The Royal Society of Edinburgh
Gannochy Trust Innovation Award Prize Lecture

Benbecula to anaesthesia – and beyond

Matt McGrath, CEO, Aircraft Medical

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Report by Peter Barr

The Gannochy Trust Innovation Award is Scotland’s highest accolade for young innovators and the 2010 winner, Matt McGrath, was recently named “Young Scot of the Year.” In his Prize Lecture at the RSE, the 33-year-old CEO of Aircraft Medical revealed the story behind his company's products – which are not just creating jobs and boosting exports from Scotland but also saving lives around the world...

McGrath began by describing his personal background, from his birthplace in Benbecula in 1977 to the University of Northumbria in Newcastle, where he graduated with a first-class honours degree in industrial design. At school, one of his teachers “brainwashed” him into the culture of winning – a man who made Sir Alex Ferguson seem gentle by comparison. From his parents, he inherited his entrepreneurial spirit – they ran their own construction business. And Aircraft Medical, the company he founded ten years ago, was not his first venture into the world of big business – he earned his spurs running the sweetshop at school.

While still at Newcastle, McGrath twice won the Royal Society of Arts student design award, an honour he shares with only two other ‘double’ winners – Jonathan Ive, Head of Design at Apple Inc., and fashion designer Vivienne Westwood. Doing the work for the second award in 1999 was a pivotal moment in the young man’s career, because it first exposed him to a medical device called the laryngoscope, with his design brief to improve a product largely unchanged for the past 50 years, and something he had never even heard of before.

McGrath described good industrial design as a combination of skills which come from opposite sides of the brain – maths, physics and art. And when he applied modern industrial design principles to the laryngoscope (a device for inspecting the larynx so doctors can insert a tube to help patients breathe during anaesthesia), he saw something which the engineers and medics who had worked together on past laryngoscope designs had missed. McGrath's new and refined design proved a winner – and led to the birth of a product which has since generated millions of dollars in sales and been used on more than 300,000 patients. McGrath displayed a quote throughout his lecture to sum up the scale of the problem: “Airway problems remain the most frequent cause of death or brain damage associated with anaesthesia.”

Two years later, McGrath founded Aircraft Medical to develop the new laryngoscope design, which was not only more streamlined but also provided an onboard video image, without using cables, providing doctors with a better view inside the airway, making it easier to insert a tube and helping to reduce problems such as patient trauma, lacerations, broken teeth and cross contamination – plus the threat of litigation.
The new design was based on feedback from hundreds of medical professionals, and also reflected what McGrath described as a trend towards designing “more distilled devices” with the complexity designed out and some of the level of refinement you might expect from a high-end consumer device. McGrath also explained how his company has been influenced by automotive design, particularly companies such as BMW - whose researchers have studied the potential to add “humanistic content” into automotive design. The same may be relevant to medical devices, which after all are human-controlled.

As well as describing some of the influences behind his company’s approach to designing its devices, McGrath spelled out the human cost of breathing problems during anaesthesia, with 30 people per month in the US and Europe having suffered brain damage or death because of failed intubations. The Macintosh device, designed in 1943, is used to help millions of patients a year, but can’t “see round corners” and is hard to insert without risking harming the patient. The first commercial video laryngoscopes, introduced in around 2002, helped to address this, dealing with the approximately 8.5 per cent of cases termed “difficult,” as well as improving the view of the user, which has proved useful in training.

The McGrath® Series 5 was introduced in 2006 after years of research by McGrath and his team at Aircraft Medical, and advanced the video laryngoscope in a number of ways, including portability, a better anterior view, an LCD screen and battery power. With support from a number of organisations, including the Prince’s Trust and the Wellcome Trust, the prototypes were developed with “a super-curved blade to better follow the anatomy,” and a camera stick inside the blade - the first of its kind to be guaranteed sterile. The design was “influenced by clinical observations,” said McGrath, “combined with good structural design.” Rival designs were more bulky and not so portable because they used cables for power.

The design has been enhanced since then, but Aircraft Medical has also addressed the limitations of the original product, particularly the need for a low-cost, mass-market device. The Series 5, which sells for up to $9,000 plus $12 each for disposable blades, is capable of addressing the most difficult cases once the user has invested some time to become expert in its use. Sales of the Series 5 have been impressive, generating in excess of $25m in the four years since its launch.

McGrath's mission is to make video laryngoscopes the standard of care and “introduce the life-saving benefits of video into mainstream clinical practice.” His new device, the McGrath® MAC, is designed to compete with the current standard-of-care Macintosh laryngoscope which is still used in around 90 per cent of all intubations, without video capability, while use of the Series 5 and other video laryngoscopes largely remains limited to a small percentage of specialist cases due to their design and price.

Manufactured in Dalgety Bay in Fife, the McGrath® MAC is the world's first high-value, low-cost portable video laryngoscope. Designed to complement the original premium McGrath® Series 5, it offers clinicians the advantages of video laryngoscopy – at low cost – while allowing medics to maintain their “hard learned” skills of the traditional Macintosh technique. The benefit – medics around the world already know how to use the McGrath® MAC. This important dual capability is designed to raise the global standard of care for fast and simple intubation in everyday practice, by adding the capability to address more difficult cases as they
arise, including potentially fatal unexpected difficult airways, through the addition of permanent video enhancement.

The McGrath® MAC system, including the handle and the display monitor, meets Aircraft's HLDi standard. Introduced in 2008, Aircraft's HLDi standard exceeds the strictest infection control requirements, which include recent advancements in vaporised hydrogen peroxide sterilisation systems.

Aircraft Medical has also improved manufacturing methods and developed a new type of chassis, reducing production costs by 70 per cent.

Aircraft Medical started generating profits soon after it launched its first product, and it now has over 50 patents and patent applications in the intubation instrument and anaesthesia technology space. The company now has a network of distributors in 33 countries, with a total of 250 sales representatives trained in airway management and McGrath® laryngoscope demonstration.

"Video is undoubtedly the future of laryngoscopy," McGrath stated. “We're planning for the future – medics will perform over 500 million intubations over the next ten years; tens of thousands of doctors will grow up using video laryngoscopes. And Aircraft Medical is now getting ready to scale up to meet this demand.”