



U.S. Drone Soccer

Condensed Rulesets

Spring Season 2023

20cm Drone Soccer Gameplay
Middle and High School

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an EdTech Robotics Company

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U.S. Drone Soccer Code of Conduct

Fielding Diverse Coed Teams - All teams must intentionally create and maintain a welcome and supportive environment for new pilots, and ensure equal representation and participation of all genders, abilities, and communities that have been 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@dronesports.us. 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 in any way.



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0. INTRODUCTION

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

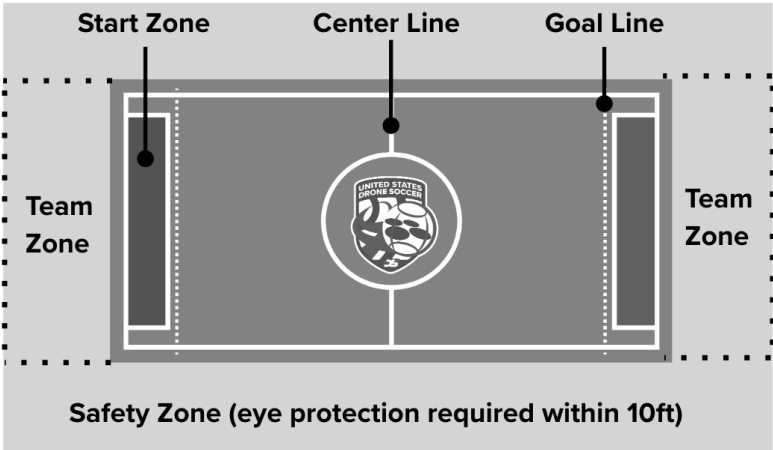
Warnings, Cautions, and Notes

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> |

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, number of smaller batteries wired in a series |
| Center Line | Vertical plane separates offensive and defensive zones |
| Crew | A team, also team members not actively flying |
| Disarm | Stop aircraft motors |
| Drone | Shorthand for Drone Soccer Ball or UAS |
| Match | A contest consisting of three Sets and two repair intervals, Approximately thirty minutes are allotted for each Match |
| Pilot | Crewmember operating the aircraft, an active player |
| Radio | Short for Radio Control and Transmitter |
| Set | A gameplay interval of three minutes elapsed time |
| Start Zone | Drones launch from this zone at the start of each Set |
| Team Zone | Area for Pilots at either end of the Arena. |

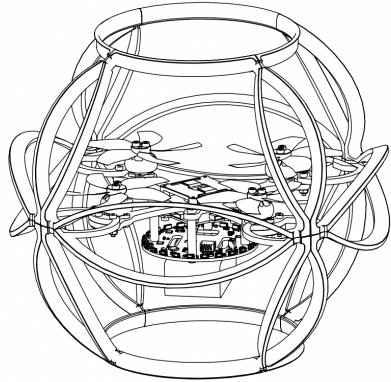


1. EQUIPMENT SPECIFICATIONS

DS200 Drone Soccer Ball

Aircraft Specifications

This high-performance aircraft was 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**

Frame Diameter **20cm ± 2 (7.9in)**

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**

Required Batteries

3S-4S Lithium Polymer Drone Racing Battery

Discharge Rate: 75C or higher

Capacity: Recommended 650mAh (4S) or 850mAh (3S)

Wiring Harness: 11-18V DC Power XT30 Connection

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.

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. If dividing equipment between two teams then have one team with white cages and a red rear panel, and one team with red cages and white rear panel. Remember that the rear panel should always correspond with the USB port on the Saker DS200 “Bantam”.

Competitive teams should paint their exoskeleton cages using a plastic paint. The rear panel should be a bright secondary color to aid in visual orientation of the drone. The rear panel should also be uniquely marked for each student to identify their individual drone. Obvious color patterns of tape, with corresponding patterns on radios, can aid in identification and gameplay.

