



California Science Center
CALIFORNIA STATE SCIENCE FAIR
2001 PROJECT SUMMARY

Your Name (List all student names if multiple authors.) Daniel S. McLaughlin	Science Fair Use Only
Project Title (Limit: 120 characters. Those beyond 120 will be ignored. See pg. 9) Autorotation of Polygonal Prisms in an Airstream	J0924
Preferred Category (See page 5 for descriptions.) 9 - Fluid Mechanics/ Aerodynamics/ Thermophysics	Division <u>X</u> Junior (6-8) _ Senior (9-12)
Abstract (Include Objective, Methods, Results, Conclusion. See samples on page 14.) Use no attachments. Only text inside these boxes will be used for category assignment or given to your judges.	
<p>Objective: My objective was to see if the number of lateral faces on a right polygonal prism affected its speed of autorotation in an airstream.</p> <p>Materials and methods: I created 6 right prisms 10 inches high, with a diameter of 2 inches, with bases of 3, 4, 5, 6, 7, and 8 sides. I placed one in a wind tunnel, mounted on a low friction bearing, and fed it an airstream perpendicular to bearing axis. I measured the speed of the wind with a ping pong ball suspended on a string in the airstream and measured the deflection angle. I calculated the airspeed with the equation: $\text{airspeed in meters/second} = 8.1 * \sqrt{\tan(\text{angular deflection})}$, from an article on the Scientific American website. When the prism started rotating, I measured its speed of rotation with a calibrated strobe light, recorded the data, and then mounted a new prism in the bearing to repeat the process.</p> <p>Results: After 5 trials of each prism, with the airspeed clocked at 2.4 meters per second, the 3 faced prism rotated 164 RPM clockwise and 158 RPM counterclockwise. The 4 faced prism rotated the fastest at a speeds of 165 RPM counterclockwise, and 158 RPM clockwise. The 5 faced prism rotated slower than either of them at 150 counterclockwise and 136 clockwise, followed by the 6 faced prism which spun at 119 RPM counterclockwise and 144 RPM clockwise. The 7 and 8 faced prisms only rotated counterclockwise. The seven faced prism rotated faster than the eight faced one, rotating at 61 and 34 RPM, respectively.</p> <p>Conclusions: I found that for the most part, prisms with fewer lateral faces rotated more quickly than ones with more lateral faces. The difference between the three and four faced prisms was very small. More trials are needed. Also note that on average, the prisms rotated counterclockwise faster than they rotated clockwise. This is probably due to imperfections in the equipment, so further research, with better equipment, is needed.</p>	
Summary Statement (In one sentence, state what your project is about.) The purpose of this project was to find out whether the number of lateral faces on a right polygonal prism affects its speed of autorotation in an airstream.	
Help Received in Doing Project (e.g. Mother helped type report; Neighbor helped wire board; Used lab equipment at university X under the supervision of Dr. Y; Participant in NSF Young Scholars Program) See Display Regulation #8 on page 4. Walt D. Custer helped to produce graphs.	