OFFICIAL RULESET

Townsville Robot Combat
Combat Robot Rules

AUS & US Antweight · Beetleweight · Mantisweight Divisions

Townsville · Queensland · Australia

1. General

1.1. All participants build and operate robots at their own risk. Combat robotics is dangerous. Please take care to not hurt yourself or others when building, testing and competing.

1.2. If you have a robot or weapon design that does not fit within the categories set forth in these rules or is in someway ambiguous or borderline, please contact this event. Safe innovation is always encouraged, but surprising the event staff with your brilliant exploitation of a loophole may cause your robot to be disqualified before it ever competes.

1.3. Compliance with all event rules is mandatory. It is expected that competitors will comply with the rules and procedures of their own accord and not require constant policing.

1.4. Each event has safety inspections. It is at their sole discretion that your robot is allowed to compete. As a builder you are obligated to disclose all operating principles and potential dangers to the inspection staff.

1.5. Cardinal Safety Rules: Failure to comply with any of the following rules will result in instant expulsion from the event and possible barring from future competition.

1.5.1. Radios may not be turned on at or near events for any purpose without obtaining the appropriate frequency clip or explicit permission from the event.

1.5.2. Proper activation and deactivation of robots is critical. Robots must only be activated in the arena, testing areas, or with expressed consent of the safety officials.

1.5.3. All robots must be able to be FULLY deactivated, which includes power to drive and weaponry, in under 60 seconds by a manual disconnect.

1.5.4. All robots not in an arena or official testing area must be raised or blocked up in a manner so that their wheels or legs cannot cause movement if the robot is turned on.

1.5.5. Locking devices: Moving weapons that can cause damage or injury must have a clearly visible locking device in place at all times when not in the arena. Locking devices must be painted in neon orange or another high-visibility color. Locking devices must be clearly capable to stopping, arresting or otherwise preventing harmful motion of the weapon.

1.5.6. It is expected that all builders will follow basic safety practices during work on the robot at your pit station. Please be alert and aware of your pit neighbors and people passing by.

2. Weight Classes and Divisions

This event offers the weight classes listed in section 2.1. Each class is run as either a 90% Plastic division or an Open Material division, as set out in section 2.2. There is a 100% weight bonus for true walkers. There is no weight bonus for shufflers or other forms of locomotion other than walking — see 3.1.2 for a definition of a walker.

2.1. Weight classes. Weights follow the international standard.

Class	Name	Weight	Division
Class 01	(AUS) Antweight	150 g	Plastic only
Class 02	(US) Antweight	454 g (1 lb)	Plastic only
Class 03	Beetleweight	1.36 kg (3 lb)	Plastic only
Class 04	Mantisweight	2.72 kg (6 lb)	Plastic or Open material (two brackets)

Other weight class Robots may be permitted to operate as an exhibition-class demonstration only — at the discretion of the event operator based on arena safety, but no organized competition or prizes will be offered for classes other than those listed. Higher weight classes will be included in the competition at later events.

2.2. Divisions. Every robot competes within one of two divisions:

2.2.1. 90% Plastic division. Applies to the AUS and US Antweight classes and the Beetleweight class, and to the plastic bracket of the Mantisweight class. Robots in this division must be built to a minimum of 90% plastic. The 90% plastic rule keeps bots affordable, safer in the arena and accessible to newcomers. Construction requirements are set out in section 2.3.

2.2.2. Open Material division. Applies to the open bracket of the Mantisweight class. Robots in this division may be built from any material.

2.3. 90% Plastic construction rules. Robots entered in a 90% Plastic division must comply with the following:

2.3.1. The robot must be built to a minimum of 90% plastic, leaving a maximum of 10% of the robot to be made from materials other than plastic.

2.3.2. The up to 10% other-material allowance must be used for securing and small parts only — for example fasteners, axles, bearings and similar hardware. The one exception is the weapon: you may instead choose to use your other-material allowance on the weapon.

2.3.3. The up to 10% other-material allowance must not be used to reinforce plastic pieces — not across the face of a plastic piece, and not inside or running through the body.

3. Mobility

3.1. All robots must have easily visible and controlled mobility in order to compete. Methods of mobility include:

3.1.1. Rolling (wheels, tracks or the whole robot)

3.1.2. Walking (linear actuated legs with no rolling or cam operated motion).

Robots are classified as "walker" at the sole discretion of the Event Organizer, and are not subject to appeal. Contact the Event Organizer if in doubt.

3.1.3. Shuffling (rotational cam operated legs)

3.1.4. Ground effect air cushions (hovercrafts)

3.1.5. Jumping and hopping is allowed

3.1.6. Flying (airfoil using, helium balloons, ornithopters, etc.) is not allowed

4. Robot Control Requirements

4.1. Tele-operated robots must be radio controlled by standard Hobby Radio Control Equipment, or use an approved custom system as described in 4.4.3.

