

Freddie Knight

MEng Aerospace & Astronautical Engineering
University of Southampton

✉ mail@freddieknight.co.uk

☎ 07471 938091

🌐 linkedin.com/in/Freddie-Knight

🌐 freddieknight.co.uk



Engineering

Portfolio

Profile

I'm a third-year MEng Aerospace & Astronautical Engineering student at the University of Southampton, specialising in aerodynamics and achieving First-Class results in Years 1 and 2. I'm experienced in taking engineering problems from analysis and simulation through CAD, manufacture and experimental validation, using SolidWorks, ANSYS, Python and workshop manufacturing. I'm particularly interested in aerospace design, aerodynamics, materials and experimental engineering. I enjoy all elements of projects and have undertaken several in my own time.

Education

University of Southampton

MEng Aerospace & Astronautical Engineering

2024–2028

Current: Year 3

- **Year 1: 75.1% – First Class** **Year 2: 73.8% – First Class**
- Specialising in **Aerodynamics**; Year 3 including an Individual Project in Experimental Aerodynamics.

Selected Engineering Projects

CubeSat & Low-Friction Environment Platform

6-Person Group Project

- Led the mechanical design of the **low-friction platform structure and fan ducting** for a yaw-controlled CubeSat system, optimising mass, airflow, fan positioning and manufacturability within the design specification constraints.
- Designed the structure in **SolidWorks**, using simple FEA to support development, and personally manufactured and assembled the platform using **laser-cut finger-jointed panels and 3D-printed ducting**; final system mass was exactly **1,800 g**, the limit of the design criteria.
- Redesigned & iterated the battery support to lower the centre of gravity and improve stability while resolving packaging and tolerance constraints; achieved the **highest low-friction assessment result of 10 teams**, completing 17 tracks with a best-three average speed of **0.32 m s⁻¹**.

Real-Time Aircraft Tracking Display

Independent Embedded Project

- Developed a standalone **ESP32**-based aircraft tracking display using live OpenSky Network data, with the microcontroller handling Wi-Fi connectivity, HTTPS/OAuth authentication, API requests and JSON processing using **ArduinoJson**.
- Calculated aircraft range and mapping nearby aircraft onto a 240×240 circular TFT with selectable **5–50 NM radar ranges** and an encoder-driven interface.
- Developed custom rendering logic to eliminate display flicker and preserve aircraft, airport and text graphics during the animated sweep; designed a serviceable **3D-printed enclosure** around the display, encoder and electronics.

Technical Skills

CAD & Engineering Design: SolidWorks – assemblies, part modelling, engineering drawings and design for manufacture; Siemens Solid Edge; Ultimaker Cura; BS 8888

Simulation: ANSYS Fluent; ANSYS APDL; CFD; FEA; mesh-convergence studies; adaptive meshing; turbulence modelling

Programming & Data: Python (NumPy, SciPy, Matplotlib); C++; ESP32; numerical modelling; engineering data analysis; REST APIs; JSON

Dynamics & Control: Flight dynamics; state-space modelling; transfer functions; P/PD/PID control

Manufacturing: Manual milling and turning; drilling; tapping; knurling; laser cutting; 3D printing; bandsaw and workshop hand tools

Engineering & Professional Experience

Self-Employed – Property Maintenance & Handyman Tasks

2024–Present

Poole

Alongside University Studies

- Completed approximately **50 customer projects**, sourced through referrals and word of mouth, independently managing site assessment, material estimation, quoting, procurement and completion.
- Delivered work including **20 m+ fencing installations**, guttering and drainage modifications, including redesigning downpipe routing to improve appearance and integration with existing buildings.
- Also covering smaller jobs such as pressure washing, smoke alarm replacement, gardening, painting and similar 'handyman' style jobs

Lucy Group – Design Engineering Work Experience

July 2022

Thame

Work Experience

- Designed an adjustable spring-powered launcher in **Siemens Solid Edge**, varying spring ratio, launch-arm length and mechanical stop position to control trajectory and range; **placed first** in the work-experience design challenge.
- Shadowed and worked with engineers across the site, observing manufacturing processes and new-product testing while developing an understanding of material selection and how designs progress from development into production.

