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**National Institute  
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*Issues and Practices*

# Report on the Attorney General's Conference on Less Than Lethal Weapons

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National Institute of Justice

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**James K. Stewart**

*Director*

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U.S. Department of Justice  
National Institute of Justice  
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# **Report on the Attorney General's Conference on Less Than Lethal Weapons**

by

**Sherri Sweetman**

**March 1987**

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*Issues and Practices in Criminal Justice* is a publication series of the National Institute of Justice. Designed for the criminal justice professional, each *Issues and Practices* report presents the program options and management issues in a topic area, based on a review of research and evaluation findings, operational experience, and expert opinion in the subject. The intent is to provide criminal justice managers and administrators with the information to make informed choices in planning, implementing and improving programs and practice.

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## Foreword

Law enforcement officials have long recognized that a wide and dangerous gap exists in the range of tools that are available to them. The most common law enforcement tools, the nightstick and the gun, may be either too weak or too strong a response to many police situations. In violent confrontations, officers may be obliged to choose an unnecessarily strong response for lack of an effective alternative weapon. The use of force, or deadly force, by law enforcement officers currently presents two serious problems for society. First, the use of deadly force frequently offends some of our highest national ideals — the preservation of life, and the right of a suspect to due process. Second, a growing number of communities are suffering financial hardship as a result of civil liability suits alleging the use of excessive force by law enforcement officers. These problems demand that we persevere in the development of less than lethal weapons, that is, weapons which are designed to provide effective enforcement while at the same time minimizing the risk to life.

The need for less than lethal weapons, however, is not limited to the officers of our law enforcement agencies. It includes those who manage our jails and prisons and are charged not only with preventing escapes, but with insuring the safety of both staff and inmates. It also includes those who deal with hostage situations and other potential terrorist incidents, where protecting the innocent must be of paramount concern during efforts to capture those who would hold or harm them. Within the private sector, it includes those charged with insuring the safety of corporate officials and essential installations within our country and abroad.

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While the benefits to be derived from the development of less than lethal weapons are clear, the development of such weapons requires the cooperation of experts from many disciplines. In June 1986, at the Attorney General's Less Than Lethal Weapons Conference, a broad range of criminal justice professionals and scientists came together to meet this challenge. Police, corrections officials, terrorism and hostage situation experts, as well as private sector security experts joined with scientists who are at the forefront of non-lethal weapons research to discuss the development and use of less than lethal weapons. In their discussions, conference participants focused on matching the needs of law enforcement officials with current and emerging technologies, the role of less than lethal weapons in the spectrum of police response, the capabilities and limitations of various non-lethal weapons, and the impact of new weapons on public opinion. Finally, conference participants addressed the crucial question of the degree of risk which can be accepted in the use of a less than lethal weapon.

This conference has provided the groundwork for the development of useful, safe, less than lethal weapons technology. The work which lies ahead, however, is great. It not only involves the development of new technologies, but also the development of protocols for testing and procedures for controlling and regulating product availability. In addition, training must be provided to ensure that those authorized to use such devices do so safely, and policies and procedures to govern the appropriate use of less than lethal weapons must be developed. The challenge is large, but the potential for enhancing safety and justice in this country is great.

James K. Stewart  
Director  
National Institute of Justice

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## Chapter One

# Less Than Lethal Weapons: An Overview

*The highest ideals of our society, justice and the preciousness of human life, demand that we persevere in the search for life saving tools for arrest.*

James Stewart  
National Institute of Justice

### The Need For Non-lethal Weapons

In 1972, the U.S. Department of Justice, in conjunction with the National Science Foundation,<sup>1</sup> sponsored a national conference on research needs for non-lethal weapons—coercive devices and agents that could subdue without creating substantial risk of permanent injury or death. Concerned about the special crowd control problems posed by the racial disturbances and student violence of the 1960s, conference participants urged that an effort be made to develop new non-lethal weapons for use by law enforcement agencies.

In June, 1986, Attorney General Edwin Meese convened a conference to reassess the progress of less than lethal weapons development, to examine recent advances in technology, and to explore issues to be considered in future development efforts. The conference was attended by 150 federal, state, and local law enforcement officers, Department of Defense representatives, scientists and academicians. In addition to the problems of crowd control, participants at this conference looked toward the development of non-lethal weapons to address a range of law enforcement needs:

- to avoid serious injury and death of fleeing felons;
- to deal with hostage-terrorist situations;

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- to decrease the number of law enforcement officers shot with their own weapons;
  - to provide adequate force options for the increasing number of women officers;
  - to respond effectively to potentially violent emotionally disturbed persons; and
  - to decrease high insurance rates and lessen the number of lawsuits involving police officers.

Further impetus for the development of improved less than lethal weapons was provided by the 1985 Supreme Court decision in *Tennessee v. Garner* which limited the permissible use of deadly force against fleeing felons. In this case, which involved an unarmed 15-year-old Memphis boy who was shot and killed in 1974 while fleeing the scene of a \$10 burglary, the Court held that the "use of deadly force to apprehend an apparently unarmed, non-violent fleeing felon is an unreasonable seizure under the Fourth Amendment."<sup>2</sup> Even prior to this decision, similar cases had challenged the constitutionality of using deadly weapons (based on the 14th amendment), arguing that such force involves the taking of life without due process of law.

The two primary objectives of the 1986 conference were to develop ideas for new weapons and to recommend a plan of action for future research and development. The conference provided an important opportunity for scientists and law enforcement officials to collaborate in discussing the utility and limitations of existing weapons and ways to improve the available technology. Participants strongly agreed that if the momentum gained through the conference were sustained through aggressive research and development efforts, new weapons might be widely available within five years.

For purposes of the conference, less than lethal weapons were defined as devices or agents used to induce compliance with law enforcement personnel without substantial risk of permanent injury or death to the subject. The phrase "less than lethal," rather than "non-lethal" was adopted to recognize the fact that any such weapon is potentially lethal if used inappropriately.<sup>3</sup> Less than lethal devices were considered particularly useful in the following five situations:

- close proximity encounters, such as breaking up a bar fight or intervening in a domestic disturbance;
- to halt fleeing suspects;
- hostage situations, including terrorists with hostages;

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- barricade situations, where the subject is violent, but has not taken a hostage; and
  - crowd-control or riot situations.

Participants identified a number of constraints that have limited past efforts to develop non-lethal weapons, and a number of new issues that must be resolved if future efforts are to succeed. These are listed below briefly and discussed further in Chapter Three.

