TECHNOLOGY BEAT
National Institute of Justice ■ National Law Enforcement and Corrections Technology Center

New Technologies Demonstrated for Law Enforcement

September 1995

Police officers and other members of the criminal justice community recently gathered at the Montgomery County Police Department Training Center in Rockville, Maryland, to see demonstrations of and hear presentations on new less-than-lethal (LTL) technologies that may help them perform their jobs in a safer and more efficient manner.

Sponsored by the National Institute of Justice (NIJ), the LTL program presentation and demonstration was held to provide the law enforcement community with an opportunity to critique and evaluate results of the research and development (R&D) efforts funded by NIJ, as well as other technologies under development independently by industry and Federal laboratories.

Demonstrated Technologies

The role that technology can play in enhancing officer and public safety is continuously evolving. The technologies presented herein are in various stages of development—some are relatively mature and need only refinement and commercialization, while others are still at the proof-of-principle stage.

The technologies listed below are discussed under two broad categories: vehicle pursuit/interdiction and law enforcement-related confrontational scenarios. The first four items fall under vehicle pursuit/interdiction, while the remaining seven are discussed under confrontational scenarios.

- Auto Arrestor System.
- Check-Point Barrier Strip.
- Fleeing Vehicle Tagging System.
- Retractable Spiked Barrier Strip.
- Airbag Restraint for Patrol Vehicles.
- Disabling Net and Launcher System.
- Disorienting Pulsed Light.
- Pepper Spray Launcher/Disperser.
- Position-Locating Device.
- Projectile Launcher With Impact Velocity Control.
- Smart Gun.

Vehicle Pursuit/Interdiction

How to safely apprehend a driver who refuses to stop when ordered by a law enforcement officer and avoid high-speed chases has been a long-standing problem in the law enforcement community.

Public concern over pursuit-related injuries and deaths and liability costs to municipalities across the country has resulted in a rethinking of pursuit policies. One of law enforcement's top priorities is the development of a technology to assist them in stopping fleeing vehicles when a pursuit is unavoidable. The technology should minimize the risk of death, injury, property damage, and agency liability, yet provide a high probability of making an arrest and recovering the vehicle. The technologies described below may offer solutions to this dilemma.

Auto Arrestor System

This technology employs a short pulse of electric current to burn out or disrupt critical electronic devices in the ignition systems of modern automobiles. Once a targeted automobile has driven over the activated system and the car's ignition system is damaged, the affected vehicle can coast to a safe stop, allowing the driver to maintain control, similar to what happens when a car runs out of gas. According to the developer, the damaged part can normally be replaced at minimal cost, rendering the vehicle fully operational again.

Developed inhouse by JAYCOR and building on previous U.S. Department of Defense research, this prototype technology could be completed as early as

fall 1995. For more information, contact Blair Stewart at JAYCOR, 25 North Cascade, Suite 300, Colorado Springs, CO 80903; 719–577–9700.

Check-Point Barrier Strip

This technology is a light-weight tire deflator that, when deployed and activated remotely prior to being driven over, will rapidly deflate the tires of vehicles, rendering an offender's vehicle incapable of high speed as it begins to accelerate away from a checkpoint. This technology would be particularly useful in rendering large trucks incapable of attaining high speeds in order to evade border patrol checkpoints. The deflator consists of an array of 1/2-inch hardened, hollow steel spikes and support blocks magnetically retained in a 6-foot deflator bar. When run over, the spikes separate from the bar and are retained in the tire, providing an unobstructed air passage for deflation. The deflators are lightweight, quickly deployable, reusable, and leave no roadway debris after use.

The Eagle Research Group, Inc., developed this tire deflator concept inhouse and has a patent pending on the design. Prototype units fabricated of aluminum and steel were demonstrated to the U.S. Customs Service and to the U.S. Immigration and Naturalization Service (INS). Subsequent to the demonstrations, Customs procured 20 deflator bars for testing and evaluation, and INS funded the development of a portable tire deflating system for use at border patrol checkpoints. For more information, contact Bert Soleau at Eagle Research Group, Inc., 1110 North Glebe Road, Suite 1090, Arlington, VA 22201–4795; 703–243–9400.

