

KEEPING TRACK OF OUR NATION'S FIRST RESPONDERS IN DANGEROUS SITUATIONS

When responders arrive at the scene of an emergency and rush into a building, it is critical their team knows their exact location at all times. In scenarios with heavy smoke, debris, or line-of-sight obstructions, maintaining awareness of responder locations not only enhances real-time response efforts but also saves valuable time when a responder is injured or lost. The critical need to track and locate firefighters while in the line of duty, has been a top priority in the field for over a decade. "A locator device that can pinpoint someone within one meter or less of their actual location is critical to keeping our first responders safe," said Greg Price, First Responder Portfolio Director for Department of Homeland Security (DHS) Science and Technology Directorate (S&T).

In 2014, DHS S&T partnered with the National Aeronautics and Space Administration (NASA) Jet Propulsion Laboratory (JPL) to mitigate this gap by developing the Precision Outdoor & Indoor Navigation & Tracking for Emergency Responders (POINTER) technology. POINTER is a precision positioning sensor that locates first responders via low frequency magnetic fields that can transmit signals through materials including wood, concrete, brick and rebar. Over the last two years, NASA JPL has made significant technological strides and improvements by:

1. Increasing the accuracy of locating a responder to within one meter or less while in rural two to three story residential homes
2. Reducing the size of the mobile receiver worn by first responders comparable to the size of an iPhone 11 or smaller
3. Refining the software for visualization to display the location of each first responder who enters the structure in a 2D rendering that is visible by command post personnel
4. Optimizing the software that processes the X, Y and Z position data generated by the magneto-quasistatic frequency in real-time and sent to a laptop at the command post running the visualization software.

MAGNETO-QUASISTATIC NAVIGATION AND VISUALIZATION

POINTER sets itself apart by using low-frequency magneto-quasistatic fields that can transmit signals through any building materials. That differentiates it from Ultra-Wide Band, GPS, radio frequency identification systems and sensor fusion methods, all of which rely on radio position location and suffer reduced performance in non-line-of-sight and indoor environments. So unlike devices that use electromagnetic waves, POINTER does not lose its accuracy around people, objects or walls, and therefore, can be used for navigation and tracking in environments where traditional devices do not work. The POINTER system will be unobtrusive to the first responder and will be built to self-deploy once activated at the scene of an incident or emergency. Transmitters can elevate from the fire engine, while responders begin their life saving duties wearing small mobile receivers, which pick up signals and send their location to a command post's 2D visualization system. The technology determines where the first responder is, including their elevation, and whether they are standing still or moving, based on the position and orientation of the mobile device; solving for positions in complex environments. The data information is then directly relayed to the command post.



Photo courtesy of NASA JPL. The POINTER receiver

PREPARING POINTER ACTIVITIES AND MILESTONES

The POINTER technology is set for commercialization in 2021 and will be available to first responders. Version one will be designed for use in single family homes, warehouses and buildings that are three stories or less. Future versions of POINTER will accurately track first responders in high-rise buildings, outdoors and subterranean environments at a greater distance.