



Airineers is a STEM challenge for secondary school aged students who will need to design, build and learn to fly their own radio controlled quadcopter, often referred to as a drone.

On their quest to become Airineers UK Champions, teams will compete in two different classes, **Micro** and **3S**.

#### **Micro Class**

Micro-Drones are just about the easiest way to learn how to build and fly a radio controlled multirotor. Teams will need to design and build an efficient and manoeuvrable micro-sized flying machine that will compete in team games, individual challenges and time trials. And just in case making your own drone wasn't amazing enough, you'll experience all the action from First Person View or FPV via a tiny camera mounted on the drone itself.

Because Micro-Drones are so small, students can use a number of manufacturing techniques to build their vehicle – 3D printing, laser cutting and CNC milling are all excellent examples of suitable types of CAM techniques that could be employed. Their small size also makes them extremely safe to operate indoors.

#### **3S Class**

The 3S is a fast, intense experience that pushes the skills of the pilots and team to the absolute limit. This class uses larger and faster racing drones than the Micro Class and it's all about speed - pilots must navigate through a course of gates in the fastest possible time.

Above everything else, the 3S Class is designed to be fun. Flips, rolls and high speed manoeuvres are what Airineers 3S is all about and the pilots will experience it all from First Person View or FPV.

#### **Rotor Rush**

Rotor Rush is a realistic FPV drone racing simulator that allows you to learn to fly in complete safety using the same transmitter that you would use to fly your real Micro or 3S Class Airineers drone.

Rotor Rush allows you to crash as many times as you need to without damaging anything but your pride meaning you can practice these superfast turns, flips and rolls anytime, rain or shine.

As well as being an important part of the learning process, Rotor Rush Academy is also used to host online virtual races so as you are getting faster, you can see how your skills compare with other Airineers pilots from all over the country before you race them for real at a live event.

As well as learning to design, build and fly their own drones, Airineers also teaches students about the safe operation of this powerful and useful technology which has applications in so many industries.

## What is a drone?

The term drone usually refers to an unmanned aircraft, more formally called a UAV or Unmanned Aerial Vehicle. The term is also often used to describe radio controlled quadcopters which are multirotor helicopters that are lifted and moved by four rotors or propellers. The direction and speed in which the quadcopter moves is controlled by the speed of rotation of each of the four propellers. They are extremely manoeuvrable and can be extremely stable in flight. Many drones of this nature have a high level of autonomous operation including the ability to take-off, navigate and land without any user inputs. However, whilst racing drones like the ones used in the Airgeiners competition have a lot of on-board processing power to manage the flight characteristics, they have very little autonomy and rely much more on the skill of the pilot to operate them.

