



**CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY**

Name(s) Elizabeth Thomson; Allyn Tolosa	Project Number S1894
Project Title Extinguishing Fire Using Sound Energy	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective is to duplicate the results achieved by DARPA in their developmental experiment to extinguish fire using sound energy. Our goal for this experiment is to further develop an environmentally friendly and safe method to extinguish fire in closed volumes such as aircraft's, and ships</p> <p>Methods/Materials A pair of speakers capable of producing below 40 Hz with a lot of power 12# Subwoofers for desired range of 20-80 Hz. Subwoofer amplifier capable of powering 12# speakers with a lot of power, Wiring and various plugs, Sound spectrum analyzer and microphone, Flame source (We used an oil candle for consistency), Earplugs, computer, sine wave test-tone generator app for iPhone, camera, tape measure, lighter, candle stand to elevate flames to the speaker height, paper & pencil. Set sound system up in various locations and analyze room response before beginning experiment. Record spectral data at the point when the fire extinguishes, analyze and compare. calculate the optimum frequency at each various distance and location.</p> <p>Results Results demonstrate that fire may be extinguished with sound but, the performance is dictated by the acoustic environment such as the way the various rooms respond to a range of frequencies(the acoustics). The overall performance of this experiment relies on the power and frequency of the sonic source. One of the major, unexpected complications of this experiment were overtones created as a result of the acoustic environment in which the test was performed. We were able to identify an optimal range of frequencies in which to achieve the minimum sound energy when extinguishing fire.</p> <p>Conclusions/Discussion The experiment was successful in duplicating the DARPA results on a smaller scale. However, the DARPA results were based on a single set up and a single frequency. my results demonstrated that the results vary based on the set up, the variables include: the distance between sound sources, the frequency, and the power available, as well as the natural acoustics of the room.</p>	
Summary Statement To expand upon DARPA's research on extinguishing fire with sound energy, by including additional variables that may influence the results.	
Help Received Interviewed sound system professionals who generously loaned 12-in low frequency speakers(Subwoofers), My Father helped me with wiring the sound system to different amplifiers. Borrowed sound pressure spectrum analyzer from father.	