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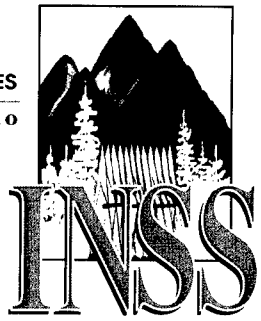

Nonlethal Weapons: Terms and References

Robert J. Bunker, Editor

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14. ABSTRACT

The purpose of this paper is to promote an understanding of and research into a new category of weapons, designated "nonlethal" by military services, and "less-than-lethal" or "less-lethal" by law enforcement agencies. The intent is to create an initial term and reference listing to help support joint-force and dual-use initiatives focused on identifying the potential drawbacks of integrating nonlethal weapons into our military services and law enforcement agencies.

The paper is split into two sections: a list of terms that describes nonlethal weapons along with the concepts both surrounding and inhibiting their use and a comprehensive listing of references to facilitate further research. Nonlethal weapons are listed under the categories of acoustics, opticals, antilethals, antiplant agents, barriers, batons, biotechnicals, electricals, electromagnetics, entanglers, holograms, markers, obscurants, projectiles, reactants, and riot control agents. Nonlethal weapons concepts are divided by the following categories: ethical, functional, operational, physiological, and theoretical.

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NONLETHAL WEAPONS:

TERMS AND REFERENCES

Robert J. Bunker, Editor

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> "Many of the weapon concepts described in this paper are merely proposals. Except where specifically identified in official Department of Defense documents, none of the concepts in this paper should be interpreted to be funded R&D programs or operational weapon systems possessed by the Department of Defense."

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The editor would like to thank the following individuals in addition to those listed on the next page for their contributions to this work: Dr Glenn W. Goodman, Jr., Dr Mark T. Clark, Amy Wittman, and Scott Boris, as well as the institutional support of *Armed Forces Journal International* and *Defense News*.

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FOREWORD

We believe you will find this reference book to be a useful addition to the current literature on nonlethal weapons. Its target audience is individuals who deal with special operations, weapons procurement and sales, and military operations other than war. It also complements other handbook literature of this type, such as *Weapons of Mass Destruction Terms Handbook* (Alexandria, VA: Defense Special Weapons Agency, May 1997), and *Nuclear Terms Handbook 1996* (Washington, D.C.: U.S. Department of Energy, 1996). The need for such a handbook on nonlethal weapons and associated technology has grown along with the perception that U.S. forces will increasingly use such systems in the post-Cold War global security environment. We hope that this comprehensive handbook will help to contribute a sense of the technological limitations of nonlethal weapons, as well as provide clarity and consistency in discussions on the future of U.S. national security policy.

About the Institute

INSS is primarily sponsored by the National Security Policy Division, Nuclear and Counterproliferation Directorate, Headquarters US Air Force (USAF/XONP) and the Dean of the Faculty, US Air Force Academy. Our other current sponsors include: the Air Staff's Directorate for Intelligence, Surveillance, and Reconnaissance (USAF/XOI); OSD Net Assessment; the Defense Special Weapons Agency; the Army Environmental Policy Institute; Army Space Command; and the On-Site Inspection Agency. The mission of the Institute is to promote national security research for the Department of Defense within the military academic community, and to support the Air Force national security education program. Its primary purpose is to promote research in fields of interest to INSS' sponsors: international security policy (especially arms control and counterproliferation), Air Force planning issues, regional security policy, conflict in the information age (including the revolution in military affairs and information warfare), environmental security, and space policy.

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PETER L. HAYS, Lt Colonel, USAF
Director, Institute for National Security Studies

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EXECUTIVE SUMMARY

The purpose of this paper is to promote an understanding of and research into a new category of weapons, designated "nonlethal" by the military services. These weapons are also classified as "less-than-lethal" or "less-lethal" by law enforcement agencies. National security experts consider these weapons increasingly important in the post-Cold War era. This type of weapon has been used throughout history, but was given new emphasis during the Vietnam War era. Law enforcement agencies and Army national guard units relying upon traditional forms of politico-military force were ineffective in countering US domestic civil unrest. As similar types of conflict, now many magnitudes greater, seem to dominate international politics since the end of the Cold War, this type of weapon takes on increasing importance.

The Department of Defense defines these weapons as follows:

> Weapons that are explicitly designed and primarily employed so as to incapacitate personnel or materiel, while minimizing fatalities, permanent injury to personnel, and undesired damage to property and the environment. Unlike conventional lethal weapons that destroy their targets principally through blast, penetration and fragmentation, non-lethal weapons employ means other than gross physical destruction to prevent the target from functioning. Non-lethal weapons are intended to have one, or both, of the following characteristics: a. they have relatively reversible effects on personnel or materiel, b. they affect objects differently within their area of influence [229:1-2].

We have followed this Western definition of nonlethal weapons in this paper, but have also included what would be considered non-Western forms of weaponry. The reason for the inclusion of these weapons, which specifically are designed to result in permanent injury to personnel, is because of the great likelihood that they will be used against US forces in future conflicts.

Our intent is to create an initial term and reference listing that will help support joint-force and dual-use initiatives focused on identifying the potential drawbacks of integrating nonlethal weapons into our military services and law enforcement agencies. Because of the limited objective of this paper, it consists solely of two sections: a list of terms that describes nonlethal weapons

along with the concepts both surrounding and inhibiting their use and a comprehensive listing of references to facilitate further research. The category of nonlethal weapons that offers the capability for information warfare has not been included in this paper because of its association with that distinct form of conflict.

The terms and descriptions provided within this paper should not be considered authoritative, static, or comprehensive. Rather, they represent a point of departure from which further research can be conducted and eventual definitions created as these weapons begin the slow and tedious process of being adapted for operational use. This paper offers a candid assessment of our current understanding of nonlethal weapons that undoubtedly contains inaccuracies, either directly or by omission.

Bearing these caveats in mind, we have attempted to create a fairly comprehensive overview of the terms and concepts relating to nonlethals and the works available for reference on this topic. The contributors to this paper represent some of our country's "best and brightest" in the field of nonlethal weapons research, development, training and operational employment. Their combined expertise spans the early years of the development of nonlethal weapons from the Vietnam War era, including their employment in the Somali operation and in recent domestic law enforcement disturbances, to newer systems still in the process of being developed and field tested.

