



SAN DIEGO
CALIFORNIA, USA
APRIL 22-25TH

TEAM INFORMATION MANUAL

VERSION: 1 DECEMBER 2023

2024 Academic Drone Soccer World Cup Team Information Manual (TIM)

This manual is designed to provide the Drone Soccer community with game information and competition procedures for use at the 2024 Academic Drone Soccer World Cup in San Diego, California, April 23-25th. All publications and procedures conform to FAA/ICAO standards as an introduction to international aviation.

Sources:

Federation of International Dronesoccer Association (FIDA)

Rule Book Dronesoccer - English

Edition: October 18th, 2022

Website: <https://www.dronesoccer.org/about-drone-soccer>

World Air Sports Federation (FAI) Sporting

Code Section 4 Aeromodelling - Volume F9 Drone Sport

Edition: March 1st, 2022

Website: <https://www.fai.org/drone-sports-soccer>

This manual contains the fundamentals required to compete within the United States. It also contains items of interest to crew members concerning drone operations, technology, Crew Resource Management, factors affecting flight safety, a crew glossary of terms, and information on safety, accident, and hazard reporting.

This manual is complemented by other publications which are available via separate subscriptions. A listing of products, dates of latest editions, and print providers is available at the website:

[HTTPS://DRONESOCCER.EDUCATION](https://dronesoccer.education)

Chapter 1. Drone Soccer Introduction.....	4
Section 1. General.....	4
1-1-1. Summary.....	4
1-1-2. Crew Member Conduct Policy.....	4
1-1-3. Policy and Rules Recommendations.....	4
Section 2. Aircraft.....	5
2-1-1. Aircraft Size & Weight.....	5
2-1-2. Aircraft Identification Number.....	5
2-1-3. Team and Position Colors.....	6
2-1-4. Control Frequency.....	6
Section 3. Competition Area.....	6
3-1. Playing Area.....	6
3-1-1. Dimensions.....	7
3-1-2. Markings.....	7
3-1-3. Pilot Area.....	7
3-1-4. Goals.....	7
Section 4. Team Composition.....	8
4-1-1. Rosters.....	8
4-1-2. Pilot Positions.....	8
Section 5. Team Equipment.....	8
5-1-1. Registered Aircraft.....	8
5-1-2. Accountability.....	9
Section 6. Matched Play Rules.....	9
6-1-1. Match Duration.....	9
6-1-2. Results.....	9
6-1-2. Overtime.....	10
6-1-3. Pilots & Aircraft.....	10
6-1-4. Staging and Set Forfeit.....	10
6-1-5. Start Procedures.....	11
6-1-6. Damaged Aircraft and Striker Retire.....	11
6-1-7. Scoring and Offsides.....	12

6-1-8. Defense.....	12
Section 7. Penalties.....	13
7-1-1. Accrual.....	13
7-1-2. Penalty Shootout.....	13
7-1-3. Fouls.....	13
Section 8. Tournament Operations.....	14
8-1-1. Ramp.....	14
8-1-1. Controlled Movement Area.....	15
8-1-1. Team Minimum Equipment List.....	15
Section 9. Signals and Terminology.....	16
9-1-1. Hand/Flag Signals.....	16

Chapter 1. Drone Soccer Introduction

Section 1. General

1-1-1. Summary

Drone Soccer is a team competition played with sUAS (small Uncrewed Aerial System) aircraft enclosed in protective spherical cages. Matches take place within a netted playing area with teams standing outside each end zone. During each Set, a designated aircraft for each team, the “Striker”, attempts to score by flying through the opposing goal. All other aircraft act as defense to block the opposing team. The team with the most goals in the three minute duration wins the Set, and the Match is determined by best out of three Sets.

