UNIVERSITY COLLEGE LONDON
Department of Mechanical Engineering
MECH0073 – Integrated Engineering Design Project

Project Risk Assessment

Design of a Portable Unidirectional Ultraclean Airflow Canopy

Project group	22
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Supervisor (approval holder)	Prof. Ian Eames, i.eames@ucl.ac.uk
Module lead	Dr Andrea Grech La Rosa
Assessment scope	All powered and unpowered testing on prototypes P1, P2 and P3 carried out in the Roberts Building thermal-fluids laboratory, UCL Bloomsbury campus
Assessment period	October 2025 – May 2026
Date issued	May 2026

1. Purpose and Scope

This document records the risk assessment for the MECH0073 Final Year Group Project "Design of a Portable Unidirectional Ultraclean Airflow Canopy". The assessment was prepared by the project team, reviewed and approved by the project supervisor (Prof. Ian Eames), and was operated for the duration of the project. The assessment covers eight activity categories that comprise the experimental and fabrication work: 3D printing, hot-wire anemometry, optical particle counting, sound-pressure measurement, mechanical assembly, fan-electrical operation (230 V AC), HEPA filter handling and laboratory access.

This assessment is provided as a standalone document for the MECH0073 risk-assessment submission portal. The same content is reproduced as Appendix A of the project's final report submission; the two documents are kept in lock-step.

2. Risk-Scoring Framework

Likelihood (L) and severity (S) are scored on the UCL departmental five-point scale (1 = very low, 5 = very high). The residual risk $R = L \times S$ is evaluated *after* the listed controls are in place. The bands used in this assessment are:

- $R \leq 4$: low residual risk – proceed under standard laboratory practice.
- $5 \leq R \leq 9$: moderate residual risk – proceed with the listed controls; supervisor briefed before each session.
- $R \geq 10$: high residual risk – additional controls required before work continues. No activity in this project sits in this band after the listed controls are applied.

All activities in this assessment are evaluated at $R \leq 6$ after controls.

3. Hazard Identification, Controls and Residual Risk

Activity	Principal hazards	L	S	R	Controls in place
3D printing (PLA / PETG; Bloomsbury Workshop)	Hot-end burns; fume exposure from PLA / PETG; toolpath errors causing collision	2	2	4	Printing performed by trained Bloomsbury Workshop staff under their own COSHH and operations procedures; student team supplied CAD only and did not operate the printers directly. Fume management covered by the Workshop's standing risk assessment.
Hot-wire anemometer (testo 405i)	Fragile sensor; ESD on probe head; battery handling	2	1	2	Pre-use functional check before each session; instrument carried in original case; one-handed orientation only, no contact with wire; Bluetooth low-power link; battery removed for storage. Instrument loaned by Prof. Eames.
Optical particle counter (Fluke 985)	Class 1 laser (eye-safe); battery handling	1	1	1	Class 1 laser interlock; manufacturer-calibrated unit; no manual defeating of interlocks; battery removed between sessions.
Sound-level meter (Extech 407732)	Capacitor microphone fragile to handling / impact; battery	2	1	2	Foam windshield fitted before each session; instrument carried in original case; battery removed between sessions; readings at fixed distances on the centreline only.
Mechanical assembly of P1, P2, P3	Sharp PETG edges; hand-tool pinch hazard; prototype instability when powered	3	2	6	Nitrile / cut-resistant gloves for printed-part handling before deburring; bench-clamp during assembly; pre-test stability inspection (centre of gravity, fan-mount integrity) before any powered run; no overhanging assembly while the fan is energised.
Fan electrical operation (230 V AC, ebm-papst D3G146)	Mains shock from loose terminations or damaged lead; short circuit from chafed insulation	1	4	4	Integrated EC motor unit; factory-terminated lead certified to EN 60335; mains plug and lead visually inspected before each session; bench isolation switch verified before energising; no field re-wiring; rig energised only with test team present.
HEPA filter handling (SPCB H14, 110 mm)	Damage to filter media on contact; skin oils contaminating media	2	2	4	Nitrile gloves worn for all filter handling; team members do not touch the filter face; gasket seating pre-checked before installation; filter kept in original packaging when not in service.
Laboratory access (Roberts Building)	Out-of-hours working; fire egress; lone-working	2	2	4	Buddy system enforced for evening sessions; fire-exit and emergency-stop awareness briefing repeated at the start of each session; no unattended powered testing; departmental sign-in / sign-out log followed.

4. Specific Notes on Controlled Hazards

COSHH (PETG / PLA filament). 3D-printing operations were performed by Bloomsbury Workshop staff under the Workshop's standing COSHH inventory and risk assessment. The student team did not handle unprocessed filament, operate the printers directly, or perform post-process heating of finished parts. Printed parts were collected after they had cooled to ambient.

Fan-electrical safety. The ebm-papst D3G146-HQ13-34 is a manufacturer-integrated unit with a factory-terminated mains lead and a built-in EC motor controller. No mains-side re-wiring was performed by the team. All electrical interfaces used the factory connectors and the CN1003 speed controller as supplied; pre-session inspection of the lead and the bench isolator was logged informally before each powered run.

HEPA exposure. The H14 cartridge filter contains glass-fibre media potted in polyurethane with an MDF / aluminium frame. Handling was always with nitrile gloves; the filter face was never touched directly. The filter is sealed and rated for normal handling under EN 1822-4; no respiratory

protection was therefore required. The team did not perform DOP testing or filter integrity testing in-house.

Working environment. All testing was performed in the Roberts Building thermal-fluids laboratory during normal working hours, with the lab door closed and personnel movement minimised to reduce background air currents. A second team member was present during every powered session.

5. Review, Update and Approval

This assessment was reviewed at the start of every powered testing session and at any change in the test set-up (i.e. each new prototype: P1 baseline; P2 open-cavity; P3 conditioned cavity). No incident or near-miss occurred during the project's lifetime; the assessment was not re-issued. The assessment was reviewed and approved by the project supervisor, Prof. Ian Eames (i.eames@ucl.ac.uk), who acts as the approval holder for all powered testing on this project. Should this project be continued into a future academic year, the assessment must be re-reviewed and re-issued under the supervisor and module lead of the new academic year.

This document is the standalone version of the project risk assessment, prepared for the MECH0073 risk-assessment Moodle submission portal. The same content is reproduced as Appendix A of the project's final report submission.