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DRONE RACING WORLD CUP RULES

F9A (Provisional class) - DRONE SOCCER RULES

F9U (Provisional class) - RC MULTI-ROTOR DRONE RACING RULES

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C. F9U (PROVISIONAL CLASS) - RC MULTI-ROTOR DRONE RACING RULES

Multi-rotor Drone Racing consists of several multi-rotor model aircraft flying together through a closed racing circuit.

Note: A multi-rotor is a rotary wing radio-controlled model aircraft equipped with at least three power driven propeller devices.

The generic term 'model' will be used in the present document.

Each model is operated by an FPV (First Person View) pilot who is considered as the competitor. The FPV pilot is equipped with a headset goggle that allows him(her) to pilot from the video picture of the onboard camera which is transmitted in real time on his(her) headset goggle.

The FPV pilot is assisted during the race by one and only one helper who stays next to him during the whole flight. The helper is mandatory. He may be another competitor.

The main task of the helper is to keep the model in visual line of sight. He must inform the FPV pilot of anything occurring that can affect his(her) piloting, especially about safety. If the helper requests the FPV pilot to land or to cut off the motors, he must do it immediately. In case of emergency, the helper is authorized to shut off the transmitter in order to trigger the fail-safe device.

C.1. GENERAL SPECIFICATIONS FOR MODELS

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

The model 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 model after a crash are permitted.

C.1.1. Weight and size

The total weight of the model including all equipment necessary for flight (including batteries) shall not exceed 1 kg.

The axes of all motors must fit within a circle of 330 mm diameter.

C.1.2. Motorization

Only electric motors are allowed.

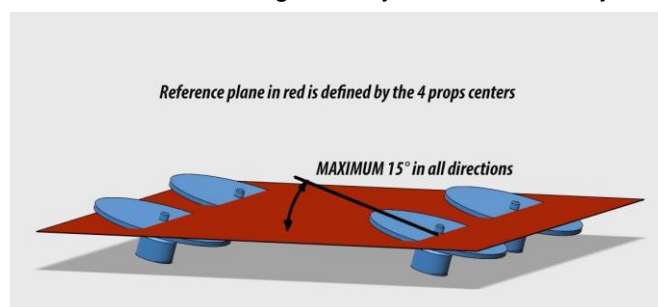
Battery pack up to 6 S is allowed. The voltage for each cell must not exceed 4.25 V. This means a maximum voltage of 17 V for a 4S battery pack, and 25.5 volts for a 6S battery pack.

The voltage measurement will be done before the flight.

Note: It may be considered in addition the opportunity to specify a maximum amount of energy ($X \text{ watt} \cdot \text{min}$) which may be used for the race. In that situation, the energy consumed must be controlled by an electronic device which stops the motors for a defined period (for example 10 seconds) in case of overrun of the maximum amount of energy authorized. Another possibility is to store in a logger the amount of energy consumed for the race and to penalize an over consumption of energy.

The reference plane is defined with propellers centres. Each motor can be tilted up to 15° maximum angle in each direction.

On a tri-copter, the inclination of a motor in flight is only allowed with the yaw order.



C.1.3. Propellers

Maximum diameter: 6 inches (15.2 cm).

Full metal propellers are forbidden.

C.1.4. Radio control (RC) equipment

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

Frequencies and emission power can only be those authorized in the organizer country.

The organizer may define a list of authorized RC equipment, for example 868 MHz / 915 MHz modules.

The output power of 868 MHz / 915 MHz RC modules must be settled to 100 mW maximum or a lower output that fulfils local regulations.

He may also define a list of authorised equipment in order to minimize risk of radio control problems. This information must be available at least one month before the event.

In order to limit risk of potential problems during the races with unwanted interference, the organizer may define restrictions for use of RC systems equipment outside the racing circuit.

In case of use of non-authorized RC equipment, penalty going up to disqualification from the event may be imposed to the concerned competitor by the event director, with the consent of the FAI Jury (see Volume CIAM General Rules paragraph C.19.1).

C.1.5. Video system

The organizer must inform before the event about the video system that will be used for races.

A digital video recorder (DVR) is strongly recommended in order to permit to review races as necessary in case of doubt or complaint.

The organizer may define a list of authorized video transmitters (VTX) in order to minimize risk of video problems and/or permit live transmission of the pilot view on large screens for the spectators and/or media production with the appropriate quality.

The list of authorized VTX must be available at least one month before the event.

Note: *The organizer may not restrict to only one VTX. The list must not be defined with commercial consideration.*

The VTX must be set with 25 mW maximum power emission.

The organizer may also request use of a certain type of VTX antennas with the appropriate polarization.

Frequencies and emission power can only be those authorized in the organizer country.

In order to limit risk of potential problems during the races with unwanted emission, the organizer may define restrictions for use of video transmitters outside the racing circuit.

In case of non-authorized activation of a video transmitter, a penalty going up to disqualification from the event may be imposed to the concerned competitor by the event director, with the consent of the FAI Jury (see Volume CIAM General Rules paragraph C.19.1).

C.1.6. LED light device (Optional)

In order to increase visibility of the models to spectators during the races and to facilitate the task of the judges, the organizer may request that competitors equip their models with an LED light device that has the capability to choose from a set of different colours so that each model in flight can be uniquely identified.

In that situation, the organizer must define the specifications of the LED light device or a list of authorized devices at least one month before the event.

Recommended specifications:

- 40 LEDs minimum for a quadcopter (32 LEDs minimum for a tri-copter) distributed evenly so that the aircraft can be seen clearly from any direction. Recommended layout: 4 on bottom and 4 on top of each arm of the model + 8 on the sides of the body.
- Colours: Blue - Green - Orange - Pink - Purple - Red - Yellow
- RGB controller to program the assigned colour before each race.

Note: *In case an LED light unit is requested, the colour and the video frequency may be assigned for each race according to the draw order in the group. This will simplify the organisation and improve the understanding of the races by spectators.*

C.1.7. Identification mark

Each model shall carry the 3 (three) letters national identification mark followed by the FAI Sporting Licence (or Drone Permission) ID number.

The letters and numbers must be at least 6 mm high and appear at least once on each model.

C.2. RACING CIRCUIT

The racing circuit may be outdoor or indoor.

A racing circuit (or track) is a volume that defines a 3D flight path. It is formed by a start line, obstacles to be crossed or avoided and a finish line.

The racing circuit can be a closed loop where several laps must be completed or an open loop to be flown once. In both cases, the track can be divided into sectors to facilitate timekeeping.

The minimum length of a racing circuit from the start line to the end line, including all laps, is 250 m. The length of a track is measured along the centerline of the optimum 3D flight path.

The organizer may keep the circuit secret or make it public before the event. In both cases, the organizer must make every effort to prevent giving an unfair advantage to some competitors.

If the circuit is made public, it must be published at least one month before the event. Only minor changes are allowed following publication and those changes must be justified. The organizer must inform the competitors immediately after any changes are approved.

If the circuit is kept secret, the main characteristics (approximate length, number of laps, focused on speed/technical/both, types of obstacles, etc.) must be published at least one month before the event to allow time for the competitors to adapt their equipment as much as possible for the event.

See Annex C.1 for the racing circuit specifications and recommendations.

C.3. NUMBER OF MODELS

Each competitor may use a maximum of 3 (three) models for the entire event.

A model can be used by only one competitor per event.

In case of an infringement to that rule, all concerned competitors will be disqualified from the event by the event director.

The competitor can change the model:

- before the start of the race as long as the competitor hasn't left the preparation area,
- or between two rounds of the qualification stage and elimination stage.

C.4. MODEL REGISTRATION AND PROCESSING

Each competitor can register up to three models. The organizer will mark each registered model with an easily visible, difficult to falsify identification such as a sticker.

During registration, the specifications of the model may be checked by the organizer. It is then recommended to check the following points:

- Identification mark.
- Weight and size.
- Batteries (voltage).
- Fail-safe and associated device to cut off the motors.
- Radio control equipment.
- VTX, camera and headset goggle.
- LED light unit if such a device is required by the organizer.

