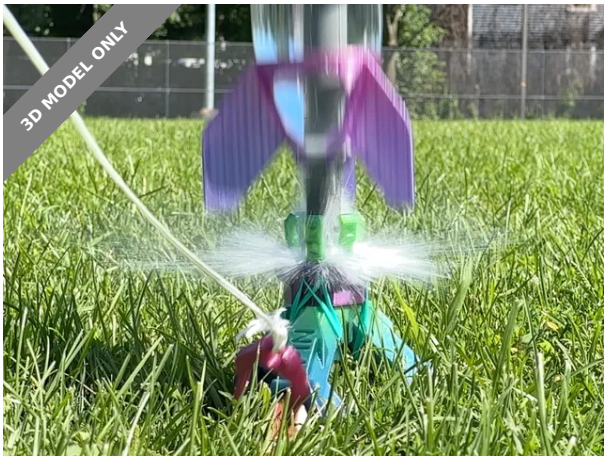

Water Rocket Launcher

Marimo Labs

VIEW IN BROWSER

updated 23. 3. 2025 | published 23. 3. 2025

Summary

3D-printed water rocket launcher. Snap-fit, no adhesives, global compatibility, pipe-optional.

Learning > Engineering

Tags: bottle rocket thingiverse launcher scienceeducation plasticbottle raketa sodabottle seltzer petbottle waterrocket fusee rakete bottlerocket

Water Rocket Launcher v1.42 - 20 May 2024

A full-bore water rocket launcher system designed for easy assembly and universal compatibility.

July 2024 update: Kits available! For those without ready access to 3D printers, you can purchase a kit will all parts from Macy Makes 3D. Proceeds go toward making the design more accessible, particularly for educators. Contact me at launcher@marimolabs.com from your institutional email address if you are an educator in need of a launcher.

- Video instructions above.
- Written instructions on Instructables: https://www.instructables.com/Simple-3D-Printed-Water-Rocket-Launcher/

- Detailed design discussions at: marimolabs.com
- Read and follow the Safety Instructions PDF on the downloads page.

Disclaimer

Hey. Pressurized systems are dangerous. Know what you are doing and take appropriate safety precautions. Make your own assessment about whether this project is appropriate for what you are trying to do, and use at your own risk. Do not attempt without appropriate experience, protective equipment, and tools. Most water rocket guides recommend not pressurizing past 60psi/4 bar. Always secure the launcher to the ground.

PARTS LIST

Non-Printed

- TR414 Tire valve stem
- O-ring 15mm ID x 3.5mm thickness x 22mm OD (if unavailable locally, can try TPU printable version by lemonydes)
- Schrader (car/mountain bike) valve hose extension
- Rubber bands, any, but silicone #33 (3 1/2" x 1/8") are nice
- String to tie to Launch Pin
- Parts for specific Cores:
    - Type B Universal: Reusable straw, 7.6-8mm OD (prevents water backflow into pump but not strictly necessary)
    - Type C: 20cm of corresponding PVC pipe for launch tube

Printed

For a launcher that can be built anywhere in the world to launch all* soda/seltzer bottles in common production:

- Base
- Collar (* see note below)
- Clamp x6 *
- Core Type B *
- Launch Pin
- Leg x3
- Peg x3 (don't skip securing the launcher to the ground!)
- Carrier

Unique to Germany are Mehrwegflaschen - a specification for reusable/refillable bottles. These may have a flange height of 23mm and diameter of 37mm, requiring special Clamps. They may also benefit from a special Core and scaling of the Collar. Please see the Clamp remix here by @LucasF_62480. Please see Core remix and notes about Collar here by @TomTom_1424482.

CORE SELECTION GUIDE

The launcher base accepts several different “Cores”, which are the central interface to the bottle. **Core B is recommended for first builds.** Core C is recommended for higher performance.

