

FINDER: Detecting Heartbeats in Rubble and Rescuing Victims of Disasters

Building the “holy grail” for search and rescue

Quickly detecting living victims buried under rubble or other debris greatly increases their chances of rescue and survival. This is especially true in situations where there are multiple rubble piles or a large extent of debris. The ability to rapidly assess whether there are live victims at a particular site allows for effective allocation of search and rescue resources and helps first responders save more lives.

During these types of search and rescue scenarios, responders are looking for the “holy grail”—a tool that will allow responders to walk down a street after an earthquake or tornado, look at a leveled building, and quickly determine whether anyone alive is trapped within the rubble.

The U.S. Department of Homeland Security Science and Technology Directorate (S&T), in partnership with the National Aeronautics and Space Administration’s Jet Propulsion Laboratory (NASA JPL) is developing one such technology: Finding Individuals for Disaster and Emergency Response, or FINDER.



FINDER’s microwave radar complements search dogs and sound tools to detect the heartbeats of victims from up to 100 feet away.

Using microwaves to detect unique heartbeats

First responders often refer to the window of time where a victim’s rescue greatly increases their chance of survival as the golden hour. Using low-power microwave radar to detect the small movements from breathing and the heartbeat of a buried victim, FINDER quickly directs rescuers to victims, thereby allowing additional victims to be identified who might have otherwise been lost.



FINDER tested at the Virginia Task Force I (Fairfax County Urban Search & Rescue Team) Training Facility in Lorton, Virginia.

Even when FINDER’s signal must pass through several feet of rubble and building debris, it is able to distinguish between human, animal, and mechanical movement. It can also distinguish between multiple victims, since each person’s breathing and heartbeat patterns are different. Cueing on heartbeat and breathing allows unconscious victims who are unable to communicate to be found.

FINDER can be set up from as far back as 100 feet from a rubble pile and can provide search results in less than a minute. FINDER can then be moved to a new location and used to conduct another search—thereby allowing large areas to be searched quickly.

With new location capabilities added, FINDER now available for purchase by response agencies

S&T and NASA JPL conducted several tests of FINDER prototypes with Virginia Task Force 1, a Federal Emergency Management Agency Urban Search and Rescue team known for its global disaster response efforts. As a result of the tests, task force members identified a need for a locator feature to enhance FINDER’s current detection capabilities. With this new feature, FINDER will not only be able to tell responders that a live victim is trapped, but will guide them to the individual’s actual location.

Final testing of the locator feature took place in May 2015. The new capability was then transferred to two commercial licensees, R4 Inc. and SpecOps Group Inc., who are manufacturing affordable FINDER units for local, tribal, state, and federal first responders.