If a model is lost or damaged after model processing, the competitor shall have the right to present a further model for checking up to one hour before the official starting time of the event.

During official event time, a random spot-check may be organized following any race to check the most important characteristics of a model.

A competitor whose model is not compliant may be disqualified from the event by the event director.

C.5. PRACTICE FLIGHTS

Practice flights on the racing circuit other than those authorized by the organizer are strictly forbidden under threat of being disqualified from the event by the event director.

A practice session will be organized at the beginning of the event. Each competitor will only enter this practice session when he/she has finished model's registration and processing.

The organizer defines the conditions of the practice session. This information must be available at least one month before the event.

It can be a free practice session organized by groups with an allocated time identical for each group. The allocated time and the number of competitors per group will be defined by the organizer.

The practice session can also be organized together with the first round of qualifying flights. Each group will be granted one or more practice flights of 3 minutes each. The number of practice flights is defined by the organizer and must be the same for all groups. After its last practice flight, the group will stay on the circuit for its first qualifying flight; a three-minute break to change the battery pack of the model or to change the model is given before the start of the qualifying flight.

In any case, each competitor can do as many circuit laps as he/she wants within the allowed practice time. Once the practice time is over, competitors still in flight can complete their ongoing circuit lap before landing.

In case of a crash, and when the model cannot go on, the model must stay on the ground with motors cut off until the end of the practice session. The competitor cannot request another practice time except if the reason for the crash cannot be attributed to him.

C.6. EVENT ORGANISATION

An event is normally organized on the basis of three stages:

- Qualification stage (rounds for qualification for the elimination stage).
- Elimination stage (to qualify for the final stage by successive elimination rounds).
- Final stage.

Note: *The event may be organized with only one stage based a fixed number of rounds for all competitors, especially when the total number of competitors is below 16. For each race, each pilot will be awarded a number of points corresponding to his/her place. The final placing is then done taking in account the sum of the points awarded to every competitor in all rounds.*

Each round for the qualification stage and the elimination stage is organized by groups (subdivision of the round corresponding to the number of pilots flying at the same time in the same race).

It is recommended to run the event with a maximum of 4 (four) pilots per race in order to minimize risk of video problems especially for elimination and final stages considering reflights are difficult to consider for those stages. Nevertheless, when the number of competitors justify it, the qualifying rounds may be run with 6 (six) pilots per group subject it is legally and technically possible.

C.6.1. Timekeeping

Wherever possible, timekeeping will be done with an electronic timing system with appropriate redundancy in order to ensure complete and permanent reliability of the timekeeping.

Note: *In case timekeeping will be done without electronic timing system (manual timekeeping only), the organizer must inform the competitors at least one month before the event.*

Except for qualifying stage (see paragraph C.6.3), timekeeping is triggered at the start of the race.

C.6.2. Procedure for the start of the race

The start of the race will be done as follows:

- After the models have been placed on the start area, the starter will request the pilots if they are ready to start.
- When the starter considers that the pilots are ready, 'Pilots, arm your quads' will be clearly announced.
- About 3 seconds after this announcement and taking care of an equivalent time for all races, there will be a brief and intelligible sound signal for the start of the race; no countdown (3, 2, 1) will be done before the start signal.

The starter must immediately stop the race and do a new start when he considers that:

- the start procedure has not been done properly;

- or a pilot has jumped the start and a decision is justified to disqualify him(her).

Before the restart, the pilots will be given the opportunity to change the battery pack on their model.

C.6.3. Qualification stage

The number of qualifying rounds is defined by the organizer according to the available time with, whenever possible, a minimum of 3 (three) qualifying rounds.

Composition and flight order of the groups will be determined with a blind draw.

Note: *A different draw for each qualifying round is recommended in order to avoid the same competitors fly in the same group for all qualifying rounds. In any case, the same draw cannot be applied to more than three qualifying rounds.*

Races with fewer than the required number of pilots (4 or 6), for example in case of withdrawal of a pilot, will be put at the end of the draw of the round, in order to allow a complete pilots race with pilot(s) that have been granted a reflight in that qualifying round.

If necessary, the last groups of each qualifying round may be rearranged by the event director (under supervision of a FAI Jury member) in order to achieve as much as possible a minimum of 3 pilots per group.

Timekeeping is triggered for each model when the model passes the timekeeping sensor. In that case, each pilot must go directly after the start where the timekeeping sensor is positioned without possibility to do flight recognition of the track.

The organizer defines the qualification method which will be used and must announce it at least one month before the event.

Find below two examples of qualification methods.

a) Fastest time to complete a required number of laps

Note: *It is not recommended to use this qualification method when only three qualifying rounds or less are scheduled.*

The organizer defines the number of circuit laps to complete and the time allowed for that.

For each competitor, the result of the qualification round corresponds to his(her) registered time to complete the required number of laps.

A provisional ranking will be established at the end of the qualifying stage, taking in account the best result obtained by each competitor on their qualifying flights. In case of a tie for the last place(s) for selection to the elimination round, the 2nd best result will be considered to split the tie, and then if necessary the 3rd result. In case the results of the qualifying flights are not sufficient, a tie-break flight will be organized between the competitors still concerned by the tie.

When the number of competitors required for the elimination stage is not reached, an additional qualifying flight will be organized for the competitors who have not been able to set a time at that stage. This will be repeated until the appropriate number of competitors for the elimination stage is reached.

b) Average of the 3 best times to perform a lap

The organizer defines the number of consecutive laps that will be timed and the time allowed for that.

When the pilot has finished those consecutive laps, he(she) must land the model.

The result of each competitor for the qualification stage will be the average of the 3 (three) best times recorded to perform one valid circuit lap taking in account all the qualifying rounds. Those best times may be done in the same qualifying round or in different ones.

Note: *Instead of 3, a different number of best times may be considered (2, 4, ...).*

A provisional ranking will be established at the end of the qualifying stage, taking in account the result obtained by each competitor. In case of a tie for the last place(s) for selection to the elimination stage, the 4th best time recorded to perform one valid circuit lap result will be considered to split the tie, and then if necessary the 5th one, and so on. In case the times are not sufficient, a tie-break flight will be organized between the competitors still concerned by the tie.

When the number of competitors required for the elimination stage is not reached with the competitors getting 3 (three) times, competitors getting only 2 (two) times to perform one valid circuit lap will be considered taking in account the average of their 2 times. If it is still not sufficient, competitors getting only 1 (one) time to perform one valid circuit lap will be considered.

When the number of competitors required for the elimination stage is still finally not reached, an additional qualifying flight will be organized for the competitors who have not been able to set a time at that stage. This will be repeated until the appropriate number of competitors for the elimination stage is reached.

In any case, the competitors who need an additional qualifying flight to achieve a time to be selected for the elimination stage will be placed after those who are already selected, and then those who need a second additional flight, and so on.

C.6.4. Elimination stage

The elimination stage will be organized according to one of the three following scenarios:

- Scenario A - 64 competitors selected from qualification stage.
- Scenario B - 32 competitors selected from qualification stage.
- Scenario C - 16 competitors selected from qualification stage.

The choice of scenario will be done by the organizer before the beginning of the event considering the total number of competitors in order to give possibility to a maximum of competitors to fly the elimination stage.

All races of the elimination stage will be run on a defined number of laps taking in account the performance achieved during the qualification stage. Except under exceptional circumstances, the number of laps will be identical for all rounds of the elimination stage.

The placing for each race is determined taking in account the time achieved when the number of laps is completed.

Those who will not finish their flight will be ranked considering the distance completed (number of laps and part of the last lap completed), disqualified competitors being placed at the end.

The two best placed will be directly selected for the next round.

In case of a tie for the second place, the placing in the provisional ranking established at the end of the qualifying stage will be considered to define who is selected for the next round.

Double elimination optional sequence

Instead of direct elimination of the competitors placed third and fourth in each race of any elimination round, the double elimination sequence may be applied.

This sequence is optional. The organizer must inform the competitors at least one month before the event if double elimination sequence will be applied or not.

This optional sequence allows competitors eliminated in elimination rounds to continue to fly still getting possibility to access the final.