Nonlethal weapons cannot be thought of in a "business as usual" sense or, for that matter, solely as a new type of force multiplier. It is the opinion of the editor (and most of the contributors to this paper) that when nonlethal weapons are ready for wide-scale application, this will signal a development as significant in magnitude as the emergence of gunpowder based firearms during the European Renaissance. Just as the firearm gave the ability for distance-killing that destroyed a Western ban existing since the time of the *Iliad*, the introduction of nonlethals may allow for tailored employment of politico-military force and challenge the accepted definition of warfare.

The US military will need to undertake significant organizational and doctrinal restructuring in order to exploit the potential of these new weapons. The most important near-term application of nonlethal technology appears to

be in areas such as: operations in "failed states," as a counter to the non-Western form of warfare that is emerging globally, as a defense against the specter of further terrorist assaults upon our homeland, and as a means of responding to civil unrest in many of our inner cities. Over the longer term, it is their fit with other nascent warfighting trends embodied in the revolution in political and military affairs (RPMA) that is of paramount significance. For example, nonlethal weapons could present new and potentially highly effective mechanisms for dealing with an advanced form of battlespace (i.e. cyberspace) and the criminally-based non-state soldier (i.e. terrorist, mercenary or "new-warrior class") as a challenger to the Western nation-state's domination of political violence.

In order to respond to these and other challenges, we must insure that our armed services retain the capability to dominate the battlefields of the 21st century. Our ability to use nonlethal weapons effectively will be a critical component of our future capabilities. It is toward improving our knowledge in that endeavor that this paper has been written.

Robert J. Bunker

December 1996

Nonlethal Weapons: Terms and References

TERM LISTING

As listed in the table of contents, the entries in this paper are organized into seventeen categories for nonlethal weapons technology and five areas for concepts associated with the use of nonlethal technology. The citation protocol for entries list the reference material number and the page number as follows: [Reference Number: Page Number]. If an entire document is cited, no page numbers are given. For the purpose of accuracy, many terms have been directly quoted from a single referenced source, while others combined reference sources.

I. Nonlethal Weapons

A. Acoustics

Acoustic Beam. High power, very low frequency beam emitted from weaponry under development. Envisioned to be a piston-driven or detonation-driven pulser which forces compressed air into tubes to generate a low frequency wave [543,546].

Acoustic, Blast Wave, Projector. Energy generation from a pulsed laser that will project a hot, high pressure plasma in the air in front of a target. It creates a blast wave with variable but controlled effects on hardware and troops [543].

Acoustic Bullets. High power, very low frequency waves emitted from one to two meter antenna dishes. Results in blunt object trauma from waves generated in front of the target. Effects range from discomfort to death. A Russian device that can propel a 10-hertz sonic bullet the size of a baseball hundreds of yards is thought to exist. Proposed fixed site defense [16,113,212,543]. Also known as sonic bullets.

Acoustic, Curdler Unit. A device which is plugged into an HPS-1 sound system to produce a shrill shrieking, blatting noise. It is used to irritate and disperse rioters and had a decibel range just below that of the danger level to the human ear. It is used in night operations to produce a "voodoo" effect and effectively breaks up chanting, singing and clapping [2:279-280,82:184,84,529].

Acoustic, Deference Tones. Devices which can project a voice or other sound to a particular location. The resulting sound can only be heard at that location [176:86].

Acoustic, Doppler Effect Alarm. Any movement in the area between a transmitter and a receiver causes a slight variation in the sound pattern received. By measuring this variation an alarm system can be made to be activated [23:204].

Acoustic, High Intensity Sound. Loud music was used by American forces to drive Manual Norriega from the Vatican Embassy in Panama in 1990. Also known as polysound [354:45].

Acoustic, HPS-1 Sound System. A 350 watt sound system with an audible voice range of 2 1/2 miles. Used by the military in Indo-China and then supplied to law enforcement. First used by police forces at San Francisco State College and at Berkeley in the 1960s [2:277-279,82,84]. See also *Acoustic, Curdler Unit.*

Acoustic, Infrasound. Very low-frequency sound which can travel long distances and easily penetrate most buildings and vehicles. Transmission of

long wavelength sound creates biophysical effects; nausea, loss of bowels, disorientation, vomiting, potential internal organ damage or death may occur. Superior to ultrasound because it is "in band" meaning that its does not lose its properties when it changes mediums such as from air to tissue. By 1972 an infrasound generator had been built in France which generated waves at 7 hertz. When activated it made the people in range sick for hours [23,302,546].

Acoustic, Squawk Box. Crowd dispersal weapon field tested by the British Army in Ireland in 1973. This directional device emits two ultrasonic frequencies which when mixed in the human ear become intolerable. It produces giddiness, nausea or fainting. The beam is so small that is can be directed at specific individuals in a riot situation [451,452,504].

Acoustic, Teleshot. Cartridge projecting a powerful sonic device delivered by a 12-gauge shotgun. Experimental use in 1972 [529].

Acoustic, Ultrasound. A very high frequency sound whose wavelength is "out of band" making it less effective than infrasound because it losses its properties when it changes mediums. Example, from air to human tissue. Like infrasound a lot of power is required to generate these waves which create biophysical effects. See also *Acoustic, Infrasound.*

B. Acoustics & Opticals

Acoustic & Optical, Air Burst Simulator. A diversionary device normally used to simulate the air burst of artillery rounds during infantry training. The device is fired via a 37-40mm launching device and has an 8 second fuze prior to ignition.

Acoustic & Optical, Cod-Weight. A heavy, (2 pounds or greater) weight to which a diversionary device is attached to allow it to be thrown through window screens, window glass, bushes and similar materials. The name is derived from the original weights used for deep-sea fishing for Cod.

Acoustic & Optical, Diversionary Device. A hand thrown pyrotechnic device which emits a loud bang and dazzling light when ignited. The device is designed to create a sensory overload which temporarily causes confusion and an inability to effectively respond to a tactical team's actions. Sometimes called a flash-bang grenade.

Acoustic & Optical, Diversionary Device, Launched. A diversionary device which can be launched from a 12 gauge shot gun [373].

Acoustic & Optical, Flash Stick. A stick or pole to which a diversionary device is affixed, allowing it to be precisely placed and held during ignition. Often used for exact insertion through chain link fences, windows, heavy brush and so forth.

Acoustic & Optical, Painter's Pole. An extendible pole to which a diversionary device is affixed allowing it to be precisely placed and held during ignition. Often used for supporting second story entries from beneath. The name is derived from the pole used by painters to hold paint rollers when painting overhead.

