



**CALIFORNIA STATE SCIENCE FAIR  
2013 PROJECT SUMMARY**

<b>Name(s)</b> <b>Kenyon B. Prater</b>	<b>Project Number</b>  33111
<b>Project Title</b> <b>Is It Possible to Construct a Vacuum Airship?</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> I wanted to investigate whether it would be possible or practical to construct a vacuum airship -- that is, an airship with a "shell" filled with vacuum rather than with a lifting gas like Helium.</p> <p><b>Methods/Materials</b> I did not have the required materials and finances to build tens of model vacuum airships, so I used a computer simulation method called Finite Element Analysis. Using it, I applied the force of the atmosphere to different shapes, sizes, and materials of vacuum airship.</p> <p><b>Results</b> With the designs I tested, there were no solutions that would work with ordinary building materials like metal. However, using new materials like manufactured diamond and carbon nanotube composites, it would be possible to construct a vacuum airship.</p> <p><b>Conclusions/Discussion</b> While my results show that it would be possible to construct a vacuum airship, whether they would be more useful than a standard airship or an airplane remains to be seen. One possible use for vacuum airships is the exploration of other planets with an atmosphere. For example, while Venus' terrible conditions on the surface would melt away any probe we sent there in hours or minutes, a high-altitude blimp might be surprisingly stable. Of course, with a standard blimp, this means carrying large amounts of helium, which would be costly to transport into space. A vacuum airship would not have to carry anything, making it more practical.</p>	
<b>Summary Statement</b> I used Finite Element Analysis, a computer simulation method, to investigate the possibility and practicality of constructing a vacuum airship using new materials.	
<b>Help Received</b> My father helped explain some math and troubleshoot the Finite Element Analysis program.	