

A. F9A (PROVISIONAL CLASS) - DRONE SOCCER

Drone soccer is a mix between drone flying and soccer done.

A drone soccer match opposed two teams with a defined number of players flying each a drone ball over the flying zone. The match is subdivided in three periods of time, each of them being considered as a set.

The team is composed of a "striker" who is the only one who may score with its drone ball going through the opponents' goal ring. The other team's players may act as guide or defender.

A.1. DRONE BALL GENERAL SPECIFICATIONS

A 1 % tolerance is applicable for inaccuracy of the measurement devices for size, weight and pack of battery voltage.

The drone ball must be equipped with a fail-safe device, the triggering of which stops the motors.

The following are strictly forbidden:

- Pre-programmed manoeuvring device.
- System for automatic positioning and/or path rectification in longitude, latitude or height.

Note: Software recovery modes such as 'anti Turtle' or 'anti crash' and automatic system or which can be activated by the pilot in order to level back the drone ball after a crash are permitted.

The drone balls may be checked by the organizer before the event begins.

A.1.1. Weight and size

The total weight of the drone ball including all equipment necessary for flight (including outer frame and batteries) shall not exceed 1 kg.

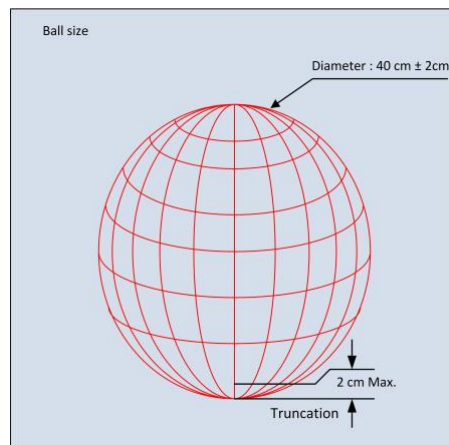
A spherical outer protective frame shall surround the drone ball. The diameter of the frame must be $40 \text{ cm} \pm 2 \text{ cm}$.

All the components of the drone ball must be inside the spherical protective frame. Nothing must be placed outside this frame.

The frame may be truncated 2 cm maximum on its base for stability of the drone ball on the ground.

Any individual open surface of the frame must be 150 cm^2 maximum.

Note: This requirement is to prevent drone balls with a too light protective framework surrounding the drone ball. Although a lighter drone ball can offer better flying performance, too protective frames can adversely affect the game due to frequent interference and damage.



A.1.2. Motorization

Only electric motors are allowed.

The drone ball may be equipped with a maximum of four electric motors.

The maximum voltage of the pack of batteries must not exceed 17.0 volts (4S). The voltage measurement will be done before the beginning of the match.

A.1.3. Propellers

Maximum diameter: 6 inches (15.2 cm).

Full metal propellers are forbidden.

A.1.4. Radio control (RC) equipment

Every 2.4 GHz spread spectrum technology RC equipment may be used.

In order to limit risk of potential problems with unwanted interference during a match, the event director may define restrictions for use of RC systems equipment outside the playing field.

In case of a non-authorized use of a RC equipment, penalty going up to disqualification of the concerned team (see A.11).

A.1.5. LED light device

In order that during a match, drone balls of each team could be clearly identified, each drone ball must be equipped with an LED light device that has the capability to choose from a set of different colours.

The organizer must define the specifications of the LED light device or a list of authorized devices.

Recommended specifications:

- 40 to 60 LEDs fixed on the spherical framework which surrounds the drone ball so that the drone ball can be seen clearly from any direction.
- Colours: Blue - Green - Red - Yellow
- RGB controller to program the assigned colour for the match.

A.1.6. Scorer drone ball

The drone ball of the striker (scorer drone ball) must be easily recognizable from any point on the playing field, compared to the other drone balls of the team, or of the opponent's team.

It may be obtained with a different or additional LED light device different, or with a specific tag. The organizer may define the corresponding specifications.

A.2. PLAYING FIELD

Drone soccer event may be run indoor or outdoor.

The playing field is mainly composed of a flying zone and two pilots' areas (one for each team).

