

Flight school

For all the unique challenges and advantages flying robots bring, the story of drones borrows from several familiar tales. It's a story about companies shrinking the size and price tag of electronics. It's about scientists and engineers developing lighter and more compact sensors. It's about military technology gliding peacefully into civilian life. For a primer on the various types of drones being harnessed for scientific research, C&EN turned to two experts: Michael G. Wing of Oregon State University, who's building a catalog of small research drones, and Greg Crutsinger, who works for the drone developer 3D Robotics helping schools and students adopt these flying tools.

Multiple blades provide stability and redundancy: If one goes out, the drone isn't necessarily going to crash. These drones are also capable of vertical take off and landing, or VTOL, meaning they can launch straight up and drop straight down.

The electronics in here aren't too different from what's in a smartphone: for instance, a CPU, a GPS, a battery. But there's also an autopilot system to help the drone fly with commands or programming from a pilot on the ground.

Most commercial copters come standard with cameras, which can easily be modified to pick up infrared light, Wing says. Near-IR light is great for monitoring moisture in vegetation, a trick Wing has used in American forests and German vineyards.



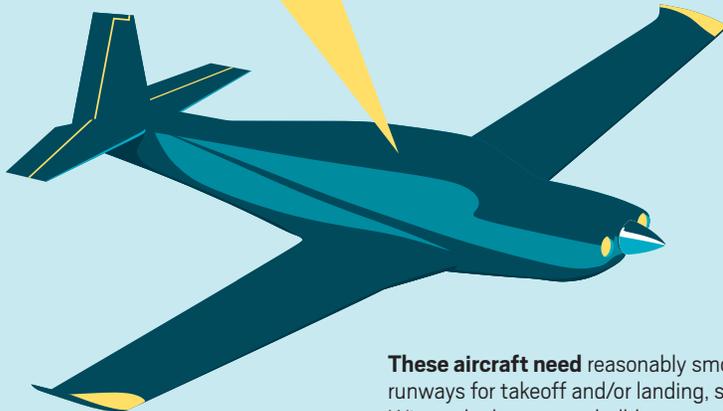
Multirotor copters (e.g., quadcopters): Commercial models "are basically just flying smartphones," Crutsinger says.

Small craft have kilogram-scale masses and wingspans on the order of a meter. Researchers have launched these drones over farms, glaciers, and wildfires and even into hurricanes.

Fixed-wing aircraft:

These come in a variety of shapes and sizes and can generally fly farther and for longer than copters, thanks to their ability to glide without consuming power.

At the opposite end of the size spectrum is the Global Hawk drone, a former military craft now serving the National Oceanic & Atmospheric Administration and the National Aeronautics & Space Administration. With a wingspan of about 35 meters, it can haul nearly 700 kg of payload.



These aircraft need reasonably smooth runways for takeoff and/or landing, says Wing, who has seen a bulldozer used to plow an ad hoc landing zone.