Acoustic & Optical, Photic Driver. A crowd control device developed by a British company prior to 1973 which uses ultrasound and flashing infrared lights which penetrate closed human eyelids. Potential for epileptic fits because of the stroboscopic flashing effect. May have been employed by South African Police during interrogations [23,450].

Acoustic & Optical, Psycho-Correction. A technology invented by a Russian scientist that involves influencing subjects visually or aurally with imbedded subliminal messages [318].

Acoustic & Optical, Stun Grenade. A non-lethal grenade, XM84, in development to be used by Army military police [338].

C. Antilethals

Antilethal. Technologies which provide counter-sniper, counter-mortar, antimissile and high-precision weapons capabilities. Advanced forms of camouflage and sensors which defeat lethal weapons are additional forms of this technology [418:24].

Antilethal, Camouflage-Active. Created by dynamically matching the object to be camouflaged to its background colors and light levels rendering it virtually invisible to the eye. This is conceptually the same camouflage process as that used by a chameleon. This is accomplished through a sophisticated color and light sensor array which detects an object's background color and brightness. This data is then computer matched and reproduced on a pixel array covering the viewing service of the object to be camouflaged. Also known as chameleon camouflage [245,302].

Antilethal, Camouflage-Metamorphic. Uniforms or paint which change color due to either light or heat sensitivity. Extremely useful for night and day operations and those taking place in urban environments [245,302].

Antilethal, Counter-Sniper. Electronic sniper-locating systems based on acoustic, shock wave or infrared measuring technologies. Provides the location of a hostile sniper to a sniper team or to an automated counter-sniper system which can fire either a kinetic round or a low-energy laser at the hostile sniper [2:300-301,505].

Antilethal, Electronic-False Target Generation. An electronic device that creates and presents an image of a target to a precision laser-guided weapon that causes that weapon to aim at the false target. Used as a countermeasure to those precision guided weapons [468:14].

Antilethal, Electronic-Shell Detonator. A system fielded by U.S. troops in Bosnia which creates an electronic field that causes mortar and artillery shells to explode prematurely by signaling to them that they have reached their target [183].

Antilethal, Electromagnetic Shielding. A form of defense against microwave attack. A metal box, known as a "Faraday Cage," can sometimes function as one by excluding electromagnetic fields [356:39].

Antilethal, Food Bomb. Humanitarian use of nonlethal weapons. Place concentrated food pellets rather than anti-personnel bomblets in a cluster bomb unit. For use in cities under siege on the verge of starvation [609].

Antilethal, Laser Protection. Protection is achieved in three ways: absorption using dyes, reflected using optical coatings and the blocking of specific wavelengths [287].

Antilethal, Laser Protection-BLPS. Ballistic and Laser Protective Spectacles. Since 1988, these devices have been issued to high priority Army and Marine Corps units. The BLPS are dye-filled polycarbonate plastic filters which will protect eyesight against the low-energy lasers most likely encountered on today's battlefield, specifically the two or three wave lengths used by common range finders and target designators based on Nd:YAG and ruby lasers. They will not give protection against frequency-agile low energy laser weapons [1:185].

Antilethal, Laser Protection-Smoke. Smoke's attenuative properties allow it to serve as a passive defense against blinding laser weaponry. Large-area smoke generation may provide a means to offer continuous protection for forward elements of U.S. combat forces [115:38].

Antilethal, Low Energy Laser. An Air Force project, known as Have Glance, in which a pod-mounted, low energy laser would be mounted on an aircraft to confuse the heat-seeking function of infrared missiles [1:161].

Antilethal, RPG Barrier. See *Barrier, Fence-RPG.*

Antilethal, Sensor-Acoustic. Remote acoustic sensors placed in an area overwatch position in urban zones to detect and locate gunfire within that area [429].

Antilethal, Sensor-Facial Recognition Technology. Experimental information systems which recognize human facial features and compare them to databases of wanted suspects. Great potential for apprehending terrorists in airport terminals and criminals in large crowds. More advanced subdermal systems will be required as a follow-on to these systems as a counter to criminals/non-state soldiers who surgically alter their facial features [642].

Antilethal, Sensor-Ground Penetrating Radar. Sensor that can detect nongeologic objects and human engineered structures beneath the ground by analyzing the return of electromagnetic waves traveling through geologic structures. Detection of buried mines and discovery/mapping of underground bunkers represent practical, nonlethal applications [215:10].

Antilethal, Sensor-Nonimaging Portable Radar. A radar unit which weighs less than 10 pounds, uses rechargeable batteries, is small enough to fit into a briefcase and will detect motion through nonmetallic walls and floors. Using sounds instead of images, it detects motion and can transmit to a receiver up to a distance of 200 feet [302].

Antilethal, Sensor-Retroreflectivity. A theory based on the reflection of light. Common example is seeing an animal's eyes at night in your headlights. Allows for an electro-optical sensing mode that can be used to find opposing electroptics looking into the night for location and targeting purposes.

Antilethal, Smart Gun. A gun which can only be used by the proper user or users. Identification is automatic and would be carried out by radio frequency signals or other technologies [620].

Antilethal, Smart Metals. See *Markers, Smart Metals.*

Antilethal, White Light Goggles. Experimental goggles which "gate out" bright white light so that the user will not be affected by them along with the targets [330:6].

D. Antiplant Agents

Antiplant Agent. Compounds used to destroy plants or crops function in one of two general ways. Growth regulators and desiccants kill or defoliate by stimulating the leaf fall process (growth regulator) or by drying the leaf blade (desiccant). The other category, soil sterilizers, contaminate the soil, preventing or retarding growth. Uses of antiplant agents include destruction of crops and foliant removal to deny/degrade camouflage [13:77-78].

Antiplant Agent Blue. Fast acting antiplant desiccant containing sodium dimethyl. The desiccant, unlike anti-plant growth regulators, works by drying the leaf blade of the plant rather than simulating the plant's leaf fall process [13:77-78].

Antiplant Agent, Defoliants. Any of a variety of chemical compounds that either stimulate the leaf fall process, dry the leaf blade or sterilize the soil [13:77-78].

Antiplant Agent, Operation Ranch Hand. A defoliation program conducted during the Vietnam War from 1962 to 1970. The primary purpose of the operation was to deny cover to enemy forces, thereby making ambushes more difficult. Crop destruction missions were also conducted in northern and eastern central areas of South Vietnam [22:66-67].

