# RCbenchmark™ Quadcopter Kit

The RCbenchmark™ Quadcopter Kit is an inclusive system intended to reduce the setup time and cost required to obtain a functional quadcopter research and development lab with motion capture. The solution includes pre-configured hardware, video and and written tutorials, as well as video conference support. RCbenchmark can also provide in-person training.

Typical use

- Artificial intelligence research
- Teaching of control and robotics course
- UAV development
- Research on UAV control
- Development of vision systems
- Development of SLAM systems
- Development of state estimators
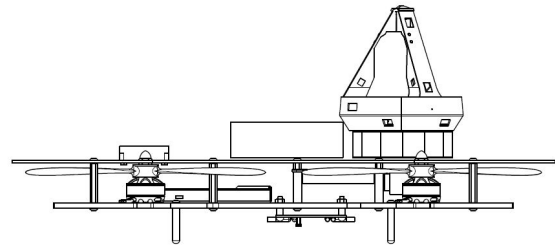
Design principles

The RCbenchmark tracking lab is built on the [Dronecode platform](). The Dronecode Project Inc. is a Linux Foundation Collaborative Project supported by a large number of private and academic organizations. All its component are open source under a business friendly BSD license. The open nature of the project encourages interoperability between components and perennity to projects using the hardware and software. The dronecode platform is flight tested with thousands of hours of flight. This means that when your project is ready to leave the lab, you will be able to do so while relying on an excellent platform.

Project components

- Pixhawk ®: Flight controller
- PX4: Firmware
- Pre-configured quadcopter
- Pre-configured high speed router
- Otus Tracker™
- Qgroundcontrol
- Lithium Polymer Battery
- Battery Charger
- LCD screen for status messages and user messages.

- RCbenchmark Tracking Lab
- Mavlink
- MavProxy
- Raspberry Pi 3 B+
- 250 mm frame
- Dronekit
- Propeller balancer
- Taranis X9D Plus

Hardware features list

- Position, velocity, orientation, and rotational velocity measurement
- Support up to 14 quadcopters in the same room

- Compact size for flight test in regular sized office.
- Full mechanical characterization of the quadcopters.

Technical specifications

**Table 1:** Design specifications of the RCbenchmark Quadcopter Kit.

Specification	Value	Unit
Position precision	±0.5	mm
Quadcopter class size	250	
Position accuracy over whole tracking space	±5	mm
Quadcopter weight	TBA	kg
I_x	TBA	kg·m2
I_y	TBA	kg·m
I_z	TBA	kg·m
Flight time	>6	min.
Wireless communication rate	250	Hz
Tracking volume	5x5x5	m^3

*The update rate is how often the Otus communicates with the computer.

Software feature list

- Plugins for Matlab, C, C++, C#, ROS, and Python
- Simple integration with other languages supporting UDP
- Easy to use interface
- Export to CSV for analysis in almost any software

- Reset local axis with a single click
- Specify custom local axis for all controllers
- Uniquely identified quadcopter
- Prediction of future velocity and position to compensate for latency in control code

Operation diagram
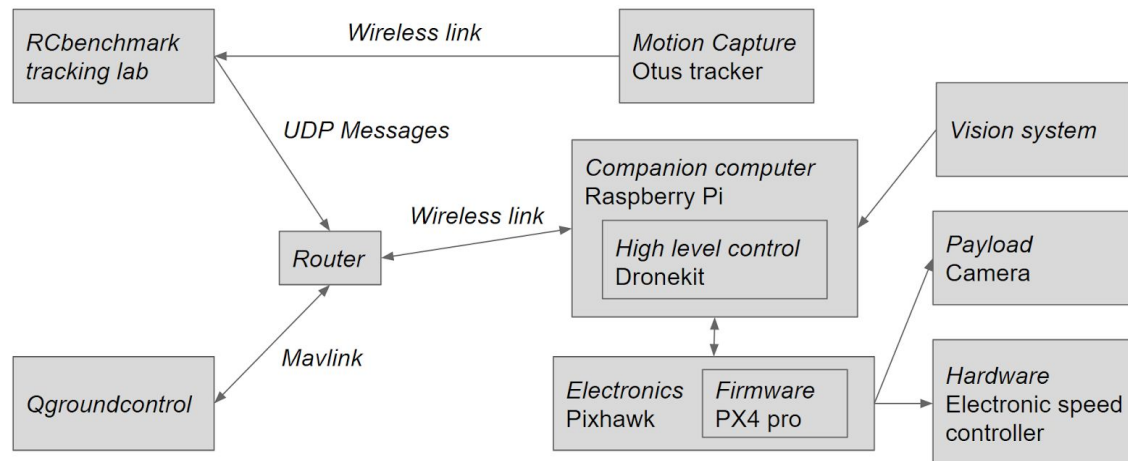
Wireless operation

The Otus tracker kit is designed to operate in a laboratory environment. Area with very heavy electromagnetic noise (such as trade shows) may interfere with the wifi network and cause the vehicles to be inoperable.

Environmental condition for operation

The Otus tracker is designed and tested for indoor use at typical room temperatures. Large mirrors will affect tracking accuracy and may cause loss of tracking. Outdoor use is not recommended as direct sunlight can overpower the sensors.

Required computer (Contact us for a pre-configured computer)

Recommended specifications:
- Windows 10 computer
- GeForce Series 1150 or equivalent.
- i5 processor of 3rd generation or better

Integration with other software

Multiple programming languages are supported and plugins are included for C, C++, Labview, Matlab, C#, ROS, and Python. The PX4 software stack has an excellent support of ROS. We recommend using Dronekit if you are planning to control you drone and do not have ROS experience.