Newport County Radio Club

Monthly Meeting Mon April 10, 2023

Founded 1945; ARRL Chartered 1949.
A 501(c)(3) non-profit

Drones

by
Andrew Staub
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First Person View (FPV) Drones

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Who am I

Andrew Staub
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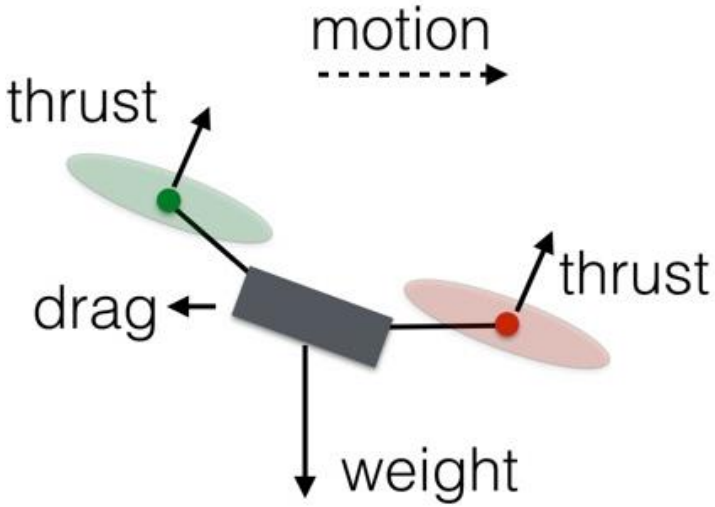
- Litigation attorney for Reynolds, DeMarco & Boland Ltd.
- Living in Rhode Island since 2010
- Married to a Rhode Islander in 2019, 2 dogs, 1 chicken, 1 duck
- Enjoy the outdoors, cooking, pets, flying FPV drones, aquariums
- Taught myself to build and fly FPV quadcopter drones in 2021
- Acquired FCC Technician Class to comply with FPV regulations
- 2023 member of Newport County Radio Club
- Interested in Parks on the Air



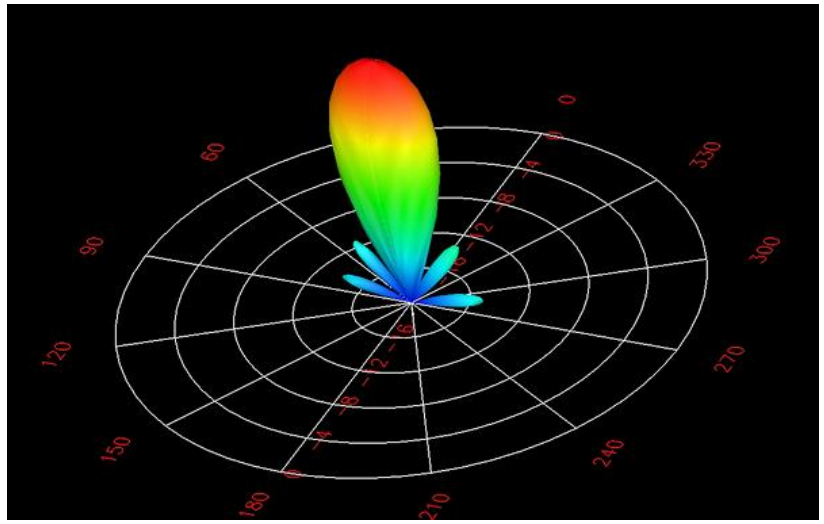
Control without wings
= thrust vectoring

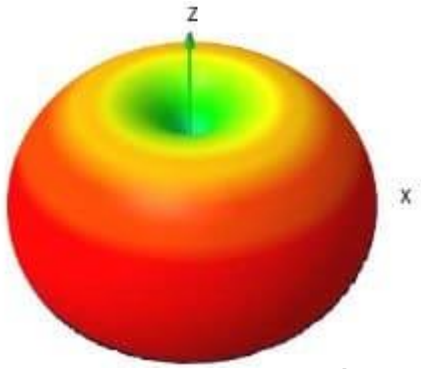
Payload

Thrust to weight ratio

Amateur Radio Links

- Control link transmitter frequencies
  - 27MHz, 72MHz, 433MHz, 900MHz, 1.3GHz and 2.4Ghz
- Video transmitter frequencies
  - 1.3 GHz, 5.8 GHz
- Antennas important





FPV Flight Video

- FPV drones differ from camera drones
  - FPV drones: fixed camera angle, no altitude/location hold, gyro stabilized, extremely agile
  - Camera drones: location/altitude hold, gyro stabilized, gimbal camera, limited agility