Antiplant Agent Orange. Antiplant growth regulator containing n-butyl esters of dichlorophenoxyacetic acid and trichlorophenoyacetic acid. Publicized for its use in Operation Ranch Hand in the Vietnam War from 1962-1970 [13:77-78].

Antiplant Agent Purple. Growth regulator similar to Agent Orange but contains, in addition, the isobutyl ester of trichlorophenoxyacetic acid [13:77-78].

Antiplant Agent White. Antiplant growth regulator composed of a mixture of tri-iso-propanolanime salt of dichlorophenoxyacetic acid and picloram in water [13:77-78].

E. Barriers

Barrier, Air Bag, Backseat. An automobile airbag designed to hold in place a suspect placed in a police car. Designed because of the frequency of violent behavior once suspects have been handcuffed and placed in a police car for transport.

Barrier, Air Bag Mine. A nonlethal vehicular mine based on a type of air bag [339].

Barrier, Caltrops. A personnel and vehicular barrier device with four projecting spikes so arranged that when three of the spikes are on the ground, the fourth points upward. The term caltrop is derived from an English water chestnut which was used to impede the mobility of heavy cavalry during the Middle Ages. Caltrops were used in Somalia by the Marines during United Shield to supplement key barrier systems at night during the final hours of the withdrawal [378].

Barrier, Coating-Slick. Teflon-type lubricants which create a slippery surface because of their chemical properties. These chemical agents reduce friction with the intent to inhibit the free movement of the target. In the 1960s the term "Instant Banana Peel" was coined to describe the capability provided by Riotril. When applied to a hard surface and wetted down, this dry, relatively-inexpensive, non-toxic, non-corrosive white powder becomes ice slick. It becomes virtually impossible for an individual to move or stand up on a hard surface so treated. Tire-type vehicles are also unable to get traction. Riotril, if allowed to dry, can easily be peeled away or, because of its water-soluble nature, can also be hosed away with high-pressure streams [2:302-303,16,91, 356,565]. Also known as low-friction polymers, slick'ems,' and superlubricants.

Barrier, Coating-Sticky. Polymer adhesives used to bond down equipment and human targets. Also known as stick'ems' and superadhesives [16].

Barrier, Electronic. See *Antilethal, Electronic-Shell Detonator.*

Barrier, Emulsifier. Agents, contained in a mixture of mutually insoluble liquids, which were dispersed over the Ho Chi Minh trail to degrade the logistical lifeline of Viet Cong forces during the Vietnam War. Used in tandem with clouding seeding. Also known as soil destabilizers [434].

Barrier, Fence-Electrical. See *Electrical, Fence.*

Barrier, Fence-RPG. Conventional fencing, usually 6 ft high, with barbed wire on top. While the anti-mobility utility of such fencing is apparent it also had an anti-lethal capability. In Vietnam this fencing was erected as a rocket propelled grenade (RPG) screen in front of armored fighting positions and around command vehicles. RPGs which hit this screen either had their fusing systems disabled (RPG7's) or prematurely detonated (RPG2's). Also known as cyclone fencing [635,637:109].

Barrier, Foam-Aqueous. Originally derived from a fire fighting compound used to put out airplane fires. Barrier foam is a derivative which is thicker in consistency. This technology employs a safe, biodegradable form of suds which can be piled up to as high as four feet. Barrier foam can be applied over fences, concertina wire, ditches to be seeded with caltrops (a four pointed device designed to puncture tires) to prevent vehicular passage. By applying the foam over obstacles, it impedes the ability to defeat them. Barrier foam, as its name implies, is used to deny entry or passage. The conceptual origins of this foam date back to 1965 [2:300,82,302,378].

Barrier, Foam-Aqueous, Generator. Concept involves blowing air through nylon net kept wet with mixture which creates aqueous foam [529].

Barrier, Foam-Aqueous Riot Control Agent. The ordinary suds of barrier foam can be enhanced with the addition of substances such as oleoresin capsicum, the primary ingredient in "pepper spray," or CS [165].

Barrier, Foam-Sticky. A name given to a polymer-based superadhesive agent. The technology first began appearing in commercial applications such as "super glue" and quick setting foam insulation. It is extremely persistent and is virtually impossible to remove without a liquid solvent which has a pleasant citrus odor. The solvent can be applied as a spray or poured on. The foam then appears to dissipate, releasing its hold and allowing suspects to be arrested and
safely transported. Sticky foam came to public attention on February 28, 1995 when U.S. Marines used it in Mogadishu, Somalia, to prevent armed intruders from impeding efforts to
extricate United Nation forces from that county [302,378].

Barrier, Foam-Sticky, Dispenser. An interior barrier system, operated by either intruder penetration or command, which administers a sticky-foam barrier in a passageway from floor to ceiling [506].

Barrier, Rope, Launcher. Nylon rope dispersed by a compressed air launcher using mounted on a truck. Thirty cubic feet per minute [529].

Barrier, Smoke-Antilaser. *See Antilethal, Laser Protection-Smoke.*

Barrier, Smoke-Cold. A thick, disorienting "cold smoke" which can be generated in areas from 2,000 to 50,000 cubic feet. It restricts an intruders eye-hand coordination and interactions among members of an intruding group [506].

Barrier, Spike. An angle-cut metal rod driven into an unsurfaced road's wheel pit. A 1/2 inch diameter rod, protruding only about 3 inches, is blunt enough so as to not penetrate a shoe sole under a person's weight, yet a heavy vehicle will drive it through a tire [15:92].

Barrier, Spiked Strip. Flat strip resembling a fire hose with retractable hollow spikes designed to flatten the tires of a target automobile. When the strip is activated, hollow spikes extend vertically and puncture the tires as the vehicle rolls over the strip. Also known as road spikes [566:2].

Barrier, Stakes. A sharp stake, often of wood or bamboo, that is concealed in high grass, deep mud or pits. It is often coated with excrement, and intended to wound and infect the feet of enemy soldiers. Can be utilized both as a booby trap and as a barrier. Commonly known as punji stick or punji stakes.

Barrier, Wire/Tape-Barbed, Launcher. Dispensing systems for flat barbed tape and barbed wire which could be quickly deployed into concertina form [82,529].

F. Batons

Baton, Biotechnical-Injector. A baton with an automatic self-injecting syringe for administering the antidote to nerve gas built into it's tip and filled with calmatives or other biotechnical agents [165].

Baton, Breakaway. A baton made of a substance that will break if used incorrectly [529].

