



Guerrilla Entertainment LLC

The Greatest FPV Racing On Earth

Midwest Drone Racing® Rulebook

January 1, 2017

Table of Contents

Preface

Event Definition

Rules acknowledged by the Midwest Drone Racing® Board and Its Affiliates

Definition of Terms

General Piloting Rules

Event and Venue Operations

Racing Course General Information

MDR Officiating

Airframe General Guidelines

Course Timing Systems

Race Count-down Procedures

Course Rules

Course Competition Stages

Seeding and Scoring

- **Single elimination and finals example**
- **Team elimination and finals example***

Determining Pilots Classification Rank

Penalties

Emergency or Fail-Safe Procedures

Specialized Events

- **Open Fly Days**

Miscellaneous

- **Hand Signals**
- **Maximum sUAS Standard Examples**
- **Mounting and Location of Timing Transponder**
- **Track Layout Example**
- **Prototype and Experimental sUAS**
- **Official Licensed Midwest Drone Racing® Teams**
- **Copyright and Trademark**
- **Contact Information**

Summary

THIS AREA LEFT INTENTIONALLY BLANK

2017 Midwest Drone Racing®

WORKING DRAFT

RULES AND REGULATIONS

V.3

Publish Date: January 1, 2017

Preface

The following rules and regulations are currently a draft working copy as of the date listed above and is subject to change. We are aware of many well-known and widely accepted FPV racing rules and regulations. The following rules will be the basis for local competitions sponsored by the Midwest Drone Racing® and its affiliates. At this time, these defined draft rules are for **U.S. based pilots only**. We will continue to develop and nurture Midwest Drone Racing® for our fellow international pilots and enthusiasts so you will have the same opportunities to be a part of the sport of drone racing.

These rules and regulations hereafter are currently for quad and other future multirotor copters. Future developments of other sUAS or “drones” will be dependent on the advancement of technologies and public desire to competitively race those technologies.

Safe, fun, healthy competition and the growth of drone racing for everyone is our passion. Midwest Drone Racing® and its affiliates hope that everyone involved will continue to achieve these milestones together.

Event Definition

Midwest Drone Racing® is a sUAS amateur and sport enthusiast event. Events are focused on community education and awareness of the sport, while providing a place for safe and competitive pilots to meet and fly. Midwest Drone Racing® events will follow the general rules and regulations of typical amateur competitions. Current National and International foundations may be used to guide the working details of these events.

Rules acknowledged by the Midwest Drone Racing® Board and Its Affiliates

These rules are guidelines set by the Midwest Drone Racing® Board and its affiliates. These rules are the most recent edition of the Midwest Drone Racing® rulebook and are available at www.guerrillafun.com. It is the responsibility of the pilot, staff and participants of the events to read, understand and follow these guidelines and rules in order to compete in the defined Midwest Drone Racing® sponsored event. Omission to rules are not loopholes and where examples are given they are not intended to be the sum of all possibilities, but simply representative samples. Midwest Drone Racing® reserves the rights to change rules at any time without notice.

Definition of Terms

- DNS: Did Not Start
- DQ: Disqualified
- LMDRO: Lead Midwest Drone Racing® Official
- MDR: Midwest Drone Racing®
- MDRB: Midwest Drone Racing® Board
- MDRO: Midwest Drone Racing® Official
- MDRR: Midwest Drone Racing® Rank
- OOB: Out of Bounds