Drone Uses

Pilots / Airspace Management / Payload Handling /Aircraft Maintenance/ Battery Technology / Software Engineering

- FPV drones focus on cinematography and racing

Infrastructure inspection	**Emergency Management**
Tunnel and pipe inspections	**Law enforcement**
Damage Assessment &	**Firefighting**
Insurance	**Military**
Cinematography	**Signals & Intelligence**
Photography	**Surveillance & Security**
Delivery	**Forestry**
Sports & Racing	**Agriculture**
Weather forecasting	**Construction**
Zone and code enforcement	**Emergency medicine**

Long Range = Ground Stations

Video Transmission

- What are we looking at?
- OSD

Digital vs. Analog 5.8 GHz Video

- DIGITAL –
  - Pros : colorful & detailed images, less background interference
  - Cons : poor long range, smaller shared spectrum, higher latency, higher cost, heavy components, closed protocol (DJI, Walksnail, HDZero)

Digital vs. Analog 5.8 GHz Video

- ANALOG -
  - Pros: signal breakup, low latency, lower cost, lightweight components, long-range transmission, open protocol
  - Cons: lacks detailed images, poor coloration, more background signal interference

Flight Time

Tiny Whoop =
<5 minutes

Long Range Quad =
10-30 minutes

FPV Frames

Toothpick

- 5-10 minute flights
- Low disc loading
- Low mass
- Floaty
- Quiet
- Efficient

FPV Frames

Cinewhoop

- Pusher and Puller setups
- Heavy mass
- Shrouded propellors
- Stable but not agile
- Yaw wash
- Indoor and outdoor
- Lower flight times with payload

FPV Frames

Freestyle Quads (Stretch X, Deadcat, H)

2 inch, 3 inch, 5 inch, 7 inch

Large mass, but durable

Loud, fast, agile

10-20 minute flight times

Racing Quad (True X)

