Skyhawk Air Rally Regulations and Requirements

Adapted from the Canadian Federation for Drone Racing in conjunction with West Coast DRL.

Definition of terms

DNS: Did Not Start – Aircraft fails to cross start gate.
DNF: Did Not Finish – Aircraft fails to complete all requirements set out by the respective competition guidelines.
DQ: Disqualified – Disqualification parameters outlined herein.
OOB: Out of Bounds – The aircraft exceeds the specified area for each respective track design.

General piloting guidelines

Unlawful flight, such as flights near an event at locations where flying is prohibited, can result in disqualification from the event.
All pilots must attend a general safety briefing and sign the appropriate waivers from the race organizer and venue.
All pilots must be able to demonstrate effective Fail-Safe procedures defined by the Race Director. In most cases this is a “Drop” method, where the aircraft will immediately cease flight by stopping all motors and operation if it loses contact with the radio transmitter.
All pilots must have an “ARMING” position switch or sequence on their radio. The aircraft should not power up by any accidental controls from the radio. Aircraft arming must be executed via a control switch.
All pilots must demonstrate an airworthy airframe and pass a general mechanics and electronics test. All testing will be executed by the Race Director
All batteries must be transported in and stored in LiPo-safe bags or an approved fire resistant container.
Pilots must use FPV to pilot aircraft. This can be with goggles or a ground station, LCD type display.
Pilots will not power up video transmitters unless instructed to do so, e.g. Race Director has given approval to take part in a race. Powering up a video transmitter at all other times may result in an immediate disqualification from the event.
Venue operations
Pilots must adhere to all rules within the competition venue, and will not fly in any other part of the venue unless it is a designated flight zone.
Pilots must contain all equipment and, airframes within the designated pilot pit area.
A public charging area will be available and 120v outlets will be supplied. It is recommended that racers bring personal chargers and extension cord.
General charging of electronic devices including radios or any device with a self-contained power supply is permitted.
All batteries must be stored in a LiPo-safe bag or in an approved, fire resistant container.

Judging and Marshaling

All races will be managed by an appointed team of judges.
All races will follow the general rules and regulations of amateur competition.
Each race will be monitored by judges, cameras, timing/lap systems and/or marshals to

maintain fair and accurate competition.
In the event of a mid-air collision, pilots can resume the race if they are able to take off again without intervention, otherwise their heat is considered a DNF.
Any practice or behavior deemed unsafe, (i.e. flying above the max ceiling height) will result in an immediate disqualification.

Pilot Responsibilities

Pilots are responsible for operating and maintaining their own equipment.

Race Commencement

Premature start before the official tone: Pilot will lose 1 Lap.
Non launch on starting tone, arming timeout, flip, etc. – DNF, no rerun.
Collision with another aircraft before first gate constitutes a re-run: DNS
Collision with another aircraft after first gate- DNF no re-run

Pilot Loses Video for Unknown Reason – DNF – no rerun unless evidence can be show via DVR of situation beyond pilot's control.

Discretionary Reruns

Pilots may request a reschedule to another heat due to technical difficulties if the pilot notifies the Race Director prior to the start of his or her heat. Maximum one requests per event.
Pilot may request a rerun due to losing video or other technical difficulty beyond the pilot's control during qualifying semi-finals and finals only.
The Race Director has absolute discretion over approval or denial of any request listed above.

Disqualifications

Any pilot not physically present on the flight line fully prepared to race at the time of their scheduled heat will receive a DNF for that heat and will not receive a rerun. Two or more DNFs for no-shows will result in disqualification of the event.
Missing a gate, flag or required obstacle: If a pilot misses a gate or obstacle, pilot will receive a DNF. Pilots may have one attempt at retrying the gate or obstacle while race is active.
Flying out of bounds: any pilot flying out of bounds, including maximum ceiling height will receive a DNF for the current run. Pilots receiving two infractions will be completely disqualified.
No celebration laps or excessive displays of celebration while race heat is still active. Any interference caused by a pilot or airframe will result in a DNF for that heat.
Two or more DNF's will result in disqualification from the event.
Un-sportsman like conduct will not be tolerated.
All decisions made by the Race Director or Judge are final.