Competitors placed third and fourth in any race of the double elimination sequence are definitively eliminated.

Organisation of the races

For the first elimination round, the composition of the groups for the races is defined considering the provisional ranking established at the end of the qualifying stage.

For each scenario, the composition of races for the first elimination round and detailed organisation of the rounds up to the final are defined in:

- Annex C.2 for scenario A (64 competitors selected from qualification stage).
- Annex C.3 for scenario B (32 competitors selected from qualification stage).
- Annex C.4 for scenario C (16 competitors selected from qualification stage).

Note: When the number of competitors is lower than the number of competitors required for the considered scenario, some races of the 1st elimination round will be flown with 3 pilots instead 4. As an illustration, if for the scenario B there are only 28 competitors (instead the 32 normally required), then races 1, 4, 5 and 8 will be flown with 3 pilots considering there are no competitors placed 29 to 32 after the qualifying stage.

C.6.5. Final stage

In any final race, those who will not finish their flight will be ranked considering the distance completed (number of laps and part of the last lap completed), disqualified competitors being placed at the end.

C.6.5.1 Double elimination sequence not applied for the elimination stage

The two best placed competitors in each of the two semi-final races are selected for the final to determine their final ranking from 1st to 4th place.

The other two competitors from the semi-final races may fly a small final to determine their final ranking from 5th to 8th place.

Optional way to proceed

Instead a single final flight, three final flights may be considered with allocation of points based on the placing in each final flight. The organizer defines which allocation of points will be applied.

The final placing will be done taking in account the sum of the points awarded to every competitor in all the additional rounds.

The organizer must clearly inform the competitors before the competition begins if the optional way will be applied. If not done, the final will be run with only one final race.

C.6.5.2 Double elimination sequence applied for the elimination stage

The two best placed in the last elimination round (one race) and the two best placed in the last round of the double elimination sequence (one race) are selected for the final to determine their final ranking from 1st to 4th place.

Optional way to proceed

The organizer must clearly inform the competitors before the competition begins if the optional way will be applied. If not done, the final will be run with only one final race.

When double elimination sequence is applied, two competitors (A and B) are qualified in the final without any loss, but the two other competitors (C and D) come from the double elimination bracket and so have one loss each.

In order to avoid a competitor with one loss placing ahead of a competitor without any loss, the final may be organized with successive final races instead a single final race.

In each successive final race, pilots placed in first and second places are directly selected for the next final race. Pilots placed third and fourth (or the pilot placed third when the race concerns only 3 pilots) get one loss.

As soon as a competitor gets two losses, he is then definitively eliminated and so does not fly in the next final race. In that situation, the winner (and also possibly the second placed pilot) got one loss maximum, all other pilots being eliminated with two losses.

When two pilots are eliminated in the same final race, the final placing of those two pilots will be determined considering their place in the considered race.

C.6.6. Additional rounds optional sequence

This sequence is optional. This option allows the competitors who are not selected to fly in the first elimination round after the qualification stage to be entitled to participate to additional rounds to determine their final placing.

The organizer must inform the competitors at least one month before the event if additional rounds sequence will be applied or not, and when applied how it will be organized.

The additional rounds sequence may be organized:

- with successive eliminating rounds as proceeded for the elimination stage (See C.6.4);
- or with a fixed number of rounds for all concerned competitors.

Additional rounds sequence based on a fixed number of rounds for all concerned competitors

The number of additional rounds is defined by the organizer considering available time.

Composition and flight order of the groups will be determined with a blind draw. The draw will be different for each additional round.

Races with fewer than the required number of pilots (4 or 6), for example in case of withdrawal of a pilot, will be put at the end of the draw of the round in question, in order to allow a complete pilots race with pilot(s) that have been granted a reflight in that round.

If necessary, the last groups of each qualifying round may be rearranged by the event director (under supervision of a FAI Jury member) in order to get a maximum of races with the required number of pilots.

When a race does not contain the required number of pilots (4 or 6) at the end of the round, volunteers will be requested to allow the remaining race to start with the required number of pilots.

If there are too many volunteers, the event director (under supervision of a FAI Jury member) will conduct a blind draw to determine the necessary volunteers and then a separate draw for the order in each group (for positioning on the start line).

If there are insufficient volunteers, the race will start with fewer than the required number of pilots number (4 or 6).

The volunteer(s) shall not be eligible to have their result registered or to be granted a reflight from this race.

At the end of each race, each pilot will be awarded a number of points corresponding to his(her) place.

The following allocation of points is suggested:

- a) **Pilots number per group = 4:** 1 point for the first placed, 2 points for the second, 3 points for the third and 4 points for the fourth. A pilot who does not fly in a race or does not finish it gets 5 points. A pilot who is disqualified for the race gets 6 points.
- b) **Pilots number per group = 6:** 1 point for the first placed, 2 points for the second, 3 points for the third, and so on. A pilot who does not fly in a race or does not finish it gets 7 points. A pilot who is disqualified for the race gets 8 points.

The organizer must clearly precise to the competitors before the competition begins which allocation of points will be applied. If not done, the above suggested points allocation will be applied.

The final placing will be done taking in account the sum of the points awarded to every competitor in all the additional rounds. In case of a tie, the placing in the provisional ranking established at the end of the qualifying stage will be considered to split the tie for the concerned competitors.

C.6.7. Final classification

Final classification tables are provided in Annex C.2 for scenario A, Annex C.3 for scenario B and Annex C.4 for scenario C.

Those tables cover the different possible situation with double elimination and/or additional rounds sequences applied or not.

C.7. FLIGHT OCCURRENCES

C.7.1. Obstacle damaged or destroyed during the race

When an obstacle is accidentally damaged or destroyed during a race, the pilots will be informed as soon as possible of the incident and how to proceed.

Note: *The organizer must define the person (event director, starter,...) in charge to decide how to proceed and to clearly inform the pilots.*

In the case where it concerns an obstacle to be crossed (air gate, tunnel,...), the decision may be to continue to cross the obstacle, or to give permission to bypass it, or to stop the race. When bypassing of the concerned obstacle is authorized, pilots must do their best not to take advantage of the situation.

In case it concerns an obstacle to be avoided, the race will continue except if it is decided differently considering for example that safety is impacted. When race continues, pilots must do their best to follow the track and not to take advantage of the situation.

C.7.2. Faults and penalties

In the case an obstacle that needs to be crossed is not effectively crossed, the pilot may try to execute a manoeuvre to cross the obstacle again. If during this manoeuvre the pilot has a collision with another model, the pilot will be disqualified for the race. If the pilot does not cross an obstacle to be crossed, the corresponding circuit lap will not be validated by his(her) assigned judge.

In the case of a circuit cut (for example during a turn), the pilot may execute as soon as possible a manoeuvre to come back into the circuit where he left it. If his(her) assigned judge considers that the pilot has not made the manoeuvre with sufficient urgency, the judge can decide that the corresponding circuit lap is not validated. If during this manoeuvre the pilot has a collision with another model, the pilot will be disqualified for the race.

In both cases, the pilot whose model has been collided into may be granted a reflight if he(she) is considered no longer able to continue his(her) flight in a competitive way. In that situation, the pilot must stop his(her) flight as soon as possible after the collision and say it clearly. The reflight will be granted subject to the corresponding judge confirming that the collision has clearly penalised the pilot. If the pilot decides to continue to fly, a reflight may not be considered.

C.7.3. Disqualification from the race

A pilot may also be disqualified from a race in the following scenarios:

- a start before the start signal if it is considered that this early start gives a clear advantage to the concerned pilot;
- a circuit exit (crossing of the safety line);
- a celebratory manoeuvre, especially after the pilot finishes.

The disqualification is decided at the discretion of the judge assigned to the concerned pilot.

The judge can also pronounce a disqualification if the judge considers that:

- the pilot flies so high that the performance of the pilot on the track cannot be judged;
- the piloting is hazardous or if safety is compromised.

