

Developed at Worcester Polytechnic Institute, Worcester, Mass.

# First Responder Locator System

## Funding

More than \$4 million from the Office of Science and Technology; National Institute of Justice; and FEMA, Fire Prevention and Safety

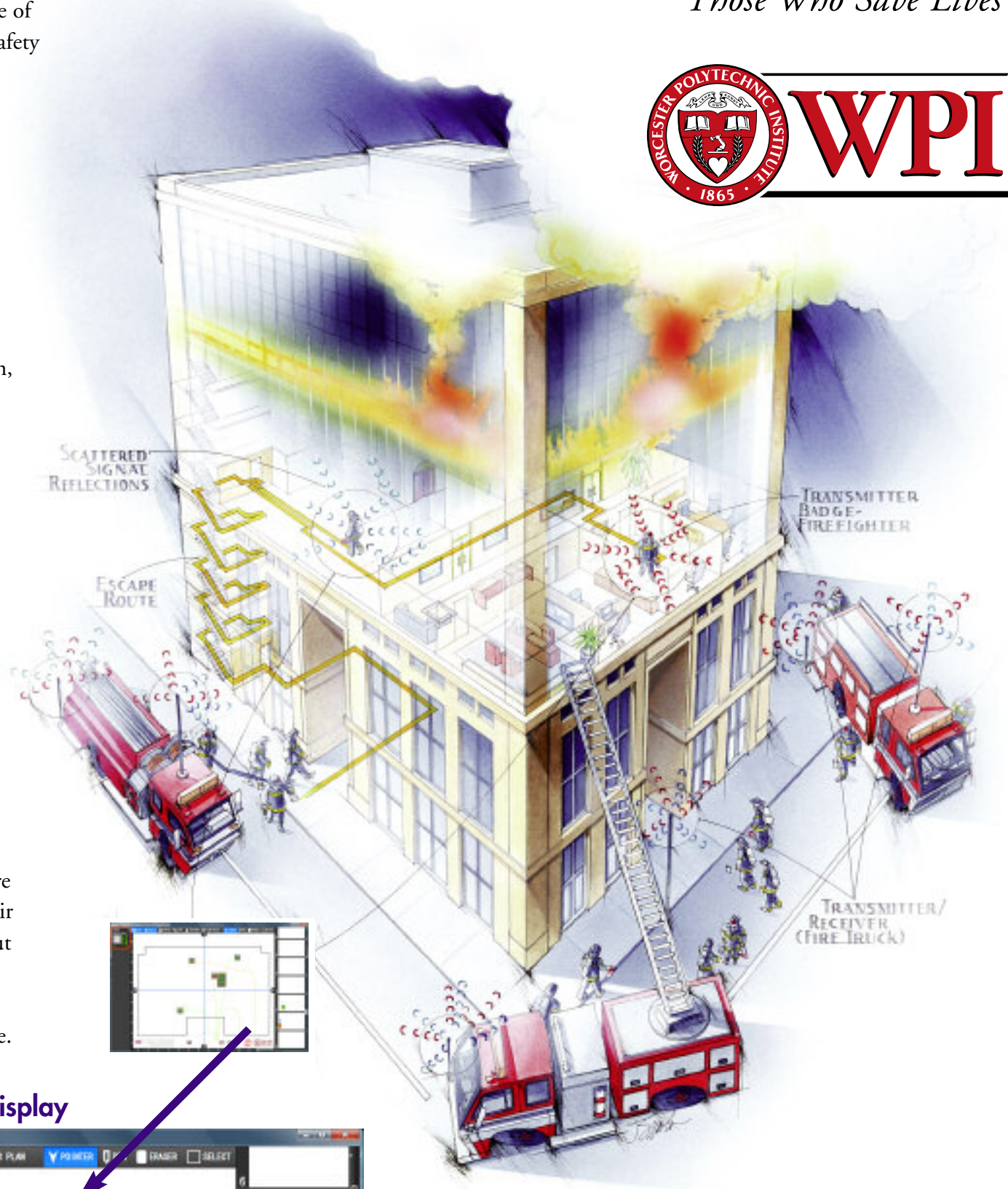
## About the System

A 1999 warehouse fire in Worcester, which claimed the lives of six firefighters who could not find their way out of the building, led a team of WPI researchers to develop a locator system that uses sophisticated signal processing and geolocation technologies to pinpoint the location of first responders in buildings, giving them a global view of their situation, and enabling them to find a safe exit or be found by rescuers in an emergency.

