Drone Requirements

ARC, Spring 2024 Season

11/20/2023

ARC Requirements

Overview

To compete in the Spring 2024 Aerospace Robotics Competition, teams may choose to purchase ARC's UAV kit ("Kit Drone") or procure their own UAV components ("Self-Designed Drone"). All UAVs must comply with the following requirements, which will be inspected during the Technical Inspection. UAVs must pass the Technical Inspection in order to fly during the competition. **Teams must operate their vehicles safely. Safety requirements will be released in the Spring 2024 Rulebook.**

The following requirements are for both Kit Drones and Self-Designed Drones. If your team chooses to use an unaltered Kit Drone, it will automatically meet all eligibility requirements.

Competition Requirements

General Requirements

A. The UAV must have 4 motors with 1 propeller each.
B. The UAV may not have any lifting surfaces other than the 4 propellers.
C. The UAV must be registered by the FAA, and the registration number must be visible.
D. STEM-ED supplied Drone Kit details can be found at https://www.stemed.org/purchase-kit/p/2023-drone-kit
E. All parts attached to the UAV must remain within 4 ft. of the UAV at all times during operation.
F. Dimensional limits:
    a. Propellers may not exceed 12 inches in diameter.
    b. The base plate of the center of the quadcopter must not be more than 7 inches from the ground when the quadcopter is on the ground
    c. The overall drone dimensions must not exceed 36 inches by 36 inches by 36 inches when placed on the ground with the propeller attached and aligned outwards.
G. Battery requirements:
    a. Teams must use a lithium polymer battery.
    b. Battery cannot have more than 4 cells.
    c. Teams must use commercially available batteries; homemade batteries are not allowed.
    d. Teams must use proper battery usage/storage techniques as outlined in Appendix D.
H. Multi-bladed (more than 2 blades) propellers are allowed.
I. Teams are encouraged but not required to cover the electronics with a protective shield or material.
J. To ensure the safety of all students and spectators, each vehicle must have a secure location where a tether can be attached by a carabiner.
    a. The competition tether will be 55 ft of polypropylene twine with a weight tied in the length to prevent it from interfering with the propeller. See Figure 1 below.
    b. The tether will be secured to the ground on one side and a carabiner on the other side.
    c. Teams should use a tether for all flights regardless if they are at competition or not.
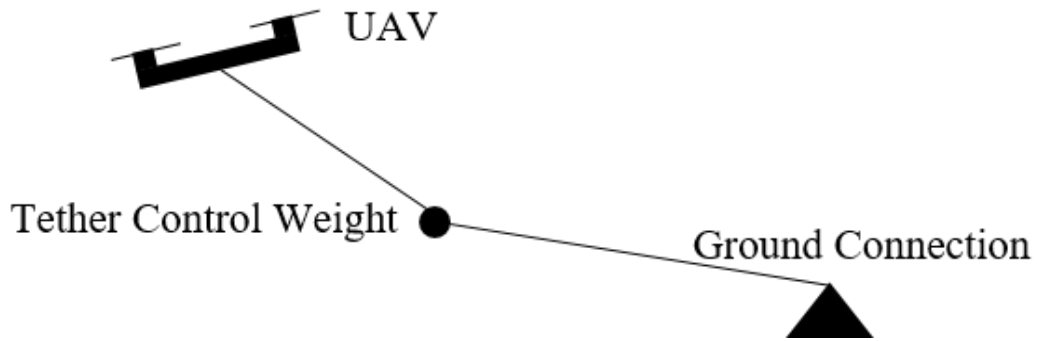   d. NOTE: A tether system will be provided at competition; there is no need to bring one.

Figure 1. Drone Tether Setup

Sensors

A. Teams MUST use a GPS sensor that is mounted securely onto the UAV.

Mechanism Design

A. Teams will need to design and build their own mechanisms to fulfill the flight portion(s).
B. The mechanism must be attached to the UAV and must fit within the area of the UAV arms and beneath the arms when on the ground. See Figure 2 below for clarification.
C. The mechanisms must be designed to NOT go above the motor arms of the UAV at any time during flight.
D. No part of the mechanisms should be designed to fall off of the UAV during any part of the competition unless indicated otherwise in the competition rules.
    a. If this does occur, regardless of if it was or was not intentional, 50% of the score will be deducted for the flight round.
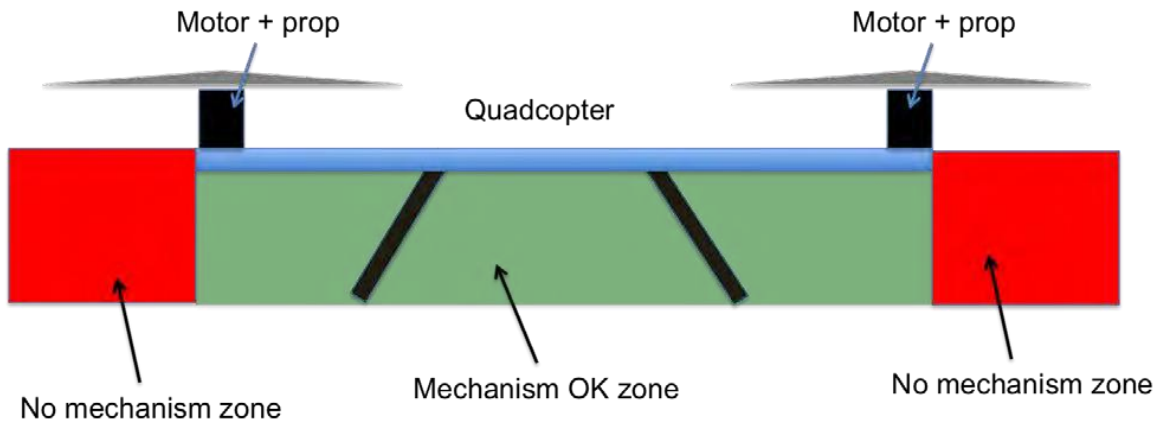E. Teams may use different mechanisms for different portions of the competition.

Figure 2. Mechanism Allowable Zones

FAA Requirements

Two rules are being implemented this year to fulfill legal requirements for drone operation. **Teams must comply with the following requirements in order to fly at the competition.**

TRUST Exam

First, the FAA legally requires that pilots complete the short course and successfully pass the FAA TRUST Exam. Any students who will be piloting a drone must complete this task before flying. Any students who will be piloting a drone at the competition venue must print their FAA TRUST Exam certificate and carry it on their person while at the event. **Students who do not have proof of completion of the FAA TRUST Exam will not be allowed to pilot their drone at the competition.**

Remote ID

The FAA has also begun legally requiring that drone locations are broadcast during flight using a Standard Remote ID. Please see the FAA website for further details. Teams are advised to use a component such as the Hex Cube ID Serial to fulfill this requirement. **Drones that are not equipped with a Standard Remote ID broadcast module will not be allowed to fly at the competition.**

Drone Requirements Revision History

Version	Notes	Date Released
A	Initial release	11/20/2023