

RULES

Revised document 11/08/2022



Robot Combat | Rules

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1. General Provisions

The rules presented in this document are based on the set of standard rules of the Robot Fighting League (RFL) and adopted by Battlebots Inc.

1.1. Warning of Robot Combat Risks

All participants build and operate robots at their own risk. Robot combat competitions can pose serious risks if proper precautions are not taken, and there is no regulation that can cover all the dangers and risks involved.

Please be careful not to injure yourself or others when building, testing, and competing with combat robots. Always remember that combat robots are not toys; they are robots built to participate in competitions and it is not safe to engage in play or demonstrations in inappropriate environments.

Builders are fully responsible for their robots, even if they have already been inspected and approved by the safety team during an event. The responsibilities of the builders include all safety requirements, operating conditions, design, compliance, and adaptation for use in any particular purpose. Team captains are responsible for all aspects related to the robots and members of their team.

1.2. Aspectos Básicos de Segurança

Events endorsed by the Brazilian Robotics League (LBR) must perform safety inspections dedicated to each participating robot. Builders are required to disclose all operational principles and potential hazards to the safety inspection team. Failure to comply with any of the rules in this document may result in **immediate expulsion** from the event

Failure to comply with any of the rules in this document may result in immediate expulsion from the event. Proper activation and deactivation of robots are critical to the safety of all participants. Robots should only be activated in combat arenas, test areas, or with the express consent of event officials and safety officers. Whenever a robot is activated, the wheels must not be in contact with any surface. All robots must be fully deactivated in less than 60 seconds by a manual disconnection. This manual disconnection (main switch) must be easily accessible and clearly identified, as well as the direction to turn it on and off.

All robots that are not in an arena or official test area must be lifted or blocked in a way that their wheels or locomotion system cannot cause movements if the robot is turned on.

Any movement of the robot's weapons that can cause damage or injury must have a clearly visible locking device, preferably in a bright color that highlights it, where these devices must be clearly capable of stopping, securing, or preventing the movement of the robot's weapon. Locking devices cannot rely solely on friction to lock the weapon. These devices must be in place while there is any type of power source connected to the robot, even if the main switch is turned off. This includes all weapons, regardless of the power source or weight class of combat robots. The locking device must secure the weapon for the entire time the robot is not in the arena, and tools or other objects that have other purposes cannot be used as locking devices (if using a tool as a lock, it cannot be used for its original purpose).

The locking device must not accidentally detach from the robot under any circumstances, and there should be no need to remove the lock to disconnect the batteries.



It is expected that all builders follow basic safety practices when working on robots. They should always be alert and attentive to neighboring builders, the public, and people passing by their box. Safety awareness is paramount during robot combat competitions.

All sharp or potentially cutting parts must be protected while the robot is in the box area, including during transportation.

For any circumstances that fall outside the scope of the rules and procedures presented here, the decision will be left to the event officials.

2. Robots

This section is specifically dedicated to the characteristics required for robots to participate in the robot combat modality.

Under no circumstances will designs, logos, or robot names that contain profane images, racial insults, obscene graphics, etc. be allowed. The event organizers have the right to remove any advertisement/image from the robots that is considered inappropriate for the audience and participants.

It is worth noting that it is not required for the robot to have an active weapon other than its own locomotion system. In other words, the minimum requirement is for the robot to move.

Each robot can only participate in one category during the event. For example, a robot registered in the combat category cannot participate in the robot hockey category and vice versa. Robots from the same team registered in the same category must be able to compete simultaneously. This means that it is allowed to use a Featherweight-class robot to compose a Lightweight-class multi-robot team, but it is not allowed to use the same robot in the same class with different names.

It is recommended that each radio-controlled robot have a unique remote control system exclusive to the robot, as depending on the event, other categories may be happening simultaneously, and the team must be able to participate in all competitions simultaneously if required by the event's schedule.

2.1. Weight classes available in LBR

Unlike the standard rules of the Robot Fighting League (RFL), robots with legs will not be rewarded with double the weight limit accepted in the class. This fact does not mean that participation of this type of robot is prohibited in competitions. If the robot is within the weight and safety specifications, it will be able to participate.

The table below shows the weight classes and their corresponding weight limits for participation in competitions with the endorsement of the Brazilian Robotics League (LBR).