1-1-2. Crew Member Conduct Policy

- a. It is a crew member’s inherent responsibility to be alert at all times for and in anticipation of all circumstances, situations, and conditions affecting the safe operation of an aircraft.
- b. Crew members should aspire to professionalism, and conduct themselves with respect and integrity at all times. Disrespectful behavior towards any other participant or official will not be tolerated.
- c. Crew members will not apply power to an aircraft unless within a netted playing area, or at a designated repair station. Crew members will not charge batteries outside of a designated battery charging station.

1-1-3. Policy and Rules Recommendations

- a. Recommendations and clarifications of the rules can be submitted to the Planning Committee via Slack at the following link: <https://academicdronesoccer.slack.com>

Section 2. Aircraft

Aircraft can be of any manufacture, or custom built. All aircraft used in competition must conform to the following specifications, which will be subject to inspection from event officials.

2-1-1. Aircraft Size & Weight

A spherical cage must surround and protect the quadcopter aircraft. Two separate classes of aircraft exist defined by the diameter of this cage; 20cm and 40cm.

- a. The diameter of the cage must comply with the aircraft class limit and tolerance; 20cm or 40 ± 2 cm. All aircraft components must be completely contained within this spherical diameter.
- b. The base of the aircraft may be truncated by a maximum of 2cm to allow for stability on the ground.
- c. The maximum weight of each aircraft (including the battery and ready for flight) is 300g for the 20cm class, and 1.1kg for the 40cm class.
- d. The largest allowable single opening of the cage is 150cm^2 .
- e. Batteries may be up to 4S for 20cm, and 6S for 40cm.
- f. Cages must be of sufficient durability to prevent damage and fouling of propellers during repeated collisions.
- g. FPV equipment can not be used by pilots during gameplay. However, it may be installed for recording purposes. Video channels must be coordinated with event officials and/or other pilots prior to use.

2-1-2. Aircraft Identification Number

- a. Each aircraft must have a unique aircraft identification code printed on the drone, visible from the top, with the following convention: a three letter country code, two letter state/province code, five letter team callsign, and two digit unique code. *Example: USA-CO-TEAMA-01 or KOR-SC-TEAMA-AB.*

2-1-3. Team and Position Colors

- a. Airframes and cages may be customized with bright team colors, dark colors such as black should be avoided. A secondary color to indicate the rear of the drone can improve visual identification of aircraft orientation.
- b. Aircraft must have programmable LEDs in a uniform team color visible from at least $\frac{3}{4}$ of the aircraft circumference.
- c. Rear and top LEDs should indicate team position:
 1. Striker (*Offense*) Green
 2. Forward (*Offense*) Red
 3. Center (*Defense*) Blue
 4. Sweeper (*Defense*) Yellow
 5. Keeper (*Defense*) White
- d. Tags attached to the bottom of the cage will clearly identify offensive aircraft; Striker (Green) and Forward (Red).

2-1-4. Control Frequency

- a. Aircraft may use any RC control frequency legal in the United States.
- b. Tampering or interfering with control frequencies of other aircraft in any way is prohibited.

Section 3. Competition Area

3-1. Playing Area

All aircraft operations take place within a netted enclosure around the playing area, with all participants and officials standing safely outside.

3-1-1. Dimensions

- a. The playing area for 20cm competitions is 3m wide, 6m long, and 3m tall (10x20x10ft).
- b. The playing area for 40cm competitions is 6m wide, 12m long, and 4.5m tall (20x40x15ft).

3-1-2. Markings

- a. Each arena must be marked by a Center Line crossing the midpoint of the playing area to separate offensive and defensive zones.
- b. An optional Starting Zone can be marked extending inwards 1m (20cm) or 2m (40cm) from the end zone line.

3-1-3. Pilot Area

- a. The Pilot Area extends ten feet outside the playing area on either end zone (short side), within the lateral confines of the playing area.
- b. For 20cm competitions, only active Pilots are allowed in the Pilot Area. Coaches and teammates may assist from the standby area.
- c. For 40cm competitions, one coach may accompany active Pilots in the Pilot Area to assist in communication.

