



U.S. Drone Soccer

Condensed Ruleset

2024-2025 Season

20cm Drone Soccer Gameplay
Middle School and High School

U.S. Drone Soccer Requirements

Fielding Diverse Coed Teams - All teams must intentionally create and maintain a welcoming and supportive environment for new pilots, and ensure equal representation and participation of all genders, abilities, and communities historically excluded from aviation.

Respect and Anti-Harassment - All players have the right to equal participation and respect without fear, bullying, intimidation, or belittlement. We maintain a zero-tolerance policy for bullying, racism, bigotry, and sexual harassment. It is a violation of this policy to retaliate against any person who asserts their rights regarding harassment.

Safe Aircraft Operation - Each pilot and crew member must take responsibility for the condition and operation of their drones and equipment. All flights should be conducted in a netted arena or designated practice area. Reckless flight or intentional damage to other teams or players will not be tolerated. Participants must practice good situational awareness to ensure the safety of themselves and others.

Anonymous Reporting - Mirroring practices in professional aviation, all concerns about unsafe situations or inappropriate conduct can be anonymously provided to league administrators. Please include your contact information and a description of your concerns to reporting@usdronesoccer.org Personally identifying information will be kept confidential unless prior consent is obtained, or the situation involves a suspected crime or threat to public safety that must be reported to law enforcement.

Integrity & Fair Play - Teams cannot interfere with the equipment or operations of other teams. Examples of prohibited activities include radio frequency interference or jamming, hacking, distraction, disruptive chatter, eavesdropping, or tampering with equipment.

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1. INTRODUCTION

1.1 Manual and Checklist Use

Manuals and checklists are written in a specific order, and doing those actions in order is important. Consistent checklist use is a sign of a disciplined and competent aircrew. Steps that must be done in order will be numbered. These steps apply to all crew unless specified (**P** for **Pilot**, and **R** for **Referee**). A separation indicates the **Cue** on the left ... and the **Action** to be taken on the right. Items with a **Verbal Response** are in quotations. Every time you complete an **Action**, you should **Verify** the results of that action, items to check and verify are listed with bullets.

For Example:

1. ON COMMAND (R).....“ARM YOUR DRONES”
2. THROTTLE (P).....IDLE
3. RADIO ARMING SWITCH (P).....ON
 - Verify propellers are spinning at idle power

1.2 Warnings, Cautions, and Notes

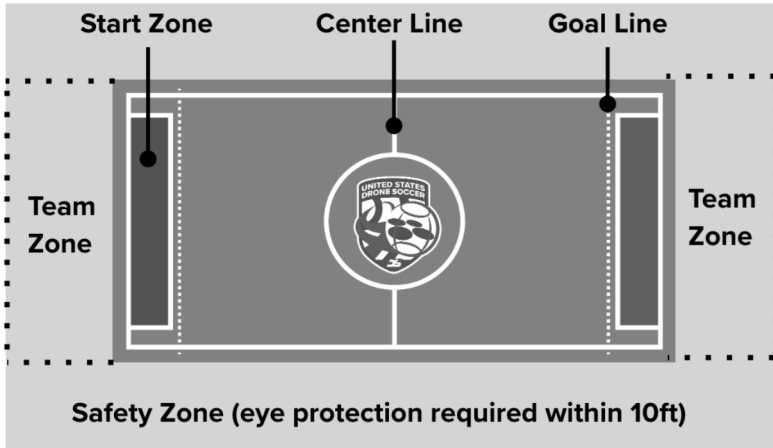
These statements are used throughout this manual to emphasize important and critical information.

<p>⚠ WARNING: <i>A procedure that may result in personal injury or property damage if not carefully followed.</i></p>
<p>⚠ CAUTION: <i>A procedure that may result in damage to equipment if not carefully followed.</i></p>
<p>Note: Information that is essential, and often related to safety.</p>

