

# Team Drone Challenge

## Building Your First Competition Drone

This is a list of parts to build a basic drone that can fly in our annual Team Drone Challenge. To be successful in completing the various missions, additional electronics and/or materials will need to be added based on your team's mission goals. CNY Drones does not guarantee the availability of any parts from any vendor. In fact, these parts regularly go out of stock or are discontinued for new versions. CNY Drones encourages and rewards teams for their creativity and out-of-the-box designs.

It is important to buy parts well in advance of when they are needed as some take a very long time to be received. CNY Drones has taken care to provide links to products from reputable vendors who usually have products in stock. However, the fact that it can take time to get a valuable part that may break in the field, it is best practice to order multiple of most parts. Propellers break, electronic speed controllers (ESCs) can burn out, and it is easy for someone inexperienced in soldering to burn through a pad on a small flight controller accidentally.

### PARTS TO ASSEMBLE A BASIC COMPETITION DRONE

- (8) Propellers, 4 + at least 4 spares – (2) Clockwise rotating and (2) Counter-Clockwise, Max. 10"
- (6) Motors, 4 + at least 2 spare, Max size 2213, Max kv 2500  
NOTE: larger props need less kv and smaller props need more kv
- (6) Electronic Speed Controllers (ESCs) 4 + at least 2 spares
- (2) Flight Controller, 1 + at least 1 spare
- (1) Quadcopter Frame – 450mm motor to motor length or less
- (2) sets of 4 landing gear skids (1 set + a spare set)
- (1) Receiver
- (1) Transmitter (Remote/Radio Controller) + spare batteries if not rechargeable
- (5) 3 cell (3s) or smaller Lithium Polymer (LiPo) Batteries
- (1) LiPo Battery Charger
- (2) sets of prop guards (1 set + at least 1 spare - sold in sets of 4)



Note: Teams interested in using a Tiny Whoop scale / micro drone as a secondary/optional drone for the 2020 competition should contact CNY Drones for additional specs. 2020 will be the first season with this second drone option. Specs allow for a secondary build or purchase of a micro drone for under \$100.

## WHERE TO PURCHASE PARTS & EQUIPMENT

We are happy to provide links to parts & further connection to a mentor for anyone interested in forming a team. Mentors provide suggestions based on their experience with parts, building and suppliers. Shipping issues, stock-outs, defective parts and upgrades are common. Please realize that links provided change often based on ever-changing availability. We do our best to replace website links as we are notified. We always suggest ordering as early as possible and always planning to have spare parts on hand.

## FPV FLIGHT EQUIPMENT

While not necessary for flight, the following parts are highly recommended and essential for First Person View (FPV) flying; without these parts, a team will be restricted to flying Line of Sight (LoS) only:



- (1) FPV Camera
  - A team may want more than one camera. This will require one transmitter per camera. The team will also need one receiver/goggle per camera, or they will have to switch channels between the cameras to each camera's feed.
  - Some cameras include the antenna and transmitter All-In-One (AIO)
- (1) FPV Transmitter
- (1) Antenna for the FPV Transmitter
- (1) FPV Receiver - either FPV goggles or a receiver that outputs to a screen
  - Multiple goggles or screens can tune into the same broadcast channel from an FPV transmitter.
- (1) Antenna for the FPV Receiver
  - While most goggles/receivers come with antenna(s), these are usually low-quality antennas and a good antenna will provide a much better signal and viewing experience
  - Some FPV receivers are diversity receivers meaning they feature two or more FPV receivers within them. Diversity FPV receivers automatically pick the strongest signal from the pool of receivers. Diversity receivers will need an antenna for each receiver and generally the antenna will be of different types serving different purposes.

# VIDEO ANTENNAS

There are three important things to know about video antennas.

1) Antennas come in *left-handed* (LHCP) and *right-handed* (RHCP) varieties, and the same variety must be used on the quadcopter and goggles. Most pilots fly RHCP, and that's what we recommend. There isn't any performance difference, but having the same type as others will allow for teams to watch others in their goggles.

2) Antennas come with different connectors: SMA and RP-SMA. The main difference being which end has a pin sticking out of it. SMA has a pin on the Male connector while RP-SMA has the pin on the Female. The connectors of the antenna must match the item it is connecting to. Don't assume that goggles and the video transmitter will have the same connector. One may be SMA and the other RP-SMA. Here is a picture of the different connectors:

	SMA	RPSMA
Male		
Female		



SMA Male



SMA Female



RP-SMA Male



RP-SMA Female

3) **Never** power up a video transmitter without an antenna attached. This can damage or destroy the video transmitter.

# ADDITIONAL DRONE TOOLS & SUPPLIES

Here's a list drone tools, materials and supplies. It has been broken down in 3 main categories.

\* = Need to have

\*\* = Good to have

\*\*\* = Nice to have

## Tools

- Soldering Iron \*
- Wire Cutter \*\*
- Wire Stripper \*\*
- Drivers \*
- Wrenches \*
- Hot Air Gun \*\*\*
- Multi-meter \*\*
- Helping Hands Tool \*\*
- Forceps \*\*\*
- Tweezers \*\*
- Needle-nose Pliers \*
- Hot Glue Gun \*\*
- File Set \*\*\*
- Awl or Punch Tool \*\*\*

## Other Helpful Items

- Tripod for mounting goggles or FPV Receivers
- Battery Checker
- Parallel charging board for charging multiple of the same type of batteries at once.
  - Parallel charging carries significant risks. DO NOT use a parallel charging board unless safety procedures are understood and followed.

## Materials and Supplies

- Electrical Tape \*
- Double-sided Foam Tape (Mounting Tape) \*\*
- Solder \*
- Flux Pen \*\*\*
- Conformal Coating (for waterproofing) \*\*
- Heat shrink \*
- Wire \*
- Superglue \*\*
- Superglue De-bonder \*\*
- Tread-locker \*\*
- Extra Screws \*\*
- Nylon M3 Standoffs \*\*\*
- Fire retardant bag or Steel Container for charging LiPo batteries \*

***(always follow safety procedures when charging or storing LiPo batteries)***