4.2. Tethered control is not allowed.

4.3. Pre 1991 non-narrow band radio systems are not allowed.

4.4. Radio system restrictions for this event with weight and or weapon restrictions:

4.4.1. Radio systems that stop all motion in the robot (drive and weapons), when the transmitter loses power or signal, are required for all robots with active weapons. (This may be inherent in the robots electrical system or be part of programmed fail-safes in the radio.)

4.4.2. All robot radio systems must have a way to change frequencies or coded channels to prevent radio conflicts. Having at least two frequencies or coded channels available is recommended. Lack of extra frequencies may result in a forfeit. Priority for frequency use will be allocated in order of Entry registration.

4.4.3. Non Standard or Home built control systems, must first be approved by this event.

4.5. This event recommends, but does not require a separate power switch for the radio.

4.6. A Frequencies in Use/Channel List will be displayed at the event.

5. Autonomous / Semi-Autonomous Robots

Any robot that moves, seeks a target, or activates weapons without human control is considered autonomous. If your robot has any autonomous features you are required to contact this event before registration.

5.1. Autonomous robots must have a clearly visible light for each autonomous subsystem that indicates whether or not it is in autonomous mode, e.g. if your robot has two autonomous weapons it should have two "autonomous mode" lights (this is separate from any power or radio indicator lights used).

5.2. The autonomous functions of a robot must have the capability of being remotely armed and disarmed. (This does not include sensors, drive gyros, or closed loop motor controls.)

5.2.1. While disarmed, all autonomous functions must be disabled.

5.2.2. When first activated the robot must have no autonomous functions enabled, and all autonomous functions must failsafe to off if there is loss of power or radio signal.

5.2.3. In case of damage to components that remotely disarm the robot, the robots autonomous functions are required to automatically disarm within one minute of the match length time after being armed.

6. Batteries and Power

6.1. The only permitted batteries are ones that cannot spill or spray any of their contents when damaged or inverted. This means that standard automotive and motorcycle wet cell batteries are prohibited. Examples of batteries that are permitted: gel cells, Hawkers, NiCads, NiMh, dry cells, AGM, etc.

6.2. All onboard voltages above 48 Volts require prior approval from this event. (It is understood that a charged battery's initial voltage is above their nominal value.)

6.3. All electrical power to weapons and drive systems (systems that could cause potential human bodily injury) must have a manual disconnect that can be activated within 15 seconds without endangering the person turning it off. (E.g. No body parts in the way of weapons or pinch points.) Shut down must include a manually operated mechanical method of disconnecting the main battery power, such as a suitable high current switch (Hella, Whyachi, etc) or removable link. Relays may be used to control power, but there must also be a mechanical disconnect. Please note that complete shut down time is specified in section 1.5.3.

6.4. All efforts must be made to protect battery terminals from a direct short and causing a battery fire.

6.5. If your robot uses a grounded chassis you must have a switch capable of disconnecting this ground. ICE robots are excepted from this rule if there is no practical way to isolate their grounding components.

6.6. All Robots must have a light easily visible from the outside of the robot that shows its main power is activated.

7. Pneumatics

7.1. All robots using pneumatic systems must comply with the following:

7.1.1. You must have a safe way of refilling the system and determining the pressure.

7.1.2. Pressures are limited to 250psi.

7.1.3. All components must be used within the specs provided by the manufacturer or supplier. If the specifications aren't available or reliable, then it will be up to the EO to decide if the component is being used in a sufficiently safe manner.

7.2. Please note that some pneumatic systems with very low pressures (below 100 total PSI on board), small volumes (12-16g CO2 cartridges), single firing applications, or pneumatics used for internal actuation (as opposed to external weaponry) may not need to comply with all the rules above. You are required to contact this event if you would like an exception.

8. Hydraulics

8.1. Good engineering and best practices must be used in all hydraulic systems. The pressure is limited to 250psi and there must be an easy way to determine this pressure.

8.2. Please note that some simple low pressure and volume hydraulic systems, like simple braking, may not need to adhere to all the rules above. You are required to contact this event if you would like an exception.

9. Internal Combustion Engines (ICE) / Liquid Fuels — [Presently NOT allowed]

For the preliminary event, ICE engines are NOT permitted in the competition. This will change for later events as we upgrade the arena and familiarize ourselves with the fire and unique hazards that ICE engines present. For future reference, here are the applicable rules for ICE bots:

9.1. Fuel and Fuel Lines

9.1.1. All commercially available grades of automobile or RC hobby fuel are allowed. Alcohol, Nitromethane, jet fuel and other specialty fuels require prior approval by the Event.

9.1.2. Fuel lines and tanks must be made of high quality materials and all ends must be clamped securely.

9.1.3. All fuel tanks and lines must be well protected and armored from all sides including moving parts and heat sources inside the robot.