Airframe general guidelines

All airframes must pass a safety and airworthiness inspection. Once the airframe has been checked and approved, it must not be modified or changed, or it will require to be re-inspected. Airframes should be repaired with equivalent parts

that were originally used during check-in. The inspector has the final decision on whether an airframe is accepted and/or requires changes or modifications in order to be approved for racing.

Craft Size (Reference to event specifications)

Nano and micro craft are less than 110mm diagonally across the motors (center to center).

Open class may be up to 330mm maximum diagonally across the motors (center to center).
Multirotor craft with min 3 motors.
No more than 4S maximum LiPo battery, maximum 4.2 volts per cell.
Must be capable of up to 3-minute race durations.

Video Transmitters

Power Outputs: 25mw - 200mw or switchable.
Required Channels: Race band capable, 40 channels.
Powering up at any time when not racing will result in immediate disqualification.
All pilots must be able to completely understand all operations of their Tx, and be able to switch channels and power as required by the track and the race officials. In all non racing cases, Tx's must be off. Channels will be pre-assigned before the race. Racers must be able to switch channels on their VTX with relative ease if required by the race director.

Field, course and venue operations

The Field is explicitly controlled by the event's Flight Line Director, as well as the Race Commissioner and the Race Director. These officials have the ability to disqualify any pilot for any reason and have the ability to stop a race or flight at any time for any reason.
The field and the venue are governed by the venue's Security and race Marshals.
The field is a restricted grounds and airspace and only authorized personnel are allowed on the flying grounds.
All flights are grounded while there are personnel actively on the field.
Personnel engaged in active recovery of any airframe must immediately remove all battery power from the aircraft upon contact.
Depending upon the field size, the field must have at least one fire extinguisher.
A First Aid station is to be located in the Pilot Pit area or an area that is easily and conveniently accessible to the active piloting areas of the event.
Event organizers must have 2-way radios with a specific channel designated for flight operations and first-aid/emergency communications. All directors (operations, flight, judging) must have access to a radio. It is highly recommended that any airframe recovery personnel on the field also have a radio.
Drone recovery crews must not enter the field until all aircraft have landed. Drone recovery crews must expediently remove all airframe parts, components and various debris from the field and do a quick analysis of the airframe to see if all parts have been retrieved. If an airframe is still powered and props are spinning, crew members must try to safely indicate via hand signals through the pilot camera the Thumbs Down signal to indicate to the pilot to power down their

aircraft. In all cases do not attempt to handle an aircraft that has motors engaged, spinning or is on fire. Use the metal plate in order to cover the craft and attempt to neutralize.

Official course dimensions and boundaries

Course should be contained within an established format, e.g. soccer field, football field or other suitable area.

Flight path should have a safety buffer zone with a minimum of 10 meters from any spectator or building area to reduce the amount of energy force and impact to the netting.

Course designs should take into consideration flight and energy direction. Flight paths should not direct 100% energy force of the airframe directly at the audience unless there is substantial distance and barriers to protect the audience.

Accidents, yaw spinouts and other impacts that cause the aircraft to alter from its flight path should be considered and implemented into the design.

If spectators are allowed for viewing purposes, there must be netting 10 meters high (or as high as necessary to cover the front of a structure that provides an alternate natural barrier) with a minimum of 1meter buffer on each side for impact recovery. Spectators must not stand within 3 meters of the netting.

Netting must be high tensile weave, with a 45 millimeter maximum weave size (either square or diamond pattern). This is to ensure there are multiple catch points in case one of the squares is breached through impact.

Course rules of engagement

If a race is ordered stopped for any reason, pilots will be instructed by the Pilot Line Director and must follow all procedures prescribed. Pilots failing to adhere to Flight Line Director, Race Commissioner or Race Director declarations may result in an immediate disqualification from the event.

