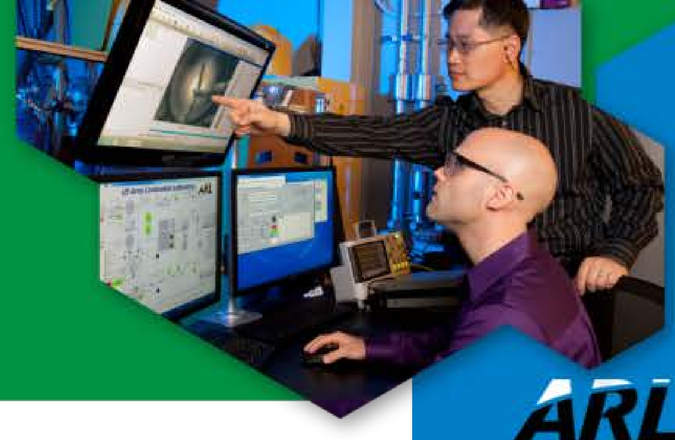
Developing a Tool to Predict Ammunition Compartment Survivability



S&T Campaign: Assessment & Analysis

Statistical methods in ballistic modeling and simulation

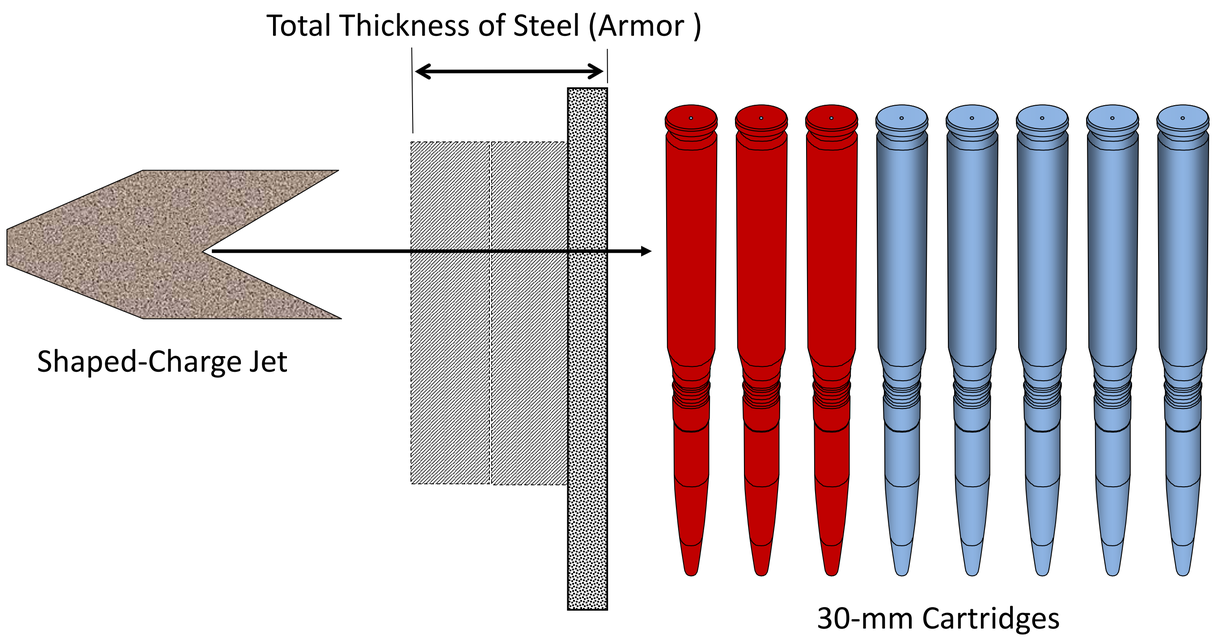
Gina Schafer, (410) 278-6929
gina.d.schafer.civ@mail.mil

Research Objective

- **To develop a model for predicting the energetic response of ammunition to ballistic impacts, which can be used to inform design and to support systems engineering, optimization, and live-fire evaluation.**
- **Extend model to predict the response of vehicle battery packs to ballistic impacts.**