Class Name	Weight	
Fairyweight	150 g / 0.33 lbs	
Antweight	454 g / 1 lbs	
Beetleweight	1,360 kg / 3 lbs	
Hobbyweight	5,440 kg / 12 lbs	
Featherweight	13,6 kg / 30 lbs	
Lightweight	27,2 kg / 60 lbs	

As tolerance for weight, the maximum measurement error of the scale or measuring equipment used by the event in question will be accepted. Always consult the adopted



precision with the event management whenever participating. The robot must have at least 40% of the maximum weight of the class.

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Multi-robot types are allowed, provided that their weights do not exceed the class weight limit.

• Regarding the robot's dimensions, the only rule to be respected is that it must be able to pass through the doors of its class arena.

2.2. Mobility

All robots must have easily visible and controlled mobility to compete. Mobility methods include, for example:

- By rolling motion (wheels, tracks, or the whole robot).
- Without rolling motion, where the robot does not have rolling elements in contact with the floor and no continuous rolling or cam-operated movement in direct contact with the floor or through a joint.
- With legs for linear actuation or other innovative traction systems that make the controlled movement of the robot.

It is not allowed to fly using wings, helium balloons, or any other mechanism. The robot must maintain contact with the floor in its controlled mode of locomotion. Jumps and hops are permitted.

2.3. Control System Specifications

In order for the robot to be allowed to participate in robot combat competitions, it must be tele-operated. This means that the robot must receive commands from at least one operator (pilot). The robot can be controlled by up to two operators. The number of team members present in the control area is also limited to two people (two pilots or one pilot and one assistant).

The robot can be controlled by one or more commercially available radio control systems manufactured after 1991 or, if it uses its own control system, it must be previously approved by the event organization. Wired controls are not allowed.

It is mandatory that all robots have the ability to completely stop (locomotion and weapons) in case of signal loss. All robot control systems must have a fail-safe, whether it is commercial or self-made.

All control systems must have a way to change frequency or channel to avoid interference with the other combat robot. The inability to change frequency that may cause interference with the opponent robot may result in defeat. Control systems that have coded communications where no other transmitter operating on the same frequency can communicate with its receiver, and its transmitter communicates exclusively with its receiver, are recommended for use.

Toy radio controls or AM radio controls are only allowed in classes up to 5.5 kg without active weapons.

If the robot uses a homemade control system or any other system not described here, prior authorization from the event organization is required.



2.4. Power Supply for Robots

The use of wires, umbilical cables, or any form of external power supply that is not onboard the robot is strictly prohibited. The robot must use power supply systems with batteries or load cells previously approved by the competition organization.

The permitted batteries are those that do not leak or spray any of their components when damaged or inverted. Examples of permitted batteries are NiCd, NiMh, sealed acid with fibers inside (AGM technology - Absorbent Glass Material), Li-Ion, LiPo, and LiFePO4. If you plan to use a new type of battery, or are unsure of the specifications, please contact the event organization beforehand.

Voltages greater than 48V require prior approval from the event organization. (It is understood that the initial charge of a battery is higher than its nominal value).

All electrical energy from weapons and locomotion systems (systems that can potentially cause harm to the human body) must have a manual connector in a location where the operator can access it in a maximum of 15 seconds without causing damage. It must contain a mechanical method for disconnecting the main battery, such as keys (Fingertech, Hella, Whyachi, RC40, etc.) or a removable link (jumper). Relays can be used to control force, but there must still be a mechanical disconnection as mentioned above.

All measures to protect terminals must be taken to prevent short circuits that damage batteries. If the robot uses a grounded chassis, there must be a switch that can disconnect it. Robots with combustion engines may be exempt from this rule if there is no practical way to isolate these components. In this case, it is required to contact the event organization beforehand.

All robots must have a light in a visible location indicating that their main power is activated. The indicative lighting of an activated robot must be visible from outside the arena.

