

City Talk



No aviation story would be complete without mentioning drones, with their wide use bringing convenience and effectiveness in a variety of roles other than military ones.

Among them, drones allow quick and uninterrupted delivery of food and other provisions while camera-carriers are used for scenic shots and to help inspections in locations not easily reached. Large models are also used in agriculture to spray insecticides.

Drones work along principles similar to helicopters but require more sophisticated control systems as they fly at much lower altitudes and are often disturbed by ground effect air flows.

With powerful motors driven by high-capacity batteries – lithium-ion normally – a drone can fly easily but will just float about and disappear like a weather balloon if not controlled precisely.

Drones today normally have four propellers, each driven by a powerful motor. One rotates in the opposite direction to the adjacent one but in the same direction as the diagonal one, balancing off reaction forces to bring stable flight.

Accurate control of speed differentiation of the propellers longitudinally, laterally and diagonally allow accurate control of pitch, roll and yaw, which are essential basic movements for flying – very much similar to a helicopter.

Properly controlled, drones can even maintain a standstill position.

The heart of the drone is a flight controller comprising a high-speed microprocessor together with small sensors in three-axis arrangements.

They include accelerometers to measure actual movements, gyroscopic sensors to provide signals to ensure stability, and magnetometers to control direction.

To fly on a stable path in a variety of weather conditions, a flight controller processor uses sophisticated algorithms to plot movements based on the immediate past flying history and present condi-



Nuts and bolts

Edmund Leung

tions, often referencing its precise location from GPS signals, every thousandth of a second.

This allows the operator, using a radio frequency controller similar to that for video games for remote control vehicles and planes, to give simple commands to fly it front, left, right, up or down.

The microprocessor system automatically interprets commands with sophisticated algorithms and converts them into signals for fine control of the individual rotational speeds for each of the four propellers to drive a drone to its destination.

The radio frequency controller can allow an operator to accurately control the drone within about two kilometers. Beyond that, a drone may have difficulties following commands, but with the GPS system it can return to the pre-set “home” location automatically for safe retrieval.

We should be pleased to note that the largest and foremost maker of consumer drones is right by our doorsteps.

DJI, widely regarded as the pioneer and world leader in consumer drones, started developing its prototypes here after founder Frank Wang completed his engineering studies in the Hong Kong University of Science and Technology. He then expanded his research team in Shenzhen and within 10 years became the world leader in drones.

Most engineering devices are based on simple principles of physics, but only those able to harness them to develop fine machines will reap great success.

It not only helps them with their business, but also the ability to serve the community at large who will benefit from using them.

Veteran engineer Edmund Leung Kwong-ho casts an expert eye over features of modern life