



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Spencer A. Krock	Project Number S1710
Project Title Static and Dynamic Shielding to Advance the Protection of Spacecraft from Cosmic Radiation	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of the study was to compare different cosmic radiation shielding methods and materials to protect spacecraft and crew.</p> <p>Methods/Materials A self constructed cloud chamber was used to view the radiation provided by 0.91 microcuries of Americium from a smoke detector which is below the U.S. Nuclear Regulatory Commission's recommended safe handling limit of 1 microcurie. Additionally, a radiation exposure handling protocol was instituted based on the U.S. Department of Health and Human Services report titled, "Toxicological Profile for Americium." This ensured that safe exposure, defined by the National Committee on Radiation Protection and Measurements (CCR, Title 17, Section 30265), was met. The sample radiation shielding materials used in the study were made of carbon fiber, Kapton, a computer hard drive magnet, as well as a homemade electromagnet.</p> <p>Results In ranking the materials from least to most effective, the dynamic shields (computer and electromagnet) did not provide the protection described in research. The static shields (Kapton and carbon fiber) protected exceptionally well and blocked most visible radiation from penetrating the material.</p> <p>Conclusions/Discussion The tests showed that the static shields were the most effective in shielding from the radiation, and they could also potentially be used as dual use structural materials for spacecraft. Contrary to research, the dynamic shields did not show any means of protection from the radiation. However, the electromagnets in other research operated in different conditions. By comparing and looking at these materials and figuring out which work best in different situations we can travel further into space and the unknown.</p>	
Summary Statement To test and compare potential shields to protect manned spacecraft from harmful cosmic radiation.	
Help Received The cloud chamber was built with assistance from my father, Dr. Kevin Krock. Also extraction and all close contact with the Americium was provided by Dr. Krock as well to minimize student exposure.	