

Impending Flashover

Burning Ears are no longer the correct sensor for effective flashover detection

By Assistant Chief (ret) Paul Siebert

Flashover. It is something we all learned about in recruit academy; how to identify the signs and act to affect the thermal condition in a compartment to delay or reduce the threat of a flashover. A growth stage fire is typically when conditions are optimal for evaluating the risk of flashover leaving us with very little time to take protective action. Experienced firefighters know they must monitor heat conditions and visually scan for rollover occurring above them during this stage. This is how it has been and in many cases is how it continues to be today. How can today's technology help us identify impending flashover and provide our firefighting crews with ample time to act? A company from the United Kingdom believes they have found a solution.

Since early 2014, the Firefighter Rescue and Support Technology®, or FiRST, has been working toward a solution. FiRST found its calling in response to firefighter fatalities at fire incidents when Project originators found an opportunity to improve the flashover potential awareness of responders. The initial phase of FiRST research and engineering trials have fielded a proven Artificial Intelligence-enabled wearable unit that consistently signals firefighters, warning them of dangerous temperature situations, including flashover. Testing and trials have continued through 2018 with ten UK fire and rescue services, the UK Fire Service College, and Gaston College, a US Fire Training College in Dallas, North Carolina. The FiRST technology has recently been granted a UK patent with further patent applications pending in Europe, the United States, and China.

The FiRST wearable technology utilizes artificial intelligence (AI) and temperature sensors to predict the rapid rise of temperatures surrounding the wearer and match that to known rate of rise metrics. The result is an initial, or precautionary alarm which seizes the wearer's attention and makes them aware of impending flashover conditions. A second alarm is activated when the surrounding environment is rising to a predicted 572°F (300°C),



1 Photo courtesy of STS Defence

indicating immediate action must be taken. The same predictions made by the AI are what firefighters have been doing with their "gut" instincts and fire service experience for many years. Does the AI replace that gut instinct and fire service experience? Not at all. Instead, it activates an alarm that is intended to refocus the firefighter's attention to a potential safety issue, signalling them to make rapid data-driven decisions to help avoid life-altering injuries.

“Although we realize technology cannot replace the training, skills, and experience of a firefighter; FiRST can give us an additional edge in protecting firefighters.... The instrumentation from STS [FiRST] is giving us another tool to warn our firefighters and instructors of impending danger. It also is giving valuable data about conditions our members are working in. All of this will help improve the safety of our folks.” says Josh Crisp, Director of the Regional Emergency Services Training Center at Gaston College.

In August 2018, STS Defence was invited to present to the IAFC Technology Council during their meeting at Fire Rescue International (FRI) in Dallas, Texas. During the presentation, Council members representing fire service members and industry leaders were shown the value of understanding the heat conditions surrounding a firefighter to improve response times to impending high-heat events and flashovers. Throughout the week at FRI, STS Defence showcased the technology in the Innovation Corral within the Exhibition Hall.

Unfortunately, this technology is not easily accessible to US first responders today. Firefighter feedback has shown how this information needs to be incorporated into SCBA or other current systems or wearables that provide immediate feedback to the wearer when alarm conditions exist. Additional feedback from the demonstration presented that the “Situational Awareness was greatly improved” with the two predicted trained AI visual and audio alarms:

- 1) Temperature Awareness: Precautionary Alarm activated @ predicted 302°F (150°C)
- 2) Flashover: Full Alarm activated @ predicted 572°F (300°C)



2 Photo courtesy of STS Defence

A prediction-based dual alarm gives the firefighter vital time to make immediate tactical decisions to mitigate the risk of flashover. The precautionary alarm has been designed to provide the reassurance previously relied upon by a firefighter’s gut instincts and fire service experience of temperature prediction. Improvements in PPE technology has limited or removed the “old school ear or neck sensor” for heat used for years by firefighters. Protective enhancements in PPE

construction should not be reduced to reinstate ear or skin injuries as a method for temperature detection; instead technologies such as FiRST need further research and adoption to give firefighters the same or better situational awareness of their environment.

STS describes some additional benefits of their technology including stored temperature data, which can be uploaded into a secure STS data portal after each burn for physiological health and safety analysis to be audited by the end user. Long-term use by researchers could lead to a better understanding of the risks associated with heat stress and its health impact to responders. Time and temperature data is also available for analysis by investigation and forensic teams post event.

Additionally, STS has demonstrated the optional telemetry capability of their trial device to provide greater risk assessment input when the temperature and alarm state information was available to the Incident Commander (IC) from each worn device by firefighters. A tablet display provides soft buttons for the bi-directional alarm functionality allowing the IC to receive a signalling event from one user, and then retransmit the alarm to all FiRST users at the scene of the incident.

STS Defence is working to create market awareness for this technology in the US within the fire service community to ensure that the technology is understood and can be discussed openly and effectively. Culture change within the US Fire Service can be especially challenging, particularly when new technology is involved. Research, testing and evaluation initiatives should look to assess the value of new technology and determine if stand-alone systems, or systems integrated into current equipment are the best option for their agency. Consulting with manufacturers and making requests for them to incorporate technologies in future versions can be one effective way to approach technology adoption. Fire service leaders successfully collaborated with equipment manufacturers to incorporate PASS technologies and bail-out systems into protective equipment worn by firefighters today. The path for new technology adoption is already established if fire service leaders continue to encourage the improvement of firefighter safety through technology. the desire to improve firefighter safety.

STS Defence Limited (STS) is an UK based technology and engineering business, operating in four inter-related sectors; defence, marine, aerospace and nuclear with mission-critical communications, electronics and intelligent systems helping customers resolve complex technical challenges.

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