

A. Title Page

Attending a Damage & Energy Applications for Collision Reconstruction Course for Vehicle
Safety Design Final Report

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B. Restatement of problem researched, creative work, or professional enhancement opportunity

Traffic accidents have become a serious social problem that threaten people and their property at an accelerating rate. In the United States, motor vehicle accidents are the leading cause of death for college age people.¹ Globally, traffic accidents are the second leading cause of death for young people between the ages of 18-25.² Astonishingly, road traffic accidents kill 1.2 million people each year and injure 50 million more.² In addition to the number of human lives affected, the financial impact on a society is significant. It is estimated that motor vehicle injuries account for 22% or \$89 billion of the total annual cost of injuries in the United States.³

The effects of vehicle accidents can be minimized by better educating/training of drivers, engineering safer trafficways, and designing safer vehicles. Vehicle safety design has made great strides during the last 20 years. Crumple zones, air bags, anti-lock brakes, and safety data recorders were direct results of control crash test and real-world accident investigations. With changing designs in automobiles (such as introduction of hybrid and all electric models) continued research is needed to make the next generation of automobiles is safe as possible.

In this professional enhancement proposal, the PI attended a course entitled “Crush Energy Analysis”, hosted by Accident Analysis and Reconstruction Inc, and the Collision Safety Institute. This course gave the PI new techniques to pursue a new area of research in vehicle safety design. Specifically, the course covered:

- Understanding of work and energy concepts as applied to motor vehicles and motor vehicle collisions.
- Understanding of the relationship between kinetic energy and "crush" or residual permanent damage.
- Recognize the limits and appropriate applications of damage-based collision analysis.

- Apply appropriate strategies for vehicle documentation (measurements) particularly when the end application is an energy-based analysis of a collision.
- Locate and identify appropriate information for stiffness coefficient calculations and conduct complex energy and momentum based analysis of collisions

D. Summary of findings, outcomes, or experiences had.

I attended the conference in December 2009 in Allentown, PA and successfully completed the course. Interestingly, I discovered that the prominent technique for measuring CRUSH damage is prone to significant error. This is important because the energy needed to create the damage is extremely sensitive to these measurements. Therefore, I am working with a group of students on their senior design project to create an automated method for measuring CRUSH profiles. If successful this tool could be utilized by police departments, investigative and engineering teams across the country.

E. Conclusions and recommendations

In conclusion I have successfully completed the “Crush Energy Analysis” course. This professional development activity will aid in future research into vehicle safety design and has already resulted in a student senior design project in the Department of Electrical Engineering.

REFERENCES

1. Center for Disease Control, "Leading Causes of Death Annual Report",
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2. World Health Organization, "Faces behind the figures: voices of road traffic crash victims and their families", (2007)
3. Center for Disease Control, "The Incidence and Economic Burden of Injury in the United States",
http://www.cdc.gov/ncipc/factsheets/CostBook/Economic_Burden_of_Injury.htm