



Drone Flight Equipment Risk Assessment

School Assessment No:	INFRA 45
Title of Activity:	Drone flight
Location(s) of Work:	Aerial Robotics Lab; Informatics Forum G.17. Outdoor sites with express permission from landowner or manager (e.g., Dryden farm).
Brief Description of Work:	Remote controlled or autonomous flight of quadcopters with a take-off weight of 2 kgs or less.

Hazard Identification:

Hazard(s)	Present Risk Evaluation L/M/H	Control Measures (i.e., alternative work methods / mechanical aids / engineering controls, etc.)	Risk Evaluation after control L/M/H
Damage caused by inexperienced user	H	No user is allowed to operate the robot without having completed an induction session with an experienced and trained user, read and signed with countersignature this Risk Assessment form, or following the safety procedures described herein.	L

<p>Impact injuries - covers cutting from propellers and collision from a drone that is potentially in a failure state</p>	<p>M</p>	<p>Pilots must be competent (as outlined in the 'Pilot competency' section of this document). IF indoors the drone's flight controller shall be tuned for indoor flight.</p> <p>When available – blade guards should be used. If no blade guards are available, the drone shall only be operated in the safety arena with the nets deployed. When flying outdoors, the pilot and all other actors shall be a minimum of 10 horizontal meters from the flying drone.</p> <p>The drone shall always be in sight of the pilot while the drone's motors are active. This includes autonomous flight.</p> <p>The pilot shall always have access to an emergency stop command, even when flying autonomously. Following software updates, the emergency stop command shall be tested in simulation and with a tethered drone prior to any untethered flight.</p> <p>Drone flight may only take place when the laboratory is clear of anyone who is not directly involved with the test plan. Warning signs must be attached to all laboratory entrances, the key card entrance furthest from the flight area is the only permissible entrance.</p> <p>The drone must be stopped if anyone enters the arena of operations who is not part of the task.</p>	<p>L</p>
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<p>Shrapnel impact - from broken propellers or objects propagated by the airflow created by the drone's rotors.</p>	<p>M</p>	<p>While the drone is powered, all persons in the laboratory shall wear eye protection as specified in the PPE section.</p> <p>Pre-flight checks to check the rotors are freely spinning and the propellers are not damaged. Flight area must be cleared of all objects that are not directly related to the test.</p>	<p>L</p>
<p>Trapping in rotors</p>	<p>M</p>	<p>Batteries should not be overdriven or charged/discharged quickly. The batteries should only be charged with an approved charger and in a safe manner.</p>	<p>L</p>
<p>Injury to children (Impact, choking hazards)</p>	<p>L</p>	<p>Drone should not be left, or flown, in any area accessible to young children/toddlers/babies.</p> <p>Drone should not be flown by anyone under the age of 16 in order to comply with the AR Drone manual and PVG requirements.</p>	<p>L</p>

Engineering Controls:

Guarding	X	Extraction (LEV)		Interlocks		Enclosure	X
Other relevant information:							

Personal Protective Equipment (PPE):

Eye / Face	X	Hand /Arm		Feet / Legs		Respiratory	
Body (clothing)		Hearing		Other (Specify)			
Specify the grade(s) of PPE to be worn:							
"Z87" (basic impact) or greater.							
Specify when during the activity the item(s) of PPE must be worn:							
All times while the drone is powered.							

Non-disposable items of PPE must be inspected regularly, and records retained for inspection

Persons at Risk:

Academic staff	X	Technical staff	X	P'Grad students	X	U'Grad students	X
Maintenance staff	X	Office staff		Cleaning staff		Emergency personnel	
Contractors		Visitors	X	Others			

Additional Information:

This document extends national standards. As a minimum the pilot should be familiar with the CAA standards (<https://www.caa.co.uk/Consumers/Unmanned-aircraft-and-drones/>) which are undergoing substantial alterations as at 02.08.2019.

Pilot should be aware of CAA, Privacy and Data Protection laws regarding the aircraft. Any likelihood of infringement should be avoided, and the drone removed from any area of contention.

Assessment carried out by:

Name:	Vladimir Ivan	Date:	25/08/2021
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Signature:		Review Date:	25/08/2022
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Safe system of work – Form SSW

Drone Flight – INFRA 45

INFRA 12 must be read, understood, and signed off along with this SSW, before use of the drones inside of the robotics labs.

No user is allowed to operate the equipment without having completed an induction session with an experienced and trained user, read and signed with countersignature this Risk Assessment form or following the safety procedures described herein.

Manual flights should only be performed by pilots with prior experience. Anyone flying for the first time should be supervised by a competent pilot as defined in the 'Pilot competency' section of this document. All pilots should have read the flight instruction manuals for the corresponding drone type, printed copies of which are stored in the filing cabinet in G.17.

Pilot competency

Pilots will demonstrate competence by completing a training program in a simulation environment. These tests will be performed with the intended control interface prior to flying with the physical drone. These manoeuvres will also be performed each time the flight controller is tuned. The test includes:

- Safely take-off and land
- Land in a designated spot
- Fly in a figure of 8 formation around the cones on the football pitch
- Emergency stop

In case of emergency:

In the event of severe injury, dial 999 and ensure someone is sent to guide the paramedic into the building.

The emergency phone number is 2222

The nearest First Aid box is in the floor kitchen

Informatics First Aider list can be found on the web at;

<http://www.inf.ed.ac.uk/safety/first-aiders.html>