- Since any force that is used against an individual can be potentially lethal, acceptable limits of potential risk must be set.
- No single device can be expected to serve the many operational needs in the field.
- The design of a new device should incorporate features to limit the potential for abusive use.
- Successful research should include Department of Defense participation because much of the existing technology is classified.
- The participation of biomedical experts is mandatory in order to clarify the physiological effects and consequences of new weapons.
- Public acceptance of any new device will be a critical concern since public perceptions of propriety will strongly influence the use of a given weapon.
- Acceptance by the officers who would use the device is equally critical.
- Human experiments will eventually be essential to demonstrate the effectiveness of a new device.
- Administrative controls for actual use should be considered in development.
- Devices must not be overly complex; they must be durable and simple for the officer to use, but potentially difficult for others to use, should the officer lose possession during a confrontation.
- The delivery system (method of applying the active element to the subject) must be at least as accurate as a conventional handgun.

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## Weapons Currently in Use and Their Constraints

Conference discussions were structured around the three types of currently available weapons technology: electrical devices, chemical devices, and impact devices. (Biomedical considerations in weapons development were treated both separately and in conjunction with other aspects of a weapon type.) The same structure will be used in this report, with the understanding that many weapons involve technologies from more than one area. Notably, most of the current weapons reviewed here were also available in 1972.<sup>4</sup> The apparent lack of significant innovation in the years between 1972 and 1986 indicated to participants the crucial need for central coordination and support of future development efforts.

### *Electrical Devices*

A good deal of attention at the conference was focused on electrical devices, since many consider them the most promising avenue for development.

The *Taser* was the first electrical shock device developed for use by law enforcement. It is a flashlight-sized device that uses gunpowder to propel barbed, dart-shaped electrodes to the subject's body. High voltage/low amperage pulsed shocks immobilize the victim. (Specifically, 50,000 volt pulses at two millionths of an amp are delivered 12-14 times per second.) The *Taser* is used by some police departments, but has not been widely adopted for a variety of reasons. As with other electrical weapons, it is not highly effective on individuals under the influence of drugs (who sometimes have nearly superhuman endurance), or on emotionally disturbed persons or those in a high state of excitement. Even under normal circumstances, individual tolerance varies widely. Tasers also have limited range: a miss is highly likely at ranges over ten feet. Furthermore, the *Taser* is a single-shot device and time frequently does not permit reloading. In addition, some police departments have found that a subject's heavy clothing can render the device useless. The *Taser* has been reported to be 60 to 85 percent effective,<sup>5</sup> a range most likely due to the cross-section of people targeted in any given jurisdiction.

Los Angeles police personnel at the conference reported that the LAPD has used the *Taser* about twice per month over the last three or four years; the frequency of its use elsewhere is not known. While some deaths have been reported, under most conditions the weapon is not lethal. A number of law enforcement officers do, nonetheless, object to using the *Taser* for safety reasons. Using it near water could cause death, for instance, and in one case, a man who had doused himself with gasoline died from a fire caused when a *Taser* was deployed. At the 1972 conference, participants questioned

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the Taser's public acceptability and suggested that the weapon might be used more effectively in hostage situations, where the public is not as sensitive about the danger to the suspect.

Significantly, the primary manufacturer of the Taser has filed for bankruptcy and will reportedly require a large capital investment to resume production. High operating costs, restrictions on foreign sales (imposed as a result of the Taser's classification as a firearm and consequent regulation under the Munitions Act), and marketing problems within the U.S. have all contributed to the manufacturer's financial problems. At the time of initial bankruptcy proceedings, the LAPD had been discussing with the manufacturers possible modifications to the Taser that might make the weapon more reliable and useful. During the conference, the LAPD reported that it was equipped with about 500 Tasers and enough cartridges to last for five years, but if the company were not back in business by then, the department would have to resume its use of mace, even though the effectiveness of mace is highly questionable. Using the Taser as a key example, Chapter Three considers the problems of financing the development of less than lethal weapons for police use.

The *Nova XR-5000 Stun Gun* is a small, two-pronged, hand-held electrical discharge weapon useful only at distances closer than an arm's length. The Nova is sold to private citizens, as well as public law enforcement agencies. Both positive and negative experience with stun guns was reported at the conference. In one police force, they are seen as the most effective non-lethal weapon in their arsenal, which also includes lights, fire extinguishers, nets, a water cannon, and dogs. Officers are not required to carry the stun guns; they may choose mace instead. Those choosing the stun gun are required to be subjected to the weapon in the course of their training.

A representative of another department reported an approximate rate of effectiveness for stun guns of only 50 percent. The following limitations of the stun gun were generally acknowledged:

- its range is limited to arm's length;
- it is more effective on smaller people;
- its effectiveness is diminished if the subject is under the influence of drugs (such as PCP), is excited, or is mentally disturbed; and
- tests by the National Research Council of Canada suggest that the stun device can potentially interrupt the action of a Pacemaker, a device that enables heart patients to control their heart rhythms.

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The *Talon* is a glove with an electrical pulse generator in the palm and bottom side of the fingers. The *Source* is a similar device—a flashlight with electrodes on the base. Reportedly, these types of electrical devices are now used primarily in correctional institutions (which might qualify them as restraining devices rather than less than lethal weapons). The effects of the *Talon* and *Source* are similar to those of other electrical weapons. While few people at the conference reported experience with either device, as electrical weapons, they share the limitations of the Taser and the Nova. Additionally, the *Talon* is bulky, and reduces the mobility of the wearer, and, like the *Source*, requires close contact.

### **Chemical Devices**

Two types of chemical agents have been developed: those that act on the central nervous system, and those that act peripherally on the body. Agents that act on the central nervous system have a relatively long onset period (typically 30 to 60 seconds) and their effects last from several minutes to one hour. Chemicals that act peripherally (tear gas, for instance) are most frequently used as riot control agents, but are also used in one-on-one and barricade situations. Onset time is short (typically a few seconds), and the effects usually last for a few minutes. An inherent problem with the use of chemical agents is that effective dosages will vary from person to person. Many incapacitating agents exist, but most are not in common use. Mechanisms of chemical action include tranquilization through action on the central nervous system, emesis (vomiting), intestinal irritation, temporary blinding, immobilization of the limbs, and unconsciousness. Methods of administering such chemicals include: 1) injection by a dart or flechette whose tip has been treated with the drug; 2) inhalation; or 3) ingestion.

Classes of *centrally-acting compounds* include fentanyls, ketamine, and stunning compounds such as BZ. Very small doses of fentanyls are effective in immobilizing limbs, but can cause depressed respiration. Ketamine is generally used as a pediatric anesthetic and can be dangerous when used on heart patients. Physiological manifestations include induced dream-like state through hallucinations, or even severe delirium, with effects being least severe on children and the elderly. BZ is an effective stunning agent that acts by mydriasis (dilation of the pupils), which can be extremely uncomfortable. BZ, which has been distributed in the Army, can also cause short-term memory loss, and different people may experience different levels of side effects. Tranquilizers, widely used in psychiatric institutes, may also be effective in other applications. These chemicals, however, are not currently administered in police situations.