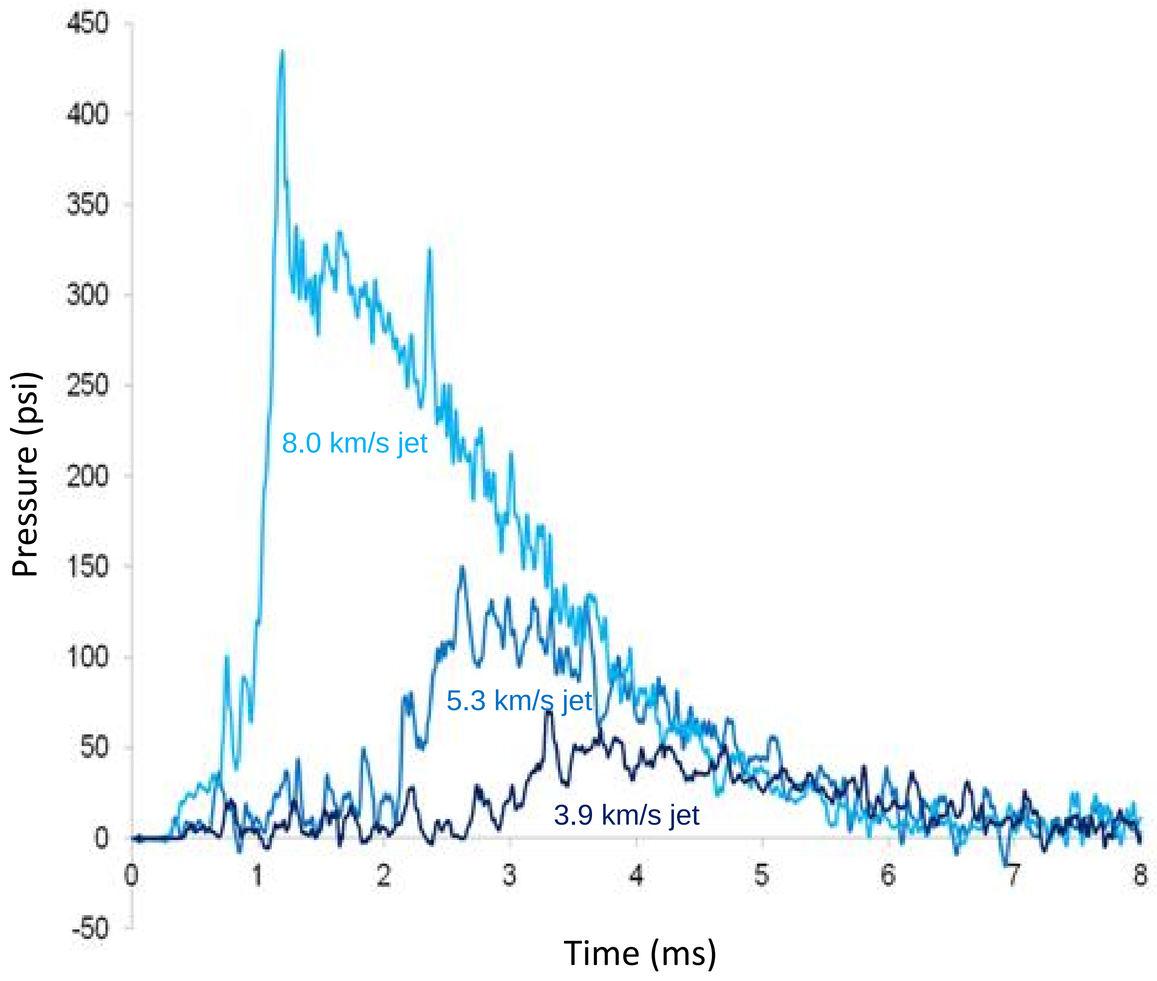
Challenges

- **Isolating and identifying the parameters affecting the energetic response of propellant subject to ballistic impacts.**



Experimental setup and shotline

- **It is difficult obtaining accurate data from instrumentation due to the violent reaction inside the ammunition compartment**



Pressure history inside the compartment

ARL Facilities and Capabilities Available to Support Collaborative Research

- **New photon Doppler velocimeter for use to measure velocity of the compartment lid during the experiment.**
- **Large body of expertise in the field of energetic reactions.**

Test chamber with compartment test rig

- **Initial mathematical model for predicting pressure inside an ammunition compartment when impacted by a shaped charge jet attack.**

$$P = P_o \times \exp\left[-0.5\left(\frac{\ln\left(\frac{t}{t_0}\right)}{C}\right)^2\right]$$

P = overpressure (psi)
t = time (s)
P_0 = peak quasi – static pressure (psi)
t_0 = time of peak quasi – static pressure (s)
C = venting constant

Pressure equation

Complementary Expertise/ Facilities/ Capabilities Sought in Collaboration

- **Capability to develop novel instrumentation solutions to collect data in violent, extremely high pressure environments.**
- **Engineering model to determine the structural response of a compartment design using predicted pressure.**