2.5. Pneumatic Systems

The robot's pneumatic systems must not contain any flammable or reactive glasses (CO2, nitrogen, or air are the most commonly used). The use of pressure vessels made of fiber containing liquefied gasses such as CO2 is not permitted. Systems with gas storage less than 60 ml (2 fl oz) are exempt from the following rules, but must comply with the following:

- There must be a safe way to charge the pneumatic system and determine its pressure.
- The actuation pressure is limited to 250 psi (17 bar).
- All components must be used with the proper specifications provided by the manufacturer or supplier. If the specifications are not available or understandable, it is up to the event organization to decide if the component in question is safe enough to be used.
- There must be a safe method for charging the pneumatic system. All pressure vessels must contain standard male quick-disconnect connectors for recharging or have an adapter for this purpose.
- All pneumatic components must be securely mounted. Special attention must be given to the mounting of the pressure vessel to ensure that in case of rupture, it does not detach from the structure.



- All pneumatic components must be regulated or certified to work with at least the maximum working pressure of the system. Approval or certification may be required for any component of the system.
- All vessels must withstand maximum pressures of 20% above their working pressure. This measure serves to provide a margin of safety in case of any damage during the fight. If the actuators, lines, or other components used work at pressures higher than 250 psi (17 bar), it will be necessary for these to be "oversized" and require pre-approval for this event.
- All primary pressure vessels must contain a regulated relief valve to prevent the internal pressure from exceeding 30% of the certified pressure (most commercial systems already have this type of valve).
- If regulators or compressors are in the line, they must have an additional control device programmed to prevent pressures above 30% of the smallest specified for the line components.
- All pneumatic systems must have a manual escape valve to isolate the tank from the rest of the system. This valve should be easily accessible.
- All pneumatic systems must have a manual depressurization valve. This valve should be easily accessible and should be kept OPEN when the robot is not in the arena to ensure that the system is not accidentally activated.
- It is required to be able to easily depressurize the robot before leaving the arena (depressurization of the entire system may be required if any damage to the components is found).
- All pneumatic systems must have gauges configured to the maximum scale indicating the pressure in the parts of the system (there must be a gauge on both sides of the regulators).
- If reflux valves are used anywhere in the system, it must be ensured that the parts isolated by it can be depressurized and have overpressure control devices.
- Any pneumatic system that does not use regulators, or contains heaters or pressure boosters, or operates above 2500 psi (172 bar) requires pre-approval from the organization.

Please understand that pneumatic systems that operate at very low pressures (less than 100 psi - 7 bar), small volumes (reservoirs of 1216 g), single-actuation applications, or pneumatic systems used in internal actuations (as opposed to external weapons) do not need to follow the rules above.

Compressed or liquefied gasses to be used in pneumatic systems must be in pre-approved cylinders in a specific location at the event.

Contact the event organization if any exceptions are needed.

2.6. Hydraulic Systems

Every hydraulic component must be assembled safely. Special attention must be taken during the assembly of the pump, accumulator, and structure to ensure that in case of rupture, the jet does not escape from the robot.

All hydraulic components must be regulated or certified to work with at least the maximum working pressure of the system. Approval or certification may be required for any component of the system.

Any accumulator or large reservoir must be regulated to withstand 20% above its working pressure (this measurement is taken to have a safety margin during fights).



Every hydraulic system must contain a relief valve sized to ensure a maximum pressure of 130% relative to the most critical component. This valve must be above the total volume of the pump and regulated to support the total volume of the hydraulic pump.

Every hydraulic system must have a manual relief valve that is easily accessible and can be disabled without danger.

All hydraulic systems must have gauges configured at the maximum scale indicating pressure in parts of the system.

All hydraulic systems cannot use flammable or corrosive fluids and must be designed not to leak if inverted.

Any hydraulic system that has pressure intensifiers, or uses pressures above 5000 psi (without an accumulator) or pressures above 2000 psi (with an accumulator) must be pre-approved by the event organization.

Please note that simple low-pressure and volume hydraulic systems such as brakes do not need to adhere to the rules above. Contact the organization if an exception is needed.

2.7. Combustion Engines and Permitted Fuels

All commercially available fuels for automobiles and models are allowed. Alcohol, nitromethane, rocket fuel, and other special types require pre-approval. Fuel lines and tanks must be made of high-quality material, and all ends must be securely sealed.

All fuel tanks and lines must be well protected and shielded from moving and heat-generating regions inside the robot. The maximum volume allowed for fuel storage must be enough to operate the engine for no more than 1 minute beyond the round period plus the pre-round and preparation period. The total volume, including combustion engines and pyrotechnic weapons (if allowed), cannot exceed 600ml unless pre-approved by the event organization.

