**Drone Development Competition Overview**

**Mission Requirements:**

Drone Specifications:

* + Number of Drones: Two drones are required.
    - Scout Drone: To scan the area, capture video, and relay information.
    - Delivery Drone: Responsible for payload delivery. Can be a 2-in-1 drone.
  + Payload:
    - Dimensions: 5 x 10 x 20 cm.
    - Weight: 200g.
  + Area to Scan: 30 hectares.
  + Mission Duration:
    - Setup Time: 5 minutes.
    - Mission Time: 30 minutes.
  + Real-time Video Transmission: The drones must stream live video back to the Command & Control station.
  + Geotagging and Communication: Drones should geotag their locations and be able to communicate via a speaker.
  + Autonomy: Drones must fly autonomously, including reporting the current status throughout the mission.

Command & Control Station:

1. Personnel Requirements:
   * Supervision: Only two people allowed to supervise the Command and Control station.
   * Drone Supervision: One team member per drone for positioning, supervision, and resetting/reloading if needed.
2. Display: A display is required to show the positions of both drones during the mission.
3. Positioning: The drones must be positioned in the designated area.

General Rules & Regulations:

1. Drone Design:
   * No Ready-Made Airframes: Participants are not allowed to use pre-built airframes.
   * Categories Allowed: Fixed Wing, Rotorcraft, Hybrid drones, etc.
   * Dimensions: Drones must fit within the size of 6 x 6 ft.
2. Propulsion:
   * No restrictions on propulsion type (e.g., electric, gas, hybrid, etc.).
3. Weight & Altitude Limits:
   * Maximum Weight: 25 kg (including payload).
   * Altitude Limit: Drones cannot fly higher than 400 feet.
4. Safety Features:
   * Return-to-Home: A "Return-to-Home" feature is required in case of mission failure or low battery.
   * Fail-Safe Features:
     + Link Loss: Drones must have a fail-safe in case of a communication link loss.
     + Low Battery: Drones should have a fail-safe for low battery situations.
5. Geofencing & Safety:
   * Geofence: Drones should be geofenced to ensure they remain within the designated area.
   * Altitude Breach: A feature to prevent breaching altitude limits is required.

SCOUT DRONE:

A tricopter design prioritizing speed and agility for scouting purposes in the drone competition is an optimal and effective choice for several reasons, based on the competition's rules and regulations.

1. Agility and Maneuverability:

* Yaw Control: One of the key advantages of a tricopter is its unique yaw control. The rear motor tilts to provide yaw control, making the tricopter more agile in turning and maneuvering. This is particularly important for scouting, as the drone needs to quickly change direction to cover different areas efficiently.
* Tight Turns: The tilting rear motor allows for tight turns with minimal loss of altitude or stability. In a scouting mission, this is critical for quickly adjusting the drone's flight path to cover specific areas or avoid obstacles.
* Faster Response: Because the tricopter has fewer motors, it can be more responsive than a larger multicopter (like a quadcopter), which translates to quicker decision-making when moving across the terrain.

2. Lightweight Design:

* Reduced Weight for Speed: Tricopters are inherently lighter than other configurations (like quadcopters or hexacopters), thanks to the fewer motors and potentially simpler frame design. This weight reduction directly contributes to faster speeds and better battery efficiency, both essential for completing the scouting mission within the 30-minute time frame.
* Higher Efficiency: With less weight to carry, the tricopter can operate more efficiently and use less power, which is crucial for scanning a large area (30 hectares). Faster speeds and longer endurance can be achieved, allowing the drone to cover more ground in less time.

3. Compact Design for Tight Spaces:

* Smaller Footprint: Tricopters generally have a more compact design than other multicopters. This smaller profile makes it easier for the drone to navigate through tighter spaces if the area to be scanned has obstacles (trees, buildings, etc.) or requires low-altitude flights in hard-to-reach areas.
* Stealth and Low Visibility: A smaller, agile tricopter can also be less noticeable than larger drones, making it useful for scouting without drawing attention. This could be an added benefit if the competition scenario involves avoiding detection or blending in with the environment.

4. Speed and Quick Coverage of the Area:

* Optimized for Speed: Tricopters, especially in a racing configuration, are designed to be fast. By prioritizing speed, the scout drone can cover the 30-hectare area in less time, allowing it to scan and transmit real-time video data more quickly. This gives a competitive edge, especially when time is limited (5 minutes setup + 30 minutes for mission).
* Direct Route for Scanning: The design allows the tricopter to fly faster while maintaining stable control, even in windy or dynamic conditions. For scouting, this is crucial to ensure that the drone reaches the desired locations in minimal time.

5. Cost-Effective for a Scout Drone:

* Simplicity of Design: The tricopter design is relatively simple compared to a quadcopter or a hexacopter. This simplicity reduces both the cost and complexity of building and maintaining the drone, which is beneficial when considering that only two people can supervise the Command and Control station.
* Low Maintenance: Fewer parts and motors mean that the tricopter has fewer things to go wrong. This is crucial when you have limited time (5 minutes setup) and the drone needs to perform consistently throughout the mission.