



**CALIFORNIA STATE SCIENCE FAIR  
2011 PROJECT SUMMARY**

<b>Name(s)</b> <b>Brenden J. Geary</b>	<b>Project Number</b> <b>J0910</b>
<b>Project Title</b> <b>H.E.A.R. Ham Radio Emergency Aerial Repeater</b>	
<b>Abstract</b> <b>Objectives/Goals</b> My objective is to build a communications device that is inexpensive, reliable and easy to deploy during a natural disaster or terrorist attack. This device should also be able survey the area and it should also be flexible enough to add additional equipment if needed. H.E.A.R. (Ham radio Emergency Aerial Repeater) is device I plan to build. <b>Methods/Materials</b> Using my past experience with electronics I was able to design a simple and lightweight Ham Radio repeater. One of my electronic mentors, Allen Lord, was able to build this repeater for me. To get the repeater into the air I used two 1,000 gram helium filled weather balloons. On board two separate payloads contained the following: 300mw cross band repeater, two APRS trackers, Spot satellite tracker, weather station, video camera, hard drive to record video, still digital camera, parachute, DTMF decoder, siren, cutoff circuit and relay board. <b>Results</b> I launched the repeater from Alta Loma, CA, it reached a maximum altitude of around 80,000 feet. I recovered it three and a half hours later in Thousand Palms, CA. Due to both my primary and secondary trackers failing I was not able to get an exact altitude. During the flight my still camera took pictures every 5 seconds, just as I programmed it with the CHDK firmware hack. I started making contacts through my repeater almost as soon as it took off. The early contacts were local, however the contacts progressively pushed out further as the balloon increased in altitude. The furthest contact I made was in Goodyear, Arizona over 320 nautical miles from the launch site. <b>Conclusions/Discussion</b> HEAR is a successful communications device. It could be deployed during a natural disaster or terrorist attack, however I believe that a longer flight is necessary. To make HEAR a longer term solution you would need to have a team releasing another HEAR every two to three hours. Then another team recovering each HEAR as it landed. HEAR would work well to cover a military operation that would be over in less then three hours. I was able to prove that HEAR is a viable solution as a communication device at altitude. In future experiments I plan to test HEAR in an unmanned solar powered drone; which I believe could increase the flight time to days not hours.	
<b>Summary Statement</b> Providing a temporary method of communication using a weather balloon and Ham radio repeater at high altitudes, for use during a natural disaster or terrorist attack.	
<b>Help Received</b> Allen Lord built the repeater, my dad drove the chase truck and my grandpa donated the helium.	