A.2.1. Surface

There are no precise specifications regarding the surface of an outdoor playing field or the floor of an indoor arena or gymnasium.

Surface of an outdoor playing field must be sufficiently flat. In addition, too hard surface covering or floor, such as asphalt or concrete, should be avoided for the flying zone in order to minimize risk to damage the drone ball when it falls on the ground.

In case the surface of the flying zone is covered with a soft artificial material, the organizer will take care a drone ball cannot sink in the covering material more than about one centimetre in order to avoid take-off problem. The organizer will also check that 'spring effect' will be limited.

A.2.2. Flying zone

The flying zone shall be a rectangle marked by lines. The dimensions of the rectangle will be fourteen to twenty meters for the longer side, and seven to ten meters for the shorter one. In any case, the length of the flying zone will be twice the width.

A centre line will be marked at the middle of the longer side of the flying zone. The centre of the flying zone (middle of the centre line) will be also marked.

There shall be no obstacle(s) on the flying zone or closed to it which may hinder the game.

Note: For indoor, height without obstacle(s) over the surface of the flying zone shall be five meters minimum in order to allow drone balls to go above the goal rings.

Two areas for start and take-off of the drone balls (one for each team) will be marked inside the flying zone. The start area will be positioned in the middle part of the baseline (shorter side of the flying zone). Length of the start area will be about half the baseline width and depth will be about (but not less) 1.5 m. Position and dimensions of the two start areas will be identical.

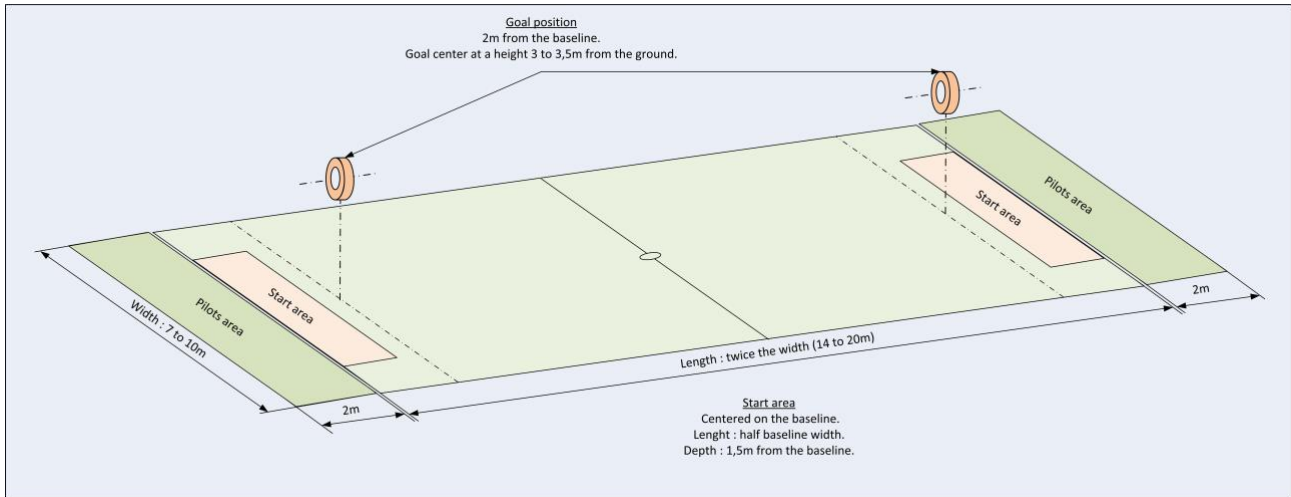
All marks on the ground will be clearly visible using a colour distinguishable from the ground surface colour.

A.2.3. Pilots' area

The pilots' areas (one for each team) will be placed outside the flying zone on the shorter sides as defined on the following scheme. Position and dimensions of the two pilots' area will be identical.

Each pilots' area will be marked.

During the sets of a match, only the players who are effectively flying (active players) may be in the pilots' area. The other members of the team (reserve players and coaches) must be outside the flying zone and the pilots' areas.