All motor outputs connected to weapons or control systems must be coupled to a clutch that will engage them when deactivated (not applicable to generator motors or hydraulic pumps).

Any motor connected to a weapon must be capable of starting even with the safety locks engaged. All motors must return to the neutral position or be turned off in case of loss of radio signal.

All motors must have a remote shutdown method.

Any robot with fuel and oil must be properly designed not to leak even when inverted (insignificant amounts of oil are tolerated, but if it affects the opponent and nearby combatants or requires cleaning due to leakage, it will be disqualified from the round). The use of any motor system beyond the conventional piston (e.g. turbines, etc.) requires pre-approval by the event organization.

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2.8. Rotating Weapons or Robots that Spin on their Axis

Rotating weapons that can reach the arena's protective walls during normal operation must be pre-approved by the event organization (contact with the arena bumper is allowed and does not require pre-approval).

Rotating weapons must come to a complete stop within 60 seconds. If necessary, the robot must use a brake system, which can be mechanical or electronic.



2.9. Springs and Energy Storage Devices

Any large spring used in locomotion or weapons must have a device capable of arming and disarming it remotely using the robot's own force. Under no circumstances should these springs be armed when the robot is outside of the arena. Small springs, such as those used without actuators or with small internal functions, are excluded from this rule.

Any energy storage device or similar device must not spin or store energy outside of the arena. There must be a way to generate and dissipate the energy through a remote device using the robot's own force.

All springs, energy storage devices, and similar kinetic energy storage devices must have a safety system that returns them to a safe position in the event of signal loss or loss of force.

2.10. Prohibited Weapons and Materials

The following weapons and materials are expressly prohibited:

- Weapons designed to cause invisible damage to the opponent, including but not limited to:
 - Electric weapons.
 - Interference generators, etc.
 - Generating noise using a combustion engine (please use proper shielding for these devices).
 - Permanent electromagnetic fields or electromagnets that affect the electronics of other robots.
 - Weapons or protections that completely immobilize one or more robots. This includes nets, tapes, lines, and interlocking devices.
- Weapons that require significant cleaning or otherwise damage the arena, affecting future rounds. This includes, but is not limited to:
 - Liquid weapons not specifically approved in the special weapons section (item 2.11 the robot cannot have liquid that leaks even when superficially damaged).
 - Foams and liquefied gasses.
 - Powder, sand, beads, and other solid waste not specifically approved in the special weapons section.
- Tethered or untethered projectiles are expressly prohibited.
- Heat and fire are prohibited as weapons. This includes, but is not limited to:
 - Heat or fire weapons not specifically approved in the special weapons section.
 - Flammable liquids or gasses not specifically approved in the special weapons section.
- Explosives or flammable solids such as:
 - Gunpowder/cartridges.
 - Military explosives.
- Light and smoke as a weapon to hinder the vision of robots by operators, judges, officials, or spectators (it is allowed to physically impair the opponent's vision using your own robot). This includes, but is not limited to:
 - Smoke or dust weapons not specifically approved in the special weapons section.



- Lights such as lasers above "class I" and strobe lights that can blind the opponent.
- Hazardous materials are prohibited anywhere in the robot that has contact with humans or may come into contact in case of damage. Please contact the organization if you have any questions.

The event organization may bar the participation of robots deemed unsafe or with weapons that may harm the integrity of the arenas.

2.11. Description of Allowed Special Weapons

Fire and heat are allowed as long as they follow the rules presented in this section. Weapons that use fire may be modified according to local safety restrictions.

The fuel must leave the robot and be ignited in a gaseous state. It cannot leave the robot in a liquid or gel form.

Permitted types of fuel are propane and butane, with a maximum amount of 150 ml allowed for robots up to 30 pounds and 480 ml for robots 60 pounds and above. The tank where the fuel will be stored must be as far away as possible from the armor and protected against heat sources. The ignition system must have a remote on/off system.

Smoke effects are allowed in small amounts at this event. Please contact the organization if you are planning to use them.

If a robot has a weapon with characteristics not mentioned in these rules, the builder must contact the event organization in advance to request approval.

3. Safety Inspections

All robots competing in the robot combat class must undergo safety inspections, including the static inspection, which must be carried out in the team's box, and the dynamic inspection, which must be carried out in the competition arena.