General Piloting Rules

- All pilots must have a current acceptable insurance through a licensed insurance agent prior to the event.
- All pilots must submit a completed and signed appropriate *waiver* for the race organizer and venue. Pilots under the age of 18 must have a parent or legal guardian's signature. A suitable identification will be presented for authentication of participating pilots.
- All pilots must adhere to any applicable FAA, FCC, DOT and other law enforcement regulations as well as event notifications, restrictions or regulations established for the event.
- All pilots must adhere to all rules and regulations of safe airframe operation and flight.
- All Pilots will be considerate to their fellow pilots, spectators and MDR staff.
- All pilots will be required to attend a general safety briefing at every event.
- All pilots must demonstrate effective Fail-Safe procedures defined by the MDRO. In most cases this is a "Power Down, no pulse" method, where the airframe 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 airframe should not power up by any accidental controls from the radio. Airframe arming may be executed by a specific switch on the radio, or by a sequence (i.e. yaw right) to actively arm the radio.
- All pilots must demonstrate an air-worthy airframe and pass a general mechanics, electronic and video test.
- All pilots must demonstrate basic piloting skills, which includes "Line of Sight", and must successfully fly a controlled flight around the course or demonstration area within a certain amount of time displaying the ability to navigate their airframe through all obstacles.
- All batteries must be transported and stored in LIPO-safe bags or an approved fire resistant container.
- Pilots may use FPV to pilot airframe unless specified event is for "Line of Sight". This can be goggles or an LCD type display.
- Pilots are required to have an MDR authorized Timing System Transponder emitter properly installed on their airframe for all official event lap timing purposes.
- All events are non-refundable. Any cancelled events by MDR will be rescheduled for a later date for that calendar year or refunded by the MDR.

Event and Venue Operations

- Pilots must adhere to all rules within the competition of the event and venue, and will not fly in any other part of the venue unless it is designated as a flight zone.
- The MDRB has invested in the use of the ImmersionRC, NexWaveRF Duo 5800 V4.1 Diversity Receiver with right/left polarity ground stations. The following FPV compliant transmitters with the ground station system are as followed; **TS832, Black Pearl LCD, TBS Dominator RX (BOSCAM/Airwave), TBS Greenhorn, Boss, Rookie and “Race” Band.** The MDRB respectfully requests that all Pilots use compatible transmitters and FPV goggles.
- Pilots will be required to have both RPH and LPH antennas for their VTX for official race events.
- FPV frequencies will be issued at the event. Pilots must provide FPV transmitter model and know the frequency switch settings before frequency assignments can be given. Pilots with shared frequencies will be placed in groups. **These groups will be responsible to monitor their shared frequency activity pertaining to not having the FPV transmitter on if not in an official race.** Any pilot who willfully disrupts the shared group’s frequency during a race is subject to automatic disqualification from the event.
- Pilots and 1 group spotter will be permitted in the racing area.
- FPV 200mW transmitters will be used to limit pilot and outside band interferences.
- FPV transmitters must be mounted to be easily accessible for any changes.
- Official races will be conducted based on the volume of pilots entered for the event. Standard races will be 2, 3 or 4 pilot single to double eliminations. Team events will consist on 2 or more pilots per event venue.

The MDRB is examining the standards and best practices for future 8 pilot races.

- Pilots must contain all equipment and airframes within the pilot pit area and must not solder, weld or cause any spark within the pit area. Pilots must use designated areas for soldering, repairs and modifications. Tools are not provided. Pilots must supply their own tools.
- Charging of electronic devices including radios or any device with a self-contained power supply is permitted. Chargers are not provided. Electric and power strips will be provided.
- Midwest Drone Racing® and its affiliates are not responsible for lost, stolen or damage of pilot property or damage caused by pilots to event venue property.

THIS AREA LEFT INTENTIONALLY BLANK

Racing Course General Information

“Drag Racing Style” is a 1vs1 straight away competition between individual pilots based on similar racing classes or open classes. This straight course will offer the best speed time for the winning pilot of that heat.

“Open Class” Pilots may submit, up to three, multiple airframes of the various classes established for event. Only the three registered airframes will be allowed for that event to fly. Each airframe must pass all MDRO checks before flying. Pilots will fly their registered airframes against same to other sized airframe classes.

“Skills Challenge” are unique events where a specific task is included with obstacle challenges during the race.

“Small Track Style” is a speed agility and obstacle course competition between individual pilots based on similar racing classes or open classes. These courses will offer a combination of obstacles such as under/over funnel gates, hairpin turns and a slalom.