A.3. GOAL RINGS

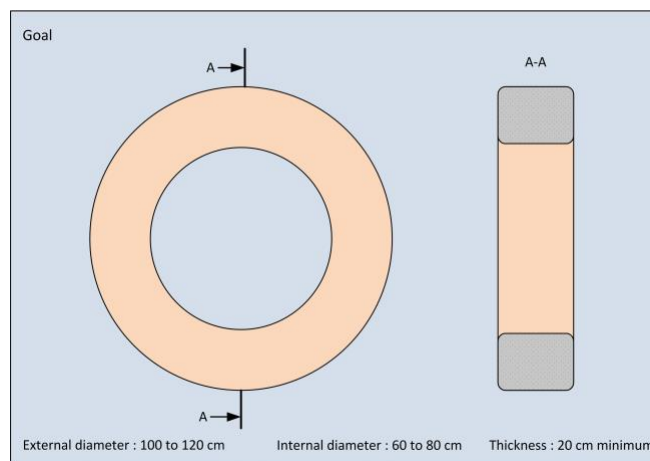
The flying zone will be equipped with two goal rings (one for each team).

A.3.1. Shape and dimensions

The goal ring will be circular, with an internal diameter of 60 to 80 cm and an external diameter of 100 to 120 cm.

The thickness of the goal ring will be 20 cm minimum.

The two goal rings will be identical.



A.3.2. Position

Each goal will be positioned at about 2 m inside the baseline (shorter sides of the flying zone) at a height from the ground of 3 to 3.5 m measured from the centre of the goal ring).

The goal rings must face the centre of the flying zone. They will be fixed on posts or suspended from the ceiling taking care they cannot fall down and to avoid any swaying. It is important to ensure a firm, stable and secure fixation of the goal rings and to avoid any possibility of swaying of the goal rings.

Position of the two goal rings will be identical.

A.3.3. Material and structure

The material must be strong enough to minimize risk of a damage or deformation which may affect the game, but sufficiently flexible to avoid damages on the drone balls.

The goal ring must be visible and easily identifiable from any position around the playing field. The goal ring shall have a distinguishable colour for easy identification. It is also possible to add lighting systems on the goal rings to increase its visibility.

A.3.4. Detection sensor

For automatic scoring, a detection sensor may be installed on each goal ring subject it does not affect possibility for the drone ball to go through the goal ring. The sensor shall be installed so that he will be actuated only when the centre of the drone ball passes through the front face of the goal ring.

Note: *In case of an automatic scoring is used, teams shall be informed about position of the detection sensors before the match begins.*

A.4. COMPOSITION OF A TEAM

The team consists of players and coaches. Unless specified differently for the event, a coach may participate as a player.

A.4.1. Active players

Drone soccer is played with a maximum of 5 active players. The organizer must precise the authorized number of active players (5, 4, 3 or 2) when announcement of the event is done. Except exceptional circumstances, this number cannot be changed during the event. In case the event is organized with different rounds, the main referee may decide (after a round is completed) to reduce the number of active players subject a majority of the teams still participating in the event agree the decision.

The organizer will also define the total number of persons authorized for a team. In any case, a maximum of 10 (ten) persons may be authorized; this maximum number must be adapted depending the authorized number of active players. The organizer may also precise a maximum number of players and/or the number of authorized dedicated coaches.

The active players include one striker (scorer). The other active players can play as guide or defender. Any active player may only control one drone ball. So, the number of drone balls in flight cannot be higher than the number of active players.

Replacement of an active player is only possible during a break between two sets and can only be considered with players mentioned on the players' list for the concerned team.

One of the active players will be appointed as the team captain. He will be the point of contact for the match referee on the playing field.

A.4.2. Players' list

The players' list for each team must be submitted before the beginning of the event as required by the organizer, and in any case no later than 30 minutes before the first match.

The players' list will also mention the dedicated coach(es) in order to check it complies with the total number of persons authorized for a team for the event.

The list may not be changed as soon as the event begins.

Note: *Mention of the strikers and team captains on the players' list will not be requested considering they may change between two sets and for the different matches.*

A.5. NUMBER OF DRONE BALLS

Each active player may have 2 (two) drone balls ready for a match. The spare drone ball cannot be equipped with a pack of batteries when it is not used for flight.

