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Drones (UAVs): Control of Use, Research Value & Operational Issues

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Drones: Background

Out-of-the-Box flyable drones for recreational and research use have really only been available over the last decade – an evolving issue.

Their availability and price point has accelerated take-up in the last 5 years or so with the advent of sub £500 consumer products e.g. from DJI which are easy to fly and can be flown with an action camera.

The majority of drones are quadcopters and are ‘ready to fly’ straight out of the box – and by anyone.

Most are for recreational rather than commercial use.

Potential for use as delivery platforms e.g. Amazon, but Beyond Visual Line of Sight (BVLOS), object avoidance, privacy etc. an issue.

Perhaps 3.5m drones in the UK in 2017. 25% of new recreational users unaware of any controls on how, where, when to fly them.

Development of tighter controls e.g. Drone Bill, CAP1627, but these primarily aimed at reducing risk to humans e.g. collision with aircraft.

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Drones: Compliance

Drone operations controlled by the CAA in the UK, but by similar agencies around the world.

Split into **Recreational** and **Commercial** areas and subject to a different level of control.

Rules for **recreational** safe flight fairly similar in countries such as the UK, US, Canada and Australia e.g. DroneCode in the UK:

- 120m max elevation to avoid aircraft issues
- Keep the drone in sight at all time (no BVLOS – Beyond Visual Line of Sight)
- Fly at least 50m away from people & property
- Fly at least 150m from crowds and built-up areas
- Stay away from airfields and airports
- Legal responsibility is with the pilot

No consideration in the code for environmental issues

New legislation likely to tighten up things in terms of potential aircraft interactions & use of geofences but no focus on environmental considerations.

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Drones: Compliance

Currently weight of UAV determines level of control e.g. >20kg threshold.

Even for sub 20kg, CAA permission is required for commercial operation or if you want to fly close to crowds, built-up areas etc.

Permission is provided on the basis that the pilot(s) e.g.:

- Can demonstrate an understanding of aviation theory
- Can pass a practical flight assessment
- Relevant to all operations where a payload is used (inc. camera).
- Type and complexity of environment of operation
- Other e.g. sighting, insurance, provision of crew, equipment etc.

All pilots trained by approved National Qualified Entity (NQE) ensures competency.

Provision & approval of Operations Manual (safety, management structure, aircraft type & maintenance and complex requirements for on site flight operation). These can determine some flight characteristics.

Further compliance with Air Navigation Orders & NATS airspace restrictions.

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Drones: Wildlife Regulation

The UAV commercial regulatory framework is therefore geared to ensuring human safety, both in terms of other airspace uses and for the local population, with other aspects such as personal security also considered.

Provisions for wildlife considerations primarily relate to bird strike and control of this risk.

CAP772 does identify the legal aspects of wildlife protection, but in the context of actions such as bird control operations rather than protection.

There are currently therefore no specific regulations relating to drone use and their effect on wildlife e.g. birds.

Control of damaging operations would therefore be via other routes e.g. Wildlife & Countryside Act & amendments, provisions on damaging activities in European sites etc.

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Drones: Wildlife Guidance

Certainly no prescriptive requirement wildlife impact assessment from the CAA, although compliance with statutory bodies is identified e.g. police but statutory conservation bodies are not mentioned.

Only landowner permission (at launch site) is required, rather than airspace.

Again wildlife not specifically noted, but the guidance does comment on individual bodies developing specific drone policy and guidance (next slide).

At a global level a similar apparent inertia in control for wildlife vs drone use.

Some development of policy e.g. New Zealand Code of Conduct (Wallace et al 2017) which includes:

Don't fly over or within 50 metres of livestock on parks, sensitive wildlife habitats such as wetlands, or nesting or roosting birds

Although a permit from the statutory body can allow this and general provisions to control disturbance are weak or inappropriate e.g. focussed on noise control around airports and for larger aerial sources than small drones.

Dunedin bylaw to ban drones form ecologically sensitive areas although with a discretionary consent clause – e.g. control of recreation not commercial.

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Drones: Wildlife Guidance

Natural England EIN035 – Marine Recreation Evidence Briefing: Drones 11/17

Disturbance to birds dependent on a range of factors e.g. altitude, model, and habituation.

No distinguishing between noise and visual cues from current research.

Research findings (Vas 2015; Drever 2015; McEvoy 2016 cited):

Drone approach to 4m without observed behavioural response in 80% of cases

Drone operation at 40m above waterbirds with no flight response although some movement away at lower altitude.

Potential for greater effects on breeding birds as well as non-lethal energetic expenditure effects which might effect breeding success.

NC Comment: For the most part, guidance is similar to that for other potentially disturbing activities, although from the available research, tolerance appears reasonable (greater?) vs other activities e.g. a human approach distance tends to elicit a flight response (FID) at around 100m for unhabituated waterbirds.

However response is complex – pers. obs. MA with young generally tolerant of a motorised UAV overhead, but immediately responded when engine cut out.

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Drones: Wildlife Guidance

NRW Guidance Note suggests:

- All relevant legislation regarding the safe and proper operation and use of drones must be followed (see the CAA website).
- Ensure that the landowner's permission is given before flying a drone.
- The welfare of birds and other wildlife, and the value of the habitats in which that wildlife is found, are more important than the drone and its use.
- Birds and other wildlife should not be harassed or disturbed by drone flights.
- Drones should not be flown over nesting areas, colonies, roosts and important feeding areas, unless a scientific or conservation need can be demonstrated, and as long as fulfilling that need is not outweighed by potential impacts on the target population.
- If it is considered that the use of a drone is likely to inhibit normal bird behavior, or may solicit an adverse reaction by the birds to the drone, then the flight should not be made.
- Where the use of a drone is likely to cause disturbance to any bird species that is listed on Schedule 1 of the Wildlife & Countryside Act (1981), alternatives must be sought. If potential impacts cannot be avoided, a license must be sought from NRW, setting out the purpose for which the drone is to be used.
- Where the drone is to be used on an SPA, it may be necessary to conduct an HRA assessment and NRW advice should be sought.

