

## **Rules & Regulation**

### **Robo-War**

#### **ROBOT CONSTRUCTION**

- 1. GENERAL, SAFETY and STYLE** The Organisers, at their sole discretion, reserve the right to alter or change these specifications at any time.

##### **1.1 General Construction**

1.1.1 The fitting of interchangeable body panels or alternative weaponry is allowed between bouts providing changes can be done within a 20-minute time-frame. Interchanging of such panels or weapons cannot be done during bouts. Body panels must be the same as the ones removed. Adding extra defensive equipment is forbidden. All interchangeable weapons must not incorporate additional defensive items. All weapons must be declared and logged on the technical check sheet. Failure to do this will result in extra weapons being excluded.

1.1.2 Limited time will be allowed between bots for repairs, adjustments, changing of batteries, etc.

1.1.3 Any on-board equipment that could require attention during the program recording - e.g. recharging of compressed gas cylinders, charging batteries, changing receiver (RX) crystals - should be easily and quickly accessible i.e. compressed gas cylinders must be installed in such a manner that they can be removed for filling and testing within five minutes. Also radio receivers must be installed in such a manner to allow a change of crystals in less than five minutes.

1.1.4 All compressed gas cylinders will be controlled. Compressed gas cylinders will be filled and stored, allowed to reach room temperature, then tested and vented if necessary to 1000 psi. The compressed gas cylinder will only be issued to the competitor for fitting ten minutes before going into battle. Gas cylinders will only be allowed to be fitted in a purpose built area rear of stage or in the bullpen.

1.1.5 All Robots in Middle and Heavyweight classes must have a cradle in which it can sit with the drive wheels or tracks supported off of the ground. The cradle must allow the robot's drive to be demonstrated on the workbench without the robot moving. (Wheels should not be fitted to the cradle).

##### **1.2 Safety**

1.2.1 Robots will be inspected for safety, reliability and conformity to the Rules before being allowed to compete.

1.2.2 The Organisers reserve the right to ban or disqualify any robot that, in their opinion does not conform to the Rules or is unsafe and could cause injury to personnel or damage to the television studio set or equipment.

1.2.3 Activation of robots will take place within a bullpen constructed rear of stage. The robot must be designed in such a manner that all switches, valves etc. are accessible from outside the bullpen. No competitor will be allowed to enter the bullpen under any circumstances with an activated robot. The bullpen has an 18 inch high door.

##### **1.3 Style**

1.3.1 Robots can be built using wheels, tracks and legs ("Walkers").

1.3.2 Other styles or methods may be considered, but contact the Organisers before starting work.

1.3.3 Flying robots that use exposed rotating aerofoils are banned, although Hovercraft will be allowed.

1.3.4 'Cluster Bots' - robots consisting of two or more components - are allowed. They must enter the arena as a single object and if 50% or more of the Cluster Bot is immobilised, the robot will be deemed to have lost that battle.

## 2. WEIGHTS and DIMENSIONS

### 2.1 Weights

#### 2.1.1 Weight Classification

Feather weight: 5kg to 25kg

Heavy weight: 25kg to 60kg

2.1.3 Total weight is measured without consumables - e.g. gases, fuel - and does not include safety bars, straps, guards or similar equipment used to immobilise moving arms/weapons, or for protection, and which are removed before battle. (Please note that batteries will not be considered as consumables).

2.1.4 If interchangeable weapons are used, the weight is measured with the heaviest set-up in place.

### 2.2 Dimensions

2.2.1 Overall dimensions must not exceed 2 metres x 1.2 metres.

2.2.2 There is no maximum height, but if your height should exceed 1 metre - please check with the Organisers.

2.2.3 Length and width is measured to the extremities of the robot, i.e. includes any overhanging bodywork, weaponry or protrusions. Providing the robot starts a bout with weaponry or other devices in a retracted position, the length and width is measured with these in this retracted position.

## 3. MOTIVE POWER

### 3.1 General

#### 3.1.2

i) Motive power for the drive and/or weapons may be electric, internal combustion (IC), hydraulic, or pneumatic. If IC engines are used, a maximum time of 2 minutes will be allowed to start the engine.

ii) A combination of engines - e.g. electric drive and IC weapons, an IC engine driving a hydraulic pump - is allowed.

iii) Other types of engines may be considered, but contact the Organisers before starting work.