MDRB will continue to expand the developments and implementation of other racing formats as demand grows. The MDRB is examining new developments for tracks, obstacle challenges and other unique setups as MDR events and additional venues are made available.

MDR Officiating

- All races will be governed by MDROs.
- Each race will be monitored by MDROs, via FPV of the pilot’s video feed, (either goggles or display) cameras, timing/lap systems and MDROs to maintain fair and accurate competition.
- The LMDRO holds the executive decision. No exceptions.
- Any practice or behavior that is deemed unsafe, i.e. flying above the max ceiling of event or venue, inappropriate behavior, etc., could result in an immediate disqualification depending on LMDRO judgement.

Airframe General Guidelines

These classifications are designed to be loosely defined in order to promote innovation in new configurations, materials, motors and prop variations. Currently there are a few class categories defined for many events. At this time, MDRB, will focus on the “250 Class and less” size airframe. As demand increase, MDRB will begin an “Open Class” and add additional class events at venues. There are no minimums defined at this point for the “250 Class and less”, only the maximum:

- Maximum Frame size under 330mm (approx. 13 inches) motor to motor. No metal or wood frames are allowed.
- 4S maximum LIPO battery.
- Any 4S spec motors.

More than 4 motors including dual motor mounts are currently being reviewed by the MDRB and based on pilot demand.

- 6" Maximum propeller size, 6" in the case of 3 bladed propellers. No wood or metal propellers.
- All airframes must pass a safety and air-worthiness inspection. Once the airframe has been checked and approved, it must not be modified or changed, or the airframe and its components will need to be resubmitted for a re-inspection and approval. Airframes should be repaired with equivalent parts that were originally used during check-in. The MDRO has the final decision on whether an airframe is accepted, and/or requires changes or modifications in order to be approved for racing.

Course Timing Systems

A MDRO will use a specialized timing track system to clock the pilots best times for official MDR events. Each pilot must rent these unique ID MDR timing transponders and properly secure it on the airframe before the start of the official event.

- Each timing transponder is encoded with a specialized and unique ID for the MDR.
- Timing transponders must be mounted to the pilot's airframe and not obstructed so that the transponder will emit the proper signal to the timing system.
- Velcro will be used to securely mount timing transponder. Do not glue or tape the timing transponder.
- Timing transponders require a maximum of 11V to operate. The MDR timing transponder will be securely mounted, using Velcro, to the top of the airframe with the timing eye facing the right outside edge as far away from all other electrical interference as best as possible. Pilots will need a "Servo" style adapter or have an open port for plugging timing transponder into their flight board or 5V-11V power source.
- Any judgments for times and/or adequate adjustments are at the sole discretion of the LMDRO and MDRO.
- All times will be recorded by the MDRO and submitted as an official judgement to MDRB. The MDRB will then compile the submitted information to begin the development of pilot bracketing and ranking for current and future events.
- Pilots are able to contest the official judgements by submitting a certified letter to the MDRB for review. An official review of the contest will be made and the decision by the MDRB will be made final.

Race Count-down Procedures

MDR will use a three stage process for all racing. Each stage is designed to check for the various conditions, prepare video transmitters and have all pilots organized and ready for racing. Each stage is staffed by a MDRO who will review each pilot and their airframe. **It is the pilot's responsibility to take all necessary steps to participate in the race. Failure to do so could automatically disqualify that pilot from that heat.** For all races, the pilots with one group spotter called will proceed together through each stage. Each heat will be 5 minutes in duration. The stages are as follows:

Stage 1: Known as “in the hole” (approx. 20 minutes from flight): Pilots will submit to a pre-flight air-worthiness check to MDROs. All airframes will be checked for valid seals and marks from the initial safety checks. If they are not present, the pilot must go through the safety check and receive a new seal or mark. At this time all cables, connectors, props and electronics will be checked by the officials.

Stage 2: Known as “on deck” (approx. 10 minutes from flight): Pilots will be assigned a race position. All cables should be connected and the video transmitter properly secured to the airframe. The airframe should not be powered up at this time.

