



JAPAN'S DRONE SECTOR FLYING HIGH

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From high-street playthings to sophisticated commercial and military aircraft, drones are seen as being at the sharp end of technology.

Yet, paradoxically, traditionally low-tech countries such as India and Pakistan are now churning out their own models. The commercial drone business is driven by advances in key components such as sensors, lenses and radio control devices – and manufacturers buy these from producers in advanced tech countries.

"Such components are typically made only in the most advanced nations, particularly Japan," says the Ireland-based journalist Eamonn Fingleton.

"In fact, Japan is the power behind the throne in the drone business," says Mr Fingleton, who has written three books on the economies of east Asian countries.

Shinji Suzuki, a professor in the department of aeronautics and astronautics at the School of Engineering of the University of Tokyo, agrees. "In advanced parts, such as sensors and controllers, Japan is still tops, and I think that will continue in the future," he says.

Not only is drone research and development and use increasing in the country, so is the technology's economic importance. Impress Corporation, a Japanese IT publishing company, estimates the overall Japanese drone market will be worth ¥113.8 billion (Dh3.56bn) by 2020. A report by the Netherlands Enterprise Agency for the embassy of the Netherlands in Tokyo says the Japanese industrial drone market was worth about ¥1.6bn in 2015, and "appears to have started growing in full swing over the past two to three years. It is expected to grow to ¥8.4bn in 2018 and ¥40.6bn in 2022."

Bordering Tokyo, the prefecture of Chiba is at the forefront of research, development and manufacturing of drones. (Japan is divided into 47 prefectures. The capital of Chiba Prefecture is Chiba City.)

Chiba City was designated this year by the Japanese cabinet as a National Strategic Special Zone for developing delivery drones, with a focus on examining institutional and regulatory reforms and the goal of introducing industrial applications of drones, or unmanned aerial vehicles (UAV). The project's technological investigative committee is chaired by the University of Chiba professor emeritus Kenzo Nonami.

Mr Nonami began developing technology for a drone with a completely autonomous control system – a small robot that could fly, from take-off to landing, without any manual control during the flight – in 1998, and in 2001 was the first to succeed at autonomous control during flight. He followed this with success in completely autonomous take-off and landing.

To apply his autonomous control system to drones for a variety of industries, Mr Nonami established in 2013 the Autonomous Control Systems Laboratory (ACSL). ACSL develops its own autopilot/flight controllers that function as the brains of the drone, and is the only company in the country that carries out everything from acquiring parts to manufacture and sales entirely in Japan.

The company imports the drones' batteries and motor drivers from China but they will be made in Japan soon, Mr Nonami says. "So most of the parts will be made in Japan," he says.

ACSL's drones can be used for aerial photography, delivery, spraying, measuring and surveying, with potential applications in fields including logistics, agriculture, disaster response, security and infrastructure inspections.

For logistics in particular, the company collaborated in May with the Tokyo electronic commerce and internet company Rakuten on a month-long trial to transport, by drone, items such as drinks and golf balls to players at Camel Golf Resort in Chiba Prefecture's Onjuku City.

Users described the service as "fun", "cool," "a state-of-the-art service so I am looking forward to using it again", says the Rakuten corporate communications team assistant manager, Yuki Tokaji. "If we can solve problems such as service operational efficiency, we would consider service continuation and expansion, as well as service development at other golf courses," Mr Tokaji says.

Rakuten is also collaborating with ACSL on a project for island and mountain site delivery. ACSL's current major endeavour, though, is implementing drone delivery by 2019 to a 50-storey, six-building residential complex under construction in Chiba City. The project is based on a plan put forward by the prime minister Shinzo Abe.

Such systems are increasingly a necessity because the country is faced with a shortage of lorry drivers, Mr Nonami says, and costs are high. "Drone delivery cost will be only 10 per cent of conventional delivery," he says.

And the target for 2029 will be passenger drones. While the future of transport is currently transfixed on driverless cars there are obstacles on the ground, not least a lack of suitable infrastructure, while there are none such in the air, Mr Nonami says. "So after carrying goods, drones will carry people," he says.

But one challenge in common with driverless cars will be legislation. International agreements already exist for traditional aircraft but drones are prohibited by Japanese law from flying higher than 150 metres, near airports or over densely inhabited areas. "There may be legal problems from owners of private property," Mr Nonami points out.

Chiba City is also one of two locations in Japan where drones are being trialled as rescue aids in case of disasters. The other is Saitama City, the capital of the prefecture of the same name. However, these drones can be used in areas outside those jurisdictions.

The Chiba City Fire Department (CHFD) was equipped in May with a disaster-response drone provided free of charge by the national Fire and Disaster Management Agency. Operators have been trained to use the drone to gather information and search for people during major disasters, and it has been operational since October.

When emergency fire response teams provide support after a major disaster occurs, the drone will be effective as a tool that can rapidly gather vital data from the air, search for people, establish rescue routes, and confirm the safety or otherwise of relevant areas.

Developed by the Japanese company enRoute, the drone can automatically navigate a specified path from take-off to landing. Able to fly for up to 20 minutes, it has the ability to automatically return to its take-off point in case of signal failure or the battery level falling below a set value.

The drone can be equipped with a digital camera, video camera or gas sensor, enabling it to photograph or send video in real-time of the disaster site from the sky or analyse the terrain using 3D imaging, or in case of a fire or leak at a chemical plant or volcanic eruption, it can measure the concentration of gas released.

Helicopters are usually used in case of disasters but there are times when helicopters cannot fly because there is not enough space or too much smoke, for instance, says the CHFD fire lieutenant Takayuki Mitsui. "Also, helicopters make a lot of noise and vibrations, which inhibits searching for people," Mr Mitsui says.

Although Mr Suzuki says the technology may not be advanced enough yet to ensure the safe use of drones for mass delivery, he points out random natural disasters such as earthquakes, heavy rains and typhoons are a serious problem in Japan. If drones were deployed in such events, it would not entail fleets of UAVs criss-crossing the skies over populated areas at all hours in a way that delivery drones might, he says.

"Also, I think it is important drones be used indoors for such things as warehouse inspections," Mr Suzuki adds.

And given the rapid development of drone technology in the country, there should be a bright future for Japan in the export market, he says.

"I think that to fulfil requirements for large, safe drones, Japan will be able to export to the world in the future."

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