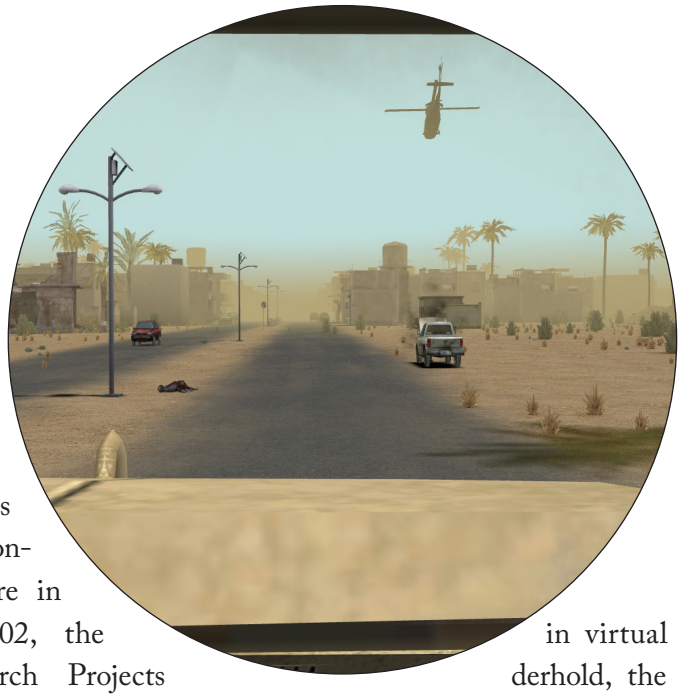
A NEW REALITY

SBIR solution builds warfighter resiliency before, during, and after combat tours



The virtual reality technology supported by DoD's SBIR program and transitioned back to military use offers an avenue of treatment for Warfighters suffering from PTSD.

In the early 2000s, the U.S. military was searching for ways to use new techniques and mediums to improve troop preparedness and training.

Part of this effort was centered on training personnel on medical trauma care in combat situations. In 2002, the Defense Advanced Research Projects Agency (DARPA) issued a Small Business Innovation Research (SBIR) solicitation topic looking for a company that could create a "real-life-like tactical and trauma care training scenario" that would teach service members care strategies while monitoring physiological markers such as heart and brain activity.

The agency's call was answered by San Diego, California-based Virtual Reality Medical Center. For company President Dr. Mark Wiederhold, the directive of the SBIR topic, as well as the company's mission at the time, both came down to one simple question:

"How do we prepare people better and give them the skills so they can perform their missions well?"

To that end, VRMC—which had a long history with virtual reality (VR) systems—developed a VR training program using state-of-the-art graphics and software technology wherein participants could train in virtual combat scenarios. For Wiederhold, the effectiveness of the technology came not only from the high-fidelity nature of the virtual worlds, but also from the thorough training regimes built into them. Moreover, the company's novel approach to the SBIR was to validate the trainings themselves—a wide variety of medical crisis scenarios from low to high intensity and based on true-to-life situations—after the fact. Following their training in a digital environment, participants would then be tested in a real-world environment in order to measure the effectiveness of the initial training.

The system validated the company's underlying ideology, according to Wiederhold, that successful, effective training is paramount to successful and effective real-world execution. The follow-up real-world testing also helped quantify the system's effectiveness, and it was eventually adopted in all of the Army's 30 medical simulation centers. But perhaps more important was the

physiological monitoring component of the system, which was at the time a unique approach to training. Users wear a head-mounted display and operate the system using a joypad and tracker, allowing them to control their virtual selves while being hooked up to a physiological device that monitors vital signs, including heart rate, respiration, skin conductance, temperature, electroencephalogram (EEG), and electrocardiogram (ECG).

"It solidified for us, in training, the importance of the cognitive, emotional, and psychological points of view. To be successful on a mission, you have to perform well in those three areas under stressful conditions," Wiederhold said. "And the name of the game is finally having the kind of objective metrics that demonstrate how effectively the training transfers to the real world."

The physiological part of the initial SBIR work with DARPA led the company to its next area of development, this time in the world of post-traumatic stress disorder (PTSD). VRMC built out a new virtual reality system, one that could monitor and analyze users for signs of PTSD before potential deployment. In one instance, the company took satellite images of Fallujah and created an environment where users drove a convoy through the city. Some sections were stressful, while others were more relaxed, and based on the real-time physiological screening tool, researchers were able to check for "measures that correlate with post-deployment issues," according to Wiederhold, including unusually elevated heart rates and erratic EEG and ECG readouts.

The system was an almost immediate success. The Marine Corps has since sent thousands of troops through VRMC's training programs, which typically last several days. The company also screened some 600 National Guard members before their deployment to Iraq and even trained Polish troops prior to their deployment to Afghanistan, earning VRMC a nomination for the country's highest civilian honor. The company has also garnered contracts in Europe to support NATO and coalition forces.

"Not all PTSD is the same, not all stress is the same, so the more granular we can get with those objective measures the better," Wiederhold said. "You follow the tools of those who went before, and you improve and adapt to them. Let's say you're going into Syria, it would be best to have weapons and terrain that matches all that."

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VRMC has also begun to use its systems for treating diagnosed PTSD in service members, with high rates of success. According to Wiederhold, 80 percent of users with PTSD are able to return to school or work in a normal capacity following VR treatment. Those PTSD systems are now commonplace in VA and DoD hospitals across the country.

"You save time, you save money, you help people," Wiederhold said. "It's a lot of good stuff."

Moreover, Wiederhold attributes much of the company's success over the past 20 years to the SBIR program, which he called "an incredible system."

"I'm a real SBIR program booster—for us it's been incredible," he said. "Basically, everything we've done is being used by the military. It's an honor to serve, and we're going to continue to do that.

"Supporting our military has been my highest honor," he added. "All of us are working toward the same goal, which is to give our troops the best training and chance for success. And I'm just thrilled to do my part."

Modernization Priority: Cyber
SBIR Contract: DAAH01-03-C-R301 **Agency**: DARPA • **Topic**: SB022-030 Physiological Monitoring During Simulation Training and Testing
National Defense Strategy Pillar: Force Readiness and Lethality