- Core Type B Universal: Universal worldwide compatibility. No PVC pipe required.
- Core Type C Sch40: Glueless “launch tube” configuration for Schedule 40 PVC pipe. Print with 3 walls. Seams in printed parts may lead to inconsequential pinpoint leaks at high pressure. Theoretically, it may help to adjust seam position to “random”, but I have not found this necessary.
- Core Type C PN16 beta: Similar to the Sch40 version, but for metric 20mm PN16 pipe. Print with 100% concentric infill. Do not trim the TR414 valve stem. Force the whole “mushroom” into the pipe.
- Core Type C UKovf alpha: For UK overflow 21.5mm pipe. Print with 100% concentric infill. Do not trim the TR414 valve stem. Force the whole “mushroom” into the pipe. Please tell me if this core works for you, as I do not have the pipe available to me to test. Let me know if you need to scale the file.
- Development for AS/NZS DN15 PN18 (OD 21.1-21.5, ID 17.8) pipe is suspended until there is need/interest.

FINS/PAYLOADS

These are are sized specifically for Polar Seltzer brand 1L bottles and similar Trader Joe's (TJ's Eastern US; Western US may differ - please confirm) 1L sparkling water bottles.

For prototype universal fins that screw onto the bottle threads, see the prototype page.

Fins

Fins are secured with a zip-tie in the shallow groove immediately below the fins (giving clearance for clamps on the bottle ledge). These designs were inspired by @HowToHomemade's https://www.printables.com/model/442398. Re-designed from scratch to allow clearance for clamps. Please message me when they break so I know where to strategically reinforce them.

- Fins PLR1L 130: 130mm diameter. 20cm2 per fin.
- Fins PLR1L 150: 150mm diameter. 28cm2 per fin.
- Fins PLR1L 170: 170mm diameter. 40cm2 per fin.

Payloads

An 84mm diameter payload system consisting of:

- Payload Mount: Uses the flexibility of thin straps to attach to the 1L bottle specified above. Insert the straps through the Shroud before fitting to the bottle and attaching with a nylon zip tie.
- Payload Mount Shroud: Stabilizes the Payload Mount
- Payload Interlock Top/Bottom: Use for your own custom payload designs. Merge these models into the top/bottom of your payloads to connect.
- Parachute Modules are on the prototypes page, in development.

PRINT SETTINGS

Launcher Parts

- **For best results, print slowly!** Layer adhesion, bridging, and text quality will be better, and especially noticeable on PETG. While your printer may be able to move at ludicrous speed, filament sometimes needs more time and heat to form the strongest bonds. Limit print speeds to 75mm/s with external wall 50mm/s or set max volumetric rate to 8mm^3/s.
- Line width: 0.4-0.45mm
- Layer height: 0.20mm
- Walls/perimeters: 3 **(especially Core Type C)**
- Infill: 20% **except “Core TypeC PN16/UKovf”: Concentric infill 100%**
- Filament: PETG ideal (for temperature stability) but not required. PLA/PLA+ is fine, but you must protect from heat to prevent deformation.
- Supports: None
- Print bed adhesion: Some parts have small footprints and may benefit from printing with brims or rafts depending on your print bed's adhesion. These include Cores Type B/C and Launch Pin (the narrow parts sometimes lift off the bed)
- Scaling: Schedule 40 Advanced Parts that depend on pipe internal diameter (Core Type C) may need scaling. Use Gauge Sch40. Make sure there are no burrs on the inside edge of your pipe. Place Gauge on a table; put the pipe on top; push the pipe down with one finger only. Use the last covered scale factor for printing ONLY these three parts (ranges 99%-103%). Avoid the temptation to mash the pipe onto the gauge. All other parts should be printed at 100% scale.

Fins

- 1 wall, 10% infill. 3D Honeycomb infill pattern ideal, as other patterns may cause inconsistent infill in thin fins. Check your slicer preview. **Concentric** pattern top and bottom. Consider brims if your bed adhesion is low; consider slowing non-print travel speed if you have later detachment issues - the aerodynamic drag is enough to move your part and cause nozzle collision.

