

Central Washington University  
Ellensburg, Washington  
Society of Physics Students

**Using Water Rockets to Launch Interest in Physics**  
**Marsh White Final Report**

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In the fall of 2012, the Central Washington University Society of Physics Students (CWU-SPS) proposed a water rocket program for Ellensburg students in the late elementary to middle school level. The group applied for and received the Marsh White Award in order to gain funding to purchase the equipment necessary for this outreach event, which included sets of metal launch pads, bike pumps, one way air valves and pipes. Using the award money, two sets of the above materials were purchased, with all additional funds being covered by the CWU physics department. The department also covered the extra cost of manufacturing two additional sets of launch pads, for a total of four water rocket stations. The event was a success, with multiple students learning about aerodynamics and propulsion. Additionally, CWU-SPS saw many students develop skills in problem solving and engineering while designing their rockets.

CWU-SPS first purchased two launch pad units, each priced at roughly \$120.00 each. Upon obtaining these stands, the group came to the conclusion that, with the physics department's facilities and support, the additional units to the original pair could be manufactured personally at a significant fraction of the original cost. After succeeding in creating two units, the rest of the supplies were purchased with funds supplied by the physics department and CWU-SPS began to collect cardboard and plastic bottles from its members for rocket supplies. The club implemented new recycling facilities in the study room in order to continue to acquire materials for future events.

The first water rocket outreach event took place on May 18<sup>th</sup>, 2013, on the CWU community fields. In addition to the water rockets, CWU-SPS brought various other aerodynamic demonstrations, such as kites and Frisbees, for attendees to play with. Students were captivated by the simplicity of the project, and were excited to build their own design and to have creative control of their own rockets. Safety was a priority with all rocket launches – everyone was required to stand a safe distance from the launch pads, and the person launching the rocket was encouraged to launch from as far back as the ropes would allow. One student's development of his rocket was particularly inspiring. His initial design had resulted in a rocket which did not fly at all, but rather than be discouraged he continuously tried new additions and altered his rocket. After almost an hour of trial and error, his rocket flew the furthest. He later told his parents that he wanted to major in physics when he grew up. The event was successful and saw a good turnout from students and community members.

The water rocket program is being adapted as a staple of CWU-SPS outreach activity. Plans for a second, larger event are finalized for this summer. This event will be in a more formal educational environment, as opposed to the open outreach structure of the May 18<sup>th</sup> event. CWU-SPS expects to

reach a larger audience and to reinforce the science background at this event.

Future developments to the program are currently being considered. While testing the launch pad units which CWU-SPS constructed compared to the ones which were purchased, there were some performance issues which will be addressed. For instance, units the club built had a larger chance of having the metal piece keeping rockets in place getting stuck or allowing the rocket to pop off the stand with minimal pressure. During tests this was fixed to ensure safe rocket launches, but it would be preferred if they were more reliable so that all stations would be operating at equal efficiency.

Finally, CWU-SPS would like to thank you for the opportunity to develop this program. This program has created a new avenue by which we can bring the full excitement of physics to the k-12 school community and the general public.

Budget:

2 Launch pads; \$119.00 each + \$25.00 shipping and handling	\$263.00
2 Large bike pumps; \$54.99 each	\$109.98
2 One way air valves + pipes; \$10.00 each	\$20.00
Rocket materials (Soda bottles, cardboard, tape, etc.)	\$20.00
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	Total: \$412.98
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Requested funds from the Marsh White Award:	\$300.00
Remaining amount to be covered by CWU:	\$112.98
 Additional two systems:	 \$412.98