Stage 3: Known as “up” Pilots will place their airframe at the queue takeoff area for the race. Pilots may power up their airframes, goggles or displays and check their video feed, but may not power up their radio. Pilots will proceed to their flight area and power up their radio when the LMDRO commences the race. The pilot must give a “Thumbs Up” to the LMDRO when they have successfully powered up and have the correct video feed. Pilots must not arm their radios until directed by the LMDRO.

Once all pilots have placed their airframes at the starting queue area and returned to their flight area, the LMDRO will commence the race start count down. It will proceed as follows:

LMDRO will ask if all pilots are ready. All pilots will give a thumbs up when ready. If a pilot finds that they are not ready they must indicate to the LMDRO their reasoning. Depending on the reason from the pilot the LMDRO may issue a warning or add penalized time to that pilot for the infraction.

- From the LMDRO “Pilots Arm your racers”
- From the LMDRO “Pilots are you ready?” Pilots will power up transmitters and indicate readiness with thumbs up.
- From the LMDRO a countdown of “3, 2, 1,” and the sound of an air horn short blast will signal the start of the race.
- At the discretion of the LMDRO or MDROs, the race may be stopped at any time. If this occurs, pilots will be instructed by the LMDRO and MDROs and must follow any procedures prescribed.

Course Rules

- Pilots must stay within all arranged flight paths at the event.
- Pilots must keep all airframes in the disarmed state until they have been given the “ARM” signal from the LMDRO. This will happen only when all airframes have been placed at the starting queue area and all MDR staff have left the area.
- Pilots must adhere to the prescribed launch sequence. No movement or revisiting the airframe once placed in queue area before the starting signal.
- Pilots must fly through start/finish gate to begin official recorded time.
- Pilots will have 5 mins to fly as many laps as possible.

- Pilots must fly through all obstacle challenges and are allowed to return to fly through missed obstacles. MDROs via FPV with the pilot or line of sight will indicate immediately to the pilot if that pilot must correct any flight path errors. Additionally, the MDROs may signal to the LMDRO 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.
- If an airframe touches the ground during the race and lands right side up and the airframe can be flown, the pilot will be allowed to continue to race. If the airframe is damaged in any way or not suitable for flight the pilot must concede. **It is the pilot's responsibility to know of the airframes flight worthiness at all times. If any MDRO sees the abuse of this rule, the pilot will be disqualified from the race and possibly the event.**
- Pilots must maintain control of their airframe at all times and only fly within their skill level. Any pilot who exhibits unsafe flying procedures may be disqualified at any time at the discretion of the LMDRO and MDROs.
- Once pilots have successfully completed all laps, they must return to the start/finish gate landing area, land and DISARM. **Pilots are not to land at the start queue area.**
- Pilots that have crashed at any point during the heat and are unable to resume racing must DISARM their airframe, give the LMDRO indication and wait until the heat is over before the airframe can be recovered.
- Maximum ceiling heights for all events will be established per event and venue. Any breach of the maximum ceiling will result in immediate disqualification from that race. If the pilot breaches the set maximum ceiling height two times during the event that pilot will be disqualified from the event.
- If a pilot goes out of bounds, the pilot must immediately land their airframe in a safe location on the field and wait for the race to complete. LMDRO and MDRO will give further instructions for the pilot to retrieve their airframe when the race has been completed and the field is deemed safe. If the pilot goes out of bounds three times during the event that pilot will be disqualified.
- In the event of a crash or the inability to resume flight safely, the pilot must immediately DISARM their airframe and indicate it to the LMDRO or MDRO.
- In all cases, if the pilot sees MDR staff in their First Person View pilot camera at any time indicating with a "Thumbs Down or Cut Off Motion" hand signal, the pilot must disarm and wait for further instructions from the LMDRO or MDROs.
- The LMDRO has the right to disqualify any pilot for any reason if the pilot's behavior is deemed unsafe or if the pilot has broken any rule or regulation within this rulebook.

