



Free as a drone: ecologists can add UAVs to their toolbox

Unmanned aerial vehicles (UAVs) are at the cutting edge of technology being applied in ecological research. As UAV technology continues to rapidly develop, Vincent *et al.* (*Front Ecol Environ* 2015; 13[2]: 74–75) noted that the potential research applications of UAVs are stymied by legislative regulations imposed by government bodies. However, US laws are being revised to reflect differences between UAV and manned aircraft, and new Federal Aviation Administration (FAA) policies in the US will greatly assist ecologists who seek to use UAVs in their research. New FAA policy grants a Certificate of Waiver or Authorization (COA) for UAV applications by registered operators who meet their new criteria (WebTable 1; FAA 2015). This is a breakthrough, given that previous policy required a “Certificate of Authorization” for individual UAV flights. Ecologists, once becoming certified operators, now have an automatic “Certificate of Authorization” for undertaking

most UAV operations relevant to conducting science. As a result of the change in policy, UAV laws in the US now more closely resemble the unambiguous and less restrictive UAV laws in Australia (WebTable 1), where Google and Amazon chose to site their drone delivery testing facilities.

Regardless of legislative change, there are ways to incorporate UAVs into research that can avoid some of the issues outlined by Vincent *et al.* If universities do not want to become registered operators, they can collaborate with industry partners who are registered. We are currently using such an approach in our ecological research. We believe this provides the best starting point for academic institutions to use UAVs for research purposes, without the need for in-house logistical support or expertise to meet legislative requirements. While few universities have UAV Operators Certificate (UOC) approval in Australia (<http://bit.ly/1cNbY6T>), 25 academic institutions in the US – as of July 2015 – hold a COA (<http://1.usa.gov/1CDy5W3>). Thus, if Vincent *et al.* worked with a registered industry partner who already had a

COA, they could work as close as two nautical miles from the airstrip they describe without the requirement to hold their own COA.

To conduct research within two nautical miles of a registered airstrip still requires a COA, and with good reason. A registered airstrip is marked on official aviation maps for all aircraft, and can be used for emergency landings. The last thing that a pilot in distress needs is to mistake a small UAV in close proximity for a large airplane in the distance. After all, UAV operators typically do not monitor aviation radio frequencies to inform pilots otherwise. It is important for the broader research community to recognize that UAVs are not toys; they are certified aircraft used for commercial purposes, and can pose a serious threat to both people and property when used irresponsibly.

Finally, proposed changes to UAV laws in Australia could relax the requirement of a UOC for remote-piloted aircraft under 2 kg (CASA 2014). As ecologists already undertaking research with UAVs under 2 kg, we are excited about the possibilities that such changes could foster.

Continued positive changes in UAV-relevant legislation globally – together with industry partnerships – should promote the rapid uptake of UAVs as important tools in conducting ecological field-based studies.

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WebTable 1. The requirements of unmanned aerial vehicle (UAV) operators in Australia and the US

Role	Australia Civil Aviation Safety Authority (CASA) requirements	US Federal Aviation Administration (FAA) requirements
Pilot	<ul style="list-style-type: none"> i. Hold a current UAV Controllers Certificate or a Remote Pilot Certificate and be operating under a current UAV Operators Certificate (UOC) ii. Hold an Instrument Rating for all flight operations beyond visual line-of-sight (VLOS) iii. Must adhere to all operational documents and policies governing the specified flight operations iv. Report any incident or infringement to CASA within 72 hours 	<ul style="list-style-type: none"> i. Pass an initial aeronautical knowledge test at an FAA-approved knowledge testing center ii. Be vetted by the Transportation Security Administration iii. Obtain an unmanned aircraft operator certificate with a small unmanned aircraft system (UAS) rating (like existing pilot airman certificates, this never expires) iv. Pass a recurrent aeronautical knowledge test every 24 months v. Be at least 17 years old vi. Make available to the FAA, upon request, the small UAS for inspection or testing, and any associated documents/records required to be kept under the proposed rule vii. Report an accident to the FAA within 10 days of any operation that results in injury or property damage
Platform	<ul style="list-style-type: none"> i. Unmanned aircraft must weigh less than 7 kg (15 lbs), but permission can be sought for up to 150 kg (330 lbs) for fixed wing and 100 kg (220 lbs) for rotorcraft ii. Cannot exceed 120 m (400 ft) altitude above ground level, except with CASA approval iii. Not fly within 30 m of vehicles, boats, buildings, structures, or people not directly involved in the operation of the aircraft iv. Not fly over any populous area v. Visibility must be no less than 5 km and 1000 ft ceiling vi. VLOS only vii. Not be flown within 5.5 km (3 NM) of any registered airfield, aerodrome, or heliport/helipad without CASA approval viii. Daylight-only operations ix. No person may act as an operator for more than one unmanned aircraft operation at one time x. Be listed on an operating UOC 	<ul style="list-style-type: none"> i. Unmanned aircraft must weigh less than 55 lbs (25 kg) ii. Maximum altitude of 200 ft above ground level iii. Small unmanned aircraft may not operate over any persons not directly involved in the operation iv. Minimum weather visibility of 3 miles from control station v. VLOS only; the unmanned aircraft must remain within VLOS of the operator or visual observer vi. 5 nautical miles (NM) from an airport having an operational control tower; or 3 NM from an airport with a published instrument flight procedure, but not an operational tower; or 2 NM from an airport without a published instrument flight procedure or an operational tower; or 2 NM from a heliport with a published instrument flight procedure vii. Daylight-only operations viii. No person may act as an operator for more than one unmanned aircraft operation at one time ix. Operations in Class G airspace only, without permission from Air Traffic Control (ATC) x. Must yield right-of-way to other aircraft, manned or unmanned xi. Maximum airspeed of 100 mph (87 knots)

Notes: Taken from the Civil Aviation Orders Part 101-3 (CASR 1998) and from FAA (2015).

WebReferences

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