The robot must comply fully with item 2. If the responsible inspector finds any violation or non-compliance with the restrictions presented in item 2, the robot will not be approved to compete.

If the robot fails to pass both inspections, it cannot participate in the competition.

3.1. Static Inspection

The static inspection is carried out at the team's workbench or box. During the static inspection, the following items will be inspected:

- Device to suspend the robot, so that the wheels or locomotion system are not in contact with the team's workbench.
- Properly isolated wiring and power transmission terminals.
- Structure or device that protects sharp or cutting parts.
- ON/OFF device for activating the robot's systems. The position of this device (main switch), as well as the direction for turning on/off, must be indicated on the robot.
- Presence of LED or Lamp indicating the power supply of the robot. Structure or device to lock the weapon system.
- Battery.
- Battery chargers must be specific to the chemistry of the batteries that the robot is using. If Lithium Polymer (LiPo) batteries are used, the charger must incorporate a balancing cable, and a LiPo Sack must be used. Regarding the LiPo Sack, all robots



using LiPo batteries must use the LiPo Sack at all times when the batteries are not inside the robot during a round.

- Pneumatic and hydraulic systems must comply with competition rules.
- Leakage no visible or audible fluid or gas leaks are allowed.

3.2. Dynamic Inspection

The dynamic inspection is carried out inside the arena. During the dynamic inspection, the following items will be inspected:

- Robot weight.
- Transmission and reception system of signals, ensuring that the robot is receiving the appropriate signal without interference.
- The lighting system, whether with LED or Lamp, must be turned on and clearly visible from the outside of the arena.
- The robot's locomotion must be controlled. The robot must move from one end to the other of the arena in a maximum of 1 minute, regardless of the movement type (can be done with the weapon activated or not, in the case of robots with an active weapon).
- The fail-safe system of the weapon and locomotion system will be tested. Both the weapon and locomotion must stop completely when the robot loses the signal with the radio control.
- Verification of the safety lock(s) of the weapon(s) in operation.
- The weapon must be able to stop completely within 60 seconds after being remotely deactivated.

4. Competition

This section clarifies all points governing the robot combat competition of events endorsed by the Brazilian Robotics League (LBR).

4.1. Arena

Robot battles must take place in completely enclosed arenas with walls made of translucent polycarbonate to provide safety, preventing parts of the robots or other objects from leaving the arena and allowing clear vision for pilots, judges, and the audience present at the event.

The table below shows the minimum specifications that arenas must have for each class to ensure the safety and dynamics of the events.

Class	Minimum Thickness of Polycarbonate	Minimum Arena Area	Minimum Height
Fairyweight	2 mm	1 m2	1 m
Antweight	3 mm	2,25 m2	1 m
Beetleweight	4 mm	4 m2	1 m
Hobbyweight	6 mm	16 m2	2 m
Featherweight	8 mm	36 m2	2 m
Lightweight	9.5 mm	49 m2	2 m



4.2. Competition Format

The robot combat competition consists of rounds with direct confrontation between robots, where only one robot is declared the winner of the round, and there is no possibility of a tie. The number of robots per round is two, with the possibility of this number being higher due to multi-robots (as per item 2.1).

The rounds are conducted in a modified double elimination format, where competitors start in the center of the tree called the key. The initial keys will be defined by a random system. In case of victory, the robot moves to the winners' tree, and in case of defeat, it moves to the losers' tree. The competitor is only eliminated after the occurrence of a second defeat. The competition ends with a battle between the winner of the winners' tree and the winner of the losers' tree in a single round. It is worth noting that friendly rounds are allowed.

In this case, the involved teams are requested to contact the event officials and verify the possibility.

4.3. Rounds

The rounds of the Fairyweight (150g), Antweight (454g), and Beetleweight (1360g) classes must have a duration of 2 minutes.

The other weight classes above the Beetleweight class (1360g) must have a duration of 3 minutes.

Competitors are given the right to an interval of at least 40 minutes between one round and another of the same robot. After this time, the organization has the right to eliminate the robot by Walkover (W.O.) if the robot does not show up at the designated location for the round. This time is calculated from the moment the competitor leaves the arena after the round. It is recommended that any maintenance (such as battery charging) be able to be performed within this period.