1.3 Terminology and Abbreviations

Arena	Playing area within a netted enclosure of 10x10x20ft
Arm	Aircraft ready to fly, motors active at idle power
Cells	S for Series, the number of smaller batteries wired in a series
Center Line	Vertical plane separates offensive and defensive zones
Coach	An adult leader who guides the Team
Crew	A team, also team members not actively flying
Disarm	Clicking a switch on the transmitter to stop aircraft motors from turning
Drone	Shorthand for Drone Soccer Ball or UAS
Match	A Match consists of three Sets and two repair intervals, Approximately thirty minutes are allotted for each Match
Player/Pilot	Crew Member operating the aircraft as an active player
Organization	The entire list of teams affiliated with an Organization and listed in LeagueOS at Fly.DroneSoccer.US
Teams	A list of students under an Organization (no greater than 10)
Team Captain	The active player & spokesperson in a Set who communicates with game referees and event leadership. Only the Team Captain may communicate on behalf of the Team during competition.
Crew Members	The recognized list of Coaches & Active Player/pilots for a given competition (no greater than 12 including coaches)
Active Players	The recognized list of pilots for a given Match
Radio	Short for Radio Control and Transmitter
Set	A gameplay interval of three minutes elapsed time. Three sets make up a Match.

Start Zone	Drones launch from this zone at the start of each Set
Pilot Area	Area for Pilots at either end of the <u>Arena</u> .

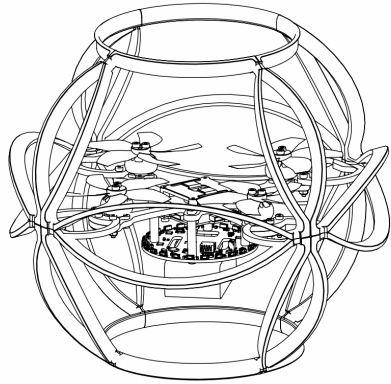


2. AIRCRAFT & EQUIPMENT

2.1 Drone Soccer Ball

Aircraft Specifications

High-performance aircraft designed to meet all World Air Sports Federation (FAI) International Drone Soccer F9A-B (20cm) sporting codes. You may modify your drone as long as it falls within the following specifications:



Maximum Total Weight: **300g**

Exoskeleton frame Diameter **20cm ± 2 (7.9in)**

(Exoskeleton can be made of anything but metal)

Maximum Base Truncation: **2cm**

Batteries: **3S or 4S** (number of cells in each battery)

Max Voltage Per Battery Cell: **4.2V**

Max Propeller Diameter: **7.6cm (3in.)**

Radio Control (RC) Spectrum: **2.4 GHz**

2.2 Required Batteries

3S-4S Lithium Polymer Drone Racing Battery

2.3 Aircraft LEDs

Aircraft LEDs must be programmed to be either red or blue and must be switchable using the aircraft transmitter (radio).

Unique tail light colors and headlight colors may be personalized to indicate aircraft orientation and battery health.

2.4 Equipment Requirements and Identification

⚠ WARNING:

Protective eyewear must be worn inside the Safety Area within ten feet of any arena, and while working at team repair tables.

Note:

All Team equipment must be labeled with unique and colorful identification. This includes drones, radios, batteries, and supplies.

Teams are responsible for their own misplaced or mislabeled equipment.

2.5 Recommendations

To assist in team identification, assemble drones so that $\frac{3}{4}$ of cage panels are one color, with the rear cage panels in a second color.

Competitive teams may paint their exoskeleton cages using plastic paint. The rear panel should be uniquely marked for each student to identify their individual drone.

Obvious color patterns of tape, with corresponding patterns on radios can aid in identifying aircraft and transmitter pairing.

3. TEAM COMPOSITION & PREPARATION

3.1 Team Composition

Drone Soccer is a coed (mixed) sport and teams must maintain a diverse and inclusive roster. Teams playing in a formal competition are *required to* field a diverse team with male and female pilots in each Set of play during a Match.

A regulation Match is played by five active players, although teams can agree to play with equal teams of smaller size as necessary. Each roster may have a maximum of ten players.

3.2 Substitutions

Only active players are allowed in the pilot area during gameplay. Substitutions can not be made during a Set. Unlimited substitutions can be made from the Team between Sets. Players may not swap radio controllers between themselves during gameplay.

3.3 Protective Equipment

All players and referees should wear glasses or protective eyewear when within 10ft of the arena during active gameplay.

Broken propeller blades can depart the arena at high speeds.

3.4 Match Preparation

Players arriving at the Pilot Area will only bring their drones, transmitters, and batteries (additional batteries are allowed). Players may not bring spare parts to the Pilot Area. Players may not repair drones in the Pilot Area.

Teams are responsible for ensuring their drones are ready to fly.
Teams are responsible for making their drones able to change LED colors between Blue or Red through a switch on their transmitter/radio.

Teams are responsible for arriving at a Match with charged batteries for the first Set of the Match in any event or tournament.