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The *peripherally-acting chemicals* include the chemical tear gas agents CN and CS (mace), and CH. CN, conventional tear gas, produces tearing of the eyes and itching skin. CS produces a heavy flow of tears, respiratory discomfort, coughing, stinging, or burning on moist skin, sinus irritation, and in stronger concentrations may produce headache, dizziness, and disorientation. There have been cases of blisters, impaired vision, and second degree burns. Tear gas has been standard in police inventories since the late 1960s. Officers frequently carry personal-issue hand dispensers, and most departments have tear gas shells for shooting dispensers past barricades. Large-volume dispensers can be used for crowd control.

The uncertain efficacy of tear gas is a key concern. Individual physiological differences are known to result in significant differences in tolerance to lachrymators (tear-inducing substances), including standard-issue mace. Moreover, mentally disturbed and highly emotional subjects, or those in an aggressive mood induced by drugs or alcohol, are known to be relatively unaffected by tear-producers or to become even more excited by them.

CH is a newer chemical irritant, and is extremely painful to the eyes. Because it is a liquid, which will vaporize, it can be flushed out of a closed area, and poses less of a problem with decontamination than either CN or CS.

These chemicals are delivered in a variety of ways, including hand-thrown grenades, aerosol cannisters, rifle-fired projectors, and fogging devices. Aerosols have a range of about 30 feet. Grenades and rifle projectors are useful at longer ranges for crowd control. Options such as burning cannisters and foggers can cover a rather large area.

Conference participants reported fewer experiences with chemical weapons than other non-lethal weaponry. The most widely used chemical is Mace. (CN is called mace in the Army, although occasionally CN and CS are both referred to as Mace.) Reportedly, both CN and CS have been widely used in correctional institutions. CS, adopted by the military as a replacement for CN in 1958, was used in Vietnam and both CN and CS are currently used or carried by many law enforcement officers. In addition, the British are moving from rubber and plastic bullets to frangible plastic rounds that hold CS powder. Finally, the soft-RAG (Ring Airfoil Grenade), an impact weapon developed by the U.S. military (and discussed in the next section), holds embedded CS powder. Although impact weapons with CS powder may prove to be effective, there was almost unanimous agreement that Mace, administered in isolation, is not an effective less than lethal weapon.

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## Impact Devices

Impact weapons have been defined to include any weapons whose effects are based on kinetic energy impact, including billy clubs.

"Batons", "nightsticks" and "billy clubs" are the oldest and still the most frequently available less than lethal impact weapons. Nightsticks are almost universally issued by the police, but their uses are limited. Few departments even issue the baton because of the training required, and the difficulties involved in gauging appropriate levels of force. One proposed addition to these impact devices is the breakaway nightstick, which would shatter or break when used with inappropriate force. Undeveloped in 1972, some research has purportedly been done on this option, but significant concerns over whether or not it will break at the right time have reduced the prospects for continued development in the immediate future.

The U.S. military developed a combination impact/chemical weapon in response to civil unrest a number of years ago, called a *sting-RAG*, or "ring airfoil grenade." The "RAG" is a pliable ring of soft rubber, about two and one-half inches in circumference, fired from a launcher that fits on the end of an M16 rifle. The launcher gives the RAG a 5,000 rpm spin, and sends the ring forward to its victim at about 200 feet per second. It has little velocity decay in flight and is effective at 60 meters or more. Unlike other rifle-launched impact projectiles intended for crowd control, the RAG is considered to be non-lethal at all ranges; it has been tested on various body parts, and theoretically will not kill even if it hits the temple at close range. (Its impact has been compared to a boxer's jab.) Disadvantages of the *sting-RAG* are that it is affected by wind, that it could cause damage to an eye, that it currently requires an M16 for firing, and that padded clothing will render it ineffective. The *sting-RAG* has not as yet been adopted for widespread police use.

*Other rifle-launched soft projectiles* include small water balloons, splatt rounds, shot-filled bean bags, and rubber batons. None of these has been widely used in the United States. Another version of the *sting-RAG*—the *soft-RAG*—holds CS powder and, on impact, releases a 3 to 5 foot cloud of this powerful tear producer. Except for the *soft-RAG*, these projectiles are heavier than the airfoil grenade, and must travel through many feet of velocity decay to become harmless. The rubber baton for example, is considered hazardous to a subject's head until it has traveled 60 feet; the water balloon is hazardous to lungs and liver until it has traveled more than 70 feet. These ballistic projectiles, lacking the aerodynamic surface of the *sting-RAG*, must also be fired at a higher, arc-shaped trajectory, and are therefore much less accurate.

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*Rubber and PCV bullets* have been used widely by the British in Northern Ireland, and have also been tried by the U.S. military. Rubber bullets are 8 to 9 inch pliable cylindrical rounds that are fired from special rifles. The major constraint on the use of these weapons is their potential to cause serious or fatal injuries. Rubber bullets reportedly kill about 1 in 5,000 persons. The British in Northern Ireland have replaced rubber bullets with PVC bullets, which are considered less lethal.

The *water cannon* produces a steady stream of water that disperses crowds through its impact and the slippery condition it creates. The water cannon lacks public appeal because of the similarity to the fire hoses that were used in the South to disperse civil rights demonstrators. At present water cannons are used more frequently in some European nations and South Africa.

## Other Less Than Lethal Weapons

Several other methods for distracting or immobilizing a subject were referenced during the conference. A *Flash/Bang grenade*, which produces explosive sound and light, results in 3 to 5 seconds of disorientation, which can provide the time necessary to apprehend a suspect. The grenade can also be loaded with a chemical that has a delayed onset time. One police department and an Air Force officer reported unsuccessful attempts to use a *three pole trip device* which uses poles held by three officers to subdue and immobilize a suspect. Similarly, the *capture net* was reported to have limited utility as at least two officers are necessary to handle the net and few situations require its use.

Some devices are designed to have a psychological impact. For instance, one police department has a weapon with a laser sight that will show the suspect where he will be hit with a bullet if he fails to surrender. Some stun guns also have a demonstration arc.

The choke hold or the carotid hold (one to the windpipe, the other to a major artery) were also defined as less than lethal techniques for immobilizing a suspect. The carotid hold was reported to have been used very effectively in the Los Angeles police department for about 40 years. Recently use of this hold was dropped following litigation asserting that it has lethal potential. Another officer mentioned that in his department, the carotid hold is used as long as one other officer is present to observe and the hold is not maintained for more than 60 seconds. Experience with the carotid hold illustrates a problem common to most all less than lethal weapons: namely, under some circumstances they may prove to be lethal.

