

# Warren J. Baker Endowment

*for Excellence in Project-Based Learning*

# Robert D. Koob Endowment for Student Success

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## FINAL REPORT

*Final reports will be published on the Cal Poly Digital Commons website  
(<http://digitalcommons.calpoly.edu>).*

### I. Project Title

**Testing of the Impact Diffusing Football Helmet**

### II. Project Completion Date

**June 3, 2016**

### III. Student(s), Department(s), and Major(s)

(1) Michael Schuster, Mechanical Engineering, Mechanical Engineering

(2) Steven Warnert, Mechanical Engineering, Mechanical Engineering

### IV. Faculty Advisor and Department

Peter Schuster, Mechanical Engineering

### V. Cooperating Industry, Agency, Non-Profit, or University Organization(s)

N/A

### VI. Executive Summary

Football is a much loved sport in the United States. Unfortunately, it is also hard on the players and puts them at very high risk of concussion. To combat this an inventor in Santa Barbara brought a new design to Cal Poly to be tested.

The design was tested in small scale first in order to make some preliminary conclusions about the design. In order to fully test the helmet design; however, full scale testing was required. In order to carry out this testing a drop tower was built based on National Operating Committee on Standards for Athletic Equipment, NOCSAE, specification. The drop tower designed for Cal Poly is a lower cost and highly portable version of the standard NOCSAE design. Using this drop tower and a 3D printed prototype the new design was tested in full scale.

With the results of the full scale testing regime and computer modeling done, it was concluded that the new design did not reduce a player's risk for concussion. The new design increased the SI value for the helmet by a factor of 2.5.

The drop tower itself is able to deliver consistent test results. With a 14% variation in impact

events the tests are fairly consistent when taking into account all the variations present and the parts of a football helmet.

## **VII. Major Accomplishments**

(1) Design and Manufacture of Bioimpact Drop Tower

(2) Testing accomplished on Football Helmet Design

## **VIII. Expenditure of Funds**

All the funds used for this project were used to build the Drop Tower apparatus. The funds went to the materials and fabrication costs which were required for the drop tower to be realized. The tower now resides with the Mechanical Engineering department and is available for use in future projects giving the department a new avenue for research

## **IX. Impact on Student Learning**

The experiences learned during this project were invaluable. We were able to learn project management, machine design, and a lot of other valuable skills that will help on the job and throughout life. The testing carried out during the test also added to the valuable real world skills obtained at Cal Poly, it was not just a design on paper but was manufactured and tested. This project truly fulfilled Cal Poly's "Learn by Doing" motto.