2inch, 3 inch, 5 inch

Balanced mass, not durable

Loud, fast, agile

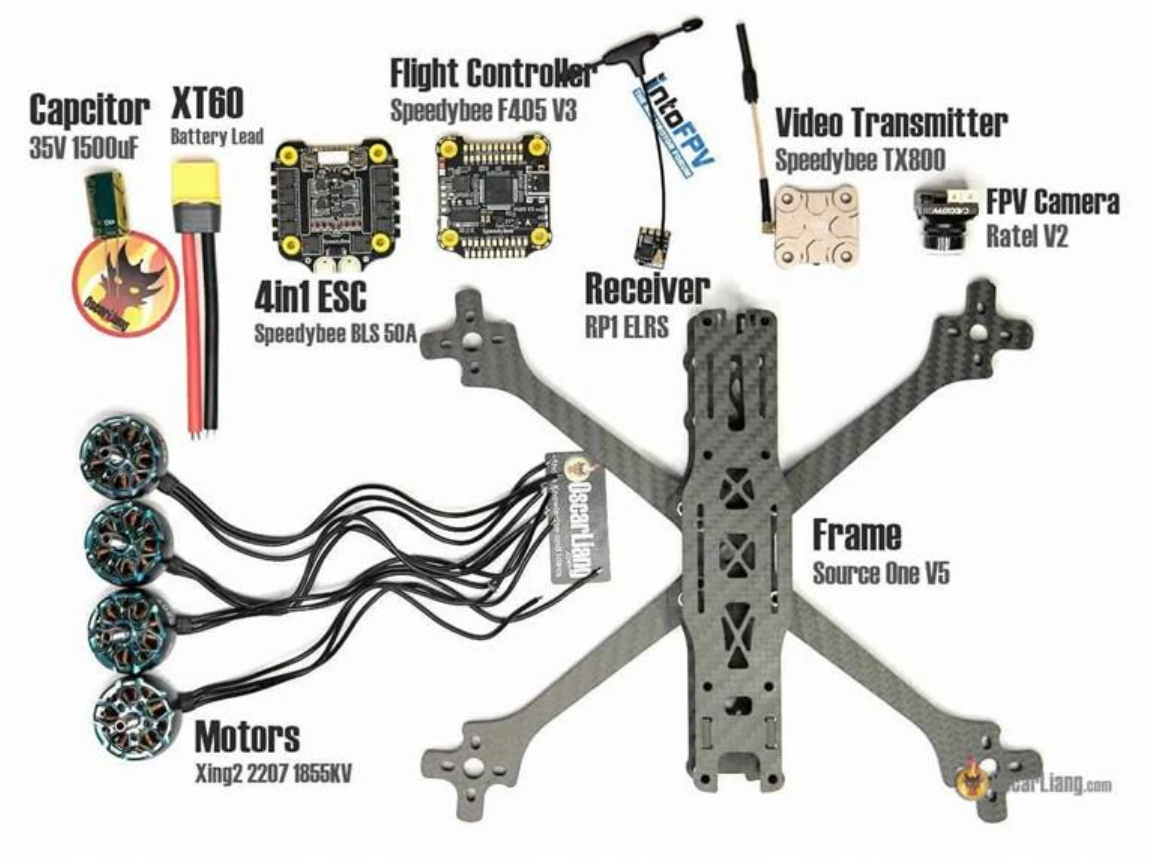
2-8 minute flight times

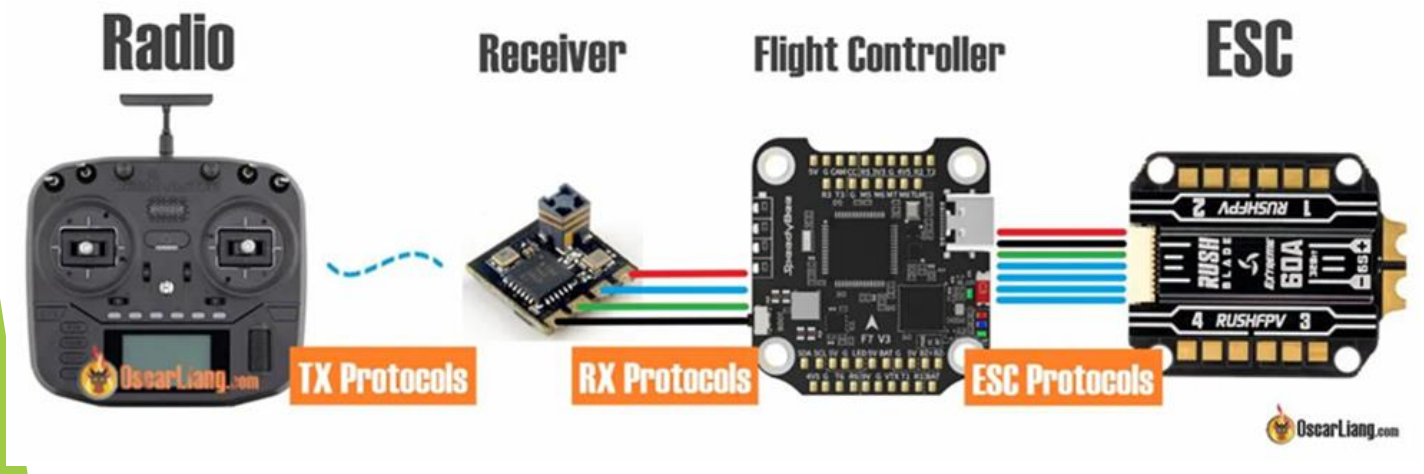
Where to begin?

