

What is a UAV?



Re-usable aircraft flown without onboard human crew have been in existence since 1916, the bulk of applications concerning reconnaissance and other military missions too shady, dirty or dodgy for human lives to be jeopardised.

Ongoing miniaturisation of electronics is enabling smaller and smaller Unmanned Aerial Vehicles (UAV), and these are increasingly equipped with cameras or other sensors to support aerial geo-data collection. UAVs appear in manifestations as diverse as aeroplanes and helicopters of all sizes and shapes, motorised para-gliders, blimps, kites and balloons. What sort of UAV is suitable as a platform for digital cameras and other remote sensors? The answers depend on application. The minimal set of criteria to be considered include cost, size and weight of payload; stability and vibration; number of people needed for launch and control; level of piloting skills; flight time; range; minimum airspeed (the lower, the less blurring of images); minimum size of takeoff and landing area; and safety. An additional design criterion concerns whether the UAV be 'dedicated', that is equipped with specific sensors constraining the range of applications, or 'general-purpose', capable of carrying a diverse set of sensors exploitable for many applications.

Copter and fixed-wing: what do you need?

Kites, blimps and the like are affected by wind and thus ill-controllable. **Fixed-wing** UAVs are stable and, depending on wingspan, can carry a payload of up to several kilograms. They have to maintain a minimum speed to stay in the air, and cannot hover. An expert has to handle the remote control to avoid crashes, and good flight preparations are vital. They are suited for mapping areas of a certain extent, conveyed in square kilometres. But data processing has to be largely automated and there should be no need for ground control points, otherwise expensive manual post-processing negates the advantage of cheap data collection. Compared to fixed-wing UAVs, **helicopters** offer more flexible manoeuvring, vertical take-off and landing, and hovering, but they require high-level piloting skills. Helicopters need blades of at least several metres in length in order to carry a payload of up to a few kilograms while remaining stable in the air. Larger, single-blade helicopters powered by petrol engines offer one option, but the rotor may cause injury, so again the pilot has to be well trained. Quad-rotor helicopters are stable enough, and less dangerous, but battery-powered flight time is limited, while vibration may blur the imagery acquired. The decisive factor limiting range is line-of-sight to the UAV, or pilot ability to blindly adjust position. There's also a [hybrid UAV](#).

A solution is guidance without human intervention, enabled through small sized and lightweight boards integrating GNSS and inertial navigation. With the maturation of miniature autonomous systems the UAV market will soar.