Fleeing Vehicle Tagging System

Offering an intermediate option between no pursuit and pursuit, this proposed technology could be operated by a single law enforcement officer from a pursuit vehicle. The fleeing vehicle tagging system concept would consist of a launcher, a projectile that is less than lethal to bystanders if it should miss its intended target; a radio-frequency transmitter tag embedded in the projectile; a polymer adhesive within the projectile to secure the tag to the fleeing vehicle; and a receiver-tracker.

The Idaho National Engineering Laboratory (INEL) has conducted a feasibility study of this technology, which is in the concept stage. A report was completed in April 1995. For more information, contact Glenn Shell at the Idaho National Engineering Laboratory, Lockheed Martin Idaho Technologies, P.O. Box 1625, Idaho Falls, ID 83415–2805; 208–526–4078.

Retractable Spiked Barrier Strip

Unlike commercially available hollow spiked barrier strips, this prototype technology can be deployed on a roadway with the spikes retracted. Then, from a safe and strategic location, the officer can extend and retract the spikes to target specific fleeing vehicles. Also, this unobtrusive strip can be placed across the road far in advance of the fleeing vehicle, with passing vehicles incurring no damage. Once the fleeing vehicle approaches and the hollow spikes are extended, puncturing and becoming embedded in the tires, the escape of air is rapid but uniform, so that the vehicle can come to a controlled stop. The barrier strip, which is designed to be comparably priced with current hollow spiked nonretractable barrier strips, can be placed safely across several potential pathways of a fleeing vehicle.

The Idaho National Engineering Laboratory delivered its prototype of this technology, which was funded by NIJ through an interagency agreement, to NIJ in March 1995. Collaborating with NIJ's Office of Law Enforcement Technology Commercialization, the Laboratory has identified and is pursuing a potential industry partnership for commercialization of this technology. For more information, contact Larry W. Hops at the Idaho National Engineering Laboratory, Lockheed Martin Idaho Technologies, P.O. Box 1625, Idaho Falls, ID 83415–3805; 208–526–6870.

Confrontational Scenarios

Confrontations between law enforcement officers and criminal suspects or emotionally disturbed, but often dangerous, subjects are not infrequent occurrences, and in large jurisdictions, can be a daily event. In a confrontational situation, the level of technology available to the police officer can mean the difference between life and death. Developing new and improved technologies for minimizing the risks of death and injury that can occur when subjects are confronted has been an area of continuing interest as expressed by law enforcement.

Use of the following technologies may effect a safer and more rapid resolution to this type of situation.

Airbag Restraint for Patrol Vehicles

This technology allows the officer to deploy a rear seat airbag restraint system from the front seat of the patrol vehicle, preventing individuals from continuing violent and distracting actions while being transported. Deployment is rapid, but not explosive, and exerts sufficient pressure to safely restrict the rear seat occupant(s). This allows the officer time to safely stop the vehicle and secure backup personnel if necessary before subduing the occupant(s). Operating the device from the front seat, the officer can inflate and deflate the bag as desired. The prototype, a modular design that permits easy removal for cleaning and replacement, is being designed for installation in existing vehicles.

The Idaho National Engineering Laboratory delivered its prototype of this technology, funded by NIJ through an interagency agreement, to NIJ in March 1995 for field evaluation. The airbag was submitted to the Naval Air Warfare Center in Pennsylvania for a health and safety

Inflatable Air Bag

risk assessment to evaluate such areas as the amount of pressure exerted on the body and potential suffocation factor. Preliminary reports suggest that the airbag poses minimal health and safety concerns. A final report of the full assessment will be sent to NIJ by end of summer 1995. If given a positive evaluation by the law enforcement community, multiple units will be fabricated and field tests will be undertaken. For technical information, contact Donna Marts at the Idaho National Engineering Laboratory, Lockheed Martin Idaho Technologies, P.O. Box 1625, Idaho Falls, ID 83415–3765; 208–526–9840. For commercialization information, contact Larry W. Hops at INEL at 208–526–6870.

Disabling Net and Launcher System

This technology is designed to produce a munition that fits conventional law enforcement weapons systems that expel a nonlethal ensnarement net for the capture of attacking or fleeing felons. Projectile-launched nets were originally conceived for the military, and the present program will explore the mechanics of reengineering that system for civilian law enforcement use. The program will address several issues, including the design of a Non-Lethal Net Deployment Mechanism, design of a complete munitions package to fit law enforcement equipment, and the canvassing of law enforcement officials to determine conditions of use.

