Keir Archibald

Mechanical Design Engineer

CONTACT

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PROFILE

Mechanical design engineer who led an independent collaboration with Global Cycling Network (GCN) that has surpassed one million views. Strongest in prototype-led, human-centred design from concept through to physical delivery. Thrives in small, fast-moving teams where collaboration and ownership are both expected.

ENGINEERING COMPETENCIES

- Autodesk Inventor · SolidWorks · Fusion 360
- Structural & Magnetic FEA
- End-to-End Product Development
- Human Factors Engineering
- Rapid Prototyping - FDM, SLA, SLS
- Test Rig Design & Fabrication
- Reverse Engineering & Photogrammetry
- Material Selection & Tolerance Analysis
- Embedded Systems & Controls
- Medical Device Design
- Client-Facing Project Management
- MATLAB & Genetic Algorithm Optimisation

PROFESSIONAL EXPERIENCE

Independent R&D Project | Global Cycling Network (GCN)

Jan 2025 – Jan 2026

Concealed Electromagnetic Assist System

Developed what is believed to be the first concealed electromagnetic drive system integrated into a UCI-class racing bicycle, built to deliver real assist while remaining undetectable under most current UCI inspection methods. No institutional support, no GCN technical resource, no workshop, £500 budget. Coordinated deliverables and produced build documentation for GCN's media team while remaining sole technical lead from first concept to rideable prototype. Met the 20 W design target. Featured in a GCN video exceeding 500,000 views within 48 hours - prompting a second collaboration with Be Amazed (13M subscribers) and renewed engagement with the UCI on motor doping detection.

- Optimised magnet configuration using FEA in FEMM linked to a genetic algorithm, optimising torque-to-mass ratio, air gap, and runtime penalty, converging on 48 N52 magnets.
- Reverse engineered the fork via photogrammetry - 300+ images through Polycam to Fusion 360 mesh - and the wheel through physical measurement; delivered the integrated shroud to a production fit on carbon components in two iterations.
- Tested four coil wire gauges against resistance, mass, and thermal behaviour; redesigned around an aluminium heatsink core, extending time-to-thermal-limit by ~40%; a calibrated thermistor LUT then allowed current and duty cycle to be pushed to material limits, gaining ~10% additional output on the 20 W target.
- Wrote the full embedded control system from scratch on an ESP32-S3; position-synchronised firing and closed-loop PI current control at 1 kHz were critical to viability, without both, the coils either underperform or fail.
- Before the build, I travelled to Budapest to interview Stefano Varjas - the only publicly known motor doping mechanic - alongside Chris Marshall-Bell and Nicholas Raudenski (UCI anti-motor-doping lead), using those conversations to directly inform the system design.

PROFESSIONAL EXPERIENCE

Design Engineer — Placement Year | Sandoz (formerly Coalesce)

Jul 2022 – Jul 2023

Medical Device Design Consultancy | Cambridge

Placement across a full-capability medical design consultancy - prototyping, machining, human factors, and industrial design. Direct responsibility on live client projects from day one within a small, senior engineering team.

- Designed the full mechanical methodology for a human factors dose counter tolerance study in collaboration with Rebus Engineering. Machined custom positional offset components and validated accuracy using a Cognex In-Sight vision system with adapted C++ inspection code, producing data used directly as regulatory evidence for medical trial approval.
- Built and used custom modular test rigs to characterise a biosimilar autoinjector device in a clean bio lab. Converting the test data into a full system requirements specification that formed the foundation of an in-house device development programme.
- Designed a novel latch mechanism from requirements through to a working 3D printed prototype, engineered to avoid patent conflicts with existing devices - mechanism entered early-stage patenting at the close of the placement.
- Built in-house manufacturing rigs - ultrasonic welding fixtures, a syringe filling rig, and a drop test apparatus with a high-speed camera - to remove manual process variability from inhaler assembly and testing, saving 6 weeks lead time against fully built devices from an external supplier.
- Ran a structured drop test failure analysis on inhaler mouthpieces. Using high-speed footage to identify crack propagation origins and latch failures, then tested ABS against PP across fully assembled devices; findings directly drove the switch from ABS to PP for the final production mouthpiece.

Automatic Day-Shape Display System | British Maritime Technology (BMT)

Jan 2024 – Jun 2024

Cross-Disciplinary Design Project

Six-month live design brief for BMT on an automatic day-shape display system for unmanned surface vessels. Absorbed both project manager and design lead roles across a five-person team, originally six. The project achieved a First.

- Managed all weekly client meetings with BMT, kept five engineers from different disciplines aligned across individual and group deliverables, and organised an early-stage site visit to Devon. Interviewing BMT design engineers, maintenance engineers, and commercial fishermen to establish the operational constraints that drove the system specification.
- Introduced a Google Design Sprint framework. Functional decomposition, morphological charting, and Pugh matrix selection gave the team an evidence-based path to concept convergence, replacing assumptions with justified, traceable decisions.
- Validated the design through FEA, actuator sizing, tolerance and thermal expansion analysis, and Granta Edupack material selection, confirming the sub-system met COLREGs requirements.
- Presented the finished system to 200+ engineering companies at a live design exhibition. Four of the five team members received job offers from ASV Global (now L3Harris Defence), myself included, with interest reconfirmed at a subsequent careers fair.

EDUCATION

MEng Mechanical Design Engineering | University of Bath 2:1 | *2020 – 2025*

Including placement year at Sandoz, Cambridge (2022–2023). Specialised in Mechanical Design in years three and four.

ADDITIONAL

- Currently running the bar at The Torbrex Inn. Trusted to work independently and close at the end of the night. The social side is what keeps it interesting; regulars, families, tour groups, no two shifts are the same, and you get good at reading people and adapting.
- Served as Social Secretary for the University of Bath Surf Society. Organised a trip to Taghazout, Morocco for 120 students, including transfers, accommodation, surf hire, and lessons. Somehow it all came together.