When a pilot is disqualified, he must land as soon as he has been informed. In any case, the result of the pilot for the race will not be validated. If the pilot is considered not being sufficiently cooperative to land, the concerned pilot may be disqualified from the event by the FAI Jury on request of the assigned judge.

C.7.4. Crash

When a model crashes, the concerned pilot can resume if the model is in a situation to do so.

When the model cannot go on, it must stay on the ground with motors cut off until the end of the race. The pilot must clearly say that he has stopped flying.

C.7.5. Safety occurrence

The pilot can be requested to stop the flight if it is considered the model no longer meets acceptable safety standards. It could be for example the case when a model is damaged after a collision or after a crash, or when the battery is dangling.

In such a situation, a reflight for the concerned pilot may not be considered.

C.8. REFLIGHTS

C.8.1. Causes for reflight

Incidents during races such as a collision with an obstacle or a collision between models cannot justify a reflight, except in the specific situation defined in sub-paragraph C.7.2.

When a pilot gets a video problem that he/she considers will prevent him/her from continuing the flight, he/she must immediately say it clearly. A reflight will only be considered if the pilot has used the video from the organizer's receiver and if the problem is confirmed by the judge.

In addition, a reflight may be considered when:

- Either the model cannot start or the flight cannot be made in normal conditions because of an unexpected cause beyond the pilot's control.
- For a reason of safety, either the model cannot be prepared or the flight cannot be made in the allotted time limit or when either is disrupted by an external interference.
- For a reason independent from the pilot's will, the pilot has been forced to land by request of an official. Failures of the model, motorization or radio cannot be considered as reasons independent from the pilot's will.
- The chair of the pilot clearly affects his/her flight; if the helper of the pilot is the cause of the problem then a reflight cannot be granted.

Noise in the environment of the pilots (noise in the public, noise from other competitors,...) cannot justify a reflight.

For any pilot being granted a reflight, the original flight for which the pilot has been granted the reflight is then definitively cancelled.

C.8.2. Organization of the reflights

Reflights for individuals are permitted for the qualifying stage and, as such, reflights may be organised separately or as part of any races that have fewer than the required number of pilots.

The same applies for the additional rounds optional sequence if done according to the modalities defined for this sequence in sub-paragraph C.6.6.

Elimination and final stages

It is not possible to organize an individual reflight for elimination stage because the placing in the race determines the selection for the next round so the race must be restarted when a reflight is granted.

The same applies for the final stage.

It is desirable to stop the race as soon as possible once an incident occurs that may justify a reflight. The restart will only concern the pilot who has been granted a reflight and the pilots who were still in the air when the stop of the race has been announced.

Note: *The organizer must define the person (event director, starter,...) in charge to decide the stop of the race and to inform clearly the pilots.*

In the case where the race has not been stopped and that subsequently a reflight is granted, a new race will be organized. This new race will include only the pilot who has been granted a reflight and the pilots who have finished the original race (or placed first or second at the end of the original race for those who don't finish it). Instead of participating in the new race, a pilot may choose to keep the time he got in the original race; in that situation, his(her) placing will be considered by comparing his(her) time in the original race against the new times of the pilots who participate in the new race.

C.9. OFFICIALS

C.9.1. Officials needed to run the event

The running of an event requires the main following officials:

- Event director in charge of preparation, organisation and oversight of the event. The event director has responsibility to ensure compliance with the applicable rules and safety during the whole event.
- Starter. The starter may be assisted by another official in charge to call pilots for racing, do pre-flight checking, etc.
- Judges (one per pilot) in charge to check all aspects of the pilot's racing on the circuit and to complete the score sheet after the race.

Note: *It is acceptable to consider for judging the pilots of the next race instead dedicated judges. In that situation, the organizer must inform the competitors at least one month before the event.*

- Official responsible for score sheets gathering and/or for results accounting.

Note: *If timekeeping is done manually (not recommended), one timekeeper minimum per pilot is necessary.*

According to the event standing and the number of competitors, some official tasks may be assumed by the same person.

C.9.2. 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.

C.9.3. Judges

In each race, each FPV pilot will be scored by a judge.

The judge will have a video device (video screen, headset or goggles) allowing them to follow the flight of his(her) assigned pilot, sharing the same picture as the pilot.

The judge will monitor that the pilot follows the circuit and crosses every gate and obstacle correctly.

If the judge is placed adjacent to his(her) assigned pilot (which is not mandatory), he may optionally notify the competitor at the moment of any infringement but is not required to do so for a lap not validated.

Note: *When judges are not placed adjacent to the pilots, the organizer must define the person who must inform a pilot when he(she) is disqualified or must stop the flight considering the model no longer meets acceptable safety standards.*

The judge must be satisfied that any undertaking by the pilot to re-attempt a missed gate, obstacle or circuit cut is conducted in compliance with the rules and that any competitive advantage has been forfeit.

At the end of the flight, the pilot will be informed if the flight is considered to be valid or if a disqualification has been pronounced; in the case of disqualification, the number of circuit laps done at the moment of the disqualification will be communicated by the judge to the concerned pilot and recorded.

Note: *The organizer may also provide a dedicated line judge in charge of informing the flight judges if a model crosses the safety line (exit of the circuit).*

C.10. INTERRUPTION OF THE EVENT

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

- Wind continuously stronger than 9 m/s measured at 2 m above the ground near the preparation area for at least one (1) minute.
- Due to atmospheric conditions (rain, stormy condition,...) in which it would be dangerous to continue to fly.
- Other exceptional circumstances such as for example incident affecting safety or requiring access for emergency services.

When an interruption occurs during an official flight, this flight is cancelled.

If the event cannot go on, the final ranking will be the last available provisional ranking.

C.11. COMPETITORS INFORMATION

The organizer has to display on the site:

- FAI Jury composition;
- start list for every round;
- results after every round;
- provisional rankings and final placing.

Note: *A posting on Internet is also advised if conditions permit it, in order to make it possible for those who are not at the site to follow the progress of the event.*

- **ANNEX C.1** -

RACING CIRCUIT

1. Racing circuit design

The track should be designed to maximize competition and to demonstrate piloting skills. The organizer is encouraged to demonstrate creativity and to take advantage of the specifics of the site. It is recommended to facilitate live spectator viewing by making the track understandable from an outside point of view.

All racing circuits must be designed on the “safety first” principle. The flight path must prevent accidental diversions from the racing area. In this context, if a pilot flies out of the optimal path, any trajectory to get back to the track must be made in the direction of a safe area without any persons (public, pilots, helpers, judges).

2. Safety

The area where the flight zone is allocated shall be demarcated by a “safety line”. The safety line shall surround the start line, end line, obstacles, 3D flight path, trajectories to get back to the track and areas which a model can reach in case of crash or losing of control.

The safety line must be an unmistakable physical element or marker that must not be crossed by any person without the authorization of an official. The organizer must prepare basic procedures in case of fire or first aid inside the safety line. The plans must be informed to any person before being authorized to cross the safety line.

During races or if any model is flying, the presence of any person without the adequate safety equipment (nets, cages, protection suit) in the flight area is strictly forbidden.

The organizer must take care that the competition, live viewing and media coverage of the event can be done while guaranteeing the safety of the concerned persons. Areas for pilots, officials and spectators must be secured (nets, fences, transparent walls, recommended minimum separation,...) to avoid uncontrolled models reaching them.

3. Start

To avoid collisions during the start, the models shall be placed on the start line using one of two schemes:

- 1) Side by side in a single line perpendicular to the optimum starting trajectory, with a minimum separation of 0.5 m and a maximum separation of 1 m between models.
- 2) An inverted 'V' or '_/' pattern with one or more models in the front. The minimum separation between models shall be 0.5 m on the side and 0.5 m on the front/back. The maximum separation shall be 1 m on the side and 1.5 m on the back.

If the track is a closed circuit, the start line can be outside of the circuit track.

The model positioning during the start should benefit the pilot with the best performance during the previous stage. If two or more pilots have the same previous performance, the positioning will be decided by a draw.

4. Obstacles

The number of obstacles must be adapted to the environment characteristics; in particular, the available space. The number of obstacles shall maximize competition and demonstrate pilot skills.