Currently in the conceptual stage, the program effort began during spring 1995. For more information, contact Arnis Mangolds at Foster-Miller, Inc., 350 Second Avenue, Waltham, MA 02154; 617–890–3200.

Disorienting Pulsed Light

This technology, a deployable flashing bright light source, induces temporary impairment of vision as well as disorientation effects on exposed target subjects, with no disabling or otherwise negative effects on law enforcement officers. The device employs a pulsed bright white light (strobe). Officers would wear special goggles, time-synchronized to the flashes, so that their vision is unimpaired.

Launcher Net

A laboratory model of this equipment, which incorporates a modified commercial photographic strobe light and components from a welder's goggle, will allow assessment of issues such as the required field of view and extinction ratio for the goggles. If given a positive evaluation, a prototype device will be built for further testing and evaluation. Similar to current devices, the prototype will be wireless and the strobe unit ruggedized to permit throwing into a structure. For further information, contact Dr. Harold Levie at Lawrence Livermore National Laboratory, Mail Stop L–366, P.O. Box 808, Livermore, CA 94551; 510–423–1503.

Pepper Spray Launcher/ Disperser

This technology offers an improved but affordable system for the delivery and dispersal of a chemical incapacitating agent into a barricaded structure, which reduces risk of overpenetration into adjoining areas. Particular features are the use of oleoresin capsicum (pepper spray) as the incapacitating agent rather than tear gas, a launcher that can deliver the agent in a projectile from a standoff position, and a projectile that can penetrate windows with minimal risk of injury to occupants and efficiently disperse the agent.

Delta Defense, Inc., with NIJ funds, has constructed a projectile that is capable of holding an off-the-shelf pressurized pepper spray canister and delivering the projectile through a barrier constructed in accordance with NIJ Standard–0111.00: Barrier-Penetrating Tear Gas Munitions, and dispersing the material in an atomized spray. The

projectile is designed to be delivered from a standard 37 mm launcher. A report and a video of this technology's performance are currently in production. For more information, contact Dr. Roy Kelly at Delta Defense, Inc., 1111 Jefferson Davis Highway, Suite 508, Arlington, VA 22202; 703–416–4928.

Position-Locating Device

In street encounters, officers need both hands free to handle immediate situations. Real-time information on location and current status is often delayed until the officer neutralizes the encounter. In some instances the officer's radio is lost during a scuffle, or the officer is injured and cannot operate the transmitter.

The Collar Locator/Personal Locator Transmitter (PLT) is designed to be worn around the collar of a police uniform to provide near-field location and communication information to police vehicles that can then be transmitted to a central command station. A collar PLT would always be in the "ON" position when the officer leaves his or her cruiser, providing real-time location and status information to incoming officers for backup or assistance. A repeater/recorder could also be placed in the patrol car to relay data back to the station and also provide a record of the encounter. In the event of an injury to the officer, the locator would give fellow officers immediate direction to the position to provide first aid.

Designed by the Idaho National Engineering Laboratory (INEL) with NIJ funding, this proof-of-principle miniature short-range, one-way voice transmitter and position-locating device involved integrating off-the-shelf hardware to demonstrate system function. While functionality has been demonstrated, further work is required to repackage the system to an on-body configuration. For more information, contact Clifton E. Stine at the Idaho National Engineering Laboratory, Lockheed Martin Idaho Technologies, P.O. Box 1625, Idaho Falls, ID 83415–3765; 208–526–0764.

"Smart" Gun

Projectile Launcher With Impact Velocity Control

Less-than-lethal munitions ranging from tear gas and pepper spray to blunt trauma projectiles need to be delivered at a variety of distances depending on the circumstances of an incident. Unfortunately, if a subject is too close to the launcher, the projectile may have the potential of producing lethal injuries and if the subject is too far away it may be less than effective. A laboratory version of an impact velocity controlled launcher was designed that utilizes an active laser range finder to determine the distance between the launcher and its target and adjusts the launch velocity of the projectile so that the impact velocity on the target is essentially constant, independent of range. This same concept can be used to deliver other ordnance in a more controlled manner, such as nets or chemical agents. A side benefit of spherical projectiles is that aiming is considerably simplified; the ballistics are such that no allowance for projectile drop need be made over the span of useful ranges.

