



# CALIFORNIA STATE SCIENCE FAIR 2014 PROJECT SUMMARY

<b>Name(s)</b> <b>Solomon Kazmie</b>	<b>Project Number</b> <b>J0911</b>
<b>Project Title</b> <b>Murphy: Covert Emergency Reporting and Transmission System</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The movie Lone Survivor tells the story of Lt. Michael Murphy. When his squad came under attack, during a covert mission in a valley in Afghanistan, their radio could not transmit back to base. Lt. Murphy gave his life climbing to the top of a high peak, under heavy gun fire, so that he could successfully transmit a desperate call for help.</p> <p>Dedicated to Michael Murphy, The Murphy CERTS repeater system is a network of small, portable, camouflaged radio repeaters, which can easily be carried and planted along a path by a covert scouting team or a search and rescue team, as they move through any terrain. The repeaters will sit silently waiting for an encoded message, and only then repeat and relay that message back down the trail to one or more identical repeaters.</p> <p><b>Methods/Materials</b> I researched micro-controllers, electronics and rf transmission. I wired 430Mhz transmitters and receivers to a PSOC 4 processor. I used PSOC Creator to configure the chips and program them. The PSOCs listen for a manchester encoded message and then rebroadcast it four times at random intervals, to avoid interference.</p> <p>I tested the Murphy repeaters many times in a number of locations. I tested them in sets of two and three, with and without wire antennas. My original prototypes just used a simple button that would send out a random number. The number was displayed as a color on an RGB LED. I tried adding a keypad to the repeaters, but then decided to use a CapSense touch sensor to allow the troops to covertly transmit their own messages with just a slight move of a finger.</p> <p><b>Results</b> The Murphy CERTS successfully transmitted, received and relayed their messages. The use of a wire antenna significantly increased the range. The addition of an in-between repeater, transmitting several randomly delayed echoes, doubled the range of the single transmitter and receiver.</p> <p><b>Conclusions/Discussion</b> Small battery-powered micro-controllers with simple transmitters and receivers can relay messages from point to point along a covert repeater network, that can be easily carried, planted, disguised and concealed along a path to relay critical reports and distress signals back to base. No soldier, ranger, rescuer, medic, scout or patrol should ever again have to give their life to send a call for help.</p>	
<b>Summary Statement</b> Lone Survivor's Michael Murphy gave his life to make a radio call to get help for his team, inspiring my new "Murphy - Covert Emergency Report and Transmission System", a life-saving message relay network of small digital radio repeaters.	
<b>Help Received</b> A family friend loaned me three PSOC Kits and taught me how to use them. Youtube blogger Kevin Darrah demonstrated the basics of Manchester Encoding in an awesome online video. Dave Van Ess' great PSocToday! videos explained how to use the PSOC peripherals.	