Pilots must stay within all prescribed flight paths.

Pilots must keep all aircraft in the disarmed state until they have been given the “ARM” signal from the Race Director or Announcer. This will happen only when the aircraft has been placed on the starting deck and all field staff have left the area.

Pilots must adhere to the prescribed launch sequence. No movement before the starting signal. False starts will incur a penalty.

Pilots must maintain control of their aircraft at all times and only fly within their skill level. Any pilot who exhibits unsafe flying procedures may be disqualified at any time from the event.

Once pilots have successfully completed all laps, they must return to the start/finish pad, land and DISARM. Pilots must give the Pilot Line Director a “Thumbs Up” that they have completed their flight.

Pilots that have crashed at any point during the heat and are unable to resume racing must DISARM their aircraft, give the Pilot Line Director a “Thumbs Down” indication and wait until the heat is over. The airframe will be recovered by the field crew.

Pilots must successfully fly through all gates, flags, and other obstacles on the course. If a pilot misses an obstacle, they must safely turn around and attempt the obstacle again. They will have up to two further attempts before being disqualified from the heat. Judges will ride along via FPV with the pilot, and will indicate immediately to the pilot if they must correct any flight path errors. Additionally, the Flight Line Director may signal to the Pilot Line Director and judges that an obstacle has been missed. In this case the pilot must immediately

and safely return to the missed obstacle and attempt to successfully navigate it.

The default Maximum Ceiling height for these events is 15 meters unless otherwise specified. Any breach of the ceiling will result in immediate disqualification from that heat. If the pilot receives two breaches of the ceiling height or goes out of bounds at any time during the event, the pilot will be completely disqualified from the event. If a pilot has breached the ceiling or has gone out of bounds, the pilot must immediately land their aircraft in a safe location on the field. The Pilot Line Director or a judge will give further instructions.

In the event of a crash or the inability to resume flight safely, the pilot must immediately DISARM their aircraft and give the Thumbs Down signal.

The field staff may use various hand signals in the front of the pilot's camera to indicate airworthiness status to the pilot. Thumbs Up means the pilot is pre-cleared for flight. Thumbs Down means the craft is damaged and is not able to fly. In all cases if you see field staff in the First Person View pilot camera, you must disarm and wait for further instructions.

Pilots may have multiple airframes, each airframe must pass all safety and airworthiness checks before flying.

The Flight Line Director, Race Director or Race Commissioner has the right to disqualify any pilot for any reason if the pilot or piloting behavior is deemed unsafe or if the pilot has breached any rule or regulation within this document.

Emergency or Fail-Safe Procedures

Should a pilot lose control of their aircraft, the pilot must attempt a safe landing, fly into a prescribed, crash, 'catch' zone net, cut throttle in a safe area or execute a fail-safe procedure in a safe area.

If a pilot loses video, they must immediately execute a fail-safe procedure and/or attempt to land the aircraft via Line of Sight. All spotters must assist pilot in determining the location of their aircraft.

Spotters must maintain visual line of sight of the corresponding pilot's airframe at all times and must provide verbal directions or situational awareness details to the pilot. If the aircraft breaches the max ceiling height or goes out of bounds, a judge will indicate to the pilot the infraction and the spotter must immediately assist the pilot in maintaining control and safely landing the aircraft.

Racing competition structure

It is recommended that the competitions use the following structure, although individual events may elect to use a different structure.

Practice: Pilots may practice at the designated practice fields before the event. Practice runs may be timed and may be used for qualifier seeding.

Qualifiers: Competitions may include one or more rounds of qualifiers, with either seeding or advancement as a result of best single lap time or best complete race time.

Mains A and B : Competitions may include one or more rounds of main heats, with best complete race time, finishing order or a points-based system based on finishing order deciding advancement to finals.

Finals A and B : Pilots who advance from the mains compete in finals, with best complete race time, finishing order or a points-based system based on finishing order deciding final results.