#### 3.1.3

i) All robots must be fitted with on-off switches/or removable links that operate both radio receiver and drive/weapon circuits - in practice totally removing all power from the robot.

ii) If there is more than one isolating device, these must be positioned adjacent to one another.

iii) The main power cutoff MUST be a removable link (See Technical Sheet No. 4.) which must NOT be in place unless the robot is in the arena or under the supervision of a technician. A key or switch is not allowed.

iv) The link must be positioned in a visible part of the robot's bodywork, fitted away from any operating weaponry or drive, and this position must be clearly marked.

v) The link may be fitted under a cover, but the cover must be able to be opened without the use of tools.

vi) If the robot uses an IC Engine(s), the "Power" cutoff can take the form of a clearly labelled "Kill" switch.

3.1.4 If the proposed robot design (e.g. a completely revolving body) could make conforming to some or all of Regulations 3.1.2 impractical, contact the Organisers before starting work.

3.1.5 The robot must be able to be activated from outside the bullpen.

### 3.2 Electric

3.2.1 A maximum of 36 volts DC will be allowed. Power supply provided by the organizers will be of 24v/5amp.

3.2.2 All power connections (connections carrying a heavy current) must be of an adequate grade and adequately insulated. Cables must be routed to minimize the chances of being cut.

3.2.3 Batteries must be totally sealed and not contain free-flowing liquid. (Whether electrolyte or otherwise.)

3.2.4 Battery connections must be adequately insulated.

### 3.3 IC Engines

3.3.1 Fuel capacity is limited to 17floz (500ml).

#### 3.3.2

i) Separate fuel tanks must be made of an acceptable type of plastic (e.g. nylon).

ii) If the tank is integral to the engine assembly and is metal, the cap must be plastic or a plastic "pop off" seal fitted.

iii) The tank must be adequately protected from puncture.

3.3.3 All fuel lines must be of the correct type and held with the correct type of fittings. They must be routed to minimise the chances of being cut.

3.3.4 A return spring must be fitted to the throttle of all IC engines to return the throttle to "idle" or "off" in the case of servo breakage or failure. (This is in conjunction with any failsafes.)

### 3.4 Hydraulic

3.4.1 Hydraulic pressure is limited to 3000 psi/204 bar. The competitor must be able to demonstrate the pressure used and carry with them a portable pressure gauge that can be fitted to the system if required to do so by the technical team.

3.4.2 The use of accumulators on the Hydraulic circuits is strictly prohibited.

3.4.3 Hydraulic fluid storage tanks must be of a suitable material.

3.4.4 Hydraulic fluid lines and fittings must be to BS (British Standard) specification. The lines must be routed to minimise the chances of being cut.

### 3.5 Pneumatic

3.5.1 Pneumatic pressure is limited to 1000 psi/68 bar.

3.5.2 Compressed gas cylinders must conform to current HSE specification. The following cylinders only will be allowed:

1.1 kilogram capacity steel.

1.1 kilogram capacity aluminium.

2 kilogram capacity aluminium.

Or multiples thereof. Please refer to Tech Sheet No. 5. These compressed gas cylinders must have been examined by a competent person within the last five years and have a valid test certificate and be stamped with the date of the test and the brand of the competent person who completed the examination. If upon inspection we consider that the construction or valve has been altered or tampered with in any way, the robot will be disqualified. Valves must be fitted using the torque values specified in BS 5430.

3.5.3 Pneumatic lines and fittings must be to BS (British Standard) specification BS EN983 or BS ISO4414. The lines must be routed to minimise the chances of being cut.

3.5.4 All gases in pneumatic systems must be inert e.g. air, carbon dioxide (CO<sub>2</sub>), argon (Ar) or nitrogen (N<sub>2</sub>) NOTE: CO<sub>2</sub> can only be considered inert when dry, so under no circumstances must moisture be allowed to enter a CO<sub>2</sub> cylinder except under the supervision of a competent person who has the correct drying procedures.

3.5.5

- i) All compressed gas cylinders and the valves/regulators must be contained within the body of the robot to protect them from puncture.
- ii) The compressed gas cylinder must be securely fastened down and the valve/regulator - unless adequately protected by the bodywork - must have an adequate strap or cage over it.

