



TECHNOXIAN
WORLD ROBOTICS CHAMPIONSHIP

RULE BOOK 2023

WATER ROCKET CHALLENGE

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TECHNOXIAN

WRC 2023 RULES BOOK

WATER ROCKET

CHALLENGE



1.0 Competition Overview

TechnoXian Water Rocket Challenge is one of the very exciting challenges of world robotics championship series. Teams design and build a water rocket within the specified dimensions, robust enough to withstand the pressure and when launched from the launch pad, it achieves the maximum altitude above ground level. The team with maximum air time will be nominated as the winner

2.0 The Team

Tournament Teams and Team members are subject to the following:

2.1.0. Team Name

All Team names must be approved by TechnoXian. The Team name must be unique and not be identical or very similar to the name of a previously-registered Team. The name also cannot be identical or very similar to any commercially-trademarked name. TechnoXian reserves the right to require the renaming of any Team whose name it deems inappropriate, offensive or conflicting. Once a Team has been accepted for entry into the Tournament, the Team's name cannot be changed, unless they receive written permission from TechnoXian

2.2.0. Team Personnel

A Team must consist of a minimum of 2 people, at least one who is not a Minor (Less than 18 Years). There are no specific limits to the maximum number of people that may be on any Team. However, there are limits on the number and age of Team members who can be on a Pit Crew. No person can be a member of more than one Team.

2.3.0. Team Technical Expertise

One member or a combination of members of the Team must have knowledge and understanding of all of the technical aspects of the water rocket.

1.0 Competition Overview

3.1.0. Field Dimensions

The Field area of the water rocket tournament would be 100 meters X 100 meters (approx.). A fixed spot for the launching pad will be marked on the competition field. The penalty area is marked by white lines. Rocket is considered to have made a penalty if it falls outside the defined area.

4.0 The Rocket

The team must design their own water rocket (minimum 2) and launch pads with safety. Commercial water rocket kits and launch pads won't be allowed. Following specifications and rules address many well-known safety issues of water rockets, but are not expected to cover all design possibilities. The team should give thought to their designs and use common sense, and be aware that inspection team will inspect and assess rockets for compliance with the safety requirements on the day of the competition.

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4.1.0. The Rocket Material

The weight of empty rocket with empty fuel tank must not exceed **0.5 kg (11 Pounds)** and the maximum allowed total height of the rocket is **76.0 cm**. The rocket shall be made of low-density materials such as paper, plastic, duct tape, and glue. Use of Metal, ceramics, and other high-density materials are prohibited. The rocket should not be too compact, that is, the overall density of the rocket (ratio of total mass to total volume) should be low in order that the rocket should “float down” slightly on descent. A handmade parachute can be used to slow down the rocket's descent so it lands softly. While designing a rocket to achieve accuracy in landing, team should strive for safety by building the rocket “larger and lighter” rather than “smaller and heavier”.

A rocket must be designed for stable flight, that is, it must have stabilizing fins in the rear of sufficient size to place the Center of Drag (COD) behind the Center of Mass (COM), also called the Center of Gravity (COG). One way to test stability is to swing the empty rocket (with fuel tank empty) around in a circle using a string tied to the rocket's COM. If the rocket is aerodynamically stable, it will automatically orient itself nose-first in its motion. The stabilizing fins must be firmly attached to the rocket and must not have sharp edges and tips.

4.2.0. Rocket Nose Shape

While a sharper nose improves aerodynamics and accuracy, for safety the nose must be somewhat rounded and made of a soft, flexible material. The nose must definitely not form a sharp, hard point. It should not break a windshield or injure anyone.

4.3.0. Fuel Tank

The water-fuel tank must be a plastic soda-bottle, not a water bottle, with a maximum size of 2 liters. A soda bottle makes an ideal fuel tank for a water rocket; the bottle should be strong, light-weight, and designed to be pressurized. The soda-bottle must be in pristine condition, with no cracks, dents, crinkles, scratches, in short, must have no defects that could compromise the bottle's strength and lead to bottle burst during pressurization and launch. Although not absolutely required, participants should consider wrapping the bottle in duct tape or similar, or encasing the bottle, for example, in a cardboard tube, to inhibit fragmentation and limit scatter in the event of burst.

4.4.0. Fuel

The rocket fuel must be water, driven by pressurized air to produce thrust. Water and air are non-toxic and non-combustible, and readily available. Air pressure must not exceed 70 psi, roughly 1/2 of the burst pressure of soda-bottles.

4.5.0. Launch Pad

The Launch pad must be of sufficiently sturdy construction to ensure a repeatable, predictable launch direction. The pad may optionally include a blast shield that disperses the rocket exhaust, a high velocity column of water, into a harmless spray, to protect participants and spectators and to prevent mud splatter from the dirt surface of the infield. Use of a launch guide pole is required to help launch the rocket in the intended direction. The launch pad may NOT be secured to the ground with spikes driven into the ground. This restriction is made to protect the field's underground sprinkler irrigation system. However, small diameter rods (wooden dowels or metal rods) which serve as guide poles may be pressed into the ground by hand, up to several inches deep.

