

DRONE RACING PRIMER

MARK KENWORTHY

PRESIDENT

FPV RACING SEATTLE



Agenda

About Mark and FPV Racing Seattle

History of quadcopters

Overview of quadrotor racer technology

Overview of drone racing organizations

FPV Racing Seattle and MultiGP

How to get started

Q&A




About

Mark Kenworthy

- Degree in Aeronautical and Astronautical Engineering from Purdue University
- 25 years in high tech (Boeing, Delta Graphics, Microsoft)
- Hobbies include racing and robotics
- Owner of Kenworthy Machine LLC (CNC machine shop - established 2006)
- Owner of BotKits.com (robotics kits for education, research, & robot combat)
- Founded FPV Racing Seattle in 2015

FPV Racing Seattle

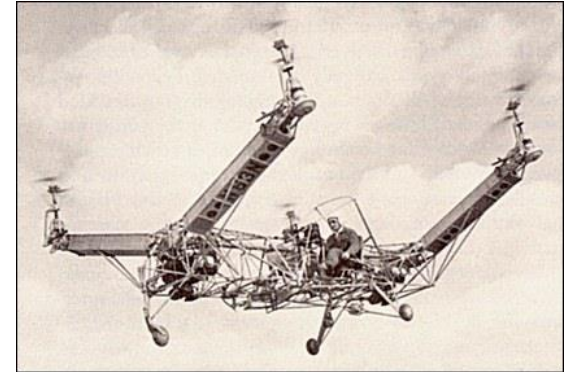
- Club focused on drone racing in the greater Seattle area
 - Washington State non-profit
 - Filing for Federal 501(c)(7) non-profit status
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Quadcopter History

Manned quadcopter have been around for a while

- Breguet-Richet Gyroplane – 1907
- Jerome-de Bothezat Flying Octopus – 1922
- Convertawings Model A – 1956
- Curtiss-Wright VZ-7 - 1958

Key goal was simplification of the cyclic mechanism of single rotor helicopters



Big Breakthrough - Compact Integrated FCs

- Microprocessor, accelerometers, gyros, and firmware provide stabilized flight
- Open source projects started about 5 years ago, leveraging Arduino microprocessors and MEMS gyros and accelerometers from the Nintendo Wii video game controller (Multi-Wii project)
- Integrated boards followed as interest in multi-rotor aircraft grew
- Flight controller performance has increased rapidly over the past two years
 - 1 kHz cycle operation possible in 2015 – Tuning for stability challenging
 - 32 kHz cycle operation now available – Greatly eases FC tuning
- Racing is pushing performance of all components (FCs, motors, ESCs, props, frames, video systems, etc.)



Overview of Drone Racing Technology

Extremely rapid technology development

Technical capability is rising, cost continues to drop

Similar to auto racing, drone racing is driving the cutting edge of many technologies

- Flight controller hardware
- Flight controller firmware
- Frames
- Motors
- Motor speed controllers
- Propellers
- Video cameras
- Video transmitters
- Radio control receivers



Primary Technologies

Goggles

Radio

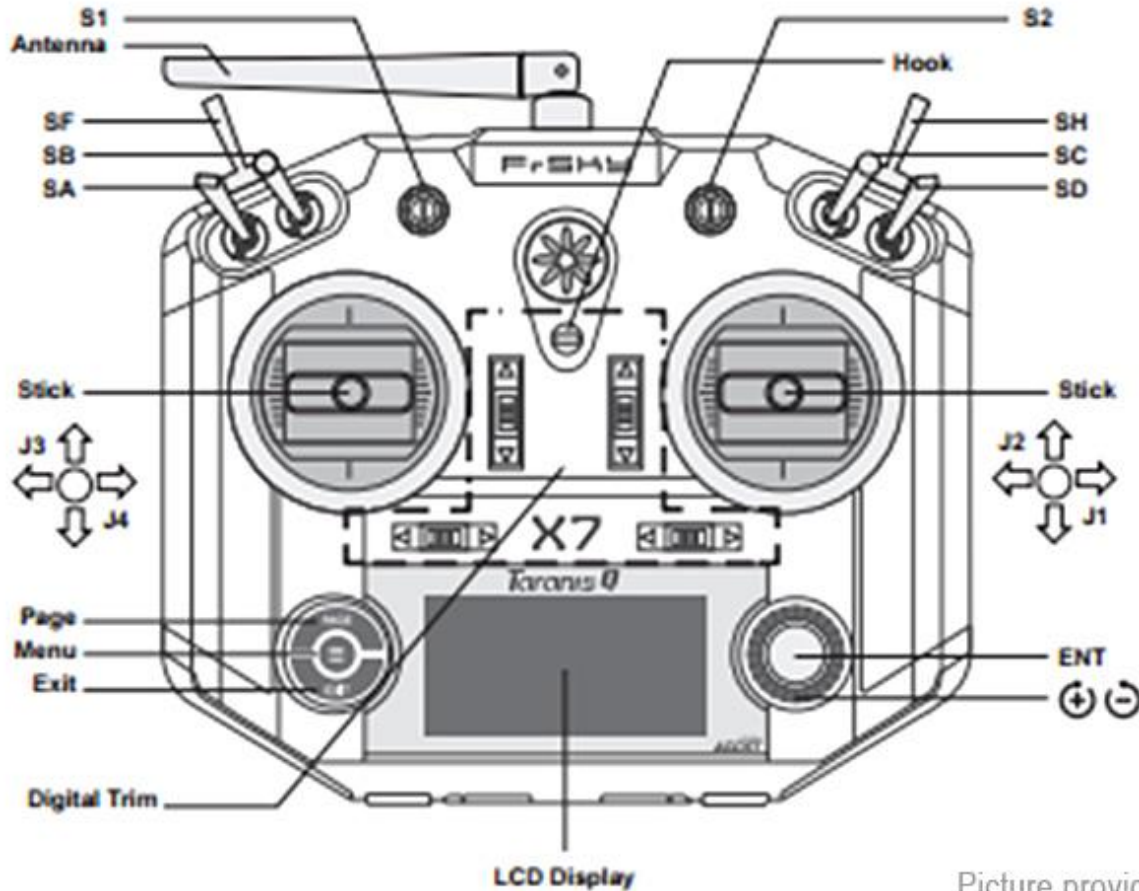
Drone



FPV Goggles



Radio Transmitter (Tx)



