



MANDATORY SAFETY ORIENTATION

AVRC Lab Safety Orientation

This orientation is required before working in the AVRC lab – Room B20, Mackey

Lucas Talbert

EECS Laboratory Coordinator

EDITION

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Scope and Applicability

- This training is required for everyone who works in or operates equipment in the AVRC Lab (Room B20, Mackey Building) - students, researchers, teaching assistants, and RAOP program participants.
- Prior experience with robotics, drones, or the Quanser platforms does not exempt any person from this requirement.
- Training must be completed before first lab access and renewed annually.
- A person who has not completed this training may not operate lab equipment unsupervised.
- Failure to follow the rules in this briefing may result in removal from the lab.
- Each Quanser platform has its own equipment-specific safety requirements in its user manual - these apply in addition to the rules in this briefing.

Digital Twin Training Requirement

Complete simulation training before you touch physical equipment - this is required, not optional.

- 1 Complete the applicable digital-twin activities and training for the platform you want to use.
- 2 See the faculty advisor or Lab Coordinator directly to get access to these activities - it is not self-service.
- 3 You must demonstrate the skill in simulation before you are authorized on the physical hardware.
- 4 This requirement is per-platform. One completed module does not authorize you on equipment you have not trained on.

What to Wear in the Lab

The following apply whenever you are working in the lab.

01 Closed-Toe Shoes

Required at all times. Sandals and open-toe footwear are not permitted.

02 Hair and Clothing Secured

Long hair tied back. Loose sleeves and drawstrings secured, clear of props and rigs.

03 No Dangling Jewelry

Remove rings, bracelets, and anything hanging from the neck before working near a manipulator.

04 Eye Protection

Required whenever a drone is in flight.

05 Hearing Protection

Required during QDrone 2 flight. Quanser's manual measures flight noise at 92 dBA at 1m and calls it hazardous.

06 No Food or Drink

Food or drink are not allowed in the lab under any circumstances.

Before You Begin Work

- Know who is in the lab. Identify who is present and what they're running - a flight or program elsewhere can affect your safety.
- Locate the safety equipment. Know where the fire extinguisher, first aid kit, and each platform's emergency stop are.
- Know every exit. Identify the room's exit and the building exit route before you begin.
- Inspect the equipment. Check the battery, frame, props or arm, and cabling for damage before powering on.
- Clear the area. Make sure the flight path or work envelope is clear of people and loose objects.
- Have a second person present. A trained spotter or second person must be there for any flight or live program.
- Read the procedure. Review the flight plan or lab exercise before starting - ask about anything you don't understand.

Equipment Handling Basics

Lift, secure, and power up each platform correctly - these rules come directly from Quanser's manuals.

01 Lift Points Matter

Lift the Aero 2 only by its support yolk, never the propeller bar. Lift the QArm and QArm Mini only by their base handlebars.

02 Secure Before Powering On

Clamp or bolt the QArm's base to the work surface. Fully support the arm while it moves to its home position at power-up.

03 Keep Clear While Running

Stay outside the clearance zone while a platform is powered: 0.5 m for the Aero 2, 1 m radius and 1 m height for the QArm.

04 ESD Grounding Required

Every platform's core board is ESD-sensitive. Ground yourself before handling any board and never let conductive material touch one.

05 Watch Current and Heat

Monitor current draw and motor temperature on any platform you run. Do not exceed the rated maximum or 50°C.

06 Cameras and LiDAR Are Lasers

The RealSense cameras and QBot's LiDAR are Class 1 laser products. Never power one on if damaged and never view the emitter through magnifying optics.

Hazards Present in This Lab

01 Battery Fire

A damaged, swollen, or overcharged LiPo pack can ignite. The most serious hazard in this room.

02 Propeller and Rotor Strike

Spinning propellers and rotors on the QDrone 2, Aero 2, and 3-DOF Hover can cause lacerations.

03 Pinch and Crush Points

The QArm, QArm Mini, and Qube-Servo rigs move under program control and can catch fingers.

04 Trip and Collision Hazards

Ground robots (QBot, QCar 2) move autonomously; cabling and chargers crowd the floor.

05 Equipment Damage

Mishandling a platform can damage costly, grant-funded hardware that is hard to replace.