9.2. Fuel tank volume, on any robot, shall not be greater than the amount required to operate the engine for more than 1 minute longer than the match time at combat power plus a reasonable prematch warm-up period. This volume may not exceed 20 oz unless prior approval is granted from this event.

9.3. The output of any engines connected to weapons or drive systems must be coupled through a clutch which will decouple the motor when it is at idle. (This does not include motors used for generators and hydraulic pumps.)

9.4. All engines must turn off or return to idle at loss of radio signal and turn off at loss of radio receiver power.

9.5. All engines must have a method of remotely shutting off.

9.6. Any robot with liquid fuel and oil must be designed not to leak when inverted. (Minor oil leakage may be tolerated, however if it affects the other robot or becomes a large cleanup issue you may be called and

the leaking robot will forfeit.)

9.7. Use of engines other than standard piston engines (i.e. turbines etc.) require prior approval at this event.

10. Rotational Weapons or Full Body Spinning Robots

10.1. Spinning weapons that can contact the outer arena walls during normal operation must be pre-approved by the event. (Contact with an inner arena curb, or containment wall is allowed and does not require prior permission.)

10.2. Spinning weapons must come to a full stop within 60 seconds of the power being removed using a self-contained braking system.

11. Springs and Flywheels

11.1. Springs are excepted from the remaining rules in this section. However, safe operation and good engineering are always required.

11.2. Any flywheel or similar kinetic energy storing device must not be spinning or storing energy in any way unless inside the arena or testing area.

11.2.1. There must be a way of generating and dissipating the energy from the device remotely under the robots power.

11.3. All flywheels and similar kinetic energy storing devices must fail to a safe position on loss of radio contact or power.

12. Forbidden Weapons and Materials

The following weapons and materials are absolutely forbidden from use:

12.1. Weapons designed to cause invisible damage to the other robot. This includes but is not limited to:

12.1.1. Electrical weapons not specifically allowed in the Special Weapons section 13.1

12.1.2. RF jamming equipment, etc.

12.1.3. RF noise generated by an IC engine. (use shielding around sparking components)

12.1.4. EMF fields from permanent or electro-magnets that affect another robots electronics.

12.1.5. Weapons or defenses that stop combat completely of both (or more) robots. This includes nets, tapes, strings, and entanglement devices not specifically allowed in the Special Weapons section 13.2.

12.2. Weapons that require significant cleanup, or in some way damages the arena to require repair for further matches. This includes but is not limited to:

12.2.1. Liquid weapons not specifically allowed in the Special Weapons section 13.3. (Also, a bot may not have liquid that can spill out when the robot is superficially damaged.)

12.2.2. Foams and liquefied gasses

12.2.3. Any powders, sand, ball bearings and other dry chaff weapons not specifically allowed in the Special Weapons section 13.4

12.3. Un-tethered Projectiles (see projectile description in Special Weapons section 13.5)

12.4. Heat and fire are forbidden as weapons. This includes, but is not limited to the following:

12.4.1. Heat or fire weapons not specifically allowed in the Special Weapons section 13.6

12.4.2. Flammable liquids or gases

12.4.3. Explosives or flammable solids such as:

12.4.3.1. DOT Class C devices

12.4.3.2. Gunpowder / Cartridge Primers

12.4.3.3. Military Explosives, etc.

12.5. Light and smoke based weapons that impair the viewing of robots by an Entrant, Judge, Official or Viewer. (You are allowed to physically engulf your opponent with your robot however.) This includes, but is not limited to the following:

12.5.1. Smoke or dust weapons not specifically allowed in the Special Weapons section 13.7

12.5.2. Lights such as external lasers above 'class I' and bright strobe lights which may blind the opponent.

12.6. Hazardous or dangerous materials are forbidden from use anywhere on a robot where they may contact humans, or by way of the robot being damaged (within reason) contact humans.

13. Special Weapon Descriptions Allowed at This Event

13.1. Electrical weapons are NOT allowed at this event.

13.2. Entangling weapons are NOT allowed at this event.

13.3. Liquid weapons are NOT allowed at this event.

13.4. Powdered material or chaff weapons are NOT allowed at this event.

13.5. Tethered Projectiles ARE allowed at this event. Tethered projectiles must have a securely attached tether of sufficient strength to safely stop the projectile at a distance of no more than 8 feet from the robot.

13.6. Heat and Fire are NOT allowed at this event.

13.6.1. If fire is allowed as an effect, the fuel must exit the robot and be ignited as a gas. It cannot leave the robot is a liquid or gelled form or use Oxidizers.

13.6.2. Fire Fuel types allowed are propane or butane. The maximum quantity allowed is 4oz

13.6.3. The Fuel tank must be as far from the outer amour of the robot as practicable and be protected from heat sources within the robot.

13.6.4. The Ignition system must have a remote operated shut-off that allows the operators to disable it using the radio control system.

13.7. Small Smoke Effects are allowed at this event.

13.7.1. Small smoke effects may be used, please contact the Event for prior approval.