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## Conclusion

This brief review of the options discussed by conference participants is not intended to represent an exhaustive inventory of all less than lethal weapons. Indeed, because awareness of the available technology is not high among law enforcement officials, participants at the conference urged that more comprehensive information be developed and shared with police agencies. In response, the National Institute of Justice's TAP Information Center plans to compile a list of all available devices and to contact users to acquire, at a minimum, anecdotal data on their experiences. This inventory will constitute a valuable first step in the process of assembling more systematic data on the characteristics and applications of less than lethal weaponry.

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## Chapter Two

# Operational Requirements for Less Than Lethal Weapons: Implications for the Future

There is, of course, no single police situation, nor can a single weapon suit all needs. Law enforcement personnel confront a variety of situations and need different weapons under different circumstances. In order to proceed systematically with less than lethal weapons development, conferees emphasized the need for detailed information about the various types of situations which call for the use of such weapons. From this knowledge, the necessary operating characteristics of particular weapons can be defined.

### Types of Encounters

Conference participants suggested categorizing encounters into the following broad categories: close proximity encounters; fleeing persons; hostage/terrorist situations; barricade situations; and crowd/riot control.

*Close proximity encounters* include those involving individuals who pose serious or potentially serious danger to the officer and others. This category includes encounters with violent or potentially violent criminal offenders as well as intoxicated persons, persons involved in domestic disputes, mentally disturbed persons, and those under custodial supervision. Such situations typically involve only one or a small number of persons who are often in an agitated state of mind. In many encounters, law enforcement personnel generally do not know whether such persons are armed; frequently they may appear not to be armed. A subject may, nonetheless, have an opportunity to produce a weapon unexpectedly or to attempt to seize the officer's weapon.

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Because subjects are capable of sudden violence or aggression, any weapon used by an officer must have the capacity for rapid incapacitation, with onset in seconds and maximum effect in no more than one minute. Though the level of appropriate force will vary with the situation, the mechanism of force must have many of the characteristics of the handgun. To meet this criterion, the weapon must:

- fire more than once without reloading;
- operate at a range of less than one foot up to five to ten feet;
- operate with one hand;
- be light enough to carry on a standard service belt; and
- have a mechanism that the officer can operate easily but that an assailant gaining control of the weapon might find difficult.

A second type of encounter involves *fleeing persons*. Fleeing suspect situations present all the weaponry requirements found in close-proximity encounters, plus the need for greatly increased range. The weapon should be as accurate as a handgun, and the debilitating mechanism must be deliverable from a position at the back of a fleeing person. Again, onset of the incapacitating effect must be in seconds, but its complete effect could be extended to minutes. Although the technology used to stop a fleeing suspect might well be the same as that used in close encounters, it is likely to require a different delivery mechanism. The 1986 conference participants also noted the desirability of delivering some form of marker in conjunction with the incapacitating agent. With this type of dual-purpose weapon, even if the incapacitating agent did not take effect, or took effect only after the felon had escaped immediate apprehension, later identification would still be possible. Conceivably, a technology may exist that would even permit tracking the marker in order to locate the subject.

A special category of fleeing person encounter is the occasional attempted rescue from prison, illustrated by recent helicopter escapes. This may involve elements of one-on-one, close proximity, and fleeing person situations. In most cases, the helicopter pilot must be assumed to be a hostage, further complicating the situation.

*Hostage situations*, including those involving terrorists, are a third type of encounter. These encounters can be complex, involving variable numbers of terrorists and hostages. Terrorist situations, and terrorist-hostage encounters, have become much more prevalent in recent years, primarily outside the U.S., but often involving U.S. citizens. Even though the majority of law enforcement officers do not encounter the situation frequently, the

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uniqueness and gravity of these encounters warrant considerable attention. A number of special considerations apply to terrorist-hostage situations:

- In many incidents, the Government has the opportunity (time) to plan a response. Surveillance, both visual and acoustical, can be used.
- The nature of the threat is complex. There can be varying numbers of terrorists and hostages, and the presence or absence of barricades.
- Although there is general agreement that because of the nature of the crime there is probably less public concern for the safety of the terrorist than for other suspected criminals, an important goal is often to capture the terrorist, in order to investigate the case, seek criminal prosecution, and discover the roots of terrorist activities.
- Negotiation and persuasion are useful non-lethal weapons in terrorist-hostage situations. It is important to make the terrorists want to release the hostages.
- Any weapon developed needs to take into consideration the possibility that a terrorist can potentially set off a bomb, or strike out in other ways, doing considerable damage before he is subdued.

A hostage situation presents quite different non-lethal weapons requirements. The person to be incapacitated is in control of one or more innocent persons, who must be protected from injury or death. While a hostage situation may start as a close encounter, in most cases it ultimately evolves into the captivity of hostages within a building, more often than not within a single room. (Aircraft hostage situations are, of course, another common scenario.)

In view of the need to protect the safety of hostages, conventional chemical agents are seldom suitable. As long as the hostage-taker can recognize his or her impending incapacitation, retaliatory action can be taken. Since agents that would take effect instantaneously are neither available nor always practical to administer in a hostage situation, conference delegates suggested that it may be most desirable to induce disorientation gradually. This might result from chemicals that produced gradual nausea or psychological effects that would lead the perpetrator to seek a way out of the confined area.

Relatively large less than lethal weapons devices potentially could be used in hostage situations as long as they can be delivered to the scene promptly. The required range would vary from approximately the range of

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a room to as much as 100 yards. In either case, the device would most likely need to operate through walls. The conference participants discussed electromagnetic fields and stroboscopic lights as candidate systems. Some forms of electromagnetic radiation, for example, extremely low frequencies (ELF), might cause nausea or other disorienting effects.

*Barricade situations* occur when one or more persons have taken refuge or barricaded themselves in a building. This also includes the self-hostage, the person who threatens to harm himself if certain demands are not met, as well as situations involving innocent hostages. Because barricade situations often involve only the perpetrator, certain weapons that result in fairly rapid incapacitation could be used, but systems that required minutes or even hours would be quite acceptable. The main concern, as in the hostage situation, is to negotiate surrender without using lethal weapons—unless, of course, the barricaded subject endangers the lives of the public or the police.

Finally, *riot and crowd control situations*, much less prevalent in the United States now than in the 1960s and early 1970s, are another class of police encounter in which less than lethal weapons have important applications. Peaceful crowds can be controlled merely through police presence and verbal commands. Crowd control becomes a major concern only when a gathering intentionally seeks to provoke police response (through attacks on law enforcement officers or other persons and property) or has the potential to degenerate into a riot. Such crowds are usually either in an open, outdoor area, or in a large facility such as an arena. The police frequently maintain a substantial distance between themselves and the crowd, sometimes hundreds of feet.

Present-day crowd control in potential riot situations employs a number of less than lethal weapons operating from a distance: tear gas in the United States, water cannon or fire hoses in some European countries, rubber bullets in the United Kingdom. Basically, two distinct categories of less than lethal weapons would be useful in crowd control: one to control major groups of people, and another to deal with individual instigators. Conference participants pointed to the potential for using stroboscopic or audio stimuli in crowd control as well as hostage situations.