Battery Safety

- Inspect every battery before use. Never charge or use a pack that is swollen, punctured, or damaged.
- Never leave a battery charging unattended, and never leave it connected to a charger or a platform overnight.
- Charge and store batteries in a fireproof bag or metal/ceramic container, away from anything a fire could damage.
- Never charge a battery that feels warm from use, sits in direct sunlight, or is inside a moving vehicle.
- After any crash, place the battery in a metal container without shorting the leads and watch for swelling or heat for 30 minutes.
- If a battery fire starts, use a fire extinguisher or dry sand. Never use water on a battery fire.
- Do not disassemble, modify, or repair any battery yourself. Report a damaged battery to the Lab Coordinator or professor.

General Operating Rules

- No food or drink at the workstations or near battery charging stations - a spill can ruin thousands of dollars of equipment.
- Do not fly a drone or run a live program alone. A second trained person must be present.
- Perform only authorized work. Confirm with the Lab Coordinator or professor before running anything outside the assigned exercise.
- Do not modify, defeat, or remove any guard, enclosure netting, emergency stop, or approved controller/motor parameters without authorization.
- Keep walkways and the flight or test area clear at all times.
- Leave all equipment powered off and batteries disconnected when you are finished.
- Report any damage, defect, or missing equipment to the Lab Coordinator or professor.

Drone & Ground Vehicle Field Safety

Follow these rules for any flight or autonomous ground test.

01 Use the Flight Enclosure

Indoor flights stay within the netted or enclosed test area. Do not fly a drone over people.

02 Faculty or Operator Must Be Present

A trained spotter watches every flight, and the faculty advisor or an authorized operator must be physically in the room.

03 Preflight Check

Inspect propellers, battery (no bloating or damage), and frame before every flight. Secure the battery with its strap.

04 Maintain Line of Sight

Keep the drone or ground vehicle within sight or on active telemetry at all times.

05 Land or Stop on Any Anomaly

Erratic movement, unexpected vibration, or lost signal means land or stop immediately.

06 Stay Outside the Operating Space

Ground vehicle tests use a marked floor area - stay outside it while equipment is running unless you're authorized inside.

Equipment Inspection & Removal From Service

Inspect equipment before each use. Remove it from service and report it if any of the following is present.

01 Swollen or Damaged Battery

Any puff, dent, or discoloration in a LiPo pack. Remove it from service. Do not charge it.

02 Damaged Propeller or Frame

Cracked, chipped, or bent props and airframes. Replace before flight.

03 Exposed Wiring or Connectors

Frayed leads, exposed conductors, or a connector that doesn't seat securely.

04 Signs of Overheating

Scorch marks, a burning smell, or a motor or ESC unusually hot to the touch.

05 Erratic Behavior

A platform that drifts or doesn't respond correctly may have a software or hardware fault.

06 Report and Tag

Notify the Lab Coordinator or professor. Do not return equipment to service yourself.

Emergency Response

Stay calm, power down what you can safely reach, and follow this order.

- 1 Battery fire: move the pack away from people and combustibles if it is safe to do so.
- 2 Activate the fire alarm if the fire is spreading or you are not sure it is contained.
- 3 Use a fire extinguisher or dry sand on the fire - never water. The battery can still reignite after flames are out.
- 4 Never touch a swollen or venting battery with bare hands. It can rupture.
- 5 Power down the platform first, then apply first aid. Call 911 for anything beyond a minor injury.
- 6 Evacuate immediately when the alarm sounds. Do not stay to finish a flight or program.

Incident Reporting and Emergency Contacts

CALL 911 FIRST: Major injury, fire, or loss of consciousness.

Report anything else to the Lab Coordinator or professor.

EMERGENCY CONTACTS

EMERGENCY

911

Major injury, fire, or loss of consciousness

CAMPUS POLICE

202-806-1100

Howard University Dept. of Public Safety

LAB COORDINATOR

Lucas Talbert

lucas.talbert@howard.edu · Office 3121B, LKD Building · 202-369-6282

HU HOSPITAL — EMERGENCY ROOM

202-865-1141

Howard University Hospital

SAFETY & SECURITY OFFICER

DeMarkus Hodge

demarkus.hodge@howard.edu · Office G018 · 202-250-5277

AVRC FACULTY DIRECTOR

Dr. Fadel Lashhab

fadel.lashhab@howard.edu · Office 1028, L.K. Downing Building · 202-806-2290