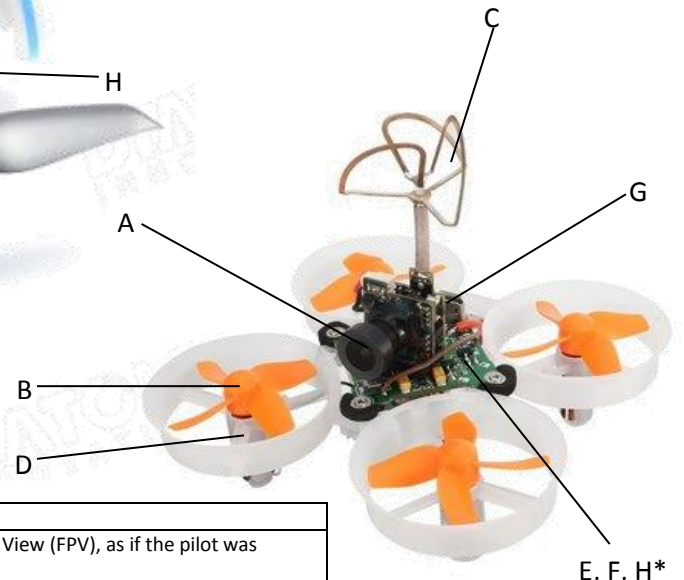
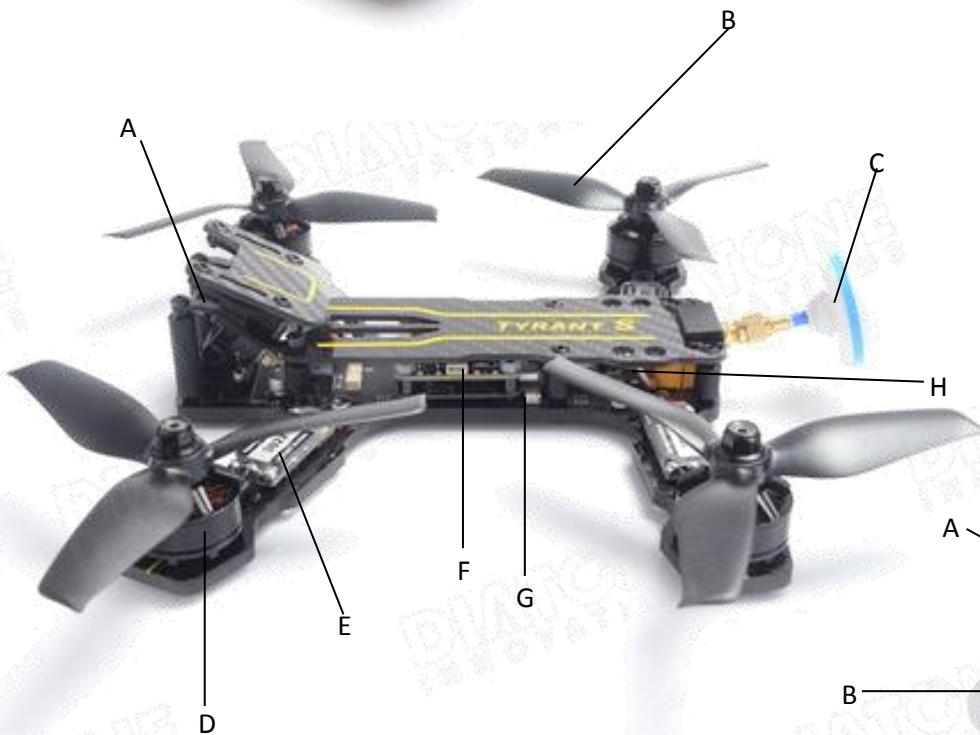
## Components of a Quadcopter

### Transmitter or Tx

The transmitter is used by the pilot to control their Quadcopter. Rapid's FS-i6S can also be connected to a computer via USB to control the Rotor Rush simulator

### FPV Goggles

These goggles allow the pilot to see the view from onboard the Quadcopter. They are fitted with an LCD screen and a 5.8GHz video receiver to wirelessly obtain a video feed.



Ref.	Component	Description
A	Camera	A small video camera that is used to see the First Person View (FPV), as if the pilot was onboard the Quadcopter
B	Propeller	4 propellers are used to provide thrust which moves the Quadcopter
C	Video Transmitter Antenna	Used by the Video Transmitter to broadcast a 5.8GHz video signal to the FPV goggles
D	Motor	4 motors are used and are connected directly to each of the propellers
E	Electronic Speed Controller (ESC)	The ESC takes a signal from the Flight Controller and converts it to voltage to control the speed of the motors
F	Flight Controller (FC)	The brain of the Quadcopter. It has accelerometer and gyroscope sensors that detect the movement of the quad. This data is combined with the inputs from the pilot and the flight controller will then work out what signals need to be sent to each motor
G	Video Transmitter (VTX)	Takes a signal from the camera and converts it to a suitable 5.8GHz signal to send to the FPV goggles worn by the pilot
H	Receiver (RX)	Receives data from the pilot's transmitter using the 2.4GHz frequency. This data is then passed to the flight controller for processing
I	Battery	A lithium polymer battery used to power the electronics and motors on the drone

\*On the Micro-Class drone, the Flight Controller, Receiver and ESCs are all integrated into one board