LED’s should be similarly patterned with a team color on the front and sides of the drone. LED’s should be programmed to change to a similar but distinct Striker pattern using a radio switch. Unique tail light colors should be personalized for each pilot.



2. TEAM COMPOSITION & PREPARATION

Team Composition

Drone Soccer is a coed (mixed) sport and teams must maintain a diverse and inclusive roster. A regulation Match is played by five active players, although teams can agree to play with equal teams of smaller size as necessary. Six is the recommended team size. Each roster may have a maximum of ten players and ten drones (maximum of two per player).

Substitutions

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

Protective Equipment

Broken propeller blades can depart the arena at high speeds. All players and referees should wear glasses or protective eyewear when within 10ft of the arena during active gameplay.

Match Preparation

Teams are responsible for ensuring their drones are ready to fly, and that they have charged batteries (four per player) for the first Match of any event or tournament.

Event Participation

Do not apply 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.



3. RULES OF PLAY

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 3-minute elapsed time and penalty time. The winner of each Match is determined by best 2 out of 3 Sets. In the event of a tied Match the winner is determined by a fourth Set that is sudden death overtime (first team to score wins). Regular season events should play all three Sets for team ranking purposes (even if the first two Sets determine a Match winner). During tournament elimination rounds the Event Officials may elect to only play best 2 out of 3 Sets in the interest of time management.

Positions

Only the Striker on each Team can score, they must be clearly identified with LEDs and flags. If the Striker is damaged, the Forward can assume the position. Other than the Striker, the four defensive positions are fluid and can trade responsibilities; Forward, two Sweepers, and Keeper. Each team must also designate a Captain who is responsible for ensuring their teams have equipment ready and on-time for each Set. Only Captains and Coaches may interact directly with Referees during events.

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 backwards through the goal in an attempt to score. Other drones that fly through the goal will not be awarded or penalized.



Offsides

After a successful goal, the Striker and all airborne teammates must retreat back across the centerline before attacking again. No point will be awarded until all active teammates have all cleared the offensive zone. Drones on the ground are not counted for offsides.

Penalties

Direction of Flight - The Striker can not fly through the other team's goal from the back. Defenders may not hover within the goal, or fly through the goal in the reverse direction. All drones who enter a goal must fly out and around to return to play.

Misconduct - Players, coaches, and spectators must exhibit respectful conduct at all times. 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. Damaged or disabled 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 interact with a drone through the arena netting.

Early Start - Players will arm but remain on the ground until the start signal begins the Set.

Penalty Shot

For a violation of the above rules that create an unfair advantage or prevent a scoring opportunity from the opposing Striker, a Penalty



Shot may be awarded 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.
- Ten seconds of extra time will be allotted per penalty.
- The awarded Striker will attack against a single defender, selected by the defending Captain.
- The Striker may attempt multiple goals during extra time by falling back across the center line.

Upside Down or Stuck Drone

Drones who are stuck upside down must utilize “turtle mode” to flip over, or have a teammate bump the drone upright. If a drone is stuck against the arena, players may notify the referee who will free it. Players are not allowed to interact with drones directly.

Damaged Drones

Players must weigh the risk of damage with how aggressively they fly. A damaged drone that cannot continue flight must be immediately disarmed and their team will continue gameplay shorthanded for the remainder of the Set.

Damaged Striker

During play, if a Striker is disabled, the Team Captain will immediately notify the Referee and call a Timeout:

- Referee will stop play and all drones will land.
- The referee will unplug the previous Striker, and that pilot will leave the Team Area.
- Lights and flags will be adjusted on the Forward drone, which will be placed in the Start Zone and serve as Striker.
- Play will resume with remaining drones from current positions.

4. GAMEPLAY

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 damaged Striker when a timeout is called by the Team Captain. Penalties will not stop gameplay, and will be addressed at the end of elapsed time.
- Pilots will remain disarmed at all times until commanded to “ARM YOUR DRONES” by the referee.

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 lighting and/or 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 referee 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.



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

Turtle Mode

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



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.