Baton, Electrical. Standard dimension baton which delivers an electric charge of low voltage, powered by standard flash-light cells [2:240,23,529]. Also known as stun baton or shok baton.

Baton, Expandable. Measures 6" to 7" in closed position. The three telescopic sections rapidly flick open to an extended 16" to 18". Also known as extensible billyclub [529].

Baton, Riot Control Agent. 12-26" plastic baton which is able to project riot control agents [2:211-212].

Baton, Side-Handle. A baton with a side-handle attachment which allows it to be twirled for greater impact and used more effectively to block an opponent's blows.

Baton, Straight. Wooden, plastic, metallic rod from 12" to 36" used as a swung impact weapon. Can either hang from a leather throng or be held in a holster. Smaller version, 6" to 8." Also known as nightstick or billyclub.

Baton, Straight, Flashlight. Heavy shock resistant flash light which can be swung like a baton.

Baton, Straight, Flashlight-Riot Control Agent. Shock resistance polyethylene flash light. Besides providing a light source, this flashlight can be used as a baton and to project a riot control agent [2:216].

Baton, Two-Handed Riot. The 36 in. long riot baton is employed like a rifle and bayonet-- overhead blows could be fatal. Short, one-handed batons are not appropriate for close-quarter riot actions [74,95].

G. Biotechnicals

Biotechnical, Behavior-Altering Drugs. See *Biotechnical, Calmatives.* Suggested delivery in a gaseous form for terrorist and hostage situations in 1987 [556].

Biotechnical, Biodegrading Microbes. Microbes which turn storage tanks full of aviation fuel into useless jelly. Such microbes may produce acids or enzymes which can be tailored to degrade almost anything, even concrete and metal, so their potential use as nonlethal weapons could be extensive [171:2,356:38].

Biotechnical, Calmatives. Biotechnical agents which are sedatives or sleep-inducing drugs; includes alfentinil, fentanyls, ketamine and BZ. Several of them make ideal choices for this application when mixed with dimethyl sulfoxide (DMSO), which promotes absorption through skin to quickly sedate persons contacted. DMSO introduces the calmative agent into the bloodstream by increasing the epidermal absorption rate by about 1,000 percent. The explosion of a flash bang (sometimes called a diversionary device) represents one method of dispersing DMSO and a calmative agent. Calmatives were reportedly used by the Soviets against the Mujahideen in Afghanistan [16,176:83,302,431,556]. Also known as sleep agents.

Biotechnical, Disease Organisms. Nonfatal diseases targeted toward troops and civilians. Such viral agents were developed by Iraq to be used against Western forces during the Gulf War so as to create long term disabling injuries. Agents being considered for use were those that cause hemorrhagic conjunctivitis, chronic diarrhea, yellow fever and Crimean Congo hemorrhagic fever [627].

Biotechnical, DM. Diphenylaminechloroarsine. A sickening agent no longer in use by the military because of health risks. Probably ruled out of use in Vietnam by October, 1965. Effects include sneezing, shortness of breath, retching and vomiting, hemorrhaging, and possible death. Mixed with CN for immediate effect [13:19,529].

Biotechnical, Genetic Alteration. The act of changing genetic code to create a desired less-than-lethal but longterm disablement effect, perhaps for generations, thereby creating a societal burden.

Biotechnical, Hypodermic Syringe-Dart. Modified shotgun or handgun in which the projectile is a drug-filled syringe activated by a small charge on impact. Wide variety of drugs available including emetic (vomiting) agents [2:293,165,529].

Biotechnical, Injector-Baton. See *Baton, Biotechnology- Injector.*

Biotechnical, Malodorous Agents. Foul-smelling gases and sprays such as hydrogen sulphide (H_2S) or a compound known as NaS_8 which is used in making plastics. Could be delivered by a grenade. Past work on "cultural specific" agents has also been undertaken [356,529]. See also *Biotechnical, Project Agile.*

Biotechnical, Neuro-Implant. Computer implants into the brain which allow for behavioral modification and control. Current research is experimental in nature and focuses on lab animals such as mice [636].

Biotechnical, Pheromones. The chemical substances released by animals to influence physiology or behavior of other members of the same species. One use of pheromones, at the most elemental level, could be to mark target individuals and then release bees to attack them. This would result in forcing them to exit an area or abandon resistance [195].

Biotechnical, Project Agile. Series of military science studies in Asia conducted by Battele Memorial Institute in May 1966 for Advanced Research Projects Agency (ARPA). One such study centered on developing 'stink' bombs which were race specific [320].

Biotechnical, Wetware. Advanced technology devices which are surgically implanted into the body rather than worn. These devices can be used to enhance memory and the human senses, modify behavior or to locate allied troops. Pacemakers represent an early form of wetware. New concept developed in this document.

H. Electricals

Electrical, Armored Personnel Carrier. Standard armored personnel carrier fitted with a gate-like apparatus in the front and charged to a high voltage.

Used by West German police to clear streets or round up small groups of people [165].

Electrical, Baton. See *Baton, Electrical.*

Electrical, Fence. A fence which delivers a nonlethal electrical shock. It can be employed as an effective barrier against intruders [74:66].

Electrical, Flashlight. A type of flashlight designed with electrodes on the base. Effective range is minimal [556].

Electrical, Glove. A glove with an electric impulse generator in the palm and the bottom sides of the glove fingers. A close-in device similar to the electric stun gun and the electric flashlight [556].

Electrical, High-Voltage Telsa Coil. Passed from public scene because of their indiscriminate use against blacks in several Southern states in the mid-1960s. Example, electric baton or electric cattle prod [165].

Electrical, Homemade Body Armor. Newspapers and magazines stuffed down inmates' clothing and/or the use of mattresses as shields to counter the effects of stun guns [385].

Electrical, Police Jacket. Police jacket which jolts anyone who touches it [165].

Electrical, Projector. An advanced version of the standoff stun gun, where no wires are required. The charges are delivered through the air through pre-ionized air channels or by charging a low energy projectile which releases the charge at impact. Another approach is to launch a low energy projectile that releases the electrical charge at impact by compressing a piezo-electric element [195:8].

Electrical, Stun Belt. A command activated belt worn by prisoners which delivers a mild electric shock when they become combative [385].

Electrical, Stun Gun-Close In. A small, two-pronged, hand held electrical discharge weapon. Effective range is less than an arm length. It works by affecting the muscle signal paths, disturbing the nerve system [556].