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5.0.0 Competition Structure

During official competition play, there are key positions must be filled.

5.1.0. Referee

Each round of competition is controlled by the referee. He has full authority to enforce the rules of the competition to which he has been appointed. Referees observe and supervise the Competitors before, during and after challenges and to give final scoring and making decision. The referee is encouraged to use the designated walking area next to the field. The decisions of the referee regarding facts connected with play are final.

The referee may only change a decision on realizing that it is incorrect or, at his discretion, on the advice of an assistant referee, provided that he has not restarted play.

The referee is not held liable for any kind of injury suffered by an official or spectator, any damage to property of any kind nor any other loss suffered by an individual, club, organization, institution or other body.

The captain is the only team member that may talk to the referee.

Duties

- The general duties of Referees are Starting Competition, Stopping Competition early, declaring a win, Declaring and administering Timeouts, watching for safety violation The referee ensures a safe competition for all participants and rockets. The referee ensures a fair competition according to the rules.
- The referee ensures that there is no interference by unauthorized persons or team members.
- If at any time before or during a competition, a Referee observes disruptive or other inappropriate behaviour by any Operator or Team support person in or around the area of competition, the Referee has the authority to require that person to leave the area immediately.

5.2.0. Assistant Referee

The assistant referee supports the referee wherever he can. He is encouraged to use the designated walking area, opposite the referee. No team members are allowed to talk to the assistant referee.

Duties

- The assistant referee indicates when misconduct or any other incident has occurred out of the view of the referee.
- The assistant referee discusses unclear situations with the referee

5.3.0. Rocket Handler

Before the start of the competition, every team has to designate rocket handlers and Air pressure pump handler and Captain.

Duties

- The captain asks the referee for timeouts if necessary
- The Rocket handler can substitute a rocket during competition.
- The rocket handler asks the referee for the permission to substitute a rocket in the next stoppage and, if the referee agrees, substitutes the rocket

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5.4.0. Competition Preparation

All people that fill a role in the competition have to be ready at least 10 minutes before the start of the competition to allow the referee to make the following preparations

- **Competition Result Sheet:** The referee obtains a competition result sheet along with ball from the organizing committee. After the competition, the referee fills in the final score, collects the required signatures and submits the sheet to the organizing committee.
- **Choosing Team Colours:** The referee asks the captain of the teams about their preferred team colour (either blue or yellow). The sticker of the same colour will be given to teams to put on their rocket.
- **Game Kick-off:** Schedule of teams to play will be announced day 1 of the competition. Teams should be available as per their scheduled time.
- **Designating Rocket:** The referee asks both captain which rocket they will use. Team can change the rocket anytime during the game with referee's permission.

6.0.0 Launch Coordination

Prior to the start of a Competition, launch pad and rockets should be made available in designated area. Specifically. Launches will be coordinated by a captain of the team. To begin, a team will raise a “pressurization in progress” flag and will fuel and pressurize their rocket, allowing a Launch Inspector to verify launch pressure if requested. When a team is ready to launch, they will raise a “ready to launch” flag and, if required, team captain will notify the referee in person. When the referee gives permission to launch, the team will raise a “launch” flag, announce the launch to all present (spectators, participants, and staff), either by sounding a horn or calling out a launch sequence, e.g., “Launching in T minus 5, 4, 3, ...”, and proceed to launch. Launch announcements must be loud enough to be heard by the Referee,

6.1.0. Countdown to Start: The Referees will determine when each Team is ready to start, at which time an Operator from each Team will show a green card to indicate their Team's readiness to begin the competition.

6.2.2 Fault: If a Referee or Judge notices premature actions or any other violation of starting procedure, he or she may declare a Fault, and require a Restart.

6.3.2. Timeouts: Any Referee can call for a Timeout to stop the Competition. Team must immediately stop the movement. The subsequent actions of the Referees, TechnoXian Officials will depend upon the circumstances that resulted in the Timeout.

7.0. Winning the Challenge

Maximum time allotted (Game time) for a team to setup and launch the rocket is 10mins. Failing to which will result in the disqualification of the team.

Each team will get three chance to launch the rocket and achieve the maximum Air Time.

Referee will record the Air time of the rocket for each attempt, maximum Air time will be chosen from all the attempt and will be declared as the official Air time of the rocket.

Rocket with the maximum Air time will be nominated as the winner.

Referee' decisions in regards to the outcome of a challenge is final and binding upon all Competitors. Referee' decisions are not subject to challenge or appeal.