3-1-4. Goals

- a. 20cm class goals have an interior diameter of 40cm, and an outer diameter of 60cm, and up to 10cm depth.
- b. 40cm class goals have an interior diameter of 60cm, and an outer diameter of 100cm, and up to 20cm depth.

Section 4. Team Composition

4-1-1. Rosters

- a. Team rosters may include up to 10 total participants, not including coaches or chaperones.
- b. During each Set, Teams will designate 5 active Pilots.
- c. Only rostered participants may handle the aircraft and equipment for maintenance or flight operations. Coaches and Managers are not counted against the roster limit.
- d. Each team roster must have one designated Captain.
- e. Prior to each Set, the Captain will update the active roster with all 5 Pilots and their designated team position.
- f. Teams must maintain a coed active roster during each Set.

4-1-2. Pilot Positions

Each Pilot is assigned a position number and corresponding identification color to be clearly marked on the aircraft:

- | | |
|-------------------------------|--------|
| 1. Striker (<i>Offense</i>) | Green |
| 2. Forward (<i>Offense</i>) | Red |
| 3. Center (<i>Defense</i>) | Blue |
| 4. Sweeper (<i>Defense</i>) | Yellow |
| 5. Keeper (<i>Defense</i>) | White |

Section 5. Team Equipment

5-1-1. Registered Aircraft

- a. Each team may have a maximum of ten aircraft with corresponding equipment at event check in.
- b. Each aircraft will be registered and inspected at daily check in for compliance at the beginning of each competition day, no aircraft may be replaced or removed from the competition area until the end of the day.
- c. Aircraft that are removed from the competition area before the end of the day will not be allowed back in.

5-1-2 Accountability

- a. Teams are responsible for ensuring that they have all necessary equipment, and that all equipment is clearly labeled with the five digit team callsign of the team, and aircraft marked with an Aircraft Identification Number.
- b. All batteries should be wrapped in visually distinct masking tape with the five-letter team callsign in large lettering visible on two sides.
- c. Teams are not permitted to swap equipment or parts with other teams, or from teams within the same parent organization. Teams may not remove or alter Aircraft Identification Numbers after check in.
- d. Additional repair/replacement parts may be acquired from the event organizer as needed.

Section 6. Matched Play Rules

6-1-1. Match Duration

- a. Thirty minutes are allotted for each Match including staging, elapsed time, and repair intervals.
- b. Each Match consists of three Sets.
- c. Each Set is three minutes elapsed time.
- d. Repair intervals are five minutes in duration, but can be reduced if both team captains indicate their team is ready.

6-1-2. Results

- a. Teams attempt to score the most points during each Set.
- b. The Match is decided by the best of three Sets.
- c. If the results are tied after three Sets, the Match winner is decided by the first team to score in sudden death overtime.

6-1-2. Overtime

- a. In the event that a tied Set results in a tied Match, an overtime is conducted to determine the winner.
- b. The roster of active pilots from the final set remains the same. Teams will not have a complete repair interval, and will only be allowed to apply new batteries to their aircraft or retrieve a spare aircraft that is already checked in and ready to fly.
- c. Use of slow motion video is highly recommended. Play will commence as normal, and conclude by sudden death with gameplay terminated immediately after the first point is scored.

- d. The first team to score in overtime is awarded one additional point to the tied Set, determining the winner of the Match.

6-1-3. Pilots & Aircraft

- a. Five pilots control five aircraft for each team during gameplay, for a total of ten aircraft in play.
- b. In the 20cm Class, only pilots are allowed in the Pilot Area. All remaining crew and coaches must remain in the staging area. In the 40cm Class, one coach may accompany the team into the Pilot Area to facilitate communication.
- c. Pilots and aircraft may not be substituted during a Set, and pilots may not trade radio controllers during a Set.
- d. Pilots and aircraft can be freely substituted during the repair interval, changes should be identified to officials.

