

WORLD SPACE WEEK 2026

MULTI-STAGE WATER ROCKET CHALLENGE

COLLEGE-LEVEL COMPETITION

ORGANISED BY



COLLABORATION & AFFILIATIONS



OFFICIAL COMPETITION GUIDELINES

Technical Specifications, Rules & Regulations, and Judging Criteria

Document Type	Competition Guideline — Official Release
Category	College Level
Event Window	5th October 2026
Venue	Haldwani, Uttarakhand
Organised By	Astroverse Experience Pvt Ltd

1. Preamble & Purpose

This document defines the technical, safety and operational requirements for the Multi-Stage Water Rocket Competition 2026. It is intended to provide teams, mentors, technical officials and safety personnel with a common set of requirements for the design, inspection, launch, stage separation and recovery of multi-stage water rockets.

The competition emphasizes multi-stage operation, reliable stage separation, flight stability, engineering design and safe recovery of every stage. Safety takes priority over competition performance at all times.

2. Objective

The primary objective of the Multi-Stage Water Rocket project is to design and launch a rocket that successfully executes all stage separations to achieve the maximum possible altitude with successful parachute deployment.

3. Scope, Class & Propulsion Classification

3.1 Competition Scope

The competition is designed for teams to build and launch multi-stage water rockets using either a 2-stage or 3-stage configuration.

Configuration	Specified Requirement
2-stage rocket	Height under 5 feet
3-stage rocket	Height under 7 feet

3.2 Staging Classification

- Series Staging configuration — **organizer-provided launchpad.**
- Parallel Staging configuration — **participant-provided launch mechanism.**

The initial/first-stage booster arrangement may therefore be either Series Staging or Parallel Staging, subject to the corresponding launcher requirements.

Note :Both Series Staging and Parallel Staging (Booster Staging) are accepted configurations. Teams may select either configuration according to their engineering design, provided that the

complete rocket successfully passes the prescribed technical inspection, stability assessment, propulsion inspection, recovery requirements and safety clearance.

4. Eligibility & Participant Conditions

- Teams must register within the official registration period (15 August – 20 September 2026) and Each team may comprise a **minimum of one** and a **maximum of five** participants.
- Participants must comply with all technical, safety and launch instructions issued by the Organizing Committee and Range Safety Officer.
- Each team must declare whether it is entering the 2-stage or 3-stage configuration.
- Each team must declare whether it is using Series Staging or Parallel Staging.
 - ❖ Both Series Staging and Parallel Staging (Booster Staging) are accepted configurations in the competition
 - ❖ In Series Staging, the stages shall be arranged one above another along a common longitudinal axis. The lower stage shall operate first, followed by the subsequent stage(s) after the intended stage-separation sequence.
 - ❖ Two-stage and three-stage Series configurations are permitted, subject to all applicable technical, stability, separation, recovery and safety requirements
 - ❖ In Parallel Staging (Booster Staging), one or more booster stages may be mounted alongside the central/core stage. The boosters may provide additional thrust during the initial phase of flight and shall subsequently separate or cease operation according to the approved design.
 - ❖ Parallel boosters shall be securely attached to the core stage before launch and shall be designed for safe and controlled separation or termination of operation.
- Teams using Parallel Staging must provide their own launch mechanism/launchpad and submit it for safety inspection before launch.
- The final rocket and launcher configuration presented for launch must match the declared competition entry.
- Only authorized team members may operate participant-provided launch equipment under official supervision.

5. Technical Specifications for the Rocket

5.1 Airframe & Structural Requirements

- The rocket shall use only organizer-approved pressure vessels.

- Only the standardized approved 2.0 L bottle configuration specified for the competition may be used.
- The pressure vessel must have the specified Bottle neck of 21.7–22 mm and the approved narrow-neck configuration.
- The rocket shall be structurally sound and capable of safely supporting its stages, stage connections, recovery systems and other declared components.
- All stage connections shall be secure before launch and shall permit the intended automatic separation sequence.
- The rocket shall maintain adequate alignment and stability throughout the flight.

