CROSSHAIRS
Hostile Fire Indication / Counter Shooter System
Overview

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CROSSHAIRS is a modular, layered, open architecture, Hostile Fire Indication / Counter Shooter System. CROSSHAIRS detects and tracks small arms, RPGs, ATGMs, direct fire mortars and other rocket threats. CROSSHAIRS enhances the vehicle crew situational awareness by displaying threat point-of-origin (POO) on a map based display, provides a counter-shooter capability through an assisted slew-to-cue of the overhead weapon station and provides a common active protection system (APS) interface enabling future RPG defeat when integrated with an APS countermeasure as shown in Figure 1 and Figure 2:

**Figure 1:** shows the CROSSHAIRS system as installed on an M-ATV vehicle. CROSSHAIRS is an affordable, software-upgradeable, scalable and modular system capable of providing on-the-move layered hostile fire indicating, Counter-shooter and APS cuing capability for current and future threats. CROSSHAIRS uses a common CROSSHAIRS “B-Kit” (electronics) for all vehicle applications and a vehicle unique CROSSHAIRS “A-Kit” (cables and brackets) to mount and adapt to a specific vehicle.

The CROSSHAIRS System has been developed through DARPA and US Army funded efforts with technology developments supplemented by L-3 Mustang Technology IRAD funds. During each step of the process, major demonstrations were conducted by government test agencies to validate the progress. CROSSHAIRS has been extensively demonstrated against numerous threats, in numerous environments and in both static and on-the-move situations. CROSSHAIRS is a proven mature TRL-8 design.

CROSSHAIRS critical factory test equipment was demonstrated and utilized to build the initial production run of 25 CROSSHAIRS Systems. These 25 CROSSHAIRS Systems have been deployed on MRAP vehicles and supported in the field by Mustang personnel.

**Figure 2:** CROSSHAIRS provides hostile fire indication for threat warning, enables fast and accurate retaliatory fire and enables RPG defeat, while enhancing overall situation awareness.

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CROSSHAIRS is a multi-modal system which employs two sensors that provide 360° near-hemispherical vehicle coverage: the CROSSHAIRS radar sensor which detects and tracks bullets, RPGs, ATGMs, rockets, and direct fire mortars, determines shooter location; and the Boomerang acoustic sensor which works with the radar to detect supersonic bullets and also determine shooter location. CROSSHAIRS takes advantage of dual independent acoustic and radar sensors, providing a significant performance improvement over acoustic-only solutions through special processing that correlates radar data with acoustic data. The CROSSHAIRS radar bullet detection and tracking capability is called Radar Assisted Sniper Location (RASL). This capability allows CROSSHAIRS to eliminate the detection ambiguities which often occur in high acoustic multi-path (echo) environments. This capability reduces false alarms and provides the Warfighter more reliable information. This benefit extends to scenarios where sniper fire may impact the ground or another object prior to passing the acoustic sensor. Additionally, radar performance is not negatively impacted in areas of high ambient noise environments like acoustic sensors are impacted. For example, the acoustic noise on tracked vehicles negatively impacts the performance of acoustic gunshot detection sensors. A block diagram of the CROSSHAIRS 2.0 system is shown in Figure 3.