Obstacles can be located at any height and position. The flight path between obstacles must allow a smooth flight.

Obstacles must contrast with the background and be perfectly visible with a standard FPV video device at a distance of 30 m. The flight path, once in the area defined by the obstacle, must be clearly marked and obvious to follow.

There are two types of obstacles:

1) Obstacles to be crossed

This type of obstacle (single air gate, combination of air gates, tunnel, etc.) can be crossed in any 3D direction. The internal space can be 2D or 3D of any length and shape. The internal space along with any area used by the optimal flight path must be free of any rigging (wire, rope, etc.).

The obstacle inside shall be free space within a minimum diameter of 1.5 m centered in the optimal flight path.

2) Obstacles to be avoided

This type of obstacle (wall, flag, pylon, flyer, etc.) defines virtual or physical areas that are not intended to cross. They can be a single obstacle to avoid shortcuts or a combination of them that create structures such as horizontal or vertical slaloms.

The design must allow a free space to avoid the obstacle. The free space shall be of a minimum 2.5 m diameter centered in the optimal 3D flight path.

Reasonable efforts should be made by organizers to create or to cover obstacles by shock absorbing materials to protect models in case of a crash.

5. Finish line

The finish line indicates the end of the race. If the track is a closed circuit, the finish line is not necessarily on the circuit track.

The finish line shall be defined by a 2D area to be crossed. The pilot finishes the race when his(her) model touches the area and crosses it completely.

There shall be a pick-up area after the finish line to land or to recover safely the models. The area shall be designed not to interfere after crossing the finish line with the flight of the other pilots.

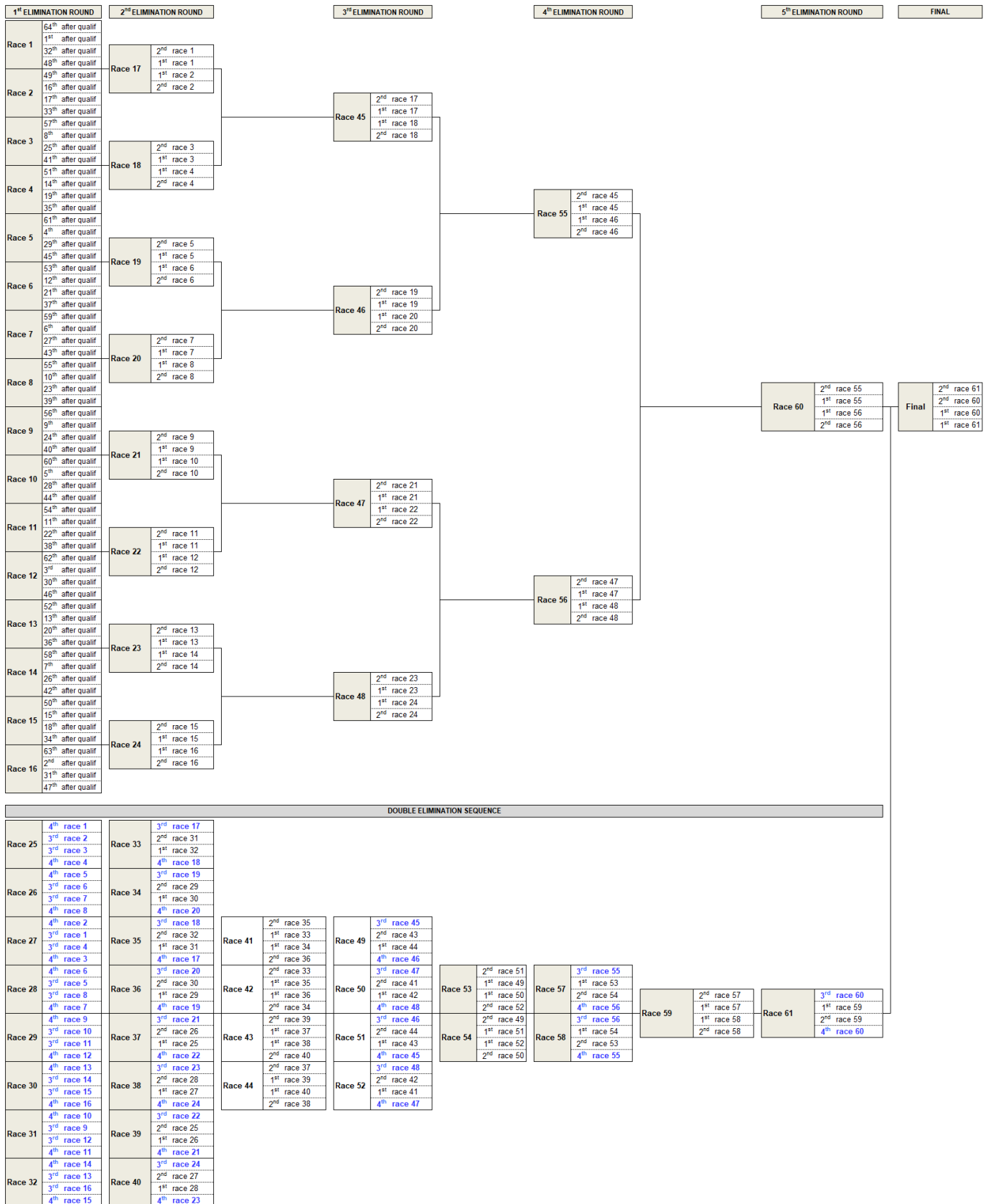
- ANNEX C.2 -**SCENARIO A - 64 competitors selected from qualification stage****1- Composition of the races for the 1st elimination round**

Race 1	Placed 1	Placed 32	Placed 48	Placed 64
Race 2	Placed 16	Placed 17	Placed 33	Placed 49
Race 3	Placed 8	Placed 25	Placed 41	Placed 57
Race 4	Placed 14	Placed 19	Placed 35	Placed 51
Race 5	Placed 4	Placed 29	Placed 45	Placed 61
Race 6	Placed 12	Placed 21	Placed 37	Placed 53
Race 7	Placed 6	Placed 27	Placed 43	Placed 59
Race 8	Placed 10	Placed 23	Placed 39	Placed 55
Race 9	Placed 9	Placed 24	Placed 40	Placed 56
Race 10	Placed 5	Placed 28	Placed 44	Placed 60
Race 11	Placed 11	Placed 22	Placed 38	Placed 54
Race 12	Placed 3	Placed 30	Placed 46	Placed 62
Race 13	Placed 13	Placed 20	Placed 36	Placed 52
Race 14	Placed 7	Placed 26	Placed 42	Placed 58
Race 15	Placed 15	Placed 18	Placed 34	Placed 50
Race 16	Placed 2	Placed 31	Placed 47	Placed 63

2- Organisation of the rounds (without applying double elimination optional sequence)