6-1-4. Staging and Set Forfeit

- a. It is every team's responsibility to ensure that their aircraft and equipment is functioning and staged on time.
- b. Prior to the Match start time, or the expiration of a repair interval, teams must have their primary and spare aircraft placed on the staging table. Aircraft not on the staging table are ineligible for play.
- c. If a pilot is not ready at the start of a Set, the team may continue shorthanded or forfeit the Set. If the team can not field a Striker or a minimum of three aircraft, the Set is automatically forfeited. In the event of a forfeit, the following repair interval begins immediately.

6-1-5. Start Procedures

- a. Officials will instruct pilots to enter the playing area.

- b. Pilots will place the aircraft in their designated Starting Area, connect the battery, verify that the aircraft can arm, and depart the Playing Area with the Remove Before Flight tag attached to their radio or lanyard.
- c. If an aircraft can not arm, pilots may quickly request a spare aircraft from the staging table, if available.
- d. Teams will exit the aircraft and proceed without delay to the Pilot Area.
- e. Once both teams are in the Pilot Area, and officials are ready, the lead official will give a ten second warning before initiating the Set.

6-1-6. Damaged Aircraft and Striker Retire

- a. Only the official may stop the game for an unsafe situation. Otherwise, gameplay does not stop for malfunctioning or damaged aircraft. Timeouts are not allowed during a Set.
- b. If an aircraft is damaged and can not fly, the pilot must disarm and place their radio on the ground.
- c. If the Striker for a team cannot continue, the pilot must signal that they have retired by disarming the aircraft, placing the radio on the ground, and signaling the official with both hands in the air. At this point, the Forward may complete an in-air substitution to assume scoring responsibilities by tagging the Striker aircraft on the ground.
- d. After the Striker retires, the referee will point at the striker aircraft. When the Forward has successfully tagged the former Striker, the referee will blow the whistle twice indicating that the in-air substitution is complete and the Forward is now eligible to score points.

6-1-7. Scoring and Offsides

- a. The designated Striker (or eligible Forward after an in-air substitution) can score a goal by flying completely through the opposing team's goal in the forward direction.
- b. The goal judge will raise a flag to indicate a goal, and keep it raised. No additional goals can be scored until all team aircraft have simultaneously returned across the center line into the defensive zone. Once all team aircraft have returned to the defensive zone, the goal judge will lower their flag and the Striker (or Forward) may attempt to score again.
- c. Aircraft immobile on the ground in the offensive zone are not counted as offsides.

6-1-8. Defense

- a. Any aircraft may attempt to block any aircraft of the opposing team, in the air or on the ground.
- b. Defensive aircraft are not allowed to intentionally defend by hovering within their own goal or passing from behind their own goal and through it in a forward direction.
- c. Teams will not be penalized, and no points will be awarded, for aircraft that fly or are pushed backwards through their own goal.
- d. However, aircraft are not permitted to return through their own goal in the forward direction once they have crossed inside the goal. Aircraft must fly out and around the goal to return to a defensive position.

Section 7. Penalties

7-1-1. Accrual

- a. Penalties may be awarded by officials after a warning for any infraction of the rules, and accumulated during each Set.
- b. Penalties accrued by each team during a Set are offset by those accrued by the other team. The total points accrued by each team are recorded on the score sheet. The penalty count is reset at the end of each Set and does not carry over.
- c. At the end of the Set, the remaining penalty differential can be awarded as goals to the team with fewer penalties if the winner of the Set is not affected by the additional points.
- d. If the outcome of the Set would be changed by the penalties awarded, then the officials will conduct a penalty shootout for a fair resolution of the penalties and final Set outcome.

7-1-2. Penalty Shootout.

- a. A penalty shootout is a one on one contest between the Striker (or Forward) and the opposing team's Keeper.
- b. Both Striker and Keeper begin in their respective starting zone.
- c. Five seconds will be awarded for each penalty differential. The Striker may score as many goals as possible during penalty time following standard offsides rules.

