



**CALIFORNIA STATE SCIENCE FAIR  
2008 PROJECT SUMMARY**

<b>Name(s)</b> <b>Surya Sivaram</b>	<b>Project Number</b> <b>S0815</b>
<b>Project Title</b> <b>Extending the Range of UAVs through the Use of Proton Exchange Membrane Fuel Cells and Other Renewable Energy Sources</b>	
<b>Abstract</b> <b>Objectives/Goals</b> The goal of this project was to extend the range and flight duration of UAVs through the use of Proton Exchange Membrane (PEM) fuel cells and other renewable energy sources. An additional goal was to attempt to harvest a percentage of the fuel from the environment. <b>Methods/Materials</b> In order to test the practicality and efficiency of harvesting fuel from the environment, different water collection devices were tested first to see if and how much water could be collected from the surrounding atmosphere. Another part of the project involved testing model helicopter motors using a Lithium Polymer battery and recording the running times. The same test was repeated using a PEM fuel cell to power the helicopter motor. The reversible PEM fuel cell was powered by the hydrogen that the electrolyzer produced. The data from these tests were recorded and later analyzed. <b>Results</b> A fuel cell used in conjunction with a battery increases the total running time to 149% of the time with just the Li-Poly battery. A maximum of 2.5 mL of water was harvested using the most efficient rainwater collection method <b>Conclusions/Discussion</b> The use of PEM fuel cells to power UAVs is very promising. The project successfully demonstrated that PEM fuel cells, when used to augment traditional power sources, achieved the goal of increasing the range and flight duration of UAVs. The success of the UAV in harvesting its own fuel entirely from the environment is plausible but not very efficient. Since the efficiencies of future PEM fuel cells are expected to be above 75%, using PEM fuel cells to increase the flight duration of UAVs is a viable and efficient option.	
<b>Summary Statement</b> The design and construction of an alternate and renewable power source for UAVs which extends their range and flight duration.	
<b>Help Received</b> Moral support from parents. Advice from Mr. Kawanami.	