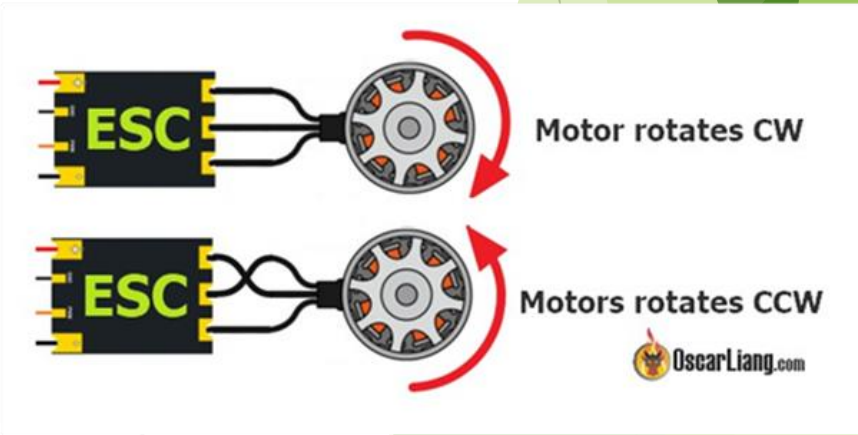
Tiny Whoops

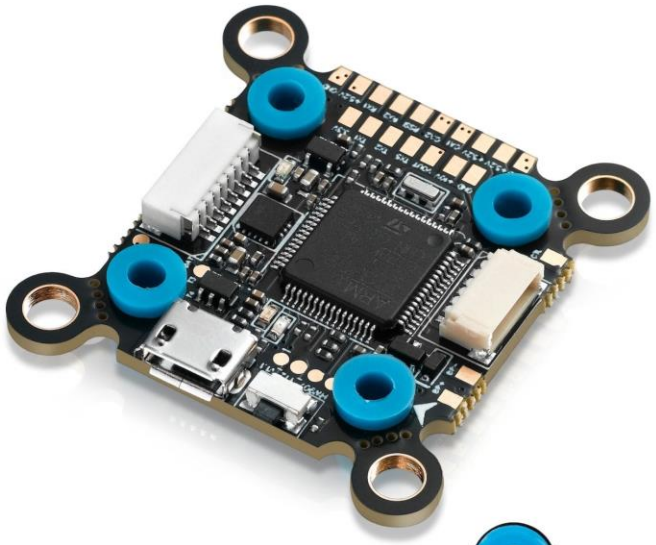
- 2-5 minute flight time
- Huge fun
- Agile, quick
- Quiet
- Durable
- Shrouded props
- Fly indoors or outdoors in calm conditions
- Simple 1S LiPo batteries
- Tiny Whoop flight video

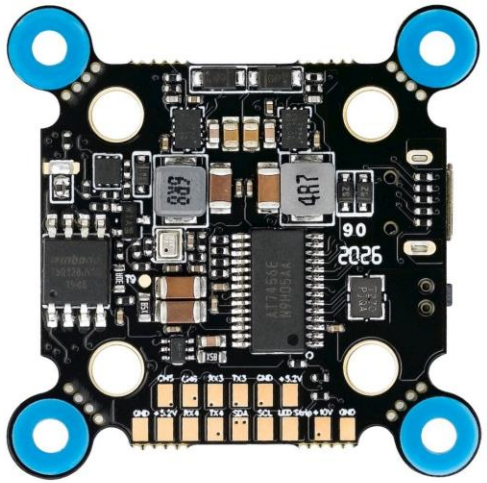
Under The Hood











Flight Controller

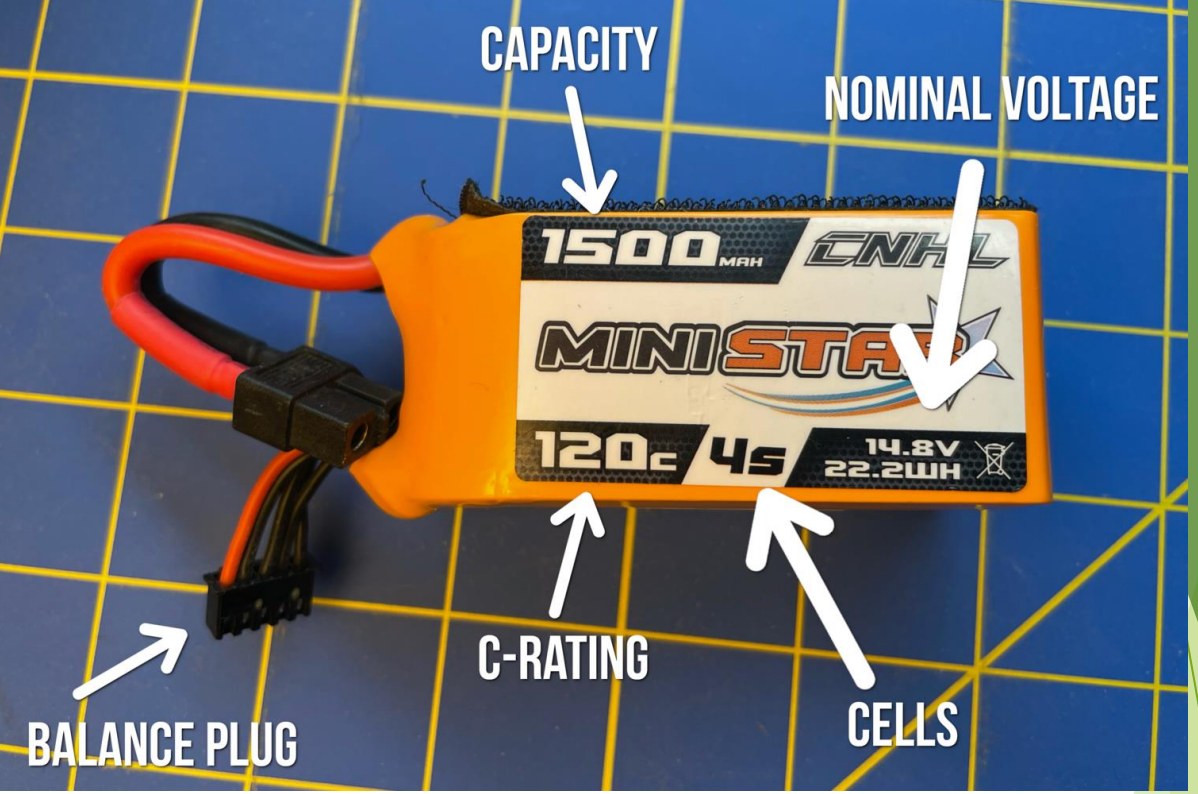
- Gyro chip
- OSD chip
- Signal processing
- Inputs/Outputs pads

