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Free as a bird

Passenger drones are a better kind of flying car

Could the dream of soaring above the traffic come true?

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TRAVELLERS have long envied the birds. In 1842 William Henson, a British lacemaker, somewhat optimistically filed a patent for an “aerial steam carriage”. It took another 60 years and the arrival of the internal combustion engine before Orville and Wilbur Wright flew the first practical aeroplane. In the 1920s Henry Ford began tinkering with the idea of making cars fly. “You may smile,” he said. “But it will come.” In 1970 his company considered marketing the Aerocar, one of the few flying-car designs that managed to gain an airworthiness certificate.

Yet flying cars have never taken off. That is not because they are impossible to build, but because they are, fundamentally, a compromise, neither good on the road nor graceful in the sky. They are also inconvenient. Most designs require a runway to take off and land, and a pilot’s licence to operate. But that is changing. Developments in electric power, batteries and autonomous-flight systems have led to a boom in sales

of small drone aircraft. Several entrepreneurs have had the idea of scaling up such machines to the point that people can fit inside them. The ultimate goal is a pilotless passenger drone that can either be parked outside your house like an ordinary car, or even summoned with a smartphone app, like a taxi.

Dozens of firms are trying to build such machines. They include Workhorse, an American maker of electric vehicles; Joby Aviation, a Californian company whose backers include JetBlue Airways and Toyota; AeroMobil, a Slovakian company; and Lilium, a German firm working on an air taxi that uses jet-type electric thrusters. Some of their products are convincing enough to have attracted powerful backing. Lilium's investors include Tencent, a giant Chinese investment firm. Larry Page, one of the co-founders of Google, has put his money into several such projects, including the Kitty Hawk Flyer, which the rider sits astride much like a flying motorcycle. Not to be left out, aircraft makers such as Boeing, Airbus and Bell Helicopter have also shown off in-house designs of their own.

A vertical market

Some of the new flying machines are modern variations on the familiar flying-car design. One of the most advanced is the TF-X, developed by Terrafugia, a company from Massachusetts. The TF-X is based on the Transition, a petrol-engined car with foldable wings and a rear-mounted propeller. That machine is already flying and is due to go on sale next year. The TF-X is a plug-in hybrid that can drive but can also take off and land vertically, like a helicopter. Although it is several years away from making its first test flights, Terrafugia says the TF-X will be able to operate autonomously with four people on board for 800km (500 miles) at a cruising speed of 320kph. The idea has attracted interest from bigger firms. In 2017 Terrafugia was bought by Geely, a Chinese firm that also owns Volvo.

The TF-X's ability to do without a runway is a common feature of many of the new designs. Most conventional drones achieve this with a number of small, electrically powered rotors mounted on the corner of the vehicle, or on extended arms. Many of Terrafugia's competitors, though, are abandoning the idea of flying machines that can also drive. Focusing on flight keeps things simple and helps save both money and weight.

One example is Volocopter, a German firm which has attracted investment from Daimler, the parent company of Mercedes-Benz, and interest from Intel, a big American chipmaker. It has been flying prototypes of its 18-rotor autonomous taxi since 2016, when it was first granted a "permit to fly" by regulators. In 2017 it took Brian Krzanich, the chief executive of Intel, on a joyride inside an exhibition hall, with a pilot on the ground controlling the aircraft remotely. A short autonomous flight was carried out in Dubai last year, although no people were on board. This way, step-by-step, Florian Reuter, Volocopter's chief executive, hopes to persuade regulators that passenger drones are safe enough for more ambitious flights and pilotless operations.

For makers of passenger drones face legal hurdles as well as technical ones. Since obtaining its permit to fly, EHang, a dronemaker based in Guangzhou, has been putting its drone, the EHang 184 (shown above), through its paces. That has included flying at 130kph, climbing to 300 metres and operating in a storm. Huazhi Hu, EHang's founder, says it will be necessary to demonstrate that the technology works before air-safety regulators come up with the necessary rules to allow commercial operations. To that end, EHang has got a representative on a technical experts' committee for unmanned aerial vehicles, which has been set up by the Civil Aviation Administration of China to consider what those regulations should be.

The law of the sky

Aviation regulators, understandably, tend to be risk-averse. That means that, although the eventual goal is fully autonomous flight, the first passenger drones are likely to be fitted with manual controls and to require some sort of pilot's licence to operate—just as the first self-driving cars require licensed humans to keep their hands on the wheel at all times. But manufacturers and governments are already discussing how restrictions might be eased. Volocopter, for instance, is hoping that the European Aviation Safety Agency can be persuaded to classify its passenger drone as a "light sports aircraft", which would mean that it can be flown by a person holding a simplified pilot's licence which requires less training.

Eventually, passenger drones may be classified as an entirely new type of aircraft. For that to happen, though, will require a number of changes to existing rules. For instance, most aircraft are supposed to carry enough spare fuel for 30 minutes of extra flying time in an emergency. For many

of the current crop of electric passenger drones that rely solely on their own batteries, though, 30 minutes is around the limit of their endurance.

Some dronemakers hope to persuade regulators that an emergency reserve could be found by running the batteries down completely. As with smartphones and electric cars, the lithium-ion batteries used in drones usually stop discharging when they are about 80% drained in order to protect themselves from damage. Another option might be to fly only at low altitudes, with pre-planned emergency landing points along the route. A final safeguard is an emergency parachute, which many designs already sport.

Another problem is other aircraft. Self-flying drones will probably need specialised “sense and avoid” equipment to prevent collisions. Such systems do not yet exist, though they are being worked on by NASA, among others. Stephen Prior, a drone expert at the University of Southampton, in England, points out that air-traffic control will be another headache. Passenger drones are designed to fly directly from place to place, rather than making use of existing airfields, as conventional aircraft do. That would make the tricky job of directing airborne traffic even more complicated than it already is. The answer will probably involve handing at least part of the job to computers, but such systems are also some way off.

The final issue is price. At least at first, passenger drones will cost supercar money: mooted prices tend to be around $200,000-300,000. That, combined with the requirement to have at least some form of pilot’s licence, will limit demand, at least at first. But as with all technology, if the machines prove popular, their prices will fall, especially once autonomous operations are routine. These new machines may not look like the flying cars that Henry Ford imagined, but he was right. Their time may, at last, have come.

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