

NEXTGen Firefighter Helmet

A New Helmet for a New Era



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Researchers at the Texas Tech Department of Industrial, Manufacturing, and Systems Engineering are reinventing the traditional firefighter helmet. Their goal is to create a NextGenHelmet improving on the iconic design and traditional materials of today's firefighter helmet through a \$562,253 grant from the United States Department of Homeland Security. Dr. Suman Chowdhury and his research team are seeking out fire departments throughout the United States who wish to participate in this first of its kind upgrade of the firefighter helmet.

Today's firefighters utilize the recognizable firefighting helmet with its long brim worn toward the back of the neck. With the excessive temperatures faced by firefighters in countless emergency scenarios, a helmet that is heat resistant and well fitted is key to personal protection and injury prevention. In addition, the roles and responsibilities of firefighters have changed significantly over the past decades. Firefighters are increasingly called upon to respond to active shooter incidents and other hostile events. Therefore, utilizing a material that is ballistic resistant protects firefighters from ballistic projectile impacts.

The firefighter helmet was first used and invented by Henry T. Gratacap, a luggage maker by trade and volunteer of the Fire Department of New York City around 1836. The reinforced dome and tall front shield protected the firefighter from falling debris and was designed for breaking windows for rescues and ventilation. Little has changed in helmet design over the past 150 years. Helmets were first made of leather, then brass, and later stronger metals to protect the firefighter from heat and falling debris. However, injuries were still very common, and over 150 years later - the design is inherently the same.

By combining the latest military ballistic technology and current state of the art thermal resistant materials, Dr. Chowdhury and his research team envision a NextGenHelmet offering more protection, usability, affordability, and complete redesign with today's firefighter in mind. "We want to make a prototype with the highest level of protection, but one with usability and comfort that firefighters want and the affordability that fire departments need," said Chowdhury. He and his research partners, Dr. Greg McKennan of North Carolina State University Chemical Engineering Department - providing the ballistic prevention technology needs and Dr. Weilong Cong of the Texas Tech Industrial, Manufacturing Systems Engineering Department - providing materials testing will examine solutions to improve upon existing elements of firefighter helmet systems.

"This NextGenHelmet is intended to provide both fire and ballistic protections as well as supporting ancillary accessories such as communication devices, face shield, and lighting devices to bring the helmet into the twenty first century.

The current materials used in both firefighting and military helmets are inadequate for a combination of temperature and ballistic resistant protection. "We hope to combine the latest technologies to create a helmet that is highly functional as well as lightweight for useability and affordability," said Chowdhury. "Challenges such as muscle fatigue, center of gravity, physical mobility, personal fit are just a few of the innovations that we hope to improve upon by redesigning the helmet."

There are four challenges that Chowdhury aims to meet in this innovative research as the team seeks out

firefighters and fire departments to aid in the testing and developing of this helmet. "First, we will evaluate the existing helmet design for effectiveness and injury prevention. Second, exploring the most suitable materials design and ballistic protections in compliance with the National Institute of Justice Standards and IIIA ballistic protection. Third, we will develop a digital impact test to simulate ballistic and falling debris dangers that firefighters face. Last, is the fabrication and testing of the new design prototype helmet based on a Finite-Element (FE) modeling platform as well as ballistic and thermal testing protocols."

Currently the research team is conducting a survey of firefighters concerning the safety and functionality of existing helmets.

Firefighters and fire departments in the United States who are interested in participating in this first of its kind firefighter helmet innovation may contact Dr. Chowdhury and his research team at the Texas Tech Department of Industrial, Mechanical, and Systems Engineering Department by emailing Suman.Chowdhury@ttu.edu. Firefighters wishing to participate in the survey may do so at <https://www.surveymonkey.com/r/DTVSZ8C>.