Electrical, Stun Gun-Standoff. A form of stun gun with a range of 20 feet. It fires small, barbed electrical contactors, via a fine trailing wire, which snare a victim's clothing. A 3-4 second lapse takes place before the target is subdued. The development of this device was inspired by the Watts Riots in 1965 [408,529].

Electrical, Water Stream. A mobile unit projects a water stream charged with high voltage, low amperage. Another method cites 2 water jets, 1 negatively charged and 1 positively charged, which meet to close the circuit [529].

I. Electromagnetics

Electromagnetic, Engine Kill. The use of high-powered microwaves to kill the electrical system of an engine.

Electromagnetic, High Power Microwave [HPM], Weapons. Energy generated by a conventional electromagnetic apparatus, such as a radar transmitter, or released from a conventional explosion converted into a radio-frequency weapon which causes the disruption of electronic systems. Usually an ultra-wide ban source focus due to target vulnerability considerations. HPMs can also cause human unconsciousness without permanent maiming by upsetting the neural pathways in the brain and/or death [256,278].

Electromagnetic, Interference (EMI). Flight control systems of military aircraft are sensitive to electromagnetic interference (EMI). It is suspected that several crashes of Army UH-60 Black Hawk helicopters may have resulted when they flew too near large microwave transmitters [278].

***Electromagnetic,* Maser.** Microwave Amplification by Stimulated Emission of Radiation. A microwave generation device.

Electromagnetic Pulse, Non-Nuclear [NNEMP], Weapons. Non-nuclear EMP generating weapons mounted on cruise missiles or unmanned aerial vehicles (UAVs) which would disable enemy tanks and early warning radars would be invaluable. Such weapons when they explode would produce a momentary burst of microwaves powerful enough to disable all but special, radiation-hardened electronic devices [205,261,262].

Electromagnetic, Radio Frequency [RF], Weapons. A class of weapons which transmit short, high-powered pulses of electromagnetic radiation over significant ranges [278].

Electromagnetic, Rocket-Powered Unit. Unmanned miniature-wheeled vehicle launched by a police cruiser which delivers an electromagnetic energy pulse to the underside of a fleeing car's engine controls and associated sensors to disable it [644:4].

Electromagnetic, Static Unit. See *Electromagnetic, Rocket-Powered Unit.* Static version resembling a pancake shaped bump in the road. Remote control or unmanned automatic control [644:4].

Electromagnetic, Thermal Gun. A device that directs energy to produce heat, in concept similar to a microwave oven [565].

J. Entanglers

Entangler, Animal "Come-Along." A pole with a looped wire attached to one end. When the wire is placed around the neck of a subject and then

tightened it produces a choking effect much in the same manner as that of a choking collar used for dogs.

Entangler, Bola. Device consisting of two or three heavy balls attached by one or two ropes/cords and used for entanglement purposes. It is twirled overhead in one hand and hurled or cast at the intended target. Designed to entangle legs to retard/stop movement. Probably an ancient weapon, but made famous by the gauchos of South America, who used them to catch cattle and ostrich.

Entangler, Cloggers. Polymer agents, sticky-soft plastics, used in burst munitions to clog up jet and tank engine intakes [144].

Entangler, Cloggers-Colored. Clogging agents when mixed with dyes result in "tinted clouds" whose presence let friendly forces know not to enter them [353].

Entangler, Cloggers-Colored, Mine-Air. Cloggers mixed with colored gas which designate an air mine to allied pilots or drones. These air mines can be intermixed with "decoy mines" consisting solely of colored gas and laid in air mine fields to restrict aerial mobility [54].

Entangler, Monofilament Fishing Line. When spread out on snow, monofilament fishing line may be sucked into a snowmobile's track mechanism and cause it to jam. Effectiveness unconfirmed [15:108].

Entangler, Net-Electrified. A net shot from a gun at a targeted individual. Will release an electric shock if the target tries to struggle [361:69].

Entangler, Net, Gun. Fires a net which entangles a human or vehicular target. One such net is 18 feet wide and employs glue-coated strands. Another is 28-foot-wide, fired from a cannon and can envelope a car or armored vehicle [121:24,165].

Entangler, Net, Mine-Human. Mine detonation fires a net into the air which lands upon a soldier target.

Entangler, Net, Mine-Vehicular. A device laid across a road which shoots a fabric barrier up about to 2 meters to ensnare an oncoming vehicle [216].

Entangler, Net-Poles. A capture device based on a pair of 6 foot nylon poles that have a strong chain interlaced between them. It is employed by two people who capture the target in the chain mesh between the poles [2:295,569:21].

Entangler, Riot Gloves. Heavy protective gloves used by prison guards and riot police which protect the hands and forearms from cuts and blunt trauma. These gloves allow for the grappling of prisoners and rioters.

K. Holograms

Hologram, Death. Hologram used to scare a target individual to death. Example, a drug lord with a weak heart sees the ghost of his dead rival appearing at his bedside and dies of fright [149:4].

Hologram, Prophet. The projection of the image of an ancient god over an enemy capitol whose public communications have been seized and used against it in a massive psychological operation [609].

Hologram, Soldiers-Forces. The projection of soldier-force images which make an opponent think more allied forces exist than actually do, make an opponent believe that allied forces are located in a region where none actually exist, and/or provide false targets for his weapons to fire upon. New concept developed in this document.

L. Markers

Marker, Foam Dye. Hand held device which is used to spray green foaming dye into the face of an opponent. Obscures vision and marks the target for one week for future identification.

Marker, Invisible. One concept envisions a fluorescent powder sprayed into crowds from pressurized container. Particles adhere to clothing and are only visible under ultraviolet light. Another concept envisions sponge grenades impregnated with infrared dye so that rioters can be later identified [529].

Marker, Laser Paint. A laser dye and scatterer suspended in a host medium. When irradiated with a laser beam, this "laser paint" exhibits laser-like properties, becoming a brilliant light source, without being a collimated beam [355].

Marker, Paint Gun. Gelatin capsule containing a marking agent which splatters on impact leaving a 3" circle and streamers from 12" to 18" [2:294,529].

Marker, Smart Metals. Metals formed with chemical additives or blended in a particular form so that they would function only when used for legitimate purposes or give off telltales signs to inspectors when used improperly [176:84].

Marker, Smoke Dyes. Marking dye added to smoke during crowd control situations [529].

M. Obscurants

Obscurant, Agents. Rapid-hardening agents used to obscure the vision ports/optics of an armored fighting vehicle [144].