Payloads

- Payload PLR1L Mount: 2-3 walls for strength of attachment to bottle
- Other payload components: 1 wall, 10% infill. 3D Honeycomb infill. **Monotonic** pattern top and bottom.

CHANGELOG

2024-09-30: Updated Leg to v1.06 (top edge of opening thickened slightly for strength). Removed Leg v1.22; v.1.41-L is now standard, per notes from 2024-05-20.
2024-06-01: Added PDF safety instructions.
2024-05-20: 1) Retired PVC Legs; moved to Retired remix. This is a project milestone; the first launcher was mainly PVC pipes and plumbing with a few printed parts to hold all parts together. Summer 2023 introduced fully-printed Legs, and since then all Makes have used printed Legs. PVC Legs are retired to increase design latitude for Legs, Pegs, Base, and Carrier. 2) Base text changed to reflect new name; version update v1.21 to v1.22 but otherwise identical. 3) Updated Leg from v1.03 to v1.05 to fix a situation where a Peg could slip through the oval hole. Updated text for improved high-speed printing and Arachne slicing. Updated Peg from v1.2 to v1.41-L with 2cm longer length for more secure anchoring. Plan to make this the standard. 4) Added link to Mehrwegflaschen Core B remix by @TomTom_1424482.
2024-04-08: Site and name migration to marimolabs.com/water-rocket-launcher
2023-12-16: Updated Leg v1.03. Thinner top layer decreases chance of problems from filament overextrusion; also saves filament!
2023-11-20: Added note re: Mehrwegflaschen and link to Clamp remix by @LucasF_62480.
2023-10-03: Design discussions updated and website migrated. Available at magicsmokestat.com.

Model files

Universal Launcher (start here) 9 files

base-v122.3mf

Universal or 21.4mm OD pipe

carrier-v131.3mf

Universal or 21.4mm OD pipe

clamp-v144.3mf

Universal. Fits flange heights 15-21mm with 33mm diameter.

collar-v142.3mf

Universal

core-typeb-v12.3mf

Universal

launch-pin-v12.3mf

Universal

leg-v106.3mf

Universal

peg-v141-l.3mf

Universal

schrader-valve-tool-v10.3mf

Tool to remove internal valve from hose extension connector

TypeC PVC Cores (advanced)

4 files

core-typec-sch40-v113.3mf

Glueless Launch Tube design for Schedule 40 1/2" nominal PVC pipe

gauge-sch40-v10.3mf

Scaling: Sch40 Cores only. Place pipe on top, push with one finger. Use last covered size.

core-typec-pn16-full-concentric-infill-beta-2023-07.3mf

Glueless launch tube design for metric 20mm PN16 pipe. Print with 100% concentric infill

core-typec-ukovf-full-concentric-infill-alpha-2023-… .3mf

Glueless launch tube design for UK overflow pipe. Print with 100% concentric infill

Fins (Polar Seltzer 1L bottles)

3 files

fin-plr1l-swept-130-v10.3mf

Small fins. Inspired by @HowToHomemade's Model 442398

fin-plr1l-swept-150-v10.3mf

Medium fins

fin-plr1l-swept-170-v10.3mf

Large fins. Clip away thin supporting bridges.

Payloads (Polar Seltzer 1L bottles) 4 files

payload-plr1l-mount-v10.3mf

Bend 5 straps into the Shroud and zip-tie to round end of bottle

payload-plr1l-mount-shroud-v10.3mf

Covers mount's straps for stability & aerodynamics. Can print upside down for better adhesion.

payload-interlock-top-v10.3mf

Top 84mm payload interlock for remixes

payload-interlock-bottom-v10.3mf

Bottom 84mm payload interlock for remixes

Other files

water-rocket-launcher-safety-instructions.pdf

Read this! rev 2024-05

License

Attribution—Noncommercial—Share Alike

✖ | Sharing without ATTRIBUTION
✔ | Remix Culture allowed
✖ | Commercial Use
✖ | Free Cultural Works
✖ | Meets Open Definition