Analysis of Shock Waves and their Implications in Various Fields

By Dennis Lin
dennislin1212@gmail.com
Flintridge Preparatory School, Class of 2016
USC Viterbi School of Engineering - Department of Mechanical and Aerospace Engineering

Introduction

Shock waves play a significant role in the world around us, with implications in fields from the military to sports. Explosives, car crashes, and football matches are all sources of some type of shock wave and (literally and figuratively) impact our everyday lives. As a result, it is essential to closely study shock waves and their effects in a controlled environment in order to better understand how we can mitigate the negative aspects of shock waves.

Experiment 1: HAMr

The aptly-named HAMr is an experiment that generates shock waves through repeated blunt impacts using a spring-loaded piston and motor. By impacting an impact sensor and a protective plate holding mouse brain cells, Dr.Eliasson’s lab can induce inflammatory protein production in the cells. Analysis of the amount of inflammatory protein and strength of each impact can be used to determine when irrevocable damage has occurred.

Experiment 2: Shock Tube

Another experiment present in Dr.Eliasson’s lab is the shock tube, which uses high pressure to generate a shock wave. This shock wave can be fired at objects ranging from ping pong balls to structures specially designed by Dr.Eliasson’s lab to mitigate the effect of shock waves.

Experiment 2 Cont.

Dr. Eliasson’s research on shock wave mitigating structures has far-reaching consequences in countless fields. We may one day see such structures saving the lives of pilots, sailors, and even soldiers on the battlefield.

Experiment 3: Oblique Shock Tube

The oblique shock tube is nearly identical to the shock tube. As the name suggests, the primary difference is the oblique shock tube’s ability to be inclined at various angles. This characteristic, combined with a test section capable of holding various liquid mediums, allows Dr. Eliasson’s lab to analyze the effects of shock waves fired at different liquids from various angles.

Schlieren System

In order to record visual data with a high speed camera, Dr. Eliasson’s lab used the schlieren System, which utilizes a complex array of mirrors and lights to produce sharp shadow images. This allows for more precise observation than a direct recording.

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