1 st ELIMINATION ROUND		2 nd ELIMINATION ROUND		3 rd ELIMINATION ROUND		SEMI FINAL ROUND		FINALS		
Race 1	64 th after qualif	Race 17	2 nd race 1	Race 25	2 nd race 17	Semi 1	2 nd race 25	4 th semi 1		
	1 st after qualif		1 st race 1		1 st race 17				3 rd semi 1	
	32 th after qualif		1 st race 2		1 st race 18				3 rd semi 2	
	48 th after qualif		2 nd race 2		2 nd race 18				4 th semi 2	
Race 2	49 th after qualif	Race 18	2 nd race 3	Race 26	2 nd race 19		Semi 2	2 nd race 27	2 nd semi 1	
	16 th after qualif		1 st race 3		1 st race 19					1 st semi 1
	17 th after qualif		1 st race 4		1 st race 20					1 st semi 2
	33 th after qualif		2 nd race 4		2 nd race 20					2 nd semi 2
Race 3	57 th after qualif	Race 19	2 nd race 5	Race 27	2 nd race 21	Semi 3	2 nd race 28	2 nd semi 1		
	8 th after qualif		1 st race 5		1 st race 21				1 st semi 1	
	25 th after qualif		1 st race 6		1 st race 22				1 st semi 2	
	41 th after qualif		2 nd race 6		2 nd race 22				2 nd semi 2	
Race 4	51 th after qualif	Race 20	2 nd race 7	Race 28	2 nd race 23	Semi 4	2 nd race 29	2 nd semi 1		
	14 th after qualif		1 st race 7		1 st race 23				1 st semi 1	
	19 th after qualif		1 st race 8		1 st race 24				1 st semi 2	
	35 th after qualif		2 nd race 8		2 nd race 24				2 nd semi 2	
Race 5	61 th after qualif	Race 21	2 nd race 9	Race 29	2 nd race 25	Semi 5	2 nd race 30	2 nd semi 1		
	4 th after qualif		1 st race 9		1 st race 25				1 st semi 1	
	29 th after qualif		1 st race 10		1 st race 26				1 st semi 2	
	45 th after qualif		2 nd race 10		2 nd race 26				2 nd semi 2	
Race 6	53 th after qualif	Race 22	2 nd race 11	Race 30	2 nd race 27	Semi 6	2 nd race 31	2 nd semi 1		
	12 th after qualif		1 st race 11		1 st race 27				1 st semi 1	
	21 th after qualif		1 st race 12		1 st race 28				1 st semi 2	
	37 th after qualif		2 nd race 12		2 nd race 28				2 nd semi 2	
Race 7	59 th after qualif	Race 23	2 nd race 13	Race 31	2 nd race 29	Semi 7	2 nd race 32	2 nd semi 1		
	6 th after qualif		1 st race 13		1 st race 29				1 st semi 1	
	27 th after qualif		1 st race 14		1 st race 30				1 st semi 2	
	43 th after qualif		2 nd race 14		2 nd race 30				2 nd semi 2	
Race 8	55 th after qualif	Race 24	2 nd race 15	Race 32	2 nd race 31	Semi 8	2 nd race 33	2 nd semi 1		
	10 th after qualif		1 st race 15		1 st race 31				1 st semi 1	
	23 th after qualif		1 st race 16		1 st race 32				1 st semi 2	
	39 th after qualif		2 nd race 16		2 nd race 32				2 nd semi 2	
Race 9	56 th after qualif	Race 25	2 nd race 17	Race 33	2 nd race 33	Semi 9	2 nd race 34	2 nd semi 1		
	9 th after qualif		1 st race 17		1 st race 33				1 st semi 1	
	24 th after qualif		1 st race 18		1 st race 34				1 st semi 2	
	40 th after qualif		2 nd race 18		2 nd race 34				2 nd semi 2	
Race 10	60 th after qualif	Race 26	2 nd race 19	Race 34	2 nd race 35	Semi 10	2 nd race 35	2 nd semi 1		
	5 th after qualif		1 st race 19		1 st race 35				1 st semi 1	
	28 th after qualif		1 st race 20		1 st race 36				1 st semi 2	
	44 th after qualif		2 nd race 20		2 nd race 36				2 nd semi 2	
Race 11	54 th after qualif	Race 27	2 nd race 21	Race 35	2 nd race 37	Semi 11	2 nd race 37	2 nd semi 1		
	11 th after qualif		1 st race 21		1 st race 37				1 st semi 1	
	22 th after qualif		1 st race 22		1 st race 38				1 st semi 2	
	38 th after qualif		2 nd race 22		2 nd race 38				2 nd semi 2	
Race 12	62 th after qualif	Race 28	2 nd race 23	Race 36	2 nd race 39	Semi 12	2 nd race 39	2 nd semi 1		
	3 rd after qualif		1 st race 23		1 st race 39				1 st semi 1	
	30 th after qualif		1 st race 24		1 st race 40				1 st semi 2	
	46 th after qualif		2 nd race 24		2 nd race 40				2 nd semi 2	
Race 13	52 th after qualif	Race 29	2 nd race 25	Race 37	2 nd race 41	Semi 13	2 nd race 41	2 nd semi 1		
	13 th after qualif		1 st race 25		1 st race 41				1 st semi 1	
	20 th after qualif		1 st race 26		1 st race 42				1 st semi 2	
	36 th after qualif		2 nd race 26		2 nd race 42				2 nd semi 2	
Race 14	58 th after qualif	Race 30	2 nd race 27	Race 38	2 nd race 43	Semi 14	2 nd race 43	2 nd semi 1		
	7 th after qualif		1 st race 27		1 st race 43				1 st semi 1	
	26 th after qualif		1 st race 28		1 st race 44				1 st semi 2	
	42 th after qualif		2 nd race 28		2 nd race 44				2 nd semi 2	
Race 15	50 th after qualif	Race 31	2 nd race 29	Race 39	2 nd race 45	Semi 15	2 nd race 45	2 nd semi 1		
	15 th after qualif		1 st race 29		1 st race 45				1 st semi 1	
	18 th after qualif		1 st race 30		1 st race 46				1 st semi 2	
	34 th after qualif		2 nd race 30		2 nd race 46				2 nd semi 2	
Race 16	63 th after qualif	Race 32	2 nd race 31	Race 40	2 nd race 47	Semi 16	2 nd race 47	2 nd semi 1		
	2 nd after qualif		1 st race 31		1 st race 47				1 st semi 1	
	31 th after qualif		1 st race 32		1 st race 48				1 st semi 2	
	47 th after qualif		2 nd race 32		2 nd race 48				2 nd semi 2	