5.2 Booster Configuration

Participants have two options for the initial/first-stage booster arrangement.

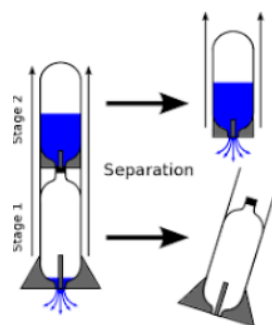
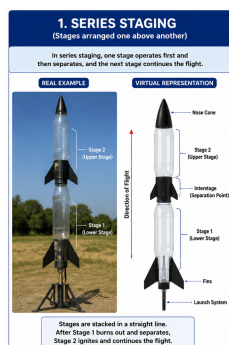
Option A — Series Staging

In **Series Staging**, the rocket stages are arranged one above another along the same longitudinal axis. The lower stage operates first and, after burnout/separation, the next stage continues the flight.

Configuration:

Payload → Upper Stage → Lower Stage

- Two-stage and three-stage series configurations are permitted.
- Each stage must be securely integrated and capable of safe separation.
- **Important** : The organizer-provided launchpad will be compatible with the approved single-booster configuration.



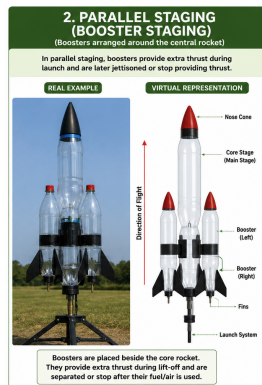
Option B — Parallel Staging

In **Parallel Staging**, one or more additional booster stages are mounted alongside the central/core stage. The boosters provide additional thrust during the initial phase of flight and are subsequently separated or safely exhausted according to the approved design.

Configuration:

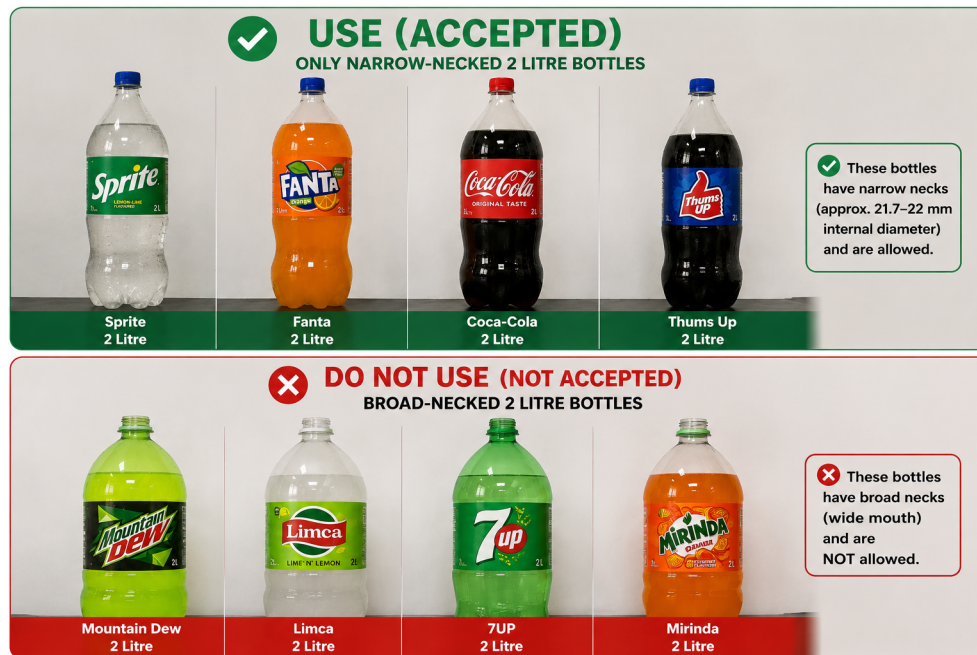
Booster + Core Stage + Booster

- Participants may use parallel boosters in the initial stage.
- **Important** : Teams choosing a multi-booster configuration must bring their own launch mechanism/launchpad.
- The launcher must be compatible with the team's rocket.
- The launcher must be submitted for safety inspection before launch.
- Approval from the event's technical/safety officials is mandatory before use.
- The organizer will not provide the launch mechanism for multi-booster configurations.