## **Desirable Operational Requirements**

With these five broad categories of encounters in mind, it is possible to construct a set of desirable operational criteria for non-lethal weapons. The major tactical options available for less than lethal weapons in such encounters include:

- distraction (e.g., flash/bang grenades);
- disorientation (e.g., CH gas);

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- dispersal (e.g., riot control gases);<sup>6</sup> and
  - immobilization or incapacitation (e.g., chemical dart guns to immobilize a fleeing felon).

Each tactical option category encompasses many levels of responses to different types and levels of threats. For instance, the handgun, a tool to immobilize or incapacitate, is a response to the suspect who poses a clear threat of injury or death. A chemical dart gun, another method of incapacitation or immobilization, would most likely be a response to a somewhat lesser threat (although still dangerous or actively resisting). Riot control gases would be a moderately lower level response to a threat by potentially violent groups of people, where the intent is to disperse rather than to force a single person to comply with a police order. Clearly, the conditions under which various weapons could be used need to be well specified.

Conference participants indicated that less than lethal weapons should have the following fundamental characteristics:

- Provide a high probability of instantaneous control over a highly motivated suspect.
- Have minimal medical implications for normally healthy subjects.
- Indicate when the device is in proper working order.
- Have observable effects, so that it is clear when it has been used.
- Have a high probability of affecting only the intended target(s).
- Be durable and capable of being operated in most environmental conditions.
- Have only a temporary effect.

Non-lethal weapons for close proximity and fleeing situations will have the most numerous and demanding requirements, making development more difficult than that required for other applications. (Ideally, however, the same weapon could be used for both types of encounters, since officers cannot hang too many objects from their belts.) Conferees suggested that non-lethal weapons intended for regular use by law enforcement officers in close encounters and fleeing felon situations should:

- Be familiar and recognizable; i.e., the design should be similar to a pistol or shotgun.
- Be of a size that one officer can handle easily with one hand.

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- Be useful in foot pursuit.
  - Be useful inside a building as well as outside.
  - Be safe and effective in close quarters.
  - Be durable (e.g., be able to withstand transportation in the trunk of a car), and be able to withstand moderate changes in temperature.
  - Be highly accurate.
  - Be capable of being activated and fired more than once without reloading.
  - Have a range of 5 to 10 feet for close encounters and up to 25 yards for fleeing suspect situations.
  - Be able to incapacitate a subject for approximately 5 minutes.

Conference participants rated the development of non-lethal weapons for use in close-proximity encounters as most urgent. (In descending order of urgency, delegates ranked the other situations as hostage, barricade, fleeing suspect, and crowd control.) In more specialized situations, such as hostage-terrorist, riot/crowd control and barricade, there is generally more time to react, which reduces the number of requirements on the weapons. In these situations, size, portability, familiarity, and durability may be less important than method of delivery, range, and speed of action.

## **New Less Than Lethal Weapon Possibilities**

Given the pressing needs for improved less than lethal weapons, a major objective of the Attorney General's conference was to develop ideas for new weapons and to recommend a plan of research. A substantial number of potentially workable new ideas emerged. At the outset of the conference, Attorney General Meese urged that the participants be candid about the constraints in the area, but at the same time imaginative and creative, and not give up any idea because it seemed too far-fetched. Consequently, the ideas that follow are only intended to illustrate a range of possibilities and do not necessarily constitute recommendations for research.

### ***Electrical and Electromagnetic Weapons***

In considering electrical weapons, improvements in the Taser received high priority. The Taser is considered to be moderately effective, but its wires limit range, make the weapon bulky, and necessitate reloading after each shot. An alternative weapon (suggested prior to 1972 and again at the 1986 conference) is an electrified water pistol that would deliver a fine jet of water,

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resistant to disturbance by the wind. Another participant suggested a double-barrelled water pistol as a means of providing point-to-point skin contact. (A single electrified jet of water would require a good ground, which would not occur if the subject were wearing rubber soled shoes.)

Participants also discussed the use of various wave lengths and forms of administration of electromagnetic energy as a non-lethal weapon. A substantial amount of preliminary research has been conducted in this area. Flashing or stroboscopic light has been found to produce a disorienting effect (termed photic driving or photic stimulation) at frequencies close to the alpha rhythm of the brain (12.5 cycles per second in most people). Stroboscopic light at exactly that frequency will induce seizures in approximately 1.5 percent of the population. One conference delegate reported testing 100 subjects, using flashing light near but not at the alpha rhythm frequency. Discomfort or disorientation were produced, and no seizures were reported. Some degree of disorientation was produced with an intensity of light down to 4 cycles per second, and the effect was still produced when the light was introduced from the side or through closed eyelids. A sharp leading edge to the waveform was found to be more effective than a round waveform.

The effect of stroboscopic light has been studied by a number of groups. In military applications, for instance, pulsed strobes in open terrain were found to cause disorientation, stumbling, and inability to concentrate. The disorienting effect produced by light flashing at an appropriate frequency is not limited to nighttime. Sunlight filtering through helicopter rotors has also been reported to produce nausea or seizures. Reflected light and closed eyelids do not negate the effect. Lights flashing on airplanes at night may also produce disorientation. The fact that the brain can be severely affected by optic stimulation of a specific type offers clear possibilities for the development of less than lethal weapons—in particular those designed for crowd control (where it should be possible to protect law enforcement personnel from the effects of the light by means such as special protective glasses).

It is also quite likely that certain human physiological systems can be affected by exposure to various specific frequencies of electromagnetic radiation. One conference participant noted that scientific knowledge of human physiology is progressing to the point where it may soon be possible to target specific physiologic systems with specific frequencies of electromagnetic radiation to produce much more subtle and fine-tuned effects than those produced by photic driving. There is some evidence (and a good deal of supposition) that sustained, extremely low frequency (ELF) radiation can produce nausea or disorientation. One researcher has subjected animals to ELF electromagnetic radiation through electrode implants, and feels that

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similar results could be produced from afar, without electrodes. One participant suggested that ideally, one might like to develop the ability to design these electromagnetic fields for specialized use, for instance to produce sleep or confusion. It is known that sleep can be induced by electrodes in the brain, and Russian scientists claim to be able to produce sleep from afar (electrosleep).

Other frequencies may have significant impacts as well. It has been reported that a man who stepped in front of a microwave communications transmitter felt various disorienting effects. A participant suggested that in contrast to the long time periods that might be necessary (1/2 hour to 4 hours) to produce disorienting effects using ELF, other frequencies could potentially stun a person within 100 milliseconds, if the targeted system is one whose normal cycle time is less than 50 milliseconds. Needless to say, very careful and extended testing would be essential and the potential for irreversible physiological damage may be high. The damage may be far more subtle than that caused by a gun and, as a result, more difficult to detect, control and restrain.