Selected Technical & Computational Work

Computational Aerodynamics & CFD

78% – ANSYS Fluent

- Modelled finite-wing aerodynamics for a **NACA 4313 wing** in ANSYS Fluent, evaluating aerodynamic coefficients across -4° to 10° **angle of attack** and comparing results against Lifting Line and Thin Aerofoil Theory.
- Conducted mesh-sensitivity studies up to approximately **3.6 million elements** and applied Hessian-based adaptive refinement around the leading edge, wing tip and wake to assess convergence and discretisation effects.
- Modelled laminar, turbulent and transitional boundary layers, comparing **Spalart–Allmaras** and $k-\omega$ formulations for convergence, mesh sensitivity and computational cost, with validation against Blasius and Law-of-the-Wall predictions.

Finite Element Analysis & Structural Optimisation

72% – ANSYS APDL

- Performed 1D, 2D and 3D finite-element studies including cantilever beams, plates with stress concentrations and full wing-shell models.
- Conducted mesh-convergence studies and compared linear and quadratic element formulations; evaluated wing thickness and material selection against **weight, deflection and factor-of-safety constraints**.

Aircraft Dynamics & Control

Python – NumPy – SciPy – Matplotlib

- Modelled Boeing 747 longitudinal dynamics using state-space, transfer-function and zero-pole-gain representations, comparing a full 3-DoF model with a reduced short-period approximation.
- Reduced model predictions of natural frequency and damping ratio agreed to within approximately **1%** of the full-order model.
- Implemented and tuned P, PD and PID controllers, reducing simulated step-response overshoot from approximately 35% to 9%, while **investigating robustness, sensor lag, filtering, sampling and ADC quantisation**.

Experimental Aerodynamics & Model Validation

Wind Tunnels – XFOIL – XFLR5 – Python

- Independently conducted boundary-layer, pressure-tapped aerofoil and finite-wing wind-tunnel experiments on a **NACA0020**, measuring velocity, pressure, lift and drag across multiple Reynolds numbers and angles of attack.
- Wrote Python analysis tools to process experimental data and numerically integrate pressure distributions, comparing measured behaviour against self-generated **XFOIL, XFLR5 and theoretical** predictions.
- Identified approximately **17% difference in lift-curve slope** and **54% difference in predicted glide ratio** between experiment and lower-order modelling, highlighting limitations in simplified drag prediction.

Flight Test & Experimental Engineering

Cranfield Flying Laboratory

June 2026

Southampton Airport

Flight Test & Experimental Analysis

- Participated in an instrumented flight-test laboratory, recording aircraft data during performance, static-stability and dynamic-stability manoeuvres, including longitudinal and lateral dynamic modes.
- Applied flight-mechanics theory to measured aircraft behaviour, using recorded data to evaluate performance and stability characteristics.

Additional Engineering & Practical Experience

VW Caddy Camper Conversion

Independent Design & Build

- Designed and manufactured a SolidWorks-developed plywood interior around vehicle contours and wheel-arch constraints, integrating a slide-out single/double bed, rear kitchen, drawers and bicycle storage.
- Designed and assembled a **4S 320 Ah LiFePO₄ electrical system**, calculating cable and fuse requirements and integrating a BMS, 2 kW inverter, DC–DC alternator charging and Victron solar charging.

Wheelie Bike Shop – Bicycle Mechanic

Mar 2022–Sep 2023

Poole

Part-Time

- Diagnosed and repaired mechanical and hydraulic bicycle systems, including suspension, brakes, wheel building, drivetrains and e-bike maintenance; trusted to **run the shop independently**, covering customer service, sales, workshop bookings and repairs.
- Still in contact to assist with company development and progression

Shore Medical – Workflow Administrator

Jul 2023–Apr 2024

Bournemouth

Full Time

- Processed and clinically coded medical correspondence across **six GP surgeries** using SystmOne, independently routing follow-up actions where accurate classification was important to subsequent patient care.

Leadership & Additional Experience

Monster Energy – Student Ambassador

Sep 2025–Present

University of Southampton

- Manage relationships with **eight university societies**, coordinating distribution of approximately **500 cans per month** and supporting events and activations; received the monthly best-content bonus **three times**.

Additional

Earlier Education: Poole Grammar School – A Levels: Mathematics (A), Physics (A), Design & Technology (A).

Qualifications & Certifications: IBM SkillsBuild – AI Fundamentals: Language and Vision in AI (2026); RYA Powerboat L2; UoS minibus driver; Microsoft Office Specialist; full UK driving licence; UK citizen with unrestricted right to work.

Interests: Competitive mountain-bike racing; skiing; camping; fabrication; 3D printing and independent engineering projects.