# Report Documentation Page

*Form Approved*
*OMB No. 0704-0188*



| 1. REPORT DATE | 2. REPORT TYPE | 3. DATES COVERED |
|---|---|---|
| **20 MAY 2004** | **Journal Article** | **10-05-2004 to 17-05-2004** |

| 4. TITLE AND SUBTITLE | 5a. CONTRACT NUMBER |
|---|---|
| **TARDEC develops programmable grenade launcher** | 5b. GRANT NUMBER |
| | 5c. PROGRAM ELEMENT NUMBER |
| 6. AUTHOR(S) | 5d. PROJECT NUMBER |
| **David Brown; Robert Washburn; John Schmitz** | 5e. TASK NUMBER |
| | 5f. WORK UNIT NUMBER |
| 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) | 8. PERFORMING ORGANIZATION REPORT NUMBER |
| **U.S. Army TARDEC,6501 East Eleven Mile Rd,Warren,Mi,48397-5000** | **#13979** |
| 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) | 10. SPONSOR/MONITOR'S ACRONYM(S) |
| **U.S. Army TARDEC, 6501 East Eleven Mile Rd, Warren, Mi, 48397-5000** | **TARDEC** |
| | 11. SPONSOR/MONITOR'S REPORT NUMBER(S) |
| | **#13979** |

12. DISTRIBUTION/AVAILABILITY STATEMENT

**Approved for public release; distribution unlimited**

13. SUPPLEMENTARY NOTES

14. ABSTRACT

**Recent world events have shown that the strength of our front line forces reqwes the enemy to look althe relatively softer supply lines to mftlct casualt1es, d1srupt operabons and continue fighting Proliferauon of rocket propelled grenades makes supply vehicles vulnerable 10 surpnse attack**

15. SUBJECT TERMS

| 16. SECURITY CLASSIFICATION OF: | | | 17. LIMITATION OF ABSTRACT | 18. NUMBER OF PAGES | 19a. NAME OF RESPONSIBLE PERSON |
|---|---|---|---|---|---|
| a. REPORT | b. ABSTRACT | c. THIS PAGE | | | |
| **unclassified** | **unclassified** | **unclassified** | **Public Release** | **1** | |

13979

# TARDEC develops programmable grenade launcher

*By John J. Schmitz, Robert G. Washburn and David E. Brown, TARDEC*

Recent world events have shown that the strength of our front line forces requires the enemy to look at the relatively softer supply lines to inflict casualties, disrupt operations and continue fighting. Proliferation of rocket propelled grenades makes supply vehicles vulnerable to surprise attack.

The U.S. tactical fleet requires the same hard and soft kill, and anti-personnel capabilities as the main battle tanks and armored personnel carriers. The Tank-automotive Research, Development and Engineering Center is developing an anti-Rocket-Propelled Grenade that uses the 66mm smoke grenade and launcher form factor.

Under development as a joint project between TARDEC and PM Obscuration is the XM8 Programmable Grenade Launcher. Based upon the widely fielded 66mm smoke grenade launcher, XM8 improves the obscurant system by digitizing the launcher and strengthening it to meet the needs of the Full Spectrum Active Protection Close-in Layered Shield anti-RPG grenade.

**The Tank-automotive Research, Development and Engineering Center is developing an anti-Rocket-Propelled Grenade that uses the 66mm smoke grenade and launcher form factor.**

The XM8 can be fielded to existing armored personnel carriers, HMMWVs and other tactical trucks, and can be used in fixed locations like checkpoints and ammunition dumps. PGLs can be setup on the fly with smoke, anti-personnel and countermeasure grenades and operated from a simple control box or a networked computer. This gives the Soldier the choice to disperse an unruly crowd with smoke, or stop an assault force from breaching the perimeter with anti-personnel grenades, while maintaining an anti-RPG over-watch with FLCAS.

At the heart of the PGL is a microcontroller that includes a Controller Area Network bus, a Bosch-developed protocol used on almost every automobile built today as well as a growing list of military vehicles such as the HMMWV, Palletized Load System, and the Family of Medium Tactical Vehicles Load Handling System variants. The CAN bus allows many sensors and controllers to operate simultaneously on the same pair of wires, providing a fully integrated system that can talk to all systems on the bus. For instance, data from GPS sensors may be needed by a map screen on the dashboard as well as a fire control computer. With the CAN bus, that data is available to any system that needs it. On most cars, the engine controller, transmission controller, HVAC, dashboard controls and body controller use the CAN bus to communicate.

On the PGL system, the grenade launch tube was redesigned to handle the larger forces produced by the FCLAS, but allow for the standard smoke grenades currently fielded. The stainless steel tubes can withstand the 5000 to 6000 PSI forces produced by the grenades, and the stainless steel has excellent anti-corrosion properties required for a long life.

Embedded in the tube launcher is a micro controller board used to sense the status of each tube, determine the type of round loaded and provide remotely controlled firing of any and all tubes. Currently fielded grenade launchers have no such feature and all, except the M6, are "all or nothing" systems – one switch typically throws a salvo of grenades.

The PGL, designed to be more flexible, can be retrofitted to a vehicle with or without existing grenade tubes with a varied number and position of tubes. The type of grenades used can also be changed on the fly and easily programmed into the controller. The launch tube controller's job is to inform the main controller (or controllers) what tube is loaded and with what type of round. This information is provided to the user via a standalone control box or integrated battlefield computer. The operator can decide to "fire all smoke" tubes or to turn on the countermeasure system. In this scenario, the countermeasure system would stay powered and watch the area around it for incoming threats. Once detected, the countermeasure would fire itself and defeat the threat. At that point, the launch tube controller would notify the main controller that a round was fired and from which tube. This type of flexibility is essential for the modern battlefield.

Safety provisions include a feature to eliminate accidental firing. Many data transmissions on the CAN bus would be required before a launch tube would be allowed to power a tube or fire a round. Future improvements could include individually serial numbered grenades with integrated data on the type of grenade and its expiration date. This would allow individual grenades that may have misfired to be reported back to the manufacturer for evaluation.

The prototype PGL utilizes a 1-megabit per second data rate and can control hundreds of tubes. The system is easier on a vehicle's electrical system than other systems. Currently fielded smoke systems would fire all the grenades at exactly the same time causing a surge. Since the PGL is designed to control every tube individually, it can fire the rounds one at a time just a few milliseconds apart, reducing the surge current to half an amp while providing the fast action required. The CAN bus enabled system can provide features like motion sensing, enabling the controller to "safe" the countermeasure during a non-mobile scenario, like a checkpoint, when a foot patrol is going by and automatically "re-arm" when the area is clear of personnel.

The XM8 Programmable Grenade Launcher is designed to be flexible and user friendly while providing the cutting edge to our fighting forces. Current designs could be fielded in less than one year.