The player may only change the drone ball or the pack of batteries during the break between two sets.

A.6. PRACTICE FLIGHTS

Practice sessions may be organized. The event director has the responsibility to define the conditions of the practice sessions.

Flights other than those authorized by the organizer are strictly forbidden under threat for the team to be disqualified from the event.

A.7. FORMAT OF THE EVENT

The organizer defines the event format. The format must be announced as soon as possible and at least one month before the event.

There are two main types of formats which may be considered:

- Group stage followed by knockout and final stages.
- Successive rounds.

Note: *The event may be a single match, a competition or contest, a tournament, etc.*

A.7.1. Format with group stage followed by knockout and final stages

This format is based on the Football World Cup format.

The event begins with a group stage followed by a knockout stage (round of 16, and/or quarter-finals, semi-finals), and then by the final stage with the play-off for the third place and the final.

In the group stage, every team play a match against each other team of the group. For each group, it could be considered 3 to 5 teams taking care of a close number of teams for all groups.

The groups are defined with a random draw.

A.7.1.1 Group stage ranking

For each match, points will be awarded as follows:

- 3 points for a win.
- 1 point for each team for a draw.
- 0 point for a defeat.

In each group, the two best placed teams will be selected for the first knockout stage round.

The ranking of each team in their group will be determined with the following criteria:

- a) Greatest number of points obtained in all matches of the group.
- b) Goals difference in all matches of the group.
- c) Greatest number of goals scored in all matches of the group.

If, on the basis of the above criteria, there is still a tie for the first or the second place in the group, a penalty shootout will be organized to break the tie between the concerned teams.

A.7.1.2 Knockout stage

The knockout stages are done with direct elimination of the teams which have lost their match.

A.7.1.3 Scenarios for illustration

See below two examples of scenarios, one corresponding to a scenario for 24 teams and the other to a scenario for 16 teams.

a) Scenario for 24 teams

- Group stage: 8 groups (A to H) with 3 teams in each group. Each team plays 2 matches which means 3 matches for each group and so a total of 24 matches for the group stage.
- First knockout stage round (round of 16) - 8 matches (16 teams)
 - . Winner A & Runner-up B = 1
 - . Winner B & Runner-up A = 2
 - . Winner C & Runner-up D = 3
 - . Winner D & Runner-up C = 4
 - . Winner E & Runner-up F = 5
 - . Winner F & Runner-up E = 6
 - . Winner G and Runner-up H = 7
 - . Winner H and Runner-up G = 8
- Second knockout stage round (quarter-finals) - 4 matches (8 teams)
 - . Winner 1 & Winner 3 = A
 - . Winner 2 & Winner 4 = B
 - . Winner 5 & Winner 7 = C
 - . Winner 6 & Winner 8 = D

- Third knockout stage round (semi-finals) - 2 matches (4 teams)
 - . Winner A & Winner C
 - . Winner B & Winner D
- Play-off for third place - 2 teams & 1 match: Semi-finals losers.
- Final - 2 teams & 1 match: Semi-finals winners.

40 matches in total: 24 for the group stage, 14 for knockout stage and 2 for the final stage.

b) Scenario for 16 teams

- Group stage: 4 groups (A to D) with 4 teams in each group. Each team plays 3 matches which means 6 matches for each group and so a total of 24 matches for the group stage.
 - First knockout stage (quarter-finals) - 4 matches (8 teams)
 - . Winner A & Runner-up B = 1
 - . Winner B & Runner-up A = 2
 - . Winner C & Runner-up D = 3
 - . Winner D & Runner-up C = 4
 - Second knockout stage (semi-finals) - 2 matches (4 teams)
 - . Winner 1 & Winner 3
 - . Winner 2 & Winner 4
 - Play-off for third place - 2 teams & 1 match: Losers of the semi-finals.
 - Final - 2 teams & 1 match: Winners of the semi-finals.
- 32 matches in total: 24 for the group stage, 6 for knockout stage and 2 for the final stage.

A.7.2. Format with successive rounds

This format may be run with direct elimination, or with double elimination.

