Aero 2

Reconfigurable Dual-Rotor Aerospace Experiment for Controls Education and Research

The Aero 2 is a fully integrated aerospace lab experiment. It is designed for teaching controls and introducing aerospace concepts at an undergraduate level with applications for research at the post-graduate level.

Two rotors provide thrust and allow users to safely control the device's dynamic response. Interchangeable propellers, user-adjustable thrust vectors, and the ability to lock axes individually mean the Aero 2 is capable of abstracting a variety of aerospace systems, such as half-quadrotor, 1-DOF VTOL, and 2-DOF helicopter.

The compact base includes a built-in amplifier with an integrated current sensor, a built-in data acquisition device, and an interchangeable QFLEX 2 interface panel offering connectivity options for a wide range of devices including PCs, embedded computers, and microcontrollers. Four high-resolution optical encoders, plus one Inertial Measurement Unit (IMU), can be used to measure and control attitude in both pitch and yaw axes. Slip ring wiring allows for unlimited, continuous, 360° yaw rotation.

With the comprehensive course materials included, you can build a state-of-the-art teaching lab for your mechatronics or control courses, engage students in various design and capstone projects, and validate your research concepts on a high-quality, robust, and precise platform. Couple the physical experiment with the QLabs Virtual Aero 2 to provide every student access to a high-fidelity digital-twin for flipped and hybrid lab experiences.

Features

High Performance

Hand-ground, precision-made components minimize damping and friction for a high-fidelity, high-performance system

Configurable

Interchangeable propellers, adjustable thrust-angles, and lockable axes can simulate multiple aerodynamic systems

Safe

Fully enclosed rotors allow users to safely tune and experiment with unstable systems

Open Software Architecture

Open-architecture design with fully documented system models and parameters providedvision system

Courseware

- Sensor interfacing and signal conditioning
- Experimental system identification
- Theoretical system modelling
- Parameter estimation and model validation
- Speed and position control
- Controller design to specification
- Gain scheduling and aerospace control
- State-space modelling and control
- LQR controller optimization
- Kalmann filters/LQG controller design

Product Details

Device Specifications

Device Dimensions (D x W x H)	18 cm x 52 cm x 40 cm
Operating Space (D x W x H)	52 cm x 52 cm x 62 cm
Mass	4.7 kg
Pitch Angle Range	90° (± 45° from horizontal)
Yaw Angle Range	360° Continuous
Pitch Encoder Resolution	2880 counts/revolution
Yaw Encoder Resolution	4096 counts/revolution
Prop Thrust Constant	5 x 10^-4 N-s/rad
Inertial Thrust Constant	0 .042 Nm/A
Inertial Measurement Unit (IMU)	IIM-42652 Compact 6-Axis MEMS Device
Tri-axis Gyroscope Range	+- 500 dps
Tri-axis Accelerometer Range	+-2g

About Quanser:
For 30 years, Quanser has been the world leader in innovative technology for engineering education and research. With roots in control, mechatronics, and robotics, Quanser has advanced to the forefront of the global movement in engineering education transformation in the face of unprecedented opportunities and challenges triggered by autonomous robotics, IoT, Industry 4.0, and cyber-physical systems.