7-1-3. Fouls

- a. **Goal Interference.** Any defender who hovers within their own goal, or passes through their own goal in the reverse

direction that prevents a scoring opportunity, will be awarded a penalty. Accidental violations that do not affect a scoring opportunity, and are corrected by flying backwards through the goal to return to position, do not result in a penalty.

- b. Pilot Interference.** A pilot or coach who intentionally distracts or interferes with the other team's operations, or interacts with aircraft through the netting, or exchanges equipment with another pilot during a Set will be awarded a penalty.
- c. Misconduct.** Unprofessional conduct towards any participants and officials may result in the award of a penalty during a Set. For violations of the no-tolerance respect policy regarding other participants and officials, the offending participant or team may be disqualified.
- d. Disqualification.** Misconduct including equipment and team rosters discovered to be intentionally in violation of the rules may result in disqualification for a set, match, or removal from an event at the discretion of officials. If a team is allowed to continue, they will do so with their active roster reduced by one pilot position for the remaining term of their disqualification.

Section 8. Tournament Operations

8-1-1. Ramp

- a.** Only badged team members and officials are allowed into the competition area referred to as the "Ramp".
- b.** Each team will have a designated pit table where equipment can be stored. Teams may not tamper with or borrow any equipment from another team's pit table.

- c. Teams from the same parent organization will be placed at separated pit tables to maintain fairness for all teams.
- d. Remove Before Flight tags will remain connected to the aircraft XT30 port at all times on the ramp. Teams that need to apply power for repairs can do so at the designated repair station.

8-1-1. Controlled Movement Area

- a. The Controlled Movement Area (CMA) is where the match and repair intervals will take place. Teams are only allowed inside the designated CMA as directed by event officials.
- b. Eye protection must be worn at all times within the CMA.
- c. Teams will check in and out the CMA with officials at their designated station ahead of each match, where the team roster will be verified and aircraft inspected.
- d. Teams will bring all required equipment and conduct match repair intervals within the CMA, and will not be allowed to retrieve additional equipment or re-enter until the conclusion of the match.

8-1-1. Team Minimum Equipment List

When teams report to the Controlled Movement Area in preparation for a match, they must bring the following:

- a. Aircraft - minimum of 5, maximum of 10
 - i. Batteries secured
 - ii. LEDs configured
 - iii. Offensive tags attached
 - iv. Remove Before Flight tag in XT30 port
- b. Radio controller/transmitters and lanyards.
- c. Additional fully charged batteries - 15 for a total of 20 per team at check in.

- d. All required tools and replacement parts, including a recommended battery checker.
- e. A laptop for avionics troubleshooting.

Section 9. Signals and Terminology

9-1-1. Hand/Flag Signals

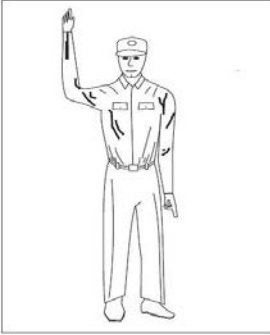


Figure 1. Goal Scored and Returning from Offsides (Official)



Figure 2. Offsides Complete and Scoring Eligible (Official)

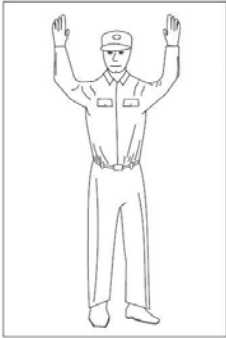


Figure 3. Striker Retiring (Pilot)

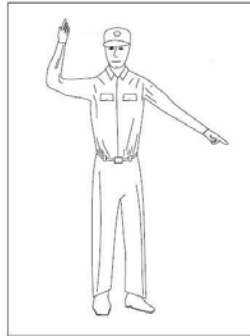


Figure 4. Striker Tag Eligible Single Whistle & Double Whistle When Complete (Official)