**APL-UW Research to Detect Improvised Explosive Devices**

Narrator: In Afghanistan and Iraq, most U.S. casualties are caused by IEDs: improvised explosive devices. In Seattle, thousands of miles from the combat zones, scientists are in the fight to detect IEDs and save lives. Scientist Bill Asher believes lasers can detect the presence of hidden explosives, in fact, see invisible threats.

Bill Asher: "The particular optical technique we use is called vibrational sum-frequency spectroscopy, where you put down two laser beams on to a surface and you measure an optical response stimulated by those two beams coming back from the surface. By looking at the change in the number of photons generated as a function of wavelength of one of the laser beams, you can get a spectrum of what's on the surface, and from that identify different classes of bomb materials. The idea being that a convoy or patrol vehicle going down the road at 60 miles per hour, if you're shining this laser out in front of them, you scan surfaces to see if you can find explosives contamination."

Eric Thorsos: "You can imagine a hovering vehicle that moves out in front of a convoy, for example, and does various measurements."

Narrator: APL physicist Eric Thorsos coordinates five counter-IED projects at the Lab: Sum-frequency spectroscopy, chromophores and nanowires, teraherz spectroscopy, superresolution algorithm, and machine learning, all conducted with support from the Office of Naval Research.

Eric T.: "We're developing sensors that, if put in place, could detect explosives in the air."

Narrator: The threat of hidden explosives aboard airplanes is being addressed by APL-UW's Antao Chen and his research team. The work here centers on extremely high-frequency electromagnetic waves and on ultrathin wires and films reacting to the presence of traces of explosive chemicals, extremely small traces.

Antao Chen: "One molecule in a trillion molecules."

Narrator: The results of this basic research could be years away from deployment on a battlefield. Armed conflict always generates debate. Working on way to detect IEDs at distance and speed before they can cause harm is the only course for APL's Bill Asher.

Bill A.: "Really the bottom line is we're trying to save lives, and no one can object to that."