3.5.6 A pressure relief/safety valve must be fitted on the high-pressure side of the circuit set to lift at 1000 psi. CO<sub>2</sub> cylinders must also be protected by a burst disc, set to rupture if the pressure within the cylinder reaches 190 bar (2700 psi).

3.5.7 The pneumatic system must be capable of being vented without removal of fittings from outside of the bullpen.

#### 4 WEAPONS

4.1 All robots with the exception of antweight and featherweight must have a working offensive weapon. Static spikes will not be classed as a working offensive weapon.

4.2 All pyrotechnics, explosives, flames, firearms, corrosives, liquids, electronic devices - e.g. radio jamming, heat-guns and Tesla coils - are banned.

4.3 Devices using inflammable or combustion-supporting gases are banned other than commercially available I.C. engines.

4.4

- i) Untethered projectiles are not allowed.
- ii) Tethered projectiles are allowed, but the tether may not exceed 2.5m (approx. 8 ft) in length, (measured from the centre of the robot to the tip of the projectile).

4.5 The speed of any rotating weapons - e.g. circular saws, carbon or steel cutting discs - must not exceed the manufacturer's specification. The manufacturer's specification must be available for inspection.

4.6 Rotating hardened steel blades that may shatter are not allowed.

4.7 Commercial blades - e.g. bayonets - must not exceed 20cm/8inches in length.

4.8 All sharp edges of weapons and robot bodywork in general that is sharp MUST be fitted with adequate protection that must be in place at all times except in the arena. (These guards are not included with the overall weight of the robot).

4.9

- i) Any moving or swinging arms - whether or not they hold sharp and/or rotating weapons - MUST be fitted with a visible locking pin that shows the arm(s) is securely locked into place.
- ii) Locking pins must be painted red or have a red tag attached and MUST be in place at all times - except in the arena. (These locking pins are not included with the overall weight).

4.10 Self-contained weapons - e.g. IC powered cutting discs - must have a secondary restraint fitted in the event of the main fitting breaking way.

4.11 Lasers up to Class 2 (1mw) are allowed.

4.12 Autonomous weapons are allowed, although strict safety features must be incorporated. Please contact the Organisers.

## 5 RADIO CONTROL

5.1 All Robots MUST use VHF frequency band 40MHz. (With the exception of 5.2 below.)

5.2 The UHF frequency band 459 may be used - but inform the Organisers at the earliest opportunity.

### 5.3

i) On Middle and Heavyweight robots all operating circuits that are deemed to be 'dangerous' (normally the drive and weapons) must have an approved failsafe device fitted to each circuit.

ii) This MUST bring that circuit to a pre-set 'off' or 'zero' position if the transmitter (TX) signal is lost, to prevent further operation.

iii) The fail-safes may take the form of plug-in commercial devices; electronic circuitry incorporated into some receivers - e.g. PCM-type- or other devices - e.g. Vantec speed controllers.

iv) Whichever device(s) is selected it MUST operate to the Organiser's satisfaction before the Robot will be allowed to compete. (See Technical Sheet No. 1).

5.4 At least three pairs of transmitter (TX) and receiver (RX) crystals of different frequencies must be available for each RC set up involved in running the Robot e.g. if two separate TX/RX sets are used, there must be six different pairs of crystals available.

5.5 Crystals - must be accessible particularly on receivers so a change of channel can take place in less than five minutes.

## 6. PITS

6.1 No power tools are allowed to be used within the pits, although battery operated drills are acceptable. Power tools may be used only in the Workshop under the supervision of a Robot Wars technician.

6.2 No welding equipment is allowed on the premises - tig and mig welding facilities will be available in the Workshop. All welding will be undertaken by a Robot Wars technician.

6.3 A maximum of 50 kilograms of tools and spares only will be allowed at each workstation.

6.4 A comprehensive tool kit will be available for the use of competitors on a book out book in basis.

6.5 Only repairs may be carried out in the workshop. Modifications to the robot once technically checked are prohibited.

6.6 Children under the age of 16 must be supervised by parent/guardian at all times. The pit is a working environment - failure to do so could result in disqualification.

Team: Maximum 5 members allowed per team. Multiple bots are allowed from same team but with separate registration fees.