### ***Chemical Devices***

Suggested categories of new chemical weapons included stench weapons, marking chemicals, mood or knockout gas, and chemical dart guns. *Stench chemicals* were generally dismissed as inadequate and on the whole, there was not a great deal of enthusiasm for *markers*. Controlling immediate problems, such as one-on-one confrontational situations, was considered more critical than the ability to identify subjects after the fact. Nevertheless, some participants believed that markers could be highly useful in certain situations, and given current levels of knowledge about chemicals, effective markers could probably be developed. The markers might contain fluorescent substances, magnetic substances, or permanent dyes, and might be administered in liquid or powder form.

Participants expressed substantial interest in developing *mood or knockout gas* in light of the world-wide increase in terrorism and hostage situations. Law enforcement agencies are particularly interested in developing a non-lethal means of causing unconsciousness in both terrorists and hostages—optimally with an undetectable, odorless, fast-acting, non-persistent chemical. A mood-altering gas was postulated as another possibility for use in these situations. The central problem with either approach is the potential for inciting violent action on the part of the terrorist—either due to the disorienting effects of a mood gas, or the anger that might be expressed in the moments before a knock-out gas achieved maximum effect. In view of these dangers, participants were especially concerned that the requirements

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for a gas weapon be carefully studied and clearly specified—and the chemical thoroughly tested under appropriate conditions prior to use in hostage-terrorist situations.

Conference participants also focused on the potential for developing *dart guns capable of delivering drugs*. Dart guns have been used only on animals in the past because of the difficulties involved in delivering the correct dosage. As would be expected, chemicals that result in unconsciousness or limb immobilization can be highly dangerous, or lethal, in excess. One possible solution to this problem is to use multiple small-dose needles or drug-containing projectiles delivered from a gun-like projector and injected on impact. Participants discussed the military's use of a self-injectable device that contains an antidote to nerve gas (atropine). These devices immediately inject a dose of the chemical when jammed against the body. In all probability this technique could be adapted to the injection of other chemicals through the use of dart-like projectiles.

One participant suggested that some drugs that cause pain when injected, such as iodine or formic acid, might effectively simulate the effects of a gun, with far less danger to the recipient. Tranquilizing drugs were also considered. Military researchers have investigated a large number of tranquilizers; some of those not suitable for battle may well prove useful for law enforcement. The one-on-one situation is ideally suited for a tranquilizer, since close proximity permits a wide range of possible methods of administration — inhalation (through a spray or burstable ballistic projectile), topical application, or introduction into the blood stream (through a hypodermic needle delivered ballistically).

### ***Impact Weapons***

Few new concepts for impact weapons were presented to the conference. A host of unused impact weapons already exist, and most are generally considered ineffective or excessively dangerous. One new possibility is the sting-RAG, which would not be difficult to adapt for police use. Another impact device that has been suggested, but never developed, is the gas vortex. A vortex is a highly stable phenomenon; if a gas vortex were projected at some velocity, the difference in pressure on the leading and trailing edges would produce an impact. Such a weapon would provide a tool primarily for crowd/riot control situations. Arguably, however, such weapons are the least urgently needed given the existing array of crowd/riot control devices.

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## Concluding Note

In summary, the development of improved less than lethal weapons for close proximity encounters was viewed as the most urgent need for law enforcement agencies. Consistent with this priority, participants called for improved electrical devices as well as the design of weapons that might administer chemical agents such as tranquilizers.

Participants also acknowledged the crucial need for less than lethal weapons designed to address the requirements of hostage situations. Although electromagnetic fields and stroboscopic lights were considered promising areas of inquiry, the discussion focused on the potential for chemical intervention. Given the rapid pace of development in the drug industry, participants were optimistic that a targeted effort could produce effective, acceptable chemical agents.

While new and refined technologies offer new possibilities for the development of increasingly effective less than lethal weapons, the dangers of causing irreversible damage are also heightened. Recognizing these risks, all discussants emphasized the importance of extended testing and evaluation efforts.

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## Chapter Three

### Conference Recommendations

In the course of discussing weapon requirements and all the attendant policy issues, a number of recommendations were made by conference participants:

- 1) **Operational requirements for less than lethal weapons need to be carefully defined for the various situations in which such weapons may be needed.**

In the past, there has been no systematic effort to define operational requirements for less than lethal weapons—either for law enforcement as a whole or for individual enforcement agencies. Conference participants agreed that defining these requirements is a critical first step in the successful development of new technology. In presenting some of the general requirements defined during the conference, Chapter 2 illustrates the range of criteria that must be considered and refined at the outset of any development program. Participants also agreed that a single, all-purpose non-lethal weapon is an impractical concept. Needs and levels of acceptability will have to be defined for a number of classes of encounters. In practice some weapons will be less non-lethal than others, and users will have to learn to deploy them accordingly.

- 2) **Design and implementation efforts need to consider the weapons' acceptability to law enforcement personnel.**

The perceptions of users are a significant factor in determining the success of any less than lethal weapon. As discussed earlier, officers must

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be convinced that the weapon is effective and reliable and that the results are predictable. In many encounters, an officer may be uncertain about (or may misperceive) the motivations of a suspect or group. There may be further uncertainty about the presence or absence of firearms. If the performance of a less than lethal device is also in doubt, the officer will hesitate to use the weapon.

Law enforcement officers must also be assured of the practicality of carrying the weapon. Police carry a multitude of items in their daily duty; their acceptance of yet another new weapon will depend in part on its being relatively lightweight and compact. Users must also be confident that they are familiar enough with the weapon to use it effectively and to decide when it should be used. Careful education and training in the use of the weapon is essential, as is the development of detailed procedural guidance—when must it be used, when does it become an alternative, when—if ever—must it *not* be used?

**3) Adequate testing and evaluation of existing and new non-lethal weapons is required.**

Non-lethal weapons are often not used (or used and found inadequate) because no central agency or facility has tested and evaluated their performance and disseminated the information to the field. Smaller police departments, in particular, are unable to perform tests themselves, and often have no clear access to reliable information on available weapons. Though many larger departments and federal agencies do perform field tests and are likely to be aware of the capabilities of new weapons, there is no standardized testing.

It is easy to say that less than lethal weapons must be tested during the development process, but actually performing those tests is more difficult, because any weapons developed must be tested on animals, and eventually on human volunteers. A medical steering committee will have to establish acceptable limits of safety, since it is unlikely that any weapon can be 100 percent safe and 100 percent effective. The medical steering committee, together with Department of Justice personnel, including the FBI, must draw up a testing protocol — possibly with the help of advisory personnel from the National Institutes of Health and the Food and Drug Administration — and closely supervise the testing to ensure that it is as safe and as humane as possible.