Note: *In such a format, a lower total of matches is played compared to the other format, which means less time necessary to run the event for a given total number of teams.*

A random draw will be done for each round. When it is possible, it is recommended to avoid a same pair of teams in two different rounds.

In a situation of an odd number of teams in a round, the last team which has been drawn will not play in the round. This team will play twice in the following round:

- in the first match;
- and then in the last match if the number of teams permits it and if the team is not eliminated after the first match.

For each match, the winning team is selected for the next round.

For the direct elimination option, each team losing its match in the first round is eliminated, and so on for the following rounds.

For the double elimination option, a team will be eliminated after losing two matches.

A.8. ORGANIZATION OF A MATCH

A match is subdivided in three sets. Period of time for each set will be 3 (three) minutes.

Except an exceptional circumstance, the break between two sets will be limited to about two to three minutes which is normally sufficient to get back the drone balls and place them on the start areas.

Note: *It is recommended to provide a LED display or equivalent to show the remaining playing time. This will be useful for the teams, the officials and the audience.*

A.8.1. Position of the teams on the playing field

The match referee does a coin toss in order to determine position of the teams on the playing field (left or right side).

The team which wins the coin toss chooses its side, which defines the pilots' area. The teams keep the same side for all the match, and so stay on the same pilots' area for the three sets. Nevertheless, if the match referee considers that a circumstance, such as wind for an outdoor match, may affect the result of the match, he may decide differently. A team cannot complain or protest against such a decision, and cannot request a side change between two sets.

After the allocation of the pilots' areas is decided, the captain of each team may check the goal ring in which the team must score.

A.8.2. Start of a set

The start of each set will be done as follows:

- After the drone balls have been placed on the start areas, the match referee will request the two team captains if their team are ready to start.
- When the match referee considers that the teams are ready, he will announce clearly 'Arm your quads'.
- About 3 to 5 seconds after this announcement, a brief and intelligible sound signal will be done for the start of the set.

The match referee must stop the game and request a new start when he considers that:

- the start procedure has not been done properly;
- a player starts before the signal and doing so may give an advantage to the team.

In case of early start, a penalty shot may be granted against the concerned team (see A.9.1).

A.8.3. End of a set

The match referee is responsible to define the end of the set.

He will take to consider when necessary additional time taking in account that time consumed for a penalty shot must not be considered as a part of the period of time of the set (see A.9.1).

The announcement of the end of the set will be done with a brief and intelligible sound signal.

A.8.4. Scoring

A team scores a goal when the scorer drone ball (striker player) passes through the goal ring of the opponents' team subject:

- the goal ring has been crossed in the direction of the opponents' baseline,
- and half of the drone ball has passed through the front side of the goal ring.

The match referee is responsible to decide if the goal may be scored even if an automatic scoring system is used.

Scoring by passing through the opponent's goal ring with the drone ball of an active player who is not the striker will not be recognized as a score. There will be no penalty for that.

When a team scores a goal, all active players of the concerned team must immediately return on their side beyond the centre line before attempting a new score. A drone ball which falls on the ground is not concerned by this requirement if the drone ball is no more in situation to take-off again. It is not forbidden for the opponents' team to do blocking to prevent the drone balls to return on their side.

In case of a violation of this rule, a penalty shot may be granted against the concerned team (see A.9.1). In any case, a score which will be considered by the match referee as resulting from a violation of this rule will not be validated.

Note: *In case of a temporarily loss of control on a drone ball, the concerned player must do the best to return on its side after recovering the control. If the player considers that the loss of control is definitive, he must actuate the fail-safe and notify the match referee (or where appropriate the assistant referee) as soon as the drone ball is on the ground. Then, the player must leave the pilots' area.*

The striker may pass or remain in its own goal ring for defence purpose. Another active player of the team may pass through its own goal ring when it is not done with the intention to block the opponents' team. When a player, other than the striker, passes or stays inside its own goal ring for defence purpose, a penalty shot is granted against the concerned team (see A.9.1).

A.8.5. Safety occurrence

An active player can be requested by the match referee (or an assistant referee) to stop to fly if it is considered the drone ball no longer meets acceptable safety standards. It could be for example the case when the drone ball is damaged after a collision or after a crash, or when the pack of batteries is dangling.

