

DHS Science and Technology Directorate

Burn Saver Thermal Sensor

Working to assist firefighters with avoiding burn hazards associated with fires

Firefighters often find themselves in situations where they are in danger of receiving burns because of a rapid rise in the ambient temperature to a level beyond the protective capabilities of the Self-Contained Breathing Apparatus (SCBA) and the Personal Protective Equipment (PPE) worn by the firefighters. The hazard associated with infrared radiation (IR) is particularly acute because the intensity of IR can increase to dangerous levels in seconds. Developing an early detection system that informs the firefighter of a rapid temperature rise, which might not be immediately evident inside the protective gear, would greatly benefit firefighter safety.

Addressing a firefighter capability gap with a helmet-mounted, real time temperature sensor

“The capability to continuously detect, monitor and analyze threats and hazards in real time can enable timely mitigation and protect responders from unwarranted risk.” — Project Responder 3

Through a Small Business Innovative Research (SBIR) award, the Department of Homeland Security Science and Technology Directorate’s First Responders Group is working with TDA Research, Inc. to develop and produce the “Burn Saver” thermal sensor that can provide real time alerts to firefighters in dangerous thermal conditions. Real time notification allows firefighters to immediately mitigate the risks associated with those conditions.

The firefighters' turnout gear ensemble can only tolerate exposure to Class IV fire conditions (500° – 1832° F; heat fluxes of 10 – 100 kW/m²) for less than one minute before degrading. Therefore, providing firefighters with a timely warning that PPE failure is imminent due to the current the thermal environment will permit them to respond to the thermal hazard to avoid catastrophic protective ensemble failure.

Working with their partner FoxFury LLC, TDA’s goal is to develop a small, lightweight, battery-powered device that would be helmet-mounted and fast responding.

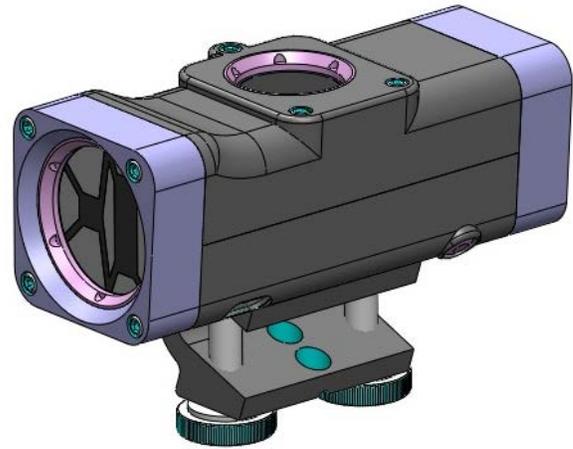


Figure 1: 3-D rendering of a preliminary design of TDA/FoxFury's helmet-mounted Burn Saver device.

The Burn Saver will respond to both IR and radiant heat sources and will be submitted for inclusion as a component of the turnout gear ensemble to meet the National Fire Protection Association’s (NFPA) 1984 standard (Figure 1).

Providing real time alerts about temperatures and radiant loads

After successful completion of the SBIR Phase I proof-of-concept studies, a Phase II SBIR award was issued March 2014. Initial experiments have indicated that the Burn Saver thermal sensor can respond quickly (less than ten seconds) to Class IV radiant and 260°C ambient air temperatures. Laboratory testing is currently being performed in order to optimize sensor design and create the software algorithms that will govern the prototype unit's response to fire conditions.

Field tests are tentatively scheduled to begin in April 2015. The results of these tests will guide the final development of the prototype. It is anticipated that initial prototypes will be ready for independent testing by June 2016. Successful development and implementation of TDA’s helmet-mounted Burn Saver device will provide firefighters with a warning of dangerous thermal conditions, giving them time to egress the situation to reduce the incidence of thermal injuries and fatalities.