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Drones: Wildlife Guidance

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Table 3 Assessment of indicative likelihood of significant impacts from recreational drone activity at the coast

Pressure	Likely overlap between activity and feature (confidence)	Evidence of impact (confidence)	Sensitivity of feature to pressure (confidence)	Likelihood of observable/measurable effect on the feature	Likelihood of significant impact on Conservation Objectives
Above water noise changes and visual disturbance – marine mammals (hauled out seals)	Low – Medium depending on geographical location. Low for most established seal colonies on rocky coastline which are generally remote with difficult access. Possibly higher for seal colonies in more accessible locations, depending on potential range of drone operating system (expert judgement)	Evidence of seals 'flushing' into the sea as a result of flying UAS at low levels above seal colonies in Scotland (one study). Additional evidence of relative lack of response of various marine mammal species (from cetaceans, sirenians and pinnipeds) when UAS operated above certain altitudes (medium)	Medium (expert judgement)	**Low-Medium** based on the relatively low likelihood of overlap (recognising some colonies may be particularly vulnerable), and the sensitivity of feature. Additional risk arises from the potential for the drone to crash if flown beyond the range of the operating system	**Low-Medium**
Above water noise changes and visual disturbance – birds	**Low-High** depending on geographical location of activity (expert judgement)	Evidence from one study of relatively little impact on wild and semi-wild waterbirds; evidence from another study that visible disturbance of wild waterfowl when UAV flown below a certain altitude (low)	**Low–High** (medium) Based difference in sensitivity to these pressures between some species e.g. red-throated diver, curlew, are highly sensitive to disturbance; other species e.g. gulls, have high thresholds (low sensitivity) to disturbance. Certain behavioural activities are considered more susceptible to disturbance e.g. nesting seabirds or breeding birds (expert judgement)	**Low - Medium** based on wide range of likely overlap between pressure and feature. Where overlap occurs mixed evidence regarding impact from drones. Strong evidence base for impact from analogous pressure (i.e. noise or visual disturbance caused by other anthropogenic activities), especially if high feature sensitivity	**Low - Medium**

Guidance precautionary, based on a limited evidence base & expert judgement.

A need therefore to provide a greater evidence base and code(s) of practice.

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Drones: Value for Research & Management

Clear potential for drone use to provide useful data for estuary **research** & **management**. A few potential applications using a simple camera payload:

- Relatively cheap to operate and quick to deploy e.g. as a rapid assessment tool for disaster management e.g. oil spills, surges, floods, seabird wrecks.
- Elevation can provide an unobtrusive 'overview' (with care taken to ensure privacy) of activities e.g. recreational activities, illegal activities.
- Habitat mapping (at differing levels of detail) to support on foot surveys e.g. saltmarsh surveys used to cover areas that are unsafe to cover on foot; biotope mapping with coverage to provide an indication of habitat extent between transects (transects often at a best 1km frequency).
- Habitat condition – an overview of the status of habitats and areas with the potential for image use to be incorporated into GIS for loss:gain calculations.
- Bird survey data (assuming operation to minimise disturbance) e.g. rapid assessment of low tide concentrations, breeding colony utilisation, MR site usage.

Plus a reduction in the requirement for *in situ* surveyor presence & disturbance.

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Drones: Value for Research & Management

Additional payloads e.g.:

LIDAR

Terrestrial, intertidal and shallow subtidal topography/bathymetry, hydrodynamic processes, elevation mapping & change, vegetation height.

Hyperspectral

CASI imagery for algal growth, water quality, sediment plumes, thermal mapping of discharges.

Sampling

Developing use of equipment to sample for a range of determinands in difficult to access areas.

Drawbacks:

E.g. limited flight time and VLOS requirements (at the moment) potential loss of equipment, disturbance/annoyance……?

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Drones: Value for Research & Management

Potential benefits of commercial drone operation for estuary management include cost (e.g. results /ha vs £), speed of deployment, ability to access inaccessible areas safely…….

The case for recreational use in terms of outputs is more difficult to assess. Millions of users and a reduction in the level of CAA control compared to commercial operators.

Suggestion therefore is that recreational users need to be made aware of the issues if operating around or over an estuary through a Code of Practice which is evidence based and targeted specifically for estuarine sensitivities.

The same CoP would be applicable (and potentially extended) for commercial operations.

CoP needs to be mindful of the COs and other statutory requirements as well as those relating to the CAA and NATS.

It needs to have a precautionary components, but based on evidence.

Need for a drone CoP originally raised by Aspinall (BB, 2015).

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Drones: Code of Practice Development

Suggested targeted research on key issues and data gaps to develop the evidence base.

Focussed on designated site wildlife disturbance, but also investigating the types of machine and payload operations intrinsic to certain typologies of survey e.g. altitude, flight patterns, speed.

Incorporating aspects of receptor variability e.g. different groups - seals, waterbirds and potential subsets e.g. roosting, foraging breeding for water birds.

Potential to include other factors such as location/habitat, function, background stimuli (remote vs industrialised) and possibly differentiate noise and visual stimuli effects.

Build on/consolidate existing research e.g. Hodgson et al 2016 Best Practice.

Develop best practice guidelines for commercial and recreational users – these may be separate although grounded in the same evidence and required outcomes.

Provide evidence base to assist in HRA requirements e.g. LSE & mitigation.

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Drones: Code of Practice Development

Thanks

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