During the development of Kevlar, the primary material used in soft body armor, Department of Defense standards on animal testing were adopted.<sup>7</sup> Most government agencies performing tests on animals typically base their standards on the Animal Welfare Act, which sets voluntary

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guidelines for the treatment of animals used in laboratories. Private firms performing animal testing would also be subject to the provisions in the Animal Welfare Act, administered in this case by the USDA.<sup>8</sup>

**4) Dissemination of public information on less than lethal weapons must be careful and candid.**

The public must be allowed to know and encouraged to learn that there is some risk, no matter how small, that any system designed to incapacitate may prove lethal to some individuals. Experience has clearly demonstrated that the public wields great power in determining whether certain weapons are acceptable. The reaction to the use of fire hoses to control civil disorder in the South has prevented the widespread use of the water cannon. When electrical shock devices were first introduced, the public immediately labeled them "cattle prods," which citizens perceived to be inhumane even when used on cattle. Similarly, the police of a Washington, D.C. suburb decided in recent years to change service ammunition, replacing solid rounds with more effective hollow-point bullets. When the news media learned of this unannounced change, the department was excoriated with the (inaccurate) charge of using dum-dum ammunition. In contrast, when another major police force in the area decided to change to hollow points, it announced the change in advance with an explanation that the "more humane" hollow-point round created less risk to bystanders from ricochets. In this case, public acceptance was high.

Conference participants agreed that public education about less than lethal weapons will be important for the successful introduction of such weapons. With respect to the use of various delivery systems for chemicals appropriate to terrorist-hostage situations, it was suggested that the public be educated about the possibilities, and allowed to comment on their acceptability before they are put into use. Participants also suggested that the best way to present non-lethal weapons to the public might be to emphasize the officer protection mission of the weapons.

Even if new weapons themselves win public acceptance, the process of testing those weapons on animal and human volunteers will require honest and skillful explanation to the public. The nature of the weapons to be tested and the necessity for the tests must not be a secret of the kind whose "leak" would result in an exaggerated expose and associated public outcry.

The National Institute of Justice demonstrated the importance of candid assessments of risk when it developed soft body armor for law enforcement officers. The design objectives were clearly stated: an individual hit by a 22-caliber bullet traveling at 1,000 feet per second, or a 38-caliber bullet traveling at 800 feet per second, should suffer no penetration and should

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have a 90 percent probability of survival without blunt trauma wounds requiring surgery. All officers wearing the armor learn these criteria, because it is mandatory that they understand that there is no such thing as a bullet-proof vest — that there is always a possibility of injury or death when an officer is shot. Thus, the program must establish and publicize a baseline figure for the likelihood that a new, safer weapon will in some cases prove lethal. This benchmark can be stated in positive terms. The public can surely be shown that the baseline level of lethality is far less significant than the probability of death when a handgun or other firearm is used.

**5) Liability issues must be considered in the design and use of less than lethal weapons.**

A major concern of both law enforcement agencies (primarily police departments) and manufacturers of less than lethal weapons is the potential for lawsuits alleging the use of excessive force. Past experience with litigation involving less than lethal weapons suggests that legal challenges will persist. While death may be a remote consequence of the appropriate use of less than lethal weapons, when and if a death occurs, litigation is likely to follow. Charges of brutality, questions of legal liability for unacceptable side effects (or the risk of side effects), as well as claims of inadequate weapons testing and inadequate training of officers, may also accompany the introduction of new less than lethal weapons.

Manufacturers, as well, are concerned about their potential liability for personal injury or property damage related to the use of an allegedly faulty or inherently unsafe weapon. The Taser manufacturer now involved in bankruptcy proceedings reportedly suffered an increase in its liability insurance, from \$12,000 to about \$400,000 in five years.

While the potential liability of law enforcement agencies may or may not be enough to hinder the use of less than lethal weapons, the liability of manufacturers could well inhibit the availability of appropriate weapons. Participants emphasized the steps that must be taken to reduce legal liability problems associated with less than lethal weapons:

- Weapons should be designed with great care to minimize the likelihood that their use will result in injury or death;
- Rigorous testing and evaluation is necessary to document the risks associated with such weapons;
- Law enforcement personnel should be thoroughly trained in the safest possible use of less than lethal weapons. Such training should include simulations of real life situations to refine skills;

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- The policies of law enforcement agencies need to specify clearly those situations in which the use of such weapons is justified for the protection of the public, the offender, and law enforcement personnel.

**6) Existing information relevant to less than lethal weapons needs to be compiled and analyzed.**

Several data bases would be useful to support the introduction or continued use of less than lethal weapons. One helpful data base would contain police experience with less than lethal weapons, based on periodic surveys. Much like the systems designed to alert pilots of aircraft mishaps and malfunctions, this data system would also contain a mechanism for law enforcement agencies to file up-dating incident reports and to access the most current available information.

A second would be a data base containing the results of central facility tests of less than lethal weapons (such as those that might be conducted by the Technology Assessment Program (TAP) of the National Institute of Justice in conjunction with the Law Enforcement Standards Laboratory (LESL) of the National Bureau of Standards). This data base could also contain the results of military testing, police department field testing, and possibly the results of drug companies' tests involving chemicals used as less than lethal weapons.

A third data base, possibly a subset of the second, would contain anthropometric and biologic information. An anthropometric data base would include such information as the reach of an individual, how much force is exerted by an individual swinging a baton, how the victim responds to the blow, and so forth. The biologic data base would include dosage information on existing chemical drugs, such as the LD 50 (the dose that would prove lethal 50 percent of the time) for animals and humans, and lower LDs relevant to their use as less than lethal weapons.

Much of the information necessary to construct these data bases exists already, but needs to be collected and organized in a usable form. A major problem is access to information. The military has undoubtedly conducted research and testing pertinent to the development of less than lethal weapons, but much of such work is classified. A similar problem may exist in accessing a corporation's proprietary information. Since the collection and dissemination of information was viewed as a key element in the successful development and refinement of less than lethal weapons, conference participants urged that efforts be made to resolve these access problems.

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**7) Guidelines for the use (and controls against the abuse) of non-lethal weapons are required.**

The excessive use of non-lethal weapons may result in no net improvement in rates of fatal injury when compared to lethal weapons practice. If, for example, a less than lethal weapon is one-tenth as lethal as a handgun but is used ten times more frequently, an identical number of subjects will be fatally injured.

Guidelines regulating the use of non-lethal weapons are clearly critical. First, it must be clear who has the power to authorize the use of such weapons. Second, the fact that different levels of threat or resistance call for different levels of response also suggests that explicit guidelines (and training) in the use of such weapons are essential. Finally, the potential for misuse and abuse of less than lethal weapons implies the need for very specific guidelines on when and how these weapons are used.

