Lab testing seeks data on modified gunner protection design

U.S. Army

PICATINNY ARSENAL, N.J. (Jan. 23, 2013) - The best way to evaluate the effectiveness of a product is to put it in the hands of the user, obtain feedback, and make adjustments accordingly

With a newly developed Virtual Environment Test Bed, or VETB, scientists and engineers at the Target Behavioral Research Laboratory at Picatinny Arsenal can record how Soldiers react and perform inside a newly modified Objective Gunner Protection Kit, or OGPK.

The OGPK is an armored turret that provides much-needed protection for tactical vehicle gunners in combat situations. Soldiers voted the OGPK as one of the Army's top 10 Greatest Inventions in 2007, the year it was first fielded.

"The purpose of testing the OGPK in a virtual test bed is to evaluate gunner performance in various threat scenarios," said Thomas Kiel, chief, Turret Engineering and Force Protection in the Systems Engineering Directorate, part of the U.S. Army Armament Research, Development and Engineering Center, known as ARDEC.

A customized version of the "America's Army" gaming environment was integrated with the actual OGPK hardware and weapon system to provide a more realistic simulation.

The evaluation team requested that infantry Soldiers who participated in the "user jury" have experience using the OGPK in either Iraq or Afghanistan.

In November, Soldiers from the 3rd Brigade Combat Team, 4th Infantry Division, at Fort Carson, Colo., visited Picatinny Arsenal to participate in the evaluation. In all, six teams of Soldiers, including units from Fort Hood, Texas, and Fort Benning, Ga., will contribute to the development of the system.

Measurements of the gunner's reaction times and ability to engage targets effectively are quantified in the system. Correlations between performance and human factors are then evaluated to generate opportunities to improve protection and the ability to fight while being constrained by a shell of armor.

Eventually, more complex testing can be done to quantify the effects of physiological stress on the gunner.

"Warfighter survivability is absolutely the most important aspect of the Objective Gunner Protection Kit design," Kiel said. "However, the ability to maneuver the

weapon sufficiently while maintaining situational awareness is critical for delivering energy on target. The VETB will allow us to evaluate various OGPK enhancements, such as larger transparent armor windows for increased visibility. It is critical for us to have the ability to analyze these upgrades in terms of gunner effectiveness."

The first four Soldiers entered the test bed facility individually, and each received a mission brief presented on video by Lt. Col. John Thane, military deputy, Munitions Engineering and Technology Directorate, which is also part of ARDEC.

The virtual scenarios were created using the Unreal Engine 3.0 video game platform. The environment immerses the gunner within the lead vehicle in an escort convoy, with instructions to suppress any armed insurgents trying to interfere with the mission.

Unknown to the Soldiers, about half way through the 15-minute evaluation they receive a change in mission orders. The changes would affect the distance of shots they fire back at the enemy and a change in route pattern.

The environment includes a six-sided room where the scenario is projected from five different projectors on five 12-foot-long walls. The back wall is larger than the others and there is no projection on that wall.

Throughout the scenario, the Soldier encounters 68 different targets. Sitting atop the 12-foot-high walls surrounding the room are nine paintball guns, which are used to simulate in-coming fire from the opposing forces. These guns fire rubber pellets at the gunner inside the OGPK when strategic targets are not engaged within two to three seconds.

A motion-capture system is integrated with the Kevlar helmet that Soldiers are required to wear. Other gear includes an Interceptor Body Armor vest, radio communications, ear piece, goggles and gloves.

The motion-capture system records Soldier movement and response time to shots fired from various locations on the screen, as well as when the weapon is positioned toward targets, and the time it takes to engage the enemy on the screen.

The Soldiers are responsible for firing a .50-caliber Browning M2 machine gun mounted inside the turret. After 100 rounds are dispensed, the Soldier then has to reload.

Spc. Robson Alokoa, a test user who has deployed three times to Iraq, with his most recent spanning from August 2010 to August 2011, said that the hand crank configuration for turret rotation during his scenario was better placed.

Also, visibility was far more advanced than what he has experienced.

"There was much better movement than the one (turret) I'm used to. I was able to use my left hand for movement and the right for shooting," Alokoa said.

"I could see from all around so I was able to keep my eyes pointed in all directions," he added.

"The front vehicles in our convoys in Iraq only had 45 degrees of visibility but with this I was able to see left and right. Two vehicles could cover 360 degrees rather than one in each direction."

Sgt. Jarred Dunton agreed with Alokoa that the placement of the crank handle in the new turret was better configured than when he had been deployed.

"The crank handle used to get caught on my gear which obviously is not very good if you are in the middle of a gun fight," Dunton said. "With the crank I used here today I had none of that."

The OGPK that the Soldiers used in the evaluation had bullet-proof glass covering all sides of the gunner, giving him full peripheral views.

John Riedener, the behavioral lab's technical director, said that future tests of the OGPK will be conducted without some windows to determine the value of each of those windows.

Those tests can be compared to results conducted with windows in all sides.

"This new test bed can be used to evaluate the lethal performance of any ARDEC armament platform," Riedener said.

Because the evaluation is done in a simulated environment, the testing can be done early in the design phase of a project and performance data can be gathered on many different designs, and through analysis, will lead to an optimal design," he added.

"Our next step is to create a virtual environment test bed for the dismounted Soldier," Riedener continued. "This test bed will be able to evaluate the performance of Soldiers and the squad as part of a lethal system and allow trade-off analysis at that level."

The feedback from the evaluations will help with the final development of the ARDEC-produced OGPK 2.0 for integration into the Joint Light Tactical Vehicle.

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