The proof-of-concept launcher project was funded by NIJ through an interagency agreement and developed by the Lawrence Livermore National Laboratory. Further development into a field demonstration device is currently under consideration. For further information, contact Dr. Harold Levie at Lawrence Livermore National Laboratory, L–366, P.O. Box 808, Livermore, CA 94551; 510–423–1503.

Smart Gun

The Smart Gun is a firearm that "recognizes" the user and can only be fired by an authorized user. The intent of the current project is not to produce a firearm, but to evaluate technologies capable of being used *in* a firearm that can recognize a user, as well as being highly reliable, safe, and secure, and meeting stringent law enforcement requirements.

Based on the law enforcement user communities' requirements, Sandia National Laboratories is developing models of smart gun systems, funded by NIJ through an interagency agreement. Research has been conducted into miniaturized sensors, ruggedized electromechanical devices, and sophisticated signal processing to facilitate the fabrication of a model that maintains the same look and feel of an actual firearm, allowing further meaningful evaluation by law enforcement personnel. For more information, contact Doug Weiss at Sandia National Laboratories, P.O. Box 5800, Mail Stop 0537, Albuquerque, NM 87185–0537; 505–845–9134.

Results of Law Enforcement Critique and Evaluation

Attendees at the Less-Than-Lethal Technology Program Review and Technology Demonstrations were asked to complete a questionnaire about the technologies presented. Their insight and candid comments were helpful as to the actual usefulness of the new technologies. Questions asked were:

- Would you purchase this device if it were available?
- How useful do you find this device?
- How much would you be willing to pay for such a device?
- To whom would you make the device available?
- Should development/refinement of this technology/device be pursued?
- What do you perceive to be the strengths or weaknesses of the technology/device?

The general consensus was that the new technology is useful and practical, but further R&D is required to make the products viable. The majority felt a priority need for such products, although they also expressed concern about issues of cost and safety.

NIJ is reviewing the results of the evaluations to help prioritize future R&D efforts. Your comments or responses to the above questions are welcome. Those interested in the availability of funding for R&D may request a copy of the NIJ Research Plan.

NIJ's grants program, operated by NIJ's Office of Science and Technology, has supported research in numerous and diverse issues of importance to law enforcement executives, as well as to officers on the street. Improving fingerprint and trace evidence identification and the development of DNA standards are some of the more notable. In the late 1980's and early 1990's, a renewed interest in LTL weapons by the criminal justice system led Congress to allocate special funding to NIJ to begin an R&D program in this area.

In late 1992 and early 1993, NIJ initiated an expanded program to investigate all aspects of this issue and to develop a broad-based research program that would lead to new tools and use-of-force options for law enforcement officers. The program has evolved into one that looks not only at weapons but at the sociological aspects of the use of LTL weapons, e.g., liability and community acceptance issues.

It has also become clear, however, that technologies other than weapons may effectively address the same operational goals of reducing the incidence of death and injury to officers, suspects (or prisoners), and the public when force has to be used to effect an arrest or combat violent behavior during transport or other custodial duties.

Under NIJ's charter, relative to its grants program, the Institute is authorized to:

- Sponsor R&D to improve and strengthen the Nation's system of justice with a balanced program of basic and applied research.
- Evaluate the effectiveness of criminal justice and law enforcement programs and identify those that merit application elsewhere.
- Support technological advances applicable to criminal justice.
- Test and demonstrate new and improved approaches to strengthen the justice system.
- Disseminate information from research, development, demonstrations, and evaluations.

New NIJ Publications

Available upon request is *NLECTC Bulletin*, "Positional Asphyxia—Sudden Death," dated June 1995. Currently in production is a report on the Second Annual Law Enforcement Technology for the 21st Century conference, held in June 1995 in Washington, D.C. Please contact NLECTC for availability of these publications.

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The National Institute of Justice is a component of the Office of Justice Programs, which also includes the Bureau of Justice Assistance, Bureau of Justice Statistics, Office of Juvenile Justice and Delinquency Prevention, and Office for Victims of Crime.

To comment or for further information, please call NIJ's National Law Enforcement and Corrections Technology Center at 800–248–2742 or write to Box 1160, Rockville, MD 20849–1160.

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