Electronic speed controller

- Controls brushless motors
- Voltage regulator
- Power filtering
- Sensors

Video Transmitter

- Digital vs. Analog signal
- Navigation
- Distance



Batteries

- Lithium polymer or lithium iron
- Require maintenance and care
- Chemistry degrades over time and use
- Least predictable factor in flight
- Real fire hazard

Where will you fly?

- No FAA jurisdiction indoors
- Check airspace with Aloft / B4UFLY / AirMap
- Rhode Island has lots of restricted airspace
- Rhode Island state parks and lands require DEM permit for flight
- National airspace is anywhere navigable
- Apply for FAA LAANC – Low Altitude Authorization and Notification Capability
- Consider drone insurance

Before you fly

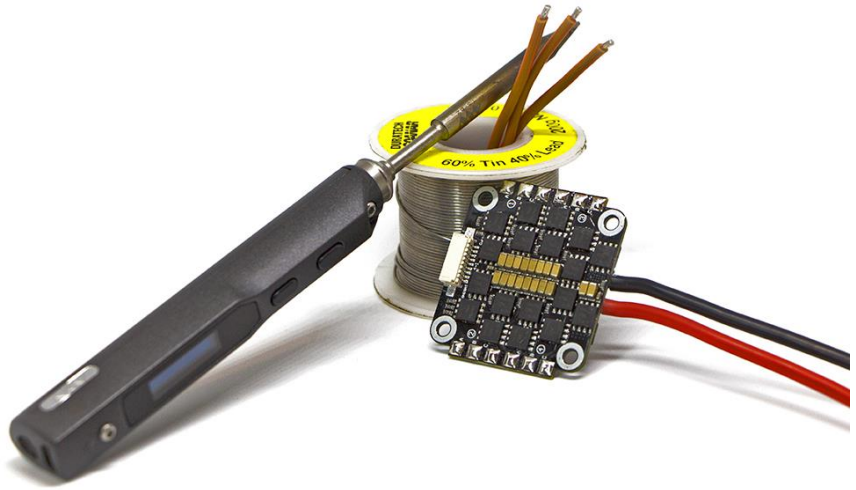
- Check airspace with Aloft / B4UFLY / AirMap
- Check for NOTAMS – Notice to Air Missions
- FAA Recreational UAS Safety Test (TRUST) Certificate or Part 107 Pilot License (all others)
- Fly under 400 feet
- Fly within line of sight and use a spotter
- Special rules if flying over people
- FAA registration if over 250 grams
- Night flying requires lighting
- Remote ID registration and broadcast requirments coming soon

You can do it!

- Nothing quite like FPV flying
- Stick coordination will improve
- Enjoyment increases with fewer crashes
- Always more time spent fixing than flying
- Soldering skills will improve

What is next?

Soldering Workshop?



Drone building?

Contact me with any questions

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More resources

- FPV Flight Dynamics: Mastering Acro Mode on High-Performance Drones: Mollica, Christian M.
- FPV website links
  - FPVKnowitall.com
  - OscarLiang.com
  - IntoFPV.com
  - https://fpvfc.org/
- Some youtube pilot links
  - CiottiFPV
  - HeadsupFPV
  - MCK FPV
  - Joshua Bardwell
  - Mr Steele
  - Nick Burns
- FPV store links
  - RaceDayQuads
  - NewbeeDrone
  - GetFPV
  - FPVCycle
  - Fractal Engineering
  - TinyWhoop
  - Rotor Riot
- MultiGP New England FPV
  - North East Racing Drones

    April 22, 11:00am in Amesbury, MA at Woodsom Farm Learning Center
- Discord has FPV channels for info, help, community