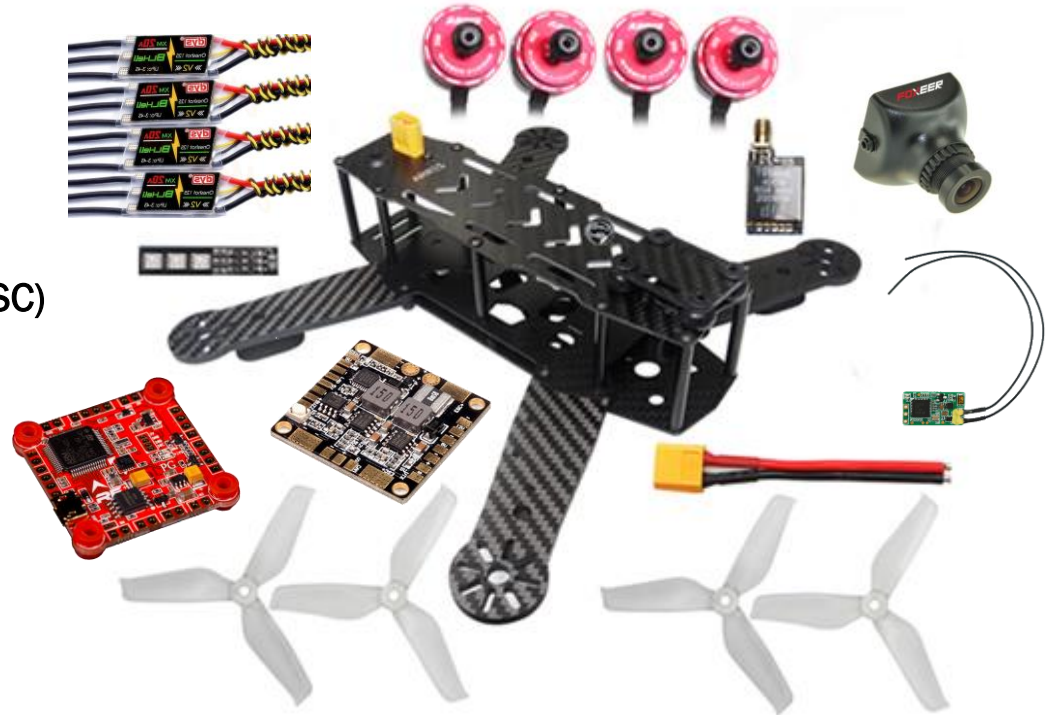
Left stick is like helicopter collective and rudder pedals

Right stick is like helicopter cyclic control

Picture provided by the manufacturer

Quadcopter Racer

- Frame
- Flight controller
- Power distribution
- Electronic Speed Controllers (ESC)
- Radio Receiver (Rx) (2.4 GHz)
- Video Transmitter (5.8 GHz)
- Camera
- Motors
- Propellers
- LiPo Battery
- Programmable software & GUI



Major Drone Racing Organizations


Drone Racing League – DRL

- US-based professional drone racing (paid pilots, prize money)
- Covered by ESPN

International Drone Racing Association (IDRA)

- Worldwide professional drone racing
- \$1M in prize money for large events (e.g., Dubai)

MultiGP


- Worldwide amateur drone racing
 - Founded in 2015
 - Currently has 400+ chapters and 14,000+ members worldwide
 - Drone racing sanctioning body for the AMA in the USA
 - Sponsor supported
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FPV Racing Seattle

- MultiGP and AMA chapter
- All volunteer organization
- Insures flying sites/owners via AMA
- Hosts ~20 race events annually
- Novice and Expert Classes
- Ages range from 7 - 70+
- Currently racing quadcopters
- Expect to add wing racing in 2017
- www.fpvrcingseattle.org



How to Get Started (A brief and incomplete summary)

1. Attend a MultiGP event, talk to pilots, check out radios, drones and goggles
 2. Join AMA (benefits include insurance), register with FAA, get amateur radio license
 3. Join a local club – Great source of information and help!
 4. Practice with a flight simulator
 - a) DRL Simulator (free), FPV Free Rider, Liftoff, Velocidrone
 - b) Simulator crashes are free
 - c) All work with common radios as a control
 - d) Get past motion (simulator) sickness
 5. Select a radio (FrySky & Spektrum are most common)
 6. Select goggles (FatShark, Cyclops, Eachine, others)
 7. Get help on your first build (club!)
 8. Required tools
 - a) Small hand tools (screw and hex drivers, pliers, etc.)
 - b) Soldering iron
 - c) Battery charger
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Questions?

Mark Kenworthy – [mark at kenworthymachine dot com](mailto:mark@kenworthymachine.com)

FPV Racing Seattle - www.facebook.com/groups/FPVracingSeattle/

