

OCrobotics reaches the parts that . . .

By Chris Duckar

Development of industrial robots for external assembly tasks is not particularly new. But the notion that one day they could solve the “eye of a needle” problem of tackling complex work inside an aeroplane wingbox always belonged to the realms of science fiction – until now.

Thanks to the inspiration of a Bristol-based company which began life in a garage just a decade ago, it is now very much on the cards.

OC Robotics makes snake-arm robots for aerospace, nuclear and security applications. And one of its most exciting initiatives involves the creation of a demonstrator for Airbus, who have co-funded the project since it began more than three years ago.

As the Duke of York discovered when he visited OC Robotics recently in his capacity as UK Special Representative for International Trade and Investment, this demonstrator is already capable of reaching into a wing rib bay mock-up and conducting swaging tasks.

Long-term implications for the aerospace industry are absolutely huge.

Back in 1997, Dr Rob Buckingham, now the managing director, and Andrew Graham, who is

technical director, set up a consultancy company. Their early work involved designing special machines for companies such as Hewlett-Packard and Rolls-Royce although Rob’s general intention was to “make money from robots.”

By 2000, the pair decided to leave consultancy work and turn their attention to snake-arm technology, which they had researched together some years before at Bristol University, where Rob was a lecturer and Andy a research assistant.

They spent several months developing their ideas (into a surprisingly good diagram on the back of a napkin) and used them to raise venture capital at the beginning of 2001 as a first step to making the new-age robots a commercial reality.

Since then, OC Robotics has gone from a two-person venture in a garage to a company delivering world-leading robotic systems. It works with Airbus, the US Department of Defense and other international operators. And it employs some of the top brains in robotics from around the world – the 12-strong staff includes engineers from the UK, Poland, India, Belgium, Latvia and Slovenia.

OC Robotics may still be small, but it is not small-time, as the Duke’s South West visit underlined. Of four aerospace companies he visited, two were the regional giants, Airbus and Augusta Westland.

Automating assembly tasks inside a wingbox was always going to present a phenomenal challenge. Of course, it is physically impossible to manoeuvre an industrial robot arm through small man-access holes – put simply, the elbows get in the way. But snake-arm robots are amazingly flexible, making them capable of conducting work in really confined spaces.

Currently, during wingbox close-off, it is necessary for aircraft fitters to climb in through small access panels and use manual or power tools to perform a variety of tasks. As future wing designs may not provide adequate manual assembly access, snake-arm robots offer a valuable alternative. For manufacturers, it will mean:

- Cost savings through reduced weight
- Improved aerodynamics by allowing wingboxes to be thinner
- Standardisation of assembly processes

Snake arm robotic technology has particular utility in the aerospace industry.



- Increased rate of production – in-wing assembly automation has the potential to speed up processes and reduce the likelihood of errors
- Reduced health and safety costs, cutting the hours personnel spend inside confined spaces

Rob Buckingham explains that, not only are aircraft manufacturers under pressure to increase production and reduce costs, "these elements are compounded by the additional challenges involved in reducing emissions and operating in an increasingly competitive, global market.

"Energy-efficient flight is such a fundamental requirement that lightweight aerodynamic design is a higher priority than ease of assembly. Inevitably, however, the proposed thinner wing sections become increasingly difficult to assemble using existing techniques."

Aerospace is just one industry where snake-arm robots have applications. "This technology is a game-changer," Rob declares. "For instance, if you can avoid disassembling plant to conduct maintenance or repair then this can change the commercial basis of an after-sales market."

OC Robotics' technology is also very 'scalable', so while Airbus and several nuclear operators are looking for larger and more powerful robots, snake-arms being developed for the US Department of Defense are only half an inch in diameter.

These briefcase-sized devices are more like a borescope than an industrial robot, except that they are controllable along the entire length. That creates applications not only in counter-terrorism for the DoD, but also in utilities, processing and aerospace to conduct inspections inside awkward areas of plant or machinery.

Snake-arm robots have many joints so, unlike conventional robotic arms, do not have prominent elbows. The operator drives the tip around obstacles and the device follows the path created by the tip, which makes control intuitive and easy to learn. In effect, therefore, snake-arm robots are controllable endoscopes capable of snaking into awkward or cluttered environments to conduct real work.

OC Robotics has come a very long way since the garage days and recently celebrated its tenth birthday.

"The ongoing support of the South West Regional Development Agency has been valuable in terms of financial support as well as the help and experience of the advisers," adds Rob.

The company has won three UK Grants for Research & Development (formerly DTI SMART awards) and is currently leading a DTI Technology Programme project entitled "Snake Skin".

Nick Peace, Bristol-based UKTI International Trade Adviser and aerospace sector specialist, said: "OC Robotics joined the Passport to Export programme in June 2006 with a particular focus on growing their business in the US market.



"Business Development Credits, supporting Passport companies, have been invaluable, assisting the company to attend and speak at aerospace events and seminars in Los Angeles and Hamburg. It is a pleasure for UKTI to help companies such as OC Robotics to develop new business overseas when they have such clear, unique selling points – innovation and new technology."

Dr Rob Buckingham ... former Bristol University lecturer.

Where will OC Robotics be in another 10 years? Robotics as an industry is growing at an astonishing rate and, according to the United Nations Economic Commission for Europe (UNECE) and the International Federation of Robotics (IFR), is forecast to be worth 55 billion a year by 2025.

Whatever the industrial landscape looks like in ten, 20 or 100 years time, OC Robotics is convinced that snake-arm robots will be part of it.

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