5.3 Rocket Dimensions & Configuration

Parameter	Specification / Limit
Stage configuration	2-stage or 3-stage
2-stage configuration height	Under 5 feet
3-stage configuration height	Under 7 feet
Standard bottle	1 × approved 2.0 L bottle
Bottle neck	21.7– 22 mm
Bottle type	Approved narrow-neck bottle



5.4 Centre of Mass & Stability

- All rockets must demonstrate safe and adequate flight stability.
- Technical inspection may check fin installation, nose cone, body alignment, stage connections and centre of mass.
- Loose components are not permitted.
- A rocket considered unstable or unsafe may be rejected before launch.

5.5 Stage Separation Requirements

- Each stage must be capable of separating safely from the previous stage.
- The separation mechanism may be mechanical, pressure-based, pneumatic, electronic, or another approved mechanism.
- The stage-separation system will be inspected before launch.

PROHIBITED STAGE-SEPARATION ACTIONS

Manual pulling of release mechanisms; remote manual activation; physical intervention after launch; or any system that intentionally directs separated components toward spectators.

5.6 Recovery System Requirements

- Every stage must have its own independently attached recovery system.
- Each stage must carry its own parachute or approved recovery system.
- The recovery system must deploy automatically.
- Manual deployment is not permitted.

- The parachute must be securely attached to its stage.
- The recovery system must not interfere with propulsion or stage separation.
- The recovery system must be inspected before launch.
- A rocket with a stage that has no recovery system will not be permitted to launch.
- The purpose of the requirement is to reduce the descent speed of individual stages and minimize the risk of damage or injury during recovery.

Configuration	Required Recovery Arrangement
2-stage	Stage 1 + parachute → separation → Stage 2 + parachute
3-stage	Stage 1 + parachute → separation → Stage 2 + parachute → separation → Stage 3 + parachute

6. Safety Guidelines

6.1 Materials & Propulsion

- The rocket must be powered by water and compressed air.
- Combustion is prohibited.
- Chemical propellants are prohibited.
- Explosives are prohibited.
- Pyrotechnic propulsion is prohibited.
- Flammable fuels are prohibited.
- Solid rocket motors are prohibited.
- Liquid rocket motors are prohibited.
- Any external propulsion assistance is prohibited.
- Teams must never exceed the organizer's specified operating-pressure limit.
 - ❖ Only organizer-approved 2.0 L narrow-neck plastic bottles with a 21.7–22 mm internal neck diameter shall be used as pressure vessels.
 - ❖ PET plastic beverage bottles of the approved specification shall be used; glass bottles are strictly prohibited.
 - ❖ Fins, nose cones and stage connectors may be made from lightweight plastic, cardboard/kraft board, foam board or other organizer-approved lightweight materials.
 - ❖ All materials shall be free from cracks, cuts, deep scratches, deformation, heat damage or chemical damage.

PRESSURE SAFETY

The organizer shall specify the maximum allowable operating pressure for the approved launch system. Teams must never exceed the specified pressure limit. No pressure-vessel condition that appears damaged, questionable or unsafe may proceed to launch.

6.2 Launch Site & Launcher Safety

- Series Staging configurations shall use the organizer-provided launchpad.
- Parallel Staging configurations shall use a participant-provided launcher that has passed safety inspection and received official approval.
- All launchers must be structurally stable and compatible with the rocket.
- Only authorized team members may operate participant-provided launch equipment under official supervision.
- All teams and spectators must remain outside the designated restricted launch area.