The ability to control the misuse of less than lethal weapons was voiced as a major concern at this conference, as it was during the 1972 conference. Given the isolated character of much police work, participants expressed the need for built-in assurances that less than lethal weapons will not be misused. These assurances might take the form of a reporting system that requires incident reports to be filed whenever a weapon is used. The design of the weapon itself might incorporate assurances against its misuse. The Nova, for instance, will leave two marks on the skin, indicating where and how many times it has been used — a design feature that may assist in controlling abuse.

**8) Careful consideration should be given to the necessary means of funding research and development and marketing less than lethal weapons.**

The market for auxiliary weapons used only by police officers is fragmented and relatively small. The difference in the distribution of Tasers and Novas demonstrates this point. While Tasers have been provided only to police departments and other law enforcement agencies, Novas were sold to private citizens as well. The number of Tasers in use (or purchased) probably numbers in the thousands. The number of Novas in circulation may be on the order of a few hundred thousand. Unlike the Nova, the Taser is classified as a firearm by the Bureau of Alcohol, Tobacco and Firearms. Since the Taser is therefore regulated under the Munitions Act, sales in foreign markets are prohibited and U.S. markets are limited.

The nature and size of the market and the regulations imposed on less than lethal weapons have important implications for financing the necessary research and development. Police would generally prefer that less than lethal

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weapons be accessible only to police. But market considerations suggest to some that it will not be economically feasible to develop weapons to be produced in such small quantities. The proper role of the federal government in financing the development and introduction of less than lethal weapons is a controversial issue. Some argue that complete federal support is necessary. Others suggest that seed money for research should be adequate and the private sector should sustain continuing development costs. One suggestion was that development of less than lethal weapons be tied to defense contracts, since those contractors are typically large, strong, and technologically sophisticated.

Given appropriate incentives, most participants agreed that the capability to develop new less than lethal weapons was clearly present among existing private sector firms:

- Research for the Department of Defense and for the National Aeronautics and Space Administration has encouraged the development of thousands of companies that focus on technological research and engineering design. Many small to medium-sized firms established laboratories capable of handling toxic chemicals during the period when DOD devoted major research to chemical warfare. They continue to use these labs for other purposes involving toxins, ranging from pesticides to pollution abatement or detection. Their staffs include not only research chemists and chemical engineers, but in most cases mechanical engineers well qualified to design chemical dispensing systems, whether mechanical, ballistic, or electromechanical. The same is true of other technologies pertinent to development of less than lethal weapons.
- Programs of the National Institutes of Health focusing on cancer detection stimulated the rapid growth of small to medium-sized companies specializing in biomedical research. Numerous firms specialize in preparing serums and anti-sera for medical or laboratory use.
- Virtually all major universities and medical centers engage in biomedical research; many could assist in risk analysis and the design of systems for delivering safe doses of specific compounds. Moreover, many universities conduct animal tests; given authority to do so, they could extend such experimentation into primate research and, eventually, controlled tests with human volunteers.

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Conducting needs assessments and creating testing scenarios are tasks that require close collaboration with potential users—state and local police, federal law enforcement agencies, military police, and private security companies. At the federal level, the FBI (especially the FBI hostage rescue team), the Secret Service, the Border Patrol, the U.S. Marshals Service, the Federal Aviation Administration, and the police of the several military services, all face the problems of fleeing suspects and close proximity confrontations.

The National Bureau of Standards could provide consultation (and eventually production standards) through the Law Enforcement Standards Laboratory, plus testing assistance and, eventually, laboratory certification through the Laboratory Accreditation program of its Office of Product Standards Policy. The Department of Defense, especially the U.S. Army, can fill key roles in document research, chemical research and product development, and testing. Furthermore, available for coordination and consultation are several existing units under the National Institute of Justice—the Technology Assessment Program Advisory Council, the TAP Information Unit, and NCJRS.

**9) Cooperation is required among scientists, law enforcement officials and manufacturers in the development of less than lethal weapons.**

Conference participants almost unanimously agreed on the need to insure that scientists, manufacturers, and law enforcement officers continuously work together and share information throughout the weapons development process. One group suggested that two committees, one of scientists and one of law enforcement personnel, might be formed and structured to collaborate in the design and development of new weapons. A related suggestion emphasized the need to involve the medical community from the start, and perhaps to establish an independent panel of medical doctors to testify as to the safety of any weapons developed or in development.

If there is any single lesson to be learned from past attempts to develop less than lethal devices, it is surely that development cannot be pursued haphazardly as too many factors complicate the introduction of a new weapon. Participants cautioned that to view the development process as purely a scientific exercise would pose formidable constraints on the effective application of new less than lethal weapons technology.

As a concluding note, participants expressed great optimism for the nation's ability to develop effective, safe less than lethal weapons, and in view of the very real need for such weapons, great hope that the momentum to pursue that goal will be maintained.

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## Endnotes

1. Research Applied to National Needs (RANN) Program of the National Science Foundation, with the Law Enforcement Assistance Administration, LEAA, of the Department of Justice. A report entitled *Non-lethal Weapons for Law Enforcement* was subsequently prepared for the NSF by the Security Planning Corporation.
2. 105 S. Ct. 1694 (1985); 710 F. 2d 240 (6th Circuit 1983). See James Fyfe, "Enforcement Workshop: The Supreme Court's New Rules for Police Use of Deadly Force" in *Criminal Law Bulletin*, January-February 1986, p. 67, and Jane Lindhout, "Criminal Law: The Demise of the Fleeing Felon Rule [Tennessee v. Garner, 105 S. Ct. 1694 (1985)]" 25 *Washburn Law Journal* 164-173, Fall 1985.
3. Whenever the term "non-lethal" is used in this report it is intended to be synonymous with this concept of "less than lethal" weaponry.
4. *Non-lethal Weapons for Law Enforcement: Research Needs and Priorities*. A Report to the National Science Foundation by the Security Planning Corporation, 1972.
5. Based on reports of participants. Novas are apparently less effective than Tasers, and measure of effectiveness may vary with the particular cross-section of people on which it is used in a given city.
6. Creation of discomfort might be a more appropriate tactical option than dispersal, since both disorientation and physical discomfort could effect dispersal. Marking or identification would be an additional option. See *Nonlethal Weapons for Law Enforcement*, A Report to the National Science Foundation by the Security Planning Corporation, 1972, p. 21.
7. Personal Communication with Mr. Lester Shubin, Program Manager for Standards, National Institute of Justice, July 1986.
8. Personal Communication with Dr. Richard Rissler, Assistant Director for Animal Health, U.S. Department of Agriculture, 14 August 1986. Since government agencies may or may not adhere to Animal Welfare Act guidelines, an interagency committee was recently formed to develop more uniform animal testing guidelines.