4.4. Round Start Procedure

Round start procedure:

- The robots will be weighed before entering the arena. If the robot is not within the weight limit of the class, it will be declared a loser.
- The robots must always be turned off, wedged, with the weapon device locked, and with the appropriate protections until the safety official authorizes the removal of these items.
- The order of entry and the position of each robot inside the arena will be determined by the safety official.
- When placing the robot in the arena, energizing, and removing the safety locks, if the robot does not turn on, move, or have any other problem, the team will have 1 minute to try to solve the problem on-site without removing the robot from the arena. At the end of this time, the judge will ask the team with the robot problem if they will still compete or lose to W.O.
- After the robot check, the safety official will first request the removal of the wedges and protections of each robot. At this point, the weapon lock should still remain on the robot.
- The safety official will then request that the competitor remove the weapon lock from their robot and then leave the arena.



• The event officials may request the fail-safe test of the robots before the round starts. This will occur when one of the robots has already had fail-safe problems in a previous round at the same event or during the safety inspection. If the fail-safe system of any of the robots fails, the robot whose fail-safe has failed will be considered the loser. If the fail-safe of both robots fails, the winner of the round will be determined by a draw.

4.5. Procedures and Conduct During the Round

Some procedures and conduct during the round must be followed:

- To corner or keep the opponent cornered will be considered pinning, even if the attacker doesn't maintain direct contact. In this case, the attacker must distance themselves so that the cornered robot can move freely in all directions to be considered released. The attacker is required to release the opponent within 10 seconds after the attack. It is up to the Round Judge to count and inform the competitor to release the opponent. If the competitor does not obey the orders of the Round Judge, they will be declared the loser.
- If the robots become entangled with each other, the round will be interrupted for their separation.
- Regardless of the situation, when pilots are asked to turn off their radio controls, if the fail-safe system of any of the robots fails, the robot whose fail-safe failed will be considered the loser. If the fail-safe of both robots fails, the winner of the round will be determined by the judges.

4.6. Determining the Round Winner

If the robot does not show controlled movement, meaning if the controller cannot demonstrate sufficient control when requested by the round judge, a 10-second countdown will be started, and at the end, the robot will be declared the loser by knockout. If there is any attack by the opponent during the countdown, it will be restarted.

During the round, there must be two Round Judges, each one standing next to the pilot of each team, guiding them according to the described procedures.

If both robots become incapacitated at the same time, the round will be determined by the judges.

Robots that can physically separate, with independent controls, are considered multi-robots. As long as at least one of its segments is active, moving when requested, the competitor is "alive." To be considered knocked out against a multi-robot, all its segments must be incapacitated.

It is possible for a robot to get stuck in the arena during the round. If this happens, no external intervention of any of the involved teams will be allowed while the round is taking place (such as kicks, slaps, and punches on the arena, among others). If such an act is detected by the round judge, the team's robot that intervened will be automatically declared the loser of the round. If it remains stuck for 10 seconds of countdown, the robot will be declared the loser. If there is any attack by the opponent during the countdown, the countdown will be interrupted, and the fight will continue normally.

The competitor is given the right to decide if the damage caused to their robot is sufficient, requesting the end of the round to the event official. At this moment, the official will



ask if the competitor confirms the end of the round. If the competitor says "yes", the opponent will be asked to cease attacks and move away, immediately being declared the winner.

The arena may be equipped with a surrender button next to the pilots. In this case, the competitor must press the surrender button when they wish to end the round. The surrendering competitor will be declared the loser by knockout.

If the competitor fails to show up or is disqualified before the start of the round, their opponent will be automatically declared the winner.

At the end of any round, officials may request that the robot be inspected. The competitor must immediately move their robot to the area indicated by the event official. If the robot needs to be disassembled, the official will ask the competitor to remove the parts. During the inspection, if the competitor has violated the rules, they will be disqualified and their robot will be considered the loser of the round.

All other cases will be judged by the judges, faithfully following the instructions of the document **"Robot Combat ROUNDS JUDGING CRITERIA".**

4.7 Robots with Name and/or Image Rights and Copyrights

Robots whose name and/or image are subject to exclusive licensing agreements cannot participate in events unless the team has authorization for the free use of the robot's name and image in question. Competitors must prove that there are no obstacles to the organization of the event regarding the use/ dissemination of the name and/or image.