Obscurant, Crazing. Higher powered low energy laser weapons have the capability of heating and distorting or cracking the glass lenses of optical systems. This effect is called crazing and is caused when the heat buildup and subsequent cooling in the glass surface creates uneven stresses in the glass surface to crack it. The result is a frosted effect, making it impossible to see through the glass lenses or vision blocks (glass windows) in tanks. Such targets may be effected at long ranges, and the optics can be crazed in less time than is needed to blink an eye [1:148].

Obscurant, Laser-Argon Beam. An Argon laser aimed at windows, automobile windshields or airplane canopies for vision denial purposes. Microabrasions in the glass scatter this particular wavelength of light turning the entire sheet a glaring, opaque green. As a result, a sniper could not see through a window or a suicide driver would not be able to look out through the windshield of the truck laden with explosives that he was driving [253].

Obscurant, Myopia. The inability of the human eye to focus light from infinity accurately, which, in practical terms, means beyond approximately 20 feet. If induced through nerve/chemical agents, performance degradation could be dramatic, especially in aviation operations, because studies indicate that as much as 85% of pilot sensory perception/ performance is through sight. Nerve gas can induce myopia [14:42].

Obscurant, Smoke-Colored. Colored smoke concentrations produce greater initial psychological and panic effect than white smoke. Caucasians are said to have a greater repugnance to brilliant green smoke, which is associated with disagreeable personal experiences such as seasickness, bile and vomit. Negroids and Latins are declared to be most adversely affected by brilliant red. Rioters confronted with a strong concentration of colored smoke feel, instinctively, that they are being marked, or stained, and thus they lose anonymity [2:198-199].

Obscurant, Smoke-White. White obscuring smoke delivered by grenades or smoke pots. Relatively inexpensive, non-toxic, noncontaminating and tactically ideal for police use. Obscuring smokes are temporarily irritating to the nose and throat, and cause those affected to lose visibility, sense of purpose and direction [2:198,529].

N. Opticals

Optical, Add-On Combat Assault Weapon. The use of a low energy laser weapon as a compliment to the main armament of a tank or infantry fighting vehicle or as a compliment to a antitank missile system [1:172].

Optical, Bucha Effect. High intensity strobe lights which flash at near human brain wave frequency causing vertigo, disorientation, and vomiting [245]. See also *Optical, Stroboscopic Device*.

Optical, Cameo Bluejay. A 75 pound version of the AN/VLO-7 Stingray designed for use by the Apache attack helicopter [1:161].

Optical, C-CLAW. The Close-Combat Laser Assault Weapon, code named "Roadrunner," was an early 1980s Army tactical laser proto-type which was designed to attack the optics of opposing armored fighting vehicles. The program was canceled in 1984 as a result of adverse publicity over human blinding issues and cost/weight requirements [435].

Optical, Cobra. Prototype of the AN/PLQ-5 Laser Countermeasures System. A 30-pound hand-held laser weapon used to damage enemy sensors and human eyes. Because this device may operate on three-different wave lengths it may be impossible to be currently defended against [1:161-164].

Optical, Cornet Prince. Air Force version of the AN/VLO-7 Stingray. It is a pod mounted system which is intended to protect an aircraft from enemy air defense weapons which are dependent on optics and electro-optics for their effect. Cornet Prince has a detection system which notifies an air crew if it is under attack or if attack is imminent so that it can take the proper counter-measures [1:160].

Optical, Crazing. See *Obscurant, Crazing.*

Optical, Dazer. Battery-operated 20,000 candlepower "flashlight." It uses an alexandrite laser and is meant to provide infantry with a nonlethal capability against armored targets by attacking sensors, night vision devices and personnel. The shoulder-fired Dazer weighs about 20 pounds and is submachine gun size [1:161-163,16].

Optical, Dazzle. A class of optical weapons that emit extremely bright light causing temporary blindness.

Optical, Dazzle Rifle. A rifle which emits an eye-safe argon-ion laser beam designed to disorient the target [352].

Optical, Demons. Term for directed-energy munitions [16].

Optical, Electro-Optical Countermeasures System. AN/VLO-7, Stingray. A laser designed to blind the optics and electro-optics of enemy tanks and armored fighting vehicles. Two test versions were deployed in the Gulf War by the Army but not used. This device weighs about 160 kilograms. It can be mounted on both the M1 Abrams tank and the Bradley infantry fighting vehicle [16,546]. See also *Antilethal, Sensor-Retroreflectivity.*

Optical, Flares. Both directional and omnidirectional flares can be used against personnel and materiel to obscure vision.

Optical Flash. A 40-mm artillery shell filled with plastic dye laser rods. Used to blind electro-optic sensors and enemy personnel [114].

Optical, High Intensity Lights. High intensity hydrogen-chloride light on a reflector equipped hand-held candle holder [529].

Optical, Illuminating-Grenade. In night ambushes in Vietnam the MK1 Illuminating Grenade, which produced 55,000 candlepower for 25 seconds, effectively blinded Viet Cong caught in the center of its illumination zone for short periods of time.

Optical, Isotropic Radiators. Special munitions that illuminate or bloom with laser-bright intensity causing the same retinal or optical damage as LEL (low energy laser) weapons. Isotropic radiation is generated by an explosive burst that superheats a gaseous plasma surrounding it, causing a laser-bright flash [246].

Optical, Laser. Light Amplification by Stimulated Emission of Radiation.

Optical, Laser-Argon Beam. See *Obscurant, Laser-Argon Beam.*

Optical, Laser-Anti-Oil Storage Tank. Man-portable laser system with a back-pack power supply designed for use against storage tanks in the Gulf War. Use debated [16,577].

Optical, Laser Countermeasures System [LCMS]. AN/PLQ-5. M-16 rifle-mounted and backpack-powered 42 pound system. Can detect and disrupt optical and electro-optical targeting systems at "stand-off ranges." While not specifically intended to harm human eyes, the system was canceled so U.S. troops would not be subjected to war crimes concerns [277,520].

Optical, Laser Dazzle System [LDS]. U.K. Royal Navy's low energy laser system deployed during the 1982 Falklands war by two of its frigates [475,476].

Optical, Laser-Infrared CO_2. Laser which can heat the skin of a target to cause pain but will not burn the skin. Application against the hand of a suspect holding a knife or gun to a hostage [253].

Optical, Light Flashing Devices. Devices which are much like a photographer's flash bulb but at a greatly increased power. They are used to disorient target individuals by causing temporary flash blindness [23:206].