A.8.6. Set and match result

For each set, the team that scores more goals in the set wins the set. If both teams score the same number of goals, or neither team scores a goal, the set ended in a draw.

The team that wins the best of three sets wins the match.

If both teams win the same number of sets in the match, the match is a draw. The main referee defines how to proceed when it is necessary to decide between the two teams (for example for an event with direct elimination rounds): coin toss, time overtime period, penalty shootout, This must be clearly announced before the beginning of the event.

Overtime period: It will be run same way as a standard set except the first goal determines the winning team (Sudden death / Golden goal).

Penalty shootout: It will be played same way as the penalty shot (see A.9.1). A minimum number of penalty shots (for example 5) is defined. Whenever possible, penalty shots must be done by different players of the team. All teams will be informed of the penalty shootout procedure which will applied before beginning of the event.

In case a team withdraws for a match (or for the rest of event), the concerned match(es) will be considered as lost by the team. The same applies or is disqualified from the event.

If a match is definitively stopped before its end, the current result based on the number of sets won determines the winner of the match except when the match is stopped because a team get a red card (see A.9.4). If both teams are equal and when it is necessary to decide between the two teams (for example for an event with direct elimination rounds), the match referee organizes a coin toss to determine the winner.

If the event cannot go on to the end, the last available provisional ranking will be considered for the final ranking.

A.8.7. Video recorder

In case a video recorder to monitor the match is installed, this "official" video record cannot be used by the match referee to make decisions or to review a decision during the match.

It may only be used by the concerned official(s) to manage a complaint or protest.

A.9. PENALTIES

All penalties (penalty shot, warning, yellow and red card) are granted by the match referee.

Penalties are no more valid as soon as the match is finished.

A.9.1. Penalty shot

A penalty shot may be granted against a team in the following situations:

- Start of a drone ball before the start signal (see A.8.2).
- When the player(s) do not return properly on their side after their team has scored a goal (see A.8.4).
- When an active player other than the striker passes or stays inside its own goal ring for defence purpose (see A.8.4).

The time consumed for the penalty shot will not be considered as a part of the period of time of the set.

A.9.2. Warning

A warning may be given to a team in the following situations:

- Non authorized person (reserve player, coach, ...) in the pilots' area during a set.
- Minor uncivilized conduct of a player or a coach towards a referee, an opponent player or coach, or a spectator.
- Delay of the start of the match or of a set caused by a team without acceptance of the match referee.
- Simple movement of a drone ball before the signal ball which will not be considered as an early start.
- Non intentional contact during a set of a drone ball on a person.

A.9.3. Yellow card

When two warnings are given for the same reason during a match to a team, a yellow card is given to the team.

In addition, a yellow card may be directly given to a team in the following situations:

- Change of an active player during a set.

- Major uncivilized conduct of a player or a coach towards a referee, an opponent player or coach, or a spectator.
- Intentional manipulation of a drone ball during a set.
- Intentional contact during a set of a drone ball on a person.

When a yellow card is given, the set is stopped and considered lost for the concerned team.

A.9.4. Red card

When two yellow cards are given during a match to a team, a yellow card is given to the team.

In addition, a red card may be directly given to a team in the following situations:

- Active player not registered on the players' list.
- Severe uncivilized conduct of a player or a coach towards a referee, an opponent player or coach, or a spectator.
- Dangerous or hazardous behaviour or action of an active player during a set.

When a red card is given, the match is stopped and considered lost for the concerned team.

A.10. INTERRUPTION OF THE EVENT

The event should be interrupted or the start delayed in the following circumstances:

- For an outdoor event, due to atmospheric conditions (rain, stormy condition, ...) in which it would be dangerous to continue to fly, or if wind is continuously stronger than 9 m/s measured at 2 m above the ground near in the centre of the playing zone for at least one (1) minute.
- Any incident affecting safety or requiring access for emergency services

The decision is taken by the main referee in conjunction with the event director.

The match referee has the right to interrupt a set for an external disturbance or any other justified reason. When an interruption occurs during a set, the set must be completely rerun when possible except if the match referee considers a team as directly responsible of the interruption (for example forfeit). In that situation, the team which is the cause of the interruption loses the set which means the other team wins it.

