# CALIFORNIA STATE SCIENCE FAIR
## 2012 PROJECT SUMMARY

**Name(s)**
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**Project Number**
**J0117**

**Project Title**
## Patterns of Fluid Dynamics

**Abstract**

**Objectives/Goals**
How does the shape of an object affect the water flow? This project was designed to understand how different shapes are more efficient than others. It could also potentially help save energy.

**Methods/Materials**
1. I sketched designs of testing equipment that I would need to machine. 2. Using Solid Works I designed the bottom plate. 3. Using a mill at Meziere Enterprises Inc. I machined bottom plate. 4. Using the test tube I tested the fit of the bottom plate. 5. Using a mill at Meziere I machined top plate. 6. I machined five legs for the mechanism to stand on. 7. I put it together to test the fit. 8. I collected testing parts. 10. I tested all objects 3 times each. 11. I collected data from the video camera. 12 .I analyzed the data collected. 13. I made graphs.

1. Two aluminum plates 610mm x 610mm x 13mm; 2. Five aluminum rods 37mm diameter x 762mm long; 3. eight steel 3/8-16 threaded rods 457mm long. 4. One aluminum spool 110mm diameter x 120mm long. 5. One stainless steel rod 20mm x 610mm long. 6. One plastic tube 406mm diameter x 406mm long. 7. Five stainless steel test objects: 19mm diameter x 30mm long 8.680g weight 9.2 pulleys 10.6mm diameter x 213cm rope

**Results**
All of the tests in my project proved incredibly consistent. The teardrop and double radius parts showed the least amount of drag. The double indent had the most drag. It appeared to make large currents. This could be the cause of its odd path. You can also see this, but less, in the double flat shape. The most dynamic shape was the teardrop point forward.

**Conclusions/Discussion**
In my testing objects with smooth transitions cause the least amount of drag. This also explains why objects with rough transitions build up great amounts of drag. The double indent, the object with the most drag, has no place for the water to travel to once it is in it. The teardrop shapes start at a point and rounds in to a half radius at the opposite side. My hypothesis was, #The shape of the object will affect the resistance of water flow.# This hypothesis proved right. This is because no objects had the same amount of resistance as another. Although every shape has the same frontal area, none of the objects have the same shape.

**Summary Statement**
In my project I tested the difference of drag through water on six different objects all containing the same frontal area.

**Help Received**
Meziere Enterprises provided material, machines, video camera, and computers so I could make test fixtures; Kyle M. provided information on design of test fixture; Michel M. provided information on machines and materials; Don M. provided information on machines and programs; Joel M. videotaped