Course Competition Stages

Practice: Pilots may only practice at the designated practice field before the event. All practice runs will be monitored through a timing system to check for any timing transponder issues. Timing will not count during practice runs. Pilots will be able to have as many practice laps needed before the commencement of the time qualifying. Pilots that practice must allow time for other pilots to take practice laps. A maximum of four pilots are allowed to practice at one time. Practice at your own risk.

Time Qualifying: Each pilot will fly individually and will attempt to fly the course two times. The best mean score will be the pilots qualifying time. If the pilot does not complete the course because of a mishap on the course, or is unable to complete all the obstacles successfully within the two attempts, they will be issued the maximum mean score for their best time for race seeding. Seed placement for maximum mean scores will be issued after all best time qualifiers.

Race and Finals: Each pilot will be ranked in order of that pilot's best mean score for that heat. Initial race groupings will be selected by a typical bracketing system. Pilots will progress through 5 heats or less. The pilot's total mean score from the 5 heats or less will be used. The top 2 pilots of each group will advance to finals. Finals will consist of 5 heats or less with final placement of 1st, 2nd and 3rd winners.

Seeding and Scoring

An example of single elimination bracketing is as follows:

**Midwest Drone Racing® Event
Single Elimination**

Race 1 Group A

	Heat 1	Heat 2	Heat 3	Heat 4	Heat 5	Total Mean
Pilot 1						
Pilot 2						
Pilot 3						
Pilot 4						

Race 1 Group B

	Heat 1	Heat 2	Heat 3	Heat 4	Heat 5	Total Mean
Pilot 5						
Pilot 6						
Pilot 7						
Pilot 8						

Race 2/Finals

	Heat 1	Heat 2	Heat 3	Heat 4	Heat 5	Total Mean
Pilot 1 of A						
Pilot 2 of A						
Pilot 3 of B						
Pilot 4 of B						

In case of a tie, the MDRO will review the millisecond of tied pilots and their mean score to determine proper pilot advancement.

Determining Pilot Classification Ranking

A pilot receives a base score for each event established on the final place they finished. The pilot who place first will receive 100 points followed by 75 points for 2nd place and 50 points for 3rd place. Each pilot that does not place 1st through 3rd will receive an automatic 10 points.

Each base score has multipliers applied to convert base score to a pilot classification ranking. Classification will be awarded at next event attended by the same pilot.

The Midwest Drone Racer Rank, MDRR, will become effective when same ranking pilots are available. These pilots will then race against same MDRRs.

**The MDRB is considering the best practices of MDRR “drop in” events. This will allow racers to compete against higher ranking MDRRs.*

MDRR Multiplier

8	32x
7	24x
6	16x
5	8x
4	4x
3	2x
2	1x
1	0.50x

Season Multiplier

Current Season	100%
Last Season	100%
Two Seasons Past	90%
Three Seasons Past	70%
Four Seasons Past	50%
Five Seasons Past	35%
> Five Seasons	25%

Number of Pilots in Race

10+	100%
9	95%
8	90%
7	85%

MDRR Classification Rank

8	7800
7	4800
6	2400
5	1200

6	80%
5	75%
4	70%
3	65%
2	60%

4	600
3	300
2	75
1	0

An Example of the MDRR is below:

Event 1	Points	MDR	# Pilots	MDRR
Pilot	10	0.5	90%	4.5

Penalties

MDRO will base penalties upon pilot's infractions. The penalties that are issued are for the following reasons.