6.3 Weather & Range Conditions

The Organizing Committee / Range Safety Officer may postpone or stop launch operations whenever weather, visibility, wind, lightning, site conditions or any other factor makes the operation unsafe.

The Range Safety Officer has final authority to suspend, delay or cancel a launch for safety reasons.

7. Pre-Launch Technical Inspection & Documentation

Every rocket and, where applicable, every participant-provided launcher must successfully clear technical and safety inspection before entering the launch area.

Inspection Item	Required Check	Status
Configuration	2-stage or 3-stage configuration	☐
Booster arrangement	Series or Parallel declared	☐
Pressure vessels	Approved bottle(s)	☐
Bottle condition	No cracks, cuts, deep scratches, deformation or other unacceptable damage	☐
Stage connections	Secure and ready for separation	☐
Fins	Secure	☐
Nozzle system	Secure	☐

Stage separation	Automatic separation system	☐
Stage 1 recovery	Parachute/recovery system installed	☐
Stage 2 recovery	Parachute/recovery system installed	☐
Stage 3 recovery	Parachute/recovery system installed, where applicable	☐
Recovery deployment	Automatic deployment	☐
Parachute attachment	Secure attachment	☐

Launcher Configuration	Required Inspection
Series Staging	Organizer launchpad used; interface, mounting arrangement, pressure limits and safety requirements verified
Parallel Staging	Team-provided launcher inspected and approved by safety officials

8. Technical Specifications Summary

Parameter	Specification / Limit	Safety / Compliance Standard
Rocket type	Multi-stage water rocket	Water + compressed air only
Stages	2-stage or 3-stage	Every stage must be recoverable
2-stage height	Under 5 feet	As specified in competition brief
3-stage height	Under 7 feet	As specified in competition brief
Standard bottle	1 × approved 2.0 L bottle	Bottle neck 21.7–22 mm
Series staging	Organizer launchpad	Organizer procedure and pressure limits apply
Parallel staging	Participant-provided launcher	Mandatory technical/safety approval
Stage separation	Automatic	Manual intervention prohibited
Recovery	Independent parachute/recovery for every stage	Automatic deployment mandatory
Operating pressure	Organizer specified	Must never be exceeded

Pressure vessel condition	Approved, undamaged bottle	Damaged/questionable vessels rejected
Propulsion	Water + compressed air	No combustion/chemical/explosive/pyrotechnic/solid/liquid propulsion

9. Competition Compliance & Disqualification Conditions

A team/rocket/launcher may be removed from launch or disqualified for any of the following:

- Using prohibited propulsion.
- Exceeding the specified pressure limit.
- Using an unsafe, damaged or unapproved pressure vessel.
- Failing to provide a parachute/recovery system for every stage.
- Using manual activation or physical intervention for stage separation during flight.
- Using an unapproved launcher.
- Entering the restricted launch area without permission.
- Ignoring safety instructions.
- Modifying the rocket after inspection without approval.
- Intentionally creating a hazardous flight condition.
- Tampering with another team's equipment.
- Attempting to circumvent competition rules.

10. Judging Criteria & Scoring

The supplied Multi-Stage Water Rocket Competition specification defines the technical and safety requirements but does not provide a numerical judging weightage or final scoring matrix. The Organizing Committee should communicate the final marks/weightage to all registered teams before the competition.

Judging Parameter	Evaluation Focus
Height	Maximum verified altitude achieved by the rocket during the flight.

Execution of Stages	Successful and sequential operation of the stages, including proper stage separation and continuation of flight.
Parachute Deployment	Successful and timely deployment of the parachute/recovery system and controlled descent of the rocket.
Flight Stability	Stability and control of the rocket throughout the flight, including during stage operation and separation.

IMPORTANT NOTE	Teams that submit a CAD (Computer-Aided Design) model/drawing of their rocket along with the project documentation may be awarded additional bonus points under the judging criteria. The CAD model should clearly represent the final rocket design and major components.
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