3- Organisation of the rounds with the double elimination sequence

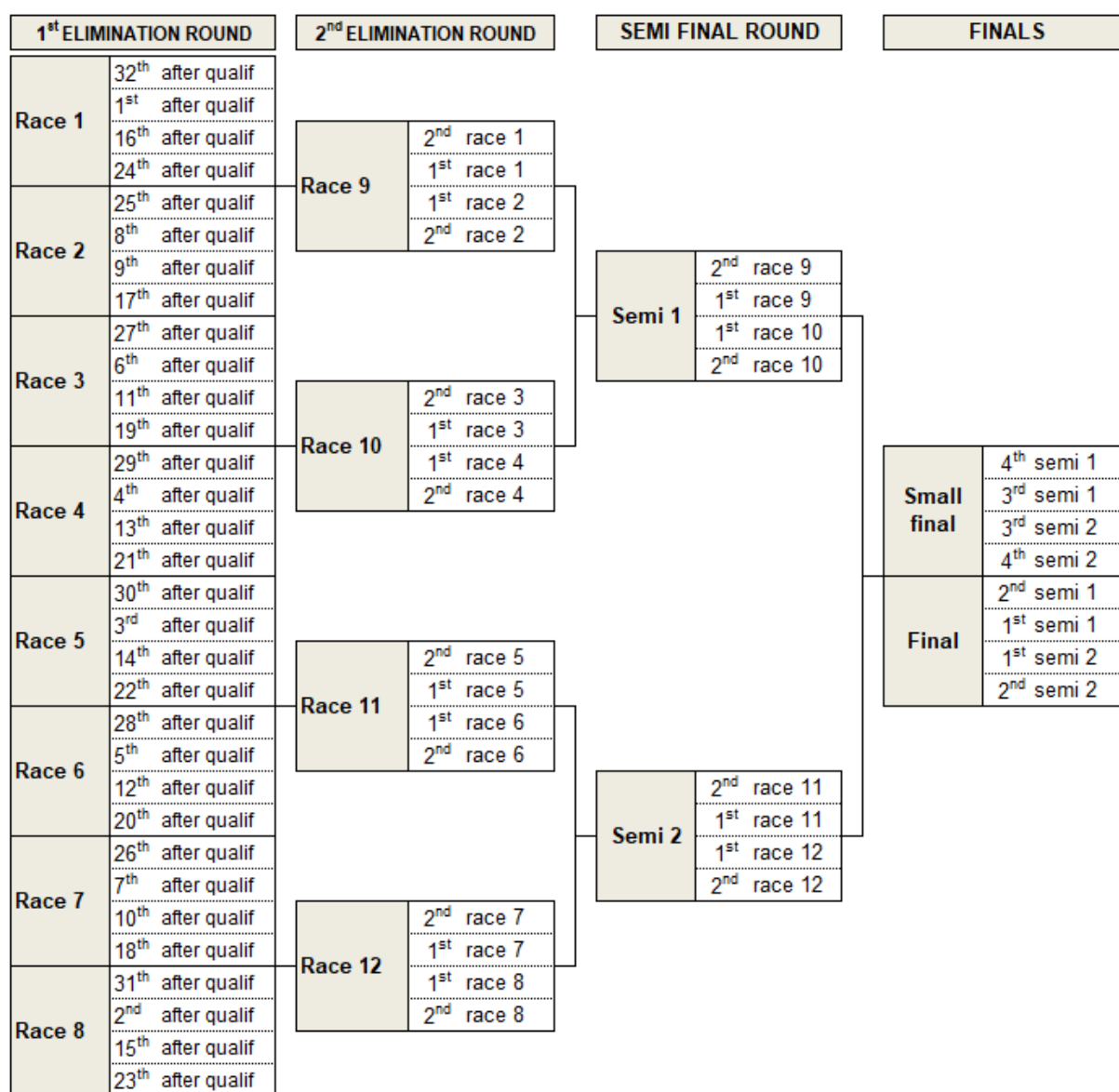


4- Final classification

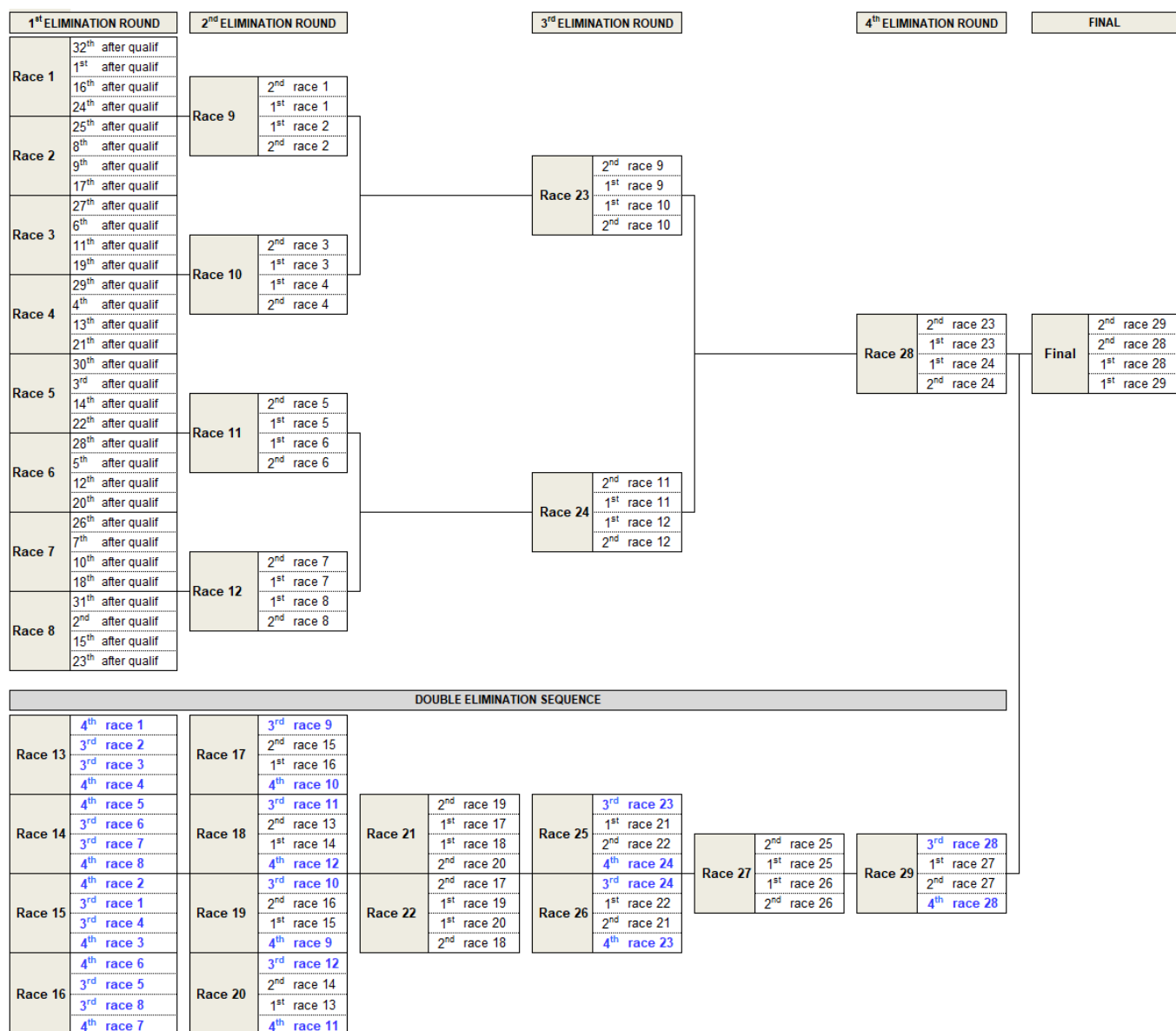
Place	Without double elimination	Place	With double elimination
1	1 st in final	1	1 st in final
2	2 nd in final	2	2 nd in final
3	3 rd in final	3	3 rd in final
4	4 th in final	4	4 th in final
5	1 st in small final	5	3 rd in race 61
6	2 nd in small final	6	4 th in race 61
7	3 rd in small final	7	3 rd in race 59
8	4 th in small final	8	4 th in race 59
9 to 16	3 rd and 4 th in races 25 to 28 with final placing according to provisional ranking after qualifying stage	9 to 12	3 rd and 4 th in races 57 and 58 with final placing according to provisional ranking after qualifying stage
		13 to 16	3 rd and 4 th in races 53 and 54 with final placing according to provisional ranking after qualifying stage
17 to 32	3 rd and 4 th in races 17 to 24 with final placing according to provisional ranking after qualifying stage	17 to 24	3 rd and 4 th in races 49 to 52 with final placing according to provisional ranking after qualifying stage
		25 to 32	3 rd and 4 th in races 41 to 44 with final placing according to provisional ranking after qualifying stage
33 to 64	3 rd and 4 th in races 1 to 16 with final placing according to provisional ranking after qualifying stage	33 to 48	3 rd and 4 th in races 33 to 40 with final placing according to provisional ranking after qualifying stage
		49 to 64	3 rd and 4 th in races 25 to 32 with final placing according to provisional ranking after qualifying stage
65 and beyond	With additional rounds sequence		
	Sequence with successive eliminating rounds as proceeded for the elimination stage: Placing done as defined for places 1 to 64.		
	Sequence based on a fixed number of additional rounds for all competitors: Placing according to sum of points in all additional rounds. In case of tie, provisional ranking after qualifying stage considered to split the tie for the concerned competitors.		
	Additional rounds sequence not applied Placing according to provisional ranking after qualifying stage.		