1. **False start penalty.** 1 to 10 seconds will be added to 1st lap time based on when pilot left queue early.
2. **All pilots must complete one lap, in each heat, to acquire best lap time.** The maximum time of lap will be issued as best lap time for a DNS or if pilot fails to make one complete lap.
3. **Not following designated flight path.** This includes passing maximum ceiling and after continual out of bounds. First infraction will be the maximum lap time for that heat. 2 infractions the pilot will be disqualification from event.
4. **Deliberately flying in the opposite direction of the designated flight path.** This does not include returning to fly through a missed obstacle. This is an automatic disqualification from event.
5. **Deliberately attacking or crashing into opponent.** This is an automatic disqualification from event.
6. **Use of unapproved or uninspected airframes, motors, and/or batteries for the event during heat.** Disqualification from event.
7. **Other minor infractions as deemed by the LMDRO and/or MDRO.**

Emergency or Fail-Safe Procedures

- Should a pilot lose control of their airframe, the pilot must attempt a safe landing, fly into a safe area and execute failsafe procedures.

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

Specialized Events

Open Fly Days

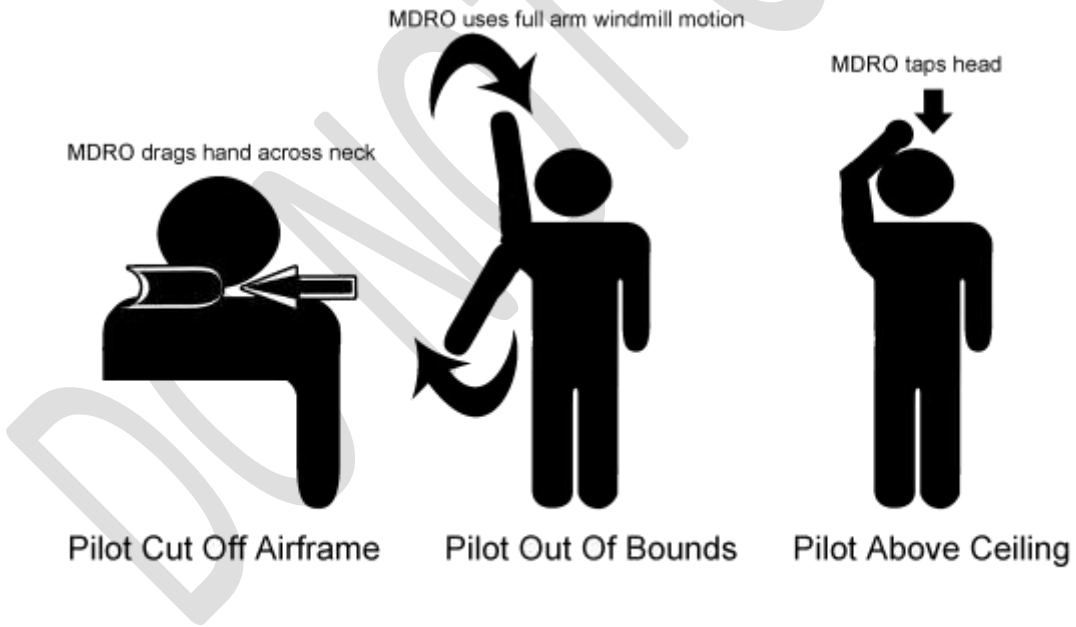
In general Open Fly Days are open to pilots and mixed sUAS classes to practice at their will. A set maximum of sUAS may be established depending on venue for event. Open Fly Days do not count as an official MDR event classification ranking. Open fly days may consist of future testing of new track layouts, gates, tunnels, themed etc.

All pilots participating in the open fly days must adhere to the same general piloting rules, airframe general guidelines and field, course rules as outlined in this rulebook.

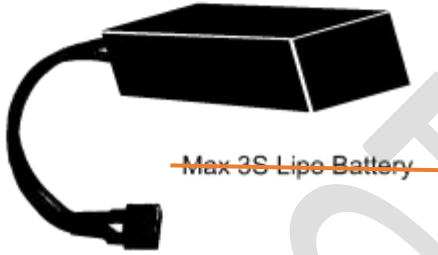
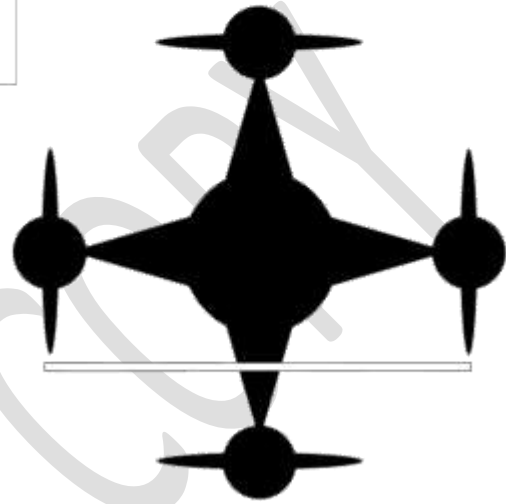
THIS AREA LEFT INTENTIONALLY BLANK

