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New aerospace research centre takes flight

Flying will be a lot safer and more efficient thanks to breakthrough collision avoidance, emergency landing and separation management technologies being developed at a new joint Queensland University of Technology and CSIRO aerospace research centre.

The technologies could also allow unmanned aircraft to perform beneficial operations such as search and rescue, bushfire fighting and monitoring ash clouds from volcanoes as well as power line inspection and crop monitoring.

The Australian Research Centre for Aerospace Automation (ARCAA) in the Da Vinci Precinct at Brisbane Airport houses more than 35 aviation research scientists and support staff. It was opened today by Queensland Treasurer Andrew Fraser as another step in the consolidation of Queensland as a global aviation and aerospace hub.

ARCAA researcher and QUT lecturer Dr Luis Mejias said the new ARCAA facility provided researchers with the tools for leading edge research.

"We are focussing on aviation technologies which will save lives and improve the efficiency of the aviation industry," Dr Mejias said. "For example, mid-air collisions between light planes over Australia have caused the death of eight people in the past five years. ARCAA is developing a Dynamic Sense-and-Act (DSA) system which could provide a cost-effective early warning solution to this problem.

"The DSA system is a safety breakthrough for small planes because until now they have had to primarily rely on the pilot's vigilance to "see-and-avoid" other planes. This can be a difficult task particularly during take-off and landing when there are can be a number of planes operating in a close area and when the pilot has a high workload.

"Recent flight testing has shown that these early warnings can be provided up to four times sooner than the minimum warning time required by a human pilot and, with some recently made refinements, we expect the warning time to be even longer."

The DSA uses an onboard camera, graphics processing hardware and sophisticated image processing algorithms to detect mid-air collisions. Dr Mejias said that while large commercial aircraft had collision avoidance systems, they had limitations and there was currently no cost-effective and self-contained collision avoidance system suitable for use on light aircraft.

"The new ARCAA- developed system could not only improve the safety of conventionally piloted aircraft operations but also provide unmanned aircraft with the collision avoidance capability necessary for them to fly in civilian airspace," he said.

Dr Mejias said the DSA system had been undergoing flight testing at Kingaroy using a specially modified aircraft. Recent trials included full autonomous "closed-loop" scenarios where the DSA system detected and manoeuvred the test aircraft without pilot input.

"We believe the autonomous closed-loop testing of the vision-based system to be the first successful civilian trials of its kind in the world," Dr Mejias said.

ARCAA has rapidly built a reputation for high-quality research and an ability to take leading edge research concepts from paper to flight-tested reality, he said.

"Since 2008, ARCAA has attracted more than $13 million in funding for real-world research projects," Dr Mejias said.

ARCAA is fostering the next generation of aviation researchers by supporting the fourth UAV (Unmanned Airborne Vehicle) Challenge- Outback Rescue at Kingaroy on September 27.

Outback Challenge coordinator and ARCAA deputy director Dr Jonathan Roberts said unmanned aircraft were another area of research where ARCAA researchers had made great strides.

"ARCAA is investigating the enormous commercial applications for unmanned aircraft including stock and pest monitoring, emergency services, reef health, aerial photography, and fighting bush fires," Dr Roberts said.

"We have recently begun exploring the use of autonomous unmanned helicopters in support of crop management."

The Challenge is open to university and high school teams of unmanned aircraft enthusiasts, who design, build and fly a UAV that can complete a rescue task in the outback. The Challenge last year attracted teams from the Netherlands and India as well as Australia and 12 high school teams.

An ARCAA project that has had an impact in regional areas is the ROAMES (Remote observation, automated modeling and economic simulation) program which is the remote inspection of the powerline network for Ergon Energy.

Ergon Energy chief executive Ian McLeod said the company had partnered with QUT, the Queensland government and industry to investigate the use of fully automated aerial technology for monitoring vegetation and its impact on the network.

"Already as part of this project we have completed aerial remote inspections of a number of regional Queensland towns and some rural networks using laser scanners and digital cameras. From this data we have developed the ability to automatically identify vegetation encroaching into powerline zones," Mr MacLeod said.

Treasurer Andrew Fraser was joined by QUT Vice-Chancellor Professor Peter Coaldrake and more than 100 representatives from the aviation industry including Boeing, CSIRO, Brisbane Airport Corporation, CASA, Ergon and Defence.

CSIRO ICT Centre director Dr Ian Oppermann said: "ARCAA represents a unique collaboration opportunity in Australia for research in aerospace automation. CSIRO and the ICT Centre are delighted to be working with QUT, Boeing and other partners in this important area."

ARCAA is a partnership between QUT, CSIRO and the Queensland Government. It was the brainchild of Professor Rod Walker from QUT's School of Engineering Systems; ARCAA deputy director Dr Jonathan Roberts; and Professor Peter Corke from QUT's School of Engineering Systems and formerly of the Autonomous Systems Lab at the CSIRO's ICT Centre.

As well as research into collision avoidance systems, ARCAA conducts research into all aspects of aviation automation, with a particular research focus on autonomous technologies which support the more efficient and safer utilisation of airspace, and the development of autonomous aircraft and on-board sensor systems for a wide range of commercial applications.

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