The decision to stop definitively a match must be taken by the main referee.

A.11. DISQUALIFICATION

A disqualification is decided by the event director with the consent of the FAI Jury.

A disqualification affects the concerned team for the entire event. A team is disqualified is placed at the end of the ranking with a 'DISQ' mention.

Disqualification may be considered in the following situations:

- Use of a drone ball or equipment which does not conform to the rules.
- Deliberate very dangerous behavior of an active player on another person.
- Unsporting behaviour of a member of the team.

A.12. OFFICIALS

A.12.1. Event director

The event director is in charge of the complete oversight of the event.

He has the responsibility of the safety concerns and will support the main referee to ensure compliance of the event with rules.

He is also in charge to:

- Organize the running of the event (draws, detailed schedule, order of the matches, etc.) according to the event format which has been retained.
- Nominate for each match the referee (and assistants where appropriate).
- Validate the result of each match and the provisional and final ranking.

Following responsibilities and duties of the event director are also defined in the present rules:

- Definition of the eventual restrictions for use of RC systems equipment outside the playing field (see A.1.4).
- Possibility of practice flights (see A.6).

- Disqualification of a team (see A.11).

A.12.2. Referees

A main referee will be appointed for the event in order to manage sportive organization of the event in conjunction with the event director.

In addition, match referees or assistant referees may also be appointed as necessary. In the situation where match referees are not appointed, the main referee will also have the function of match referee.

A.12.2.1 Main referee

The main referee has the final authority regarding application of the drone soccer rules for the event.

Responsibilities and duties of the main referee as defined in the present rules are:

- Before the beginning of the event, definition how to proceed when it is necessary to decide between the two teams in case the match is a draw (see A.8.6).
- Checking of the compliance of the drone balls with specification rules (see A.1).

Note: *Before the event, a processing with marking of the drone balls may be organised. During the event, in case of doubt, main referee may request the organiser to check the characteristics of a specific drone ball. He may also consider a random spot-check following any race to check the most important characteristics of the drone ball.*

- Decision to reduce during the event the number of authorized active players (see A.4.1).
- Interruption of the event or delay of the start if necessary (see A.10).

A.12.2.2 Match referee

The match referee has the global responsibility to lead the match seamlessly, smoothly, and fairly in cooperation with the assistant referees where appropriate.

He must also take appropriate attention about the safety concerns during the match and take care that only authorized persons are present on the playing field.

He will be positioned in order to have an overview of the entire playing field and to be seen by the active players. He will be equipped with a microphone or equivalent in order to be heard clearly by every active player on both sides of the playing field.

Responsibilities and duties of the match referee as defined in the present rules are:

- Choice of the position of the two teams on the playing field (see A.8.1).
- Check before each set that the active players for both teams are on the players' list (see A.4.2).
- Start (see A.8.2A.8.3) and end (see A.8.3) of each set.
- Break time between two sets (see A.8).
- Validation of goals and scores (see A.8.4).
- Request an active flyer to stop to fly if it is considered the drone ball no longer meets acceptable safety standards (see A.8.5).
- Set and match result (see A.8.6).
- Granting of penalties (see A.9).
- Interruption of a set for an external disturbance or any other justified reason (see A.10).
- Record at the end of the match of the score of each set, the final result of the match, the penalties which have been granted during the match and any incident he will consider justified to notice.

The main referee may change his(her) decision if he considers he has done an error of judgment or after considering the advice of an assistant referee. In any case, the position of the main referee prevails in case an assistant referee has a different opinion.

A.12.2.3 Assistant referee

When assistant referees are considered, it is recommended to appoint two assistant referees for a match (one on each side of the playing field).

Each of them will be positioned outside the flying zone in a correct place to observe their goal ring and pilots' area. They must in situation to easily communicate with the main referee.

They will be in charge to particularly follow the game on their side of the playing field.

The main referee will precise before the match to the assistant referees what he expects first and foremost from them.

A.12.3. FAI Jury

In any FAI Open International event, a FAI Jury must be nominated according to Volume CIAM General Rules C.7.1 and C.7.3.