Miscellaneous

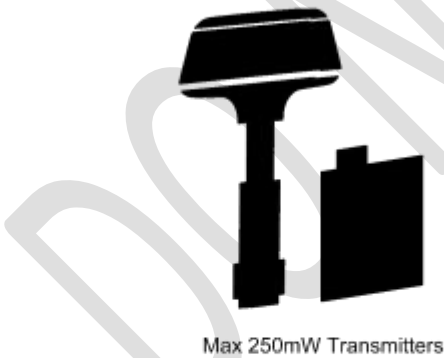
Hand signals will be used by the LMDRO, MDROs and MDRO staff to indicate to pilots and other MDRO staff as an additional form of communication during the event. Pilots will know and use these hand signals when required at a MDR events. Some, but not all, hand signals are as follows.



Maximum sUAS Standard Examples.

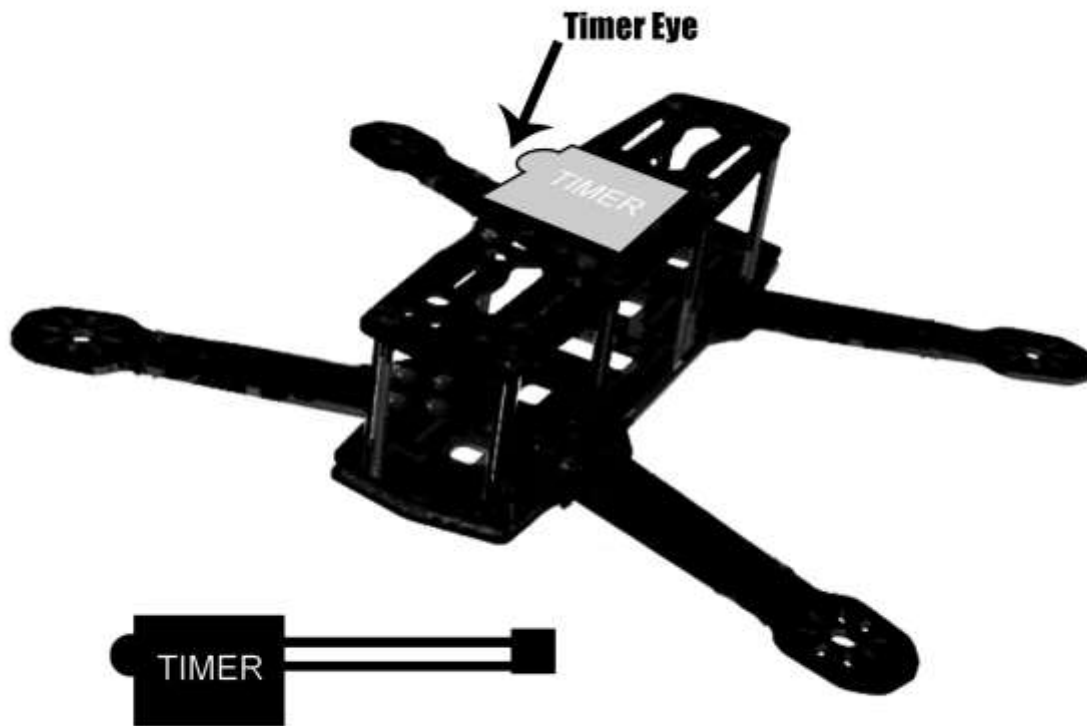


Max airframe approx 13" or less motor to motor

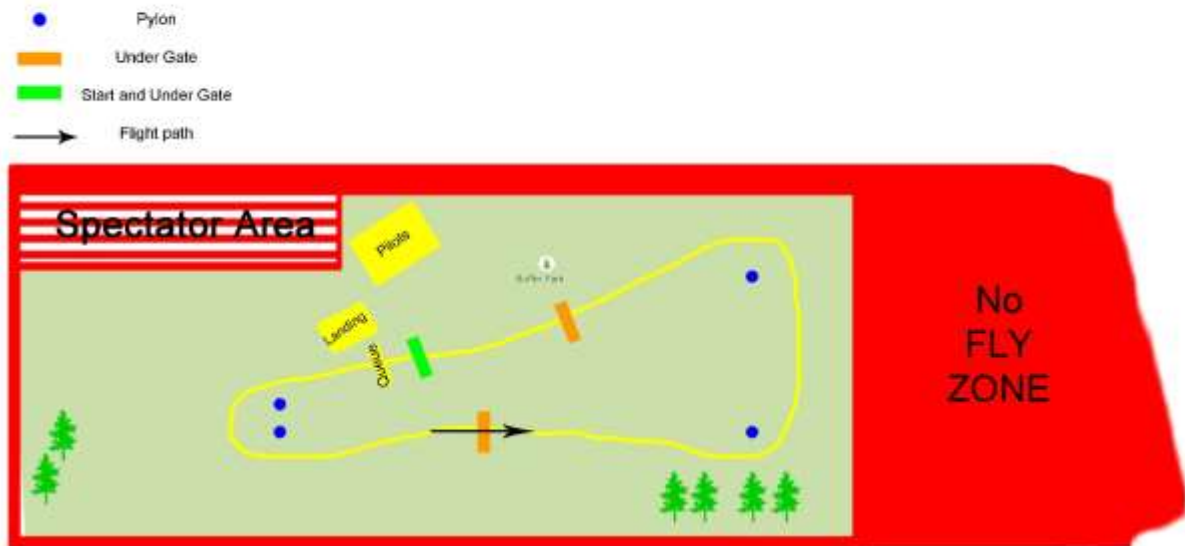


Mounting and Location of Timing Transponder

The MDR timing transponder will be securely mounted, using Velcro, to the top of the airframe with the timing eye facing the right outside edge as far away from all other electrical interference as best as possible. Pilots will need a “Servo” style adapter or have an open port for plugging timing transponder into their flight board or 5V-11V power source on quad.



Track Layout Example



Prototype and Experimental sUAS

The MDRB welcomes and encourages the use of new technologies toward drone racing. Prototype and Experimental sUAS can only be tested during open fly days unless approved by the MDRB for race events.

If a hobbyist has an experimental concept that they would like to use at an open fly day event please contact the email or address listed within this document to set up a prescreening of your concept and its approval of use during open fly day. At no time can the MDRB allow unapproved experimental sUAS to fly without MDRB consent for an open fly day.

Official Licensed Midwest Drone Racing® Teams

Jokers Wild



Flight Club



Freedom Flyers FPV



Copyright and Trademark

Copyright of the rules and regulations are by Guerrilla Entertainment LLC. Midwest Drone Racing® is a registered trademark. Any use of this document, website and material provided by Guerrilla Entertainment LLC is prohibited without written consent.

Contact Information

Email: mac@guerrillafun.com

Address: Guerrilla Entertainment LLC

PO BOX 63

Hopkins, MN 55343-7476 USA

Summary

These draft rules and regulations by the Midwest Drone Racing® Board and its affiliates are continuing to be developed for the sUAS racing community. It is the Midwest Drone Racing® Boards hope that these guidelines and rules will help become a solid case study to build on. It is anticipated that this will then contribute to and help define future sUAS racing or any FPV racing rules and regulations for the continual growth of Midwest Drone Racing®.