- ANNEX C.3 -**SCENARIO B - 32 competitors selected from qualification stage****1- Composition of the races for the 1st elimination round**

Race 1	Placed 1	Placed 16	Placed 24	Placed 32
Race 2	Placed 8	Placed 9	Placed 17	Placed 25
Race 3	Placed 6	Placed 11	Placed 19	Placed 27
Race 4	Placed 4	Placed 13	Placed 21	Placed 29
Race 5	Placed 3	Placed 14	Placed 22	Placed 30
Race 6	Placed 5	Placed 12	Placed 20	Placed 28
Race 7	Placed 7	Placed 10	Placed 18	Placed 26
Race 8	Placed 2	Placed 15	Placed 23	Placed 31

2- Organisation of the event (without double elimination)

3- Organisation of the event with the double elimination

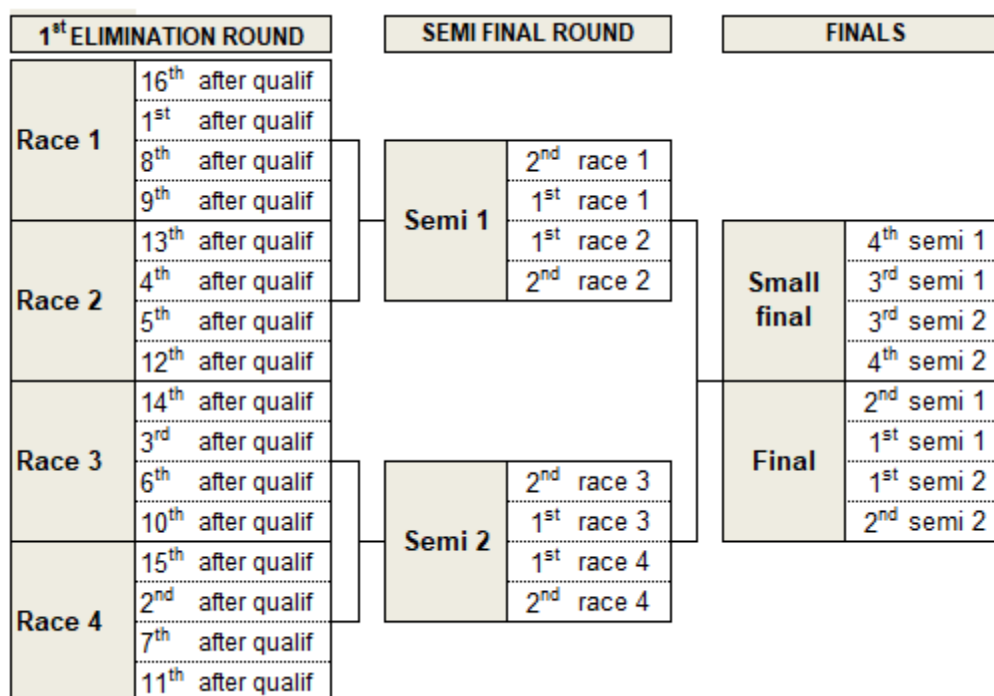
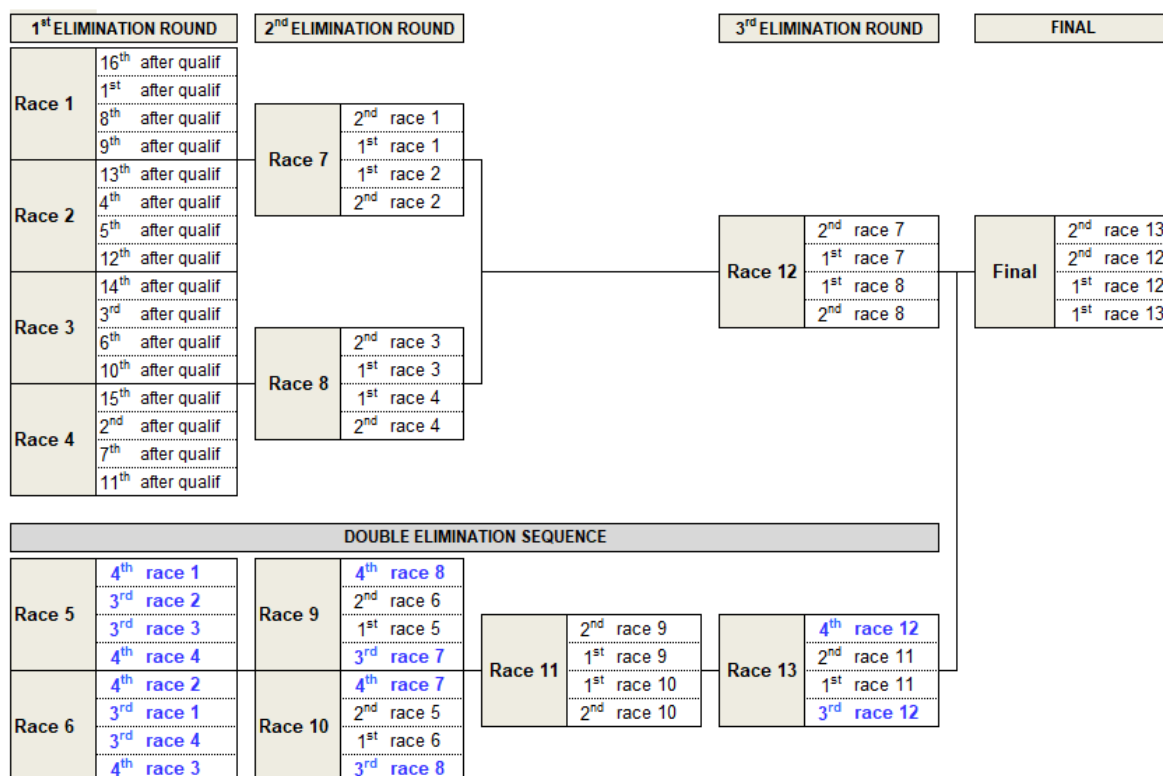


4- Final classification

Place	Without double elimination	Place	With double elimination
1	1 st in final	1	1 st in final
2	2 nd in final	2	2 nd in final
3	3 rd in final	3	3 rd in final
4	4 th in final	4	4 th in final
5	1 st in small final	5	3 rd in race 29
6	2 nd in small final	6	4 th in race 29
7	3 rd in small final	7	3 rd in race 27
8	4 th in small final	8	4 th in race 27
9 to 16	3 rd and 4 th in races 9 to 12 with final placing according to provisional ranking after qualifying stage	9 to 12	3 rd and 4 th in races 25 and 26 with final placing according to provisional ranking after qualifying stage
17 to 32	3 rd and 4 th in races 1 to 8 with final placing according to provisional ranking after qualifying stage	13 to 16	3 rd and 4 th in races 21 and 22 with final placing according to provisional ranking after qualifying stage
		17 to 24	3 rd and 4 th in races 17 to 20 with final placing according to provisional ranking after qualifying stage
		25 to 32	3 rd and 4 th in races 13 to 16 with final placing according to provisional ranking after qualifying stage
With additional rounds sequence			
33 and beyond	Sequence with successive eliminating rounds as proceeded for the elimination stage: Placing done as defined for places 1 to 32.		
	Sequence based on a fixed number of additional rounds for all competitors: Placing according to sum of points in all additional rounds. In case of tie, provisional ranking after qualifying stage considered to split the tie for the concerned competitors.		
	Additional rounds sequence not applied Placing according to provisional ranking after qualifying stage.		

- ANNEX C.4 -**SCENARIO C - 16 competitors selected from qualification stage****1- Composition of the races for the 1st elimination round**

Race 1	Placed 1	Placed 8	Placed 9	Placed 16
Race 2	Placed 4	Placed 5	Placed 12	Placed 13
Race 3	Placed 3	Placed 6	Placed 10	Placed 14
Race 4	Placed 2	Placed 7	Placed 11	Placed 15

2- Organisation of the event (without double elimination)**3- Organisation of the event with double elimination**

4- Final classification

Place	Without double elimination	Place	With double elimination
1	1 st in final	1	1 st in final
2	2 nd in final	2	2 nd in final
3	3 rd in final	3	3 rd in final
4	4 th in final	4	4 th in final
5	1 st in small final	5	3 rd in race 13
6	2 nd in small final	6	4 th in race 13
7	3 rd in small final	7	3 rd in race 11
8	4 th in small final	8	4 th in race 11
9 to 16	3 rd and 4 th in races 1 to 4 with final placing according to provisional ranking after qualifying stage	9 to 12	3 rd and 4 th in races 9 and 10 with final placing according to provisional ranking after qualifying stage
		13 to 16	3 rd and 4 th in races 5 and 6 with final placing according to provisional ranking after qualifying stage
17 and beyond	With additional rounds sequence		
	Sequence with successive eliminating rounds as proceeded for the elimination stage: Placing done as defined for places 1 to 16.		
	Sequence based on a fixed number of additional rounds for all competitors: Placing according to sum of points in all additional rounds. In case of tie, provisional ranking after qualifying stage considered to split the tie for the concerned competitors.		
	Additional rounds sequence not applied		
	Placing according to provisional ranking after qualifying stage.		