3.5 Tournament Preparation

Teams must be prepared for Equipment Inspection (see below).

Teams must bring 4 fully charged batteries per aircraft to any competition.

Equipment Inspection

- Checking the integrity of aircraft exoskeleton, softly rotating the drone ball with two hands to confirm zip ties are tight.
- Checking for non-sharp edges to zip ties.
- Checking for zip tie bodies not protruding from the airframe.
- Check that the aircraft receiver body is firmly attached to the airframe and not flopping.
- Confirming all screws are firmly tightened.
- All up weight (aircraft and battery) at 300 grams or less.
- Pass inspection stickers will be applied to each aircraft prior to formal competition start.

3.6 Event Participation

Do not apply battery power to a drone outside of a netted arena.
Do not charge batteries in the venue, all batteries will be charged in a designated charging area by designated staff.

4. RULES OF PLAY

4.1 Match Format & Results

Each Match consists of three 3-minute Sets, with two 5-minute repair intervals.

A winner is determined for each *Set* based on the highest score. The winner of each *Match* is determined by the best 2 out of 3 Sets.

4.2 Set Tie-Breaker

In the event of a tied score at the end of a three-minute Set, the winner is determined by immediate sudden death. Sudden death is one Striker versus one Striker with no defenders. Both Strikers are placed within their respective starting areas. Arming and liftoff is announced by the referee. The first Striker to score a goal wins that set for their team.

If a tied set occurs however a team has gone through both Strikers, the team with a remaining Striker automatically wins the Set.

4.3 Positions

Only the Striker on each Team can score, they must be clearly identified with Striker flags. Other than the Striker, the four defensive positions are fluid and can trade responsibilities; Forward, two Sweepers, and Keeper.

4.4 Team Captain

For every Set, each team must designate a Captain who is responsible for ensuring equipment is ready and on-time (See section 4.2 for reference). Only Captains and Coaches may interact directly with Referees during events. A team captain *must* be an active pilot for that Set.

4.5 Scoring

A point will be awarded each time a Striker successfully flies through their opponent's goal in the forward direction. The drone must pass completely through the goal. The Striker cannot pass backward through the goal in an attempt to score. Other drones that fly through the goal will not be awarded or penalized.

4.6 Offsides

After a successful goal, the Striker and all airborne teammates must retreat back across the centerline before becoming eligible to score again.

The scoring referee will keep their flag raised until all teammates have crossed the centerline establishing the team as eligible to score.

Points will not be awarded until all active teammates have returned to their half of the field (as indicated by the Centerline). Drones on the ground, which are unable to fly, are not counted for offsides.

4.7 Penalties

Direction of Flight - The Striker cannot fly through the other team's goal from the back. This will result in a penalty.

Goaltending - Defenders are not allowed to hover within the goal, or fly through the goal in the reverse direction. All drones that enter a goal must fly out and around to return to play.

Misconduct - Players, coaches, and spectators must exhibit respectful conduct at all times (refer to coach, player, and spectator code of conduct). Officials may remove participants from the Match or Tournament for infractions or violations of the Code of Conduct.

Controlled Flight - Drones must be flown under control to the best of a player's ability. Reckless flight that intentionally causes damage may result in penalties and/or removal from the game. Disabled or damaged drones should be immediately disarmed to prevent further damage.

Interference - Only the referee can physically interact with drones within the arena. No player, coach, or spectator may touch a drone through the arena netting.

Early Start - Players will await the referee's signal to arm their drones and begin flight. Whilst armed, drones must remain grounded until the start signal begins the Set. Penalties will be given to pilots who fail to remain grounded until the signal to begin is given.

4.8 Penalty Shot

For a violation of any of the above rules, a Penalty Shot may be granted by the Referee. Penalty Shots will be announced during gameplay but conducted at the end of each Set.

- Penalties for each side cancel out - only remaining penalty shots will be conducted. For example, if the Red team has 3 penalties, and the Blue team has 2, the penalties will offset and the Red team will be left with only one penalty ($3 - 2 = 1$).
- Ten seconds of extra time will be allotted per Penalty Shot.
- The awarded Striker will attack against a single defender, selected by the defending Captains.
- The Striker may attempt multiple goals during extra time by retreating back across the center line. Offsides still applies

to penalty shots, the Striker must return to his or her side in order to score multiple goals

4.9 Upside Down or Stuck Drone

Drones who are stuck upside down may utilize “turtle mode” or “flip over after crash” to right itself, or have a teammate’s drone bump the drone upright. If a drone is stuck on a part of the arena (i.e., in the netting or under the mat), the team Captain may notify the referee who will evaluate the situation and potentially free it. Players are not allowed to touch the drones.