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8.0. General Rules of Tournament

8.1.0. Prohibited Activities: TechnoXian expects all Competitors to act in a safe and legal manner. The actions of a single Team member may be grounds for Disqualification or Expulsion of the entire Team. The following activities are prohibited; violation of any of these terms may result in Competitor and/or Team Disqualification, as determined by TechnoXian. and/or Producer in their sole and absolute discretion.

- **Unruly Behaviour:** Fighting, belligerence, threat of physical violence or other unruly behaviour, including abusive physical contact with any TechnoXian Official, will not be tolerated and can result in the immediate Expulsion of the offending Team member's entire Team from the Tournament.
- **Vehicles in Pit Areas:** Scooters, bicycles, skateboards, skates and similar vehicles cannot be used in any of the Pit Areas. In addition, powered vehicles such as Segways, hoverboards or powered scooters cannot be used or stored in the Pit Areas. The only exceptions are wheelchairs (manual and powered) occupied by disabled persons, and vehicles used by authorized personnel for Tournament operations.
- **Running and Playing:** Running in the Pit Area, except in an emergency, is not allowed. Running while carrying a charged pneumatic tank, or any sharp or otherwise dangerous part, may result in the revoking of the Pit Pass of the offender. Engaging in horseplay, tossing balls or other items, or operating remote-control vehicles or equipment in the Pit Area is also not allowed.
- **Team Property:** No Team member may deliberately touch, handle or otherwise come in contact with any Rocket, parts, tools or other equipment belonging to another Team, without the explicit verbal authorization from a member of the other Team
- **Smoking:** Use of either tobacco products, nicotine vapor devices (e-cigarettes) or similar non-nicotine delivery devices is specifically prohibited in any of the Pit Areas, and in any other indoor or nearby outdoor area that is marked as "No Smoking".
- **Alcohol Use:** No alcohol may be consumed at the Tournament by any Team member at any time. In addition, no alcoholic beverage may be brought into any of the Pit Areas. A Team member under the influence of alcohol is not allowed in any of the Pit Areas, and cannot participate in any activity involving the preparation, transport or operation of any Rocket at the Tournament.
- **Illegal Drugs:** No possession of illegal drugs or other substances or any use thereof will be tolerated at any time or place during the entire production, on camera or off. Penalty is immediate dismissal of the entire Team of the offender from the Competition and Program.
- **Firearms and Explosives:** No firearms, weapons, explosives or other dangerous items or materials of any kind may be possessed or brought to any Tournament location by any Competitor or anyone else other than authorized law enforcement personnel.
- **Lasers:** Deliberate pointing of any laser at any other person at the Tournament will not be tolerated and may result in the immediate Expulsion of the offending Team member's entire Team from the Tournament.
- **No Pets:** No pets of any kind are allowed anywhere at the Tournament. The only exception is a certified service dog being used to assist a disabled person

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8.2.0. Prize: Winner of the tournament will be awarded cash prize, certificate and trophy. TechnoXian reserve the right to make changes to the total prize pool amount and/or the prize pool allocation prior to the commencement of the Tournament.

- **Prize Forms:** Each Team Member will be required to fill out and sign his/her Team's Team Member & Prize Allocation Form prior to commencement of the Tournament. The Team Member Prize & Allocation Form specifies how that Team wants its prizes (if any) allocated amongst the Team Members. Only Team members listed on the Team Member & Prize Allocation Form are eligible to receive a prize (if any). Additionally, prior to the awarding of any Tournament prizes, each Team member entitled to part of the prize will be required to execute a Prize Acceptance Form outlining the amount of the total prize that the Team is entitled to, and portion of the Team prize to which the individual Team member is entitled.

8.3.0. Rule Changes During Competition: Rule changes between years can have unforeseen consequences. If a rule is found to cause significant negative impact to the competition, the rules may be adapted under the following conditions:

- Only between phases of the competition
- Only for major problems, as a last resort.
- The change must be approved by all team leaders (by an unanimity vote)

8.4.0. Final Authority: TechnoXian organizer shall have final authority over the interpretation and application of all Rules and decisions regarding the Rules shall be made by TechnoXian in their sole and absolute discretion. Decisions by TechnoXian in regards to the interpretation and application of the Rules, the Tournament and the Program shall be final and not subject to challenge or appeal.

NOTICE

These Design Rules may change at any time with or without specific notice to you. Any changes made to these rules will be noted in a revised Design Rules document with a higher Rev number. You acknowledge and agree that it is your responsibility to read, understand, and comply with any and all rules provided herein or otherwise by TechnoXian. It is strongly encouraged that you check these Design Rules often for any changes that may affect your design, build, and/or ability to compete in the Tournament. TechnoXian reserves the right to remove any Team from the Tournament at any time for any reason (including, without limitation, failure to meet safety and/or technical requirements) in its sole and absolute discretion