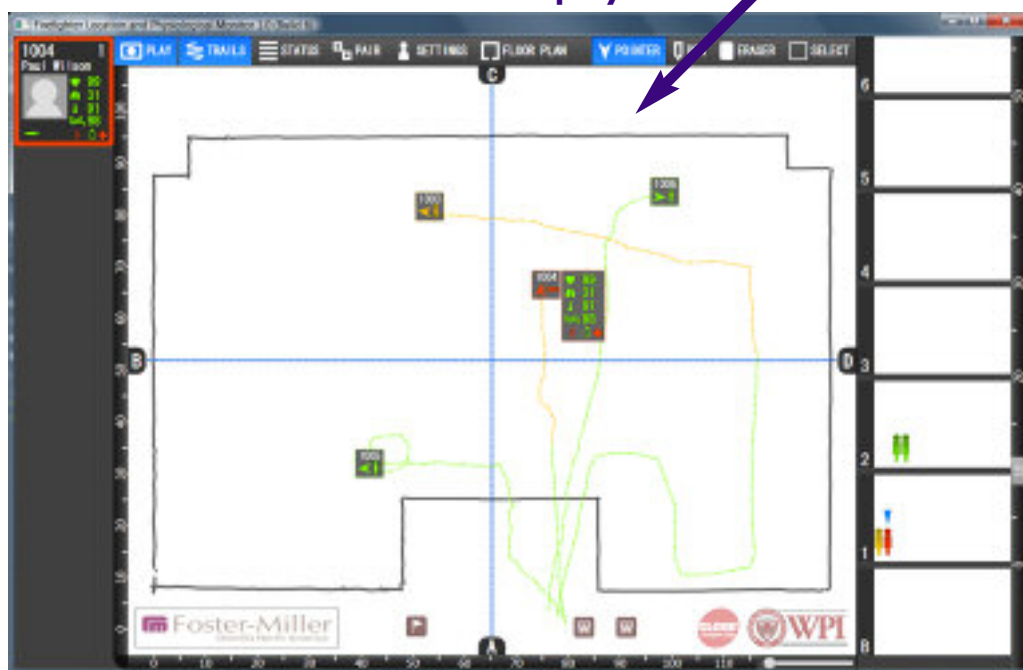
## About the Technology

The system employs principles from **orthogonal frequency division multiplexing (OFDM)**, which transmits high-speed data via wired and wireless channels and integrates well in the radio spectrum, as well as super-resolution techniques as used in **synthetic aperture radar (SAR)**, which can extract great detail from radar signals. Customized OFDM signals are emitted continuously by transmitters worn by each first responder. Receivers located on emergency vehicles are able to decipher the signals, determine their distance from the transmitters, and sort out a multitude of straight-line and reflected signals to determine the exact location of the transmitters in three-dimensional space.

*Protecting the Lives of  
Those Who Save Lives*



## Incident Commander's Tactical Display



The command screen for the First Responder Locator System combines real-time location and tracking information with physiological data. Shown are the location and tracks of four responders: two on the first floor and two on the second. Icons of responders whose physiological readings stray from normal levels turn yellow. The icon of a responder in trouble turns red and a box appears with real-time physiological data, name, photo, and position.

radio call sign   first responder   first responder (prone)   direction of movement   physiological data

## How It Works (see diagram above)

Three or more vehicles equipped with transmitter/receivers are positioned at several locations around a building to capture the precision location information. As firefighters or other first responders enter the building, their cell-phone size transmitters send continuous signals. These are tracked and displayed by the site commander's system, which shows first responder locations and lines tracing their movements. Since the system also senses elevation, the display can show the floor location of each first responder. With a FEMA Fire Prevention and Safety grant, WPI has integrated technology from Foster-Miller into the system to provide real-time physiological status monitoring.

If exits become impassable, the site commander's display can automatically show alternate routes out of the building. Since the site commander knows where each responder is, to within 12 inches, assistance can be provided to help anyone in trouble get out, whether or not the responder is lost, disoriented, or unable to see.