### High-Pressure Foam Rocket: DIY Guide & Safety Tips

A **high-pressure foam rocket** is a type of water rocket that uses compressed air and foam (like from a pool noodle or foam pipe insulation) to create a lightweight, high-flying projectile. These rockets are popular in STEM education, backyard experiments, and hobbyist rocketry due to their simplicity and impressive launches.

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## 🚀 How to Build a High-Pressure Foam Rocket

### Materials Needed:

✓ **Foam body** (pool noodle, foam pipe insulation)
✓ **Plastic soda bottle** (2L works best)
✓ **PVC pipe & fittings** (for launcher)
✓ **Bike pump or air compressor** (for pressurization)
✓ **Duct tape & zip ties** (for reinforcement)
✓ **Plastic fins** (for stability, cut from folders or bottles)
✓ **Water** (acts as a reaction mass)

### Step-by-Step Assembly:

1. **Rocket Body:**
   - Cut a **12–24" section of foam** (pool noodle or pipe insulation).
   - Seal one end with **duct tape or a foam cap** (for aerodynamics).
2. **Nozzle & Pressure Chamber:**
   - Attach the foam body to a **2L soda bottle** (the pressurized chamber).
   - Reinforce the connection with **zip ties and duct tape** (must be airtight).
3. **Fins (Stabilizers):**
   - Cut **3-4 fins** from plastic or cardboard.
   - Attach them symmetrically at the base for stability.
4. **Launcher Setup:**
   - Use a **PVC pipe launcher** with a bike valve for pressurization.

- Fill the bottle **1/3 with water** (too much reduces height).

5. **Launching:**

- Pump to **60–100 PSI** (safety first—wear goggles!).
- Release the trigger and watch it soar **100+ feet!**

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## ⚠ Safety Precautions

- **Never exceed 100 PSI** (risk of bottle explosion).
- **Wear safety goggles** and stand back.
- **Launch in open areas** (away from people, cars, power lines).
- **Use a release mechanism** (never hold while pressurizing).

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## 🎯 Tips for Maximum Height & Distance

- **Optimal water volume:** ~30% of bottle capacity.
- **Smooth fins** reduce drag (sand edges if needed).
- **Angle launcher at 45°** for best distance.
- **Experiment with foam shapes** (pointed nose = better aerodynamics).

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## 🔧 Advanced Modifications

- **Parachute recovery system** (add a slow-release chute).
- **Carbon fiber reinforcement** (for higher PSI launches).
- **Multiple-stage rockets** (attaching sequential bottles).

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## 📚 Educational Applications (STEM)

- Teaches **Newton's 3rd Law** (action-reaction).
- Demonstrates **pressure, aerodynamics, and trajectory**.
- Great for **science fairs & physics classes**.

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### Where to Get Supplies?

- **Hardware stores** (PVC, foam, tape)
- **Dollar stores** (pool noodles, bottles)
- **Online** (Amazon for bike pumps/launch kits)