equipment can machine large aerospace complex components 2.5 times faster than existing technology. Furthermore, precision and surface quality is so high that manual hand finishing, which would normally be required, is almost completely eliminated. Moyola looked at several

technologies in the United States, Japan, and Europe before choosing the Ecospeed.

Moyola does not rest on its laurels. Ongoing developments include more work for Bombardier Aerospace. The company has also recently secured contracts for fuselage edge frames, pylon brackets, and wing and gear ribs.

Raymond Semple also affirms that Moyola has major opportunities with the UK supply base for Airbus. It is one of only three companies accredited to test for customer approvals for the airframer. On staff are a CAD/CAM manager who project manages all CAD/CAM projects and six CAD/CAM engineers.

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### **... specialist tooling and fixtures, sub-assemblies, and complete assemblies ...**

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The company has forged strong links with the local universities and has a policy of training its engineers on industry leading CATIA v5 software. It also offers Six Sigma projects. Moyola constantly evaluates the facility and optimises each cell within the factory for best practice. Its workforce is highly trained and it has developed an accredited four-year modern apprenticeship programme.

This policy of innovative thinking and people development has paid dividends, and Moyola has won several awards for service and for investment in people.

A telling story of how the workforce feels about this forward-thinking family firm happened one weekend. There was a fire in the factory. Without being asked, workers from across the divisions turned up in their downtime to see how they could help. With a team spirit like that, this company is bound to go from strength to strength.

*Liz Moscrop is a specialist aerospace journalist*

## *Widening Customer Service and Developing the Future*

David Fanning

### **BOMBARDIER**

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**In December last year, Bombardier Aerospace in Belfast announced its involvement in a three-year United Kingdom national research programme aimed at developing and validating technologies that are expected to lead to a new generation of aircraft wings.**

The £34m 'Integrated Wing' programme brings together 17 leading UK organisations from industry, research bodies, and academia. Jointly funded by industry, the UK government's Department of Trade and Industry, and regional development agencies including Invest Northern Ireland, it will address sustainable aviation challenges, such as environmental impact, fuel burn and maintenance costs.

The programme, which forms a key element of the UK National Aerospace Technology Strategy, will look at new wing design, materials and manufacturing techniques, noise reduction and flow control, and advanced fuel and landing gear systems. The aim is to determine the most promising combination of technologies and develop a large-scale physical demonstrator in a second phase of the programme.

Bombardier Aerospace is leading the Wing Structures package of the programme, and will be focusing primarily on developing composites

technologies, including design and analysis techniques, simulation and modelling, materials selection and advanced manufacturing processes.

Bombardier's Belfast operation already designs and manufactures large aircraft structures for all of Bombardier's families of aircraft, as well as engine nacelle systems for several engine manufacturers.

It is also a centre of excellence for advanced composites, and has made significant investment in recent years in this area of its business, particularly in resin transfer moulding and resin transfer infusion technology.

#### **... improving customer satisfaction ...**

"This is an excellent opportunity for us to participate in a collaborative research programme that will enable us to further develop our capabilities and skills in the design and manufacture of large aircraft structures," says Michael Ryan, vice-president and general manager, Bombardier Aerospace, Belfast.

"Developing new technologies also helps to underpin our competitiveness in terms of enabling us to provide higher value added products in an extremely challenging market place.

"We are delighted to be involved in a programme that not only allows us to demonstrate our innovation, but which could lead to a completely new way of designing aircraft, and indeed potentially change the very look of aircraft of the future.

"The programme will also play an important part in helping the UK aerospace industry meet its commitments to sustainable aviation."

Earlier last year, in November, Bombardier Aerospace opened a new £1.5m repair and maintenance facility in Belfast, as part of plans to expand and develop its customer support operations in Northern Ireland. The

#### ***Leading the World***

Bombardier is a world-leading manufacturer of innovative transportation solutions ranging from regional aircraft and business jets to rail transportation equipment, systems, and services. Headquartered in Montréal, Canada, Bombardier has a presence in more than 60 countries on five continents, and operates manufacturing facilities in 21 countries.



Bombardier Aerospace

Bombardier Learjet 60XR

50,000 sq ft facility, located in Belfast's Titanic Quarter, will carry out all Bombardier contracts for the maintenance and repair of engine nacelles.

In addition to the design and production of major aerostructures, Bombardier's Belfast facility also provides product support to airlines which have Belfast designed-and-built nacelles. Emirates, UPS, British Airways, BMI, and Icelandair are among the range of major airline operators supported by the repair facility. Recent contracts won include those with Continental Airlines and Cathay Pacific for the maintenance and repair of engine nose cowls.

Pierre Beaudoin, president and chief operating officer, Bombardier Aerospace, says that the group is providing an 'amazing customer experience'.

"That includes providing world-class

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**... further develop ... capabilities and skills in the design and manufacture of large aircraft structures ...**

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customer support and aftermarket services.

"As the world fleet grows, so does the demand for these services and no one is in a better position than us to serve our customers and capture this growing business.

"This investment also reinforces Bombardier's commitment to Belfast and to the continued development of the site's capabilities and its people.

"Since 1989 we have invested some £1.2bn in plant, machinery, product development, and training at our Northern Ireland facilities."

Mr Ryan says that the Belfast

operation's customer support business has grown significantly in recent years.

"The repair station expansion, along with our enhanced capabilities in aftermarket services, will ensure that we are ready to respond to the increasing demand and will help us further improve customer satisfaction while growing this part of our business."

Over the preceding year, Bombardier Aerospace had been working to extend its repair and maintenance capabilities at its Belfast operation, and was granted approval by the Civil Aviation Authority (CAA) to carry out specialised non-destructive testing on aircraft components. This specialized repair work will also be carried out in the new repair and maintenance facility.

*David Fanning is Editor of Corporate Northern Ireland*