4.10 Disabled Drones

A drone that cannot continue flight must be immediately disarmed and their team will continue gameplay shorthanded for the remainder of the Set.

If a battery is dangling below a drone in flight, that drone must be immediately disarmed and their team will continue gameplay shorthanded.

If a disabled drone is the Striker, that Striker is out for the Set; a new Striker must be assigned.

4.11 Disabled Striker

During gameplay, if a Striker becomes disabled, the Team Captain (and only the Team Captain) will notify the Referee who stops play.

- At stop of play all drones will land.
- The referee will unplug the disabled Striker, and that pilot will leave the Team Area.
- Flags will be adjusted on the new Striker, which will be placed in the Start Zone and serve as Striker.

- Play will resume with remaining drones from current positions. Play will resume on referees command.
- Substitution of a disabled Striker may only occur once per Set.

5. GAMEPLAY

5.1 Referee Commands and Stoppages

A timer will count down from three minutes per Set, and pause during stoppages.

- The game only stops for a referee whistle or game horn. Verbal commands from the referees or scorekeepers are for individuals and do not stop gameplay, although the referee may command a particular pilot to “DISARM”.
- Referees may stop play at any time for safety, or for a disabled Striker when a timeout is called by the Team Captain. Penalties will not stop gameplay, and will be addressed at the end of Set.
- Pilots will remain disarmed at all times until commanded to “ARM YOUR DRONES” by the referee.

5.2 Prior to Each Set

- Captains will check in with referees and/or scorekeepers to verify pilots participating in the Set.
- Teams will clearly designate a Striker before each Set using flags.
- Each drone should have a charged battery securely attached to the drone, with the power cable disconnected.
- Teams will monitor start time and ensure all drones are placed on the team’s designated table prior to Set start. Teams may place additional spare drone balls (with battery and radio).
- Teams who do not have drones ready at Set start time will compete short handed or otherwise forfeit that Set.

5.3 Set Start

Referees (R) will place all drones into the respective Start Zone, oriented in the correct direction. Obey referee commands to verify arming, only two attempts will be made to establish a drone connection before a spare will be utilized (if available).

⚠ WARNING:

***Do not attempt to arm while the aircraft is being handled.
Failure to follow these procedures may result in injury.***

1. PLACE DRONE IN START ZONE (R).....COMPLETE
2. ON COMMAND (R).....“RADIOS ON”
3. RADIO POWER (P)..... ON
4. BATTERY CABLE (R)..... CONNECT
5. FLIGHT AREA.....CLEAR
6. ON COMMAND (R).....“ARM YOUR DRONES”
7. THROTTLE (P).....IDLE
8. RADIO ARMING SWITCH (P).....ON
 - Verify propellers are spinning at idle power
9. ON LIFTOFF, FLIGHT TIMER (3 MIN)..... START

5.4 “Turtle Mode” or Flip Over After Crash

During gameplay, pilots must be able to recover their own drone. Failure to disarm while rolling on the ground can create a suction effect and result in getting stuck upside down. To activate Turtle Mode and recover:

1. THROTTLE.....IDLE
2. RADIO ARMING SWITCH.....DISARM
3. TURTLE MODE SWITCH.....PRESS & HOLD
4. RIGHT STICK.....FULL FORWARD
 - Wait for drone to settle in an upright position
5. RADIO ARMING SWITCH.....DISARM, ARM

5.5 Team Match/Event Checklist

- Event Registration and Required Forms Complete
 - Correct Roster Verified Prior to Match
- All Batteries and Equipment Clearly Labeled
- Preflight Inspection (6-10 Drones)
- All Radios Charged
- 20 Batteries Charged (4 per Position)
- Toolkits and Spare Parts
- Safety Glasses and Closed Toed Shoes
- Loose Hair and Jewelry Secured

⚠ WARNING:

Do not connect power to a drone outside of a netted flying area.

⚠ WARNING:

Battery charging is conducted by event officials. Do not charge batteries outside of designated charging area.

Note:

A positive attitude, respect, and fair play are expected at all times.

If you have questions or need more information, please contact info@USDroneSoccer.org.