Optical, Low Energy Laser-Antilethal. See *Antilethal, Low Energy Laser.*

Optical, Low Energy Laser-Eye Safe. A continuous wave laser, mounted on a M-16/M-203 rifle, that produces a high-intensity glare strong enough to temporarily delay and disorient an adversary so that he can't complete a mental task, like cutting a fence or walking on rough terrain. Effective range of several hundred meters. Laser powered by 6 rechargeable AA size batteries [310:19].

Optical, Mobile Test Unit. Mid-1970s Army tactical laser concept utilizing a medium powdered laser mounted on a Marine Corps armored personnel carrier called the Mobile Test Unit. Used to shoot down some helicopter drones [435].

Optical Munitions. A class of non-lethal weapons which rely upon either a multi-directional or uni-directional intense burst of light [isotropic radiator (laser)] generated by the high-explosive shock heating of an inert gas [543].

Optical, Stroboscopic Device. Devices employed against demonstrators which cause stroboscopic flashing. Same principle as a discotheque "strobe." In the 5-15 hertz range these devices can cause various physical symptoms and in a small portion of the population may trigger epileptic seizures [23:206].

O. Projectiles

Projectile, Bag-Bean. Fabric sacks filled with lead shot (usually No. 9) weighing from 40 to 150 grams, designed to be fired from 12 gauge shotguns and 37mm (40mm) launchers. The bags conform to the shape of the target on impact, producing less damage than a solid hard projectile. The bags are rolled in the cartridge and unroll after exiting the launch barrel. These projectiles are designed for direct impact on the target, therefore accuracy is important to ensure effective impacts. The level of energy delivered ranges from 40 to 100-foot pounds, depending on the distance the projectile has to travel. Also known as Flying Bean Bag or Shot Bag.

Projectile, Bag-Bean-Rubberized, Gun. A prison gun which utilizes rubberized bean bag projectiles. Used for movement of cell blocks and surprise advances [385].

Projectile, Bag-Stun. Early form of nonlethal projectile composed of a 5 1/4 ounce canvas pouch filled with metal buckshot which spread into a 3-inch diameter pancake in flight. Known to cause serious injury [511:672].

Projectile, Bag-Stun, Launcher. An obsolete gun which delivered a cartridge containing a 4" diameter stun-bag loaded with 1/5 to 1/2 lb. of shot. It could be used as handgun or with an extension as a shotgun. It has been replaced by the 12 gauge shotgun and the 37 (and 40) mm launchers [529]. Also known as the stun gun.

Projectile, Ball-Rubber, Grenade. An explosive anti-riot device which hurtles a large number of small "stinging" rubber balls at rioters when ignited. May or may not contain riot control agents [373]. Also known as stingball or stinger grenade.

Projectile, Ball-Rubber, Round. The common usage of this term now refers to a number of 5/8 in. rubber balls fired from a 12 ga. shotgun. The 3/8 in. ball is also common. Both have a hardness of about 50 shore. These rounds have maximum effect when fired in confined spaces, where multiple bounces

augment the number of impacts on the target with sufficient force to sting rather than hurt. The eyes are the most at risk of damage, due to the small size and velocity of the balls. The older use of this term refers to a rubber ball fitted with a "Blake" attachment to a shotgun. The ball can be solid or filled with liquid or gas. Various designs existed for point or area targets [529].

Projectile, Barricade Penetrating. Any projectile which delivers a riot control agent into a barricade situation via a window or plate-glass. One such projectile is a fin stabilized injection-molded plastic device which disperses a highly-volatile liquid CS agent [2:150,82].

Projectile, Baton-Plastic. A PVC cylinder 1/2 inches in diameter and 4 inches long. Instead of being bounced off of the ground these rounds are directly fired at the intended target. Causes a bruising impact blow with a claimed effective range of 30 to 65 yards. At point blank range this round can be fatal. First used by the British Army in Northern Ireland in February of 1973 as a replacement for rubber bullets [2:159,511:672]. Also known as riot baton round, plastic bullets or PVC bullets.

Projectile, Baton-Rubber. Pliable rubber cylindrical projectiles delivered from the riot gun or British Army signal gun. Aimed at crowd's legs or at the ground for ricochet effect into a crowd [165,529]. Also known as rubber baton or rubber bullet 6-inch.

Projectile, Baton-Wooden. Wooden cylinder delivered by a riot gun or by a British Army signal gun [529]. Also known as broomstick round.

Projectile, Baton-Wooden Multiple. A 37-38mm round which disperses 5 wooden pellets which can be fired from a distance or ricocheted into the mob. Direct fire at close or point blank range can cause serious or fatal injuries [2:158].

Projectile, Baton-Wooden Whistling. A short fluted cylinder made of wood and fired at low-velocity for crowd dispersal. This round makes a whistling sound when fired. Whistling sound and visibility of round valued over kinetic impact. Fired by a Hong Kong Pellet Gun [165].

Projectile, Chaff-Ceramic. Dropped or fired in front of an aircraft which when ingested by a jet engine will destroy its turbine blades and other mechanisms [356:35].

Projectile, Gas Vortex. If a gas vortex, a highly stable phenomenon, was projected at some velocity, the difference in pressure on the leading and trailing edges would produce an impact. Potential use in crowd and riot control situations [556:19].

Projectile, Launcher-ARWEN. Anti-Riot Weapon Enfield. A hand-held, cylinder fed, shoulder-launched 37mm anti-riot weapon which is used to launch a variety of impact devices such as bean bags, pellets, rubber and wooden baton rounds, etc.

Projectile, Launcher-Blake Impact Gun. Aluminum alloy-type, golf ball sized projectile fitted to a bolt-action shotgun [529].

Projectile, Launcher-Velocity Adjusting. Small arms weapon with an adjustable muzzle velocity intended for delivery of less-than-lethal munitions such as rubber or PVC bullets. The purpose of the adjustment is to tailor the velocity to the range [35].

Projectile, Launcher-Very Pistol. A 37mm pistol used to fire tear gas and other nonlethal projectiles.

Projectile, Liquid Filled. Several types of hollow rubber projectiles have been manufactured. The most recent, in a 12 ga. shotgun size, is filled with a liquid dye to mark the target for subsequent identification, in addition to the impact effect. The working range is from 5 to 75 feet. Older types included a 3 inch diameter, .5 lb. rubber ball filled with water, to be used as an impact projectile. The range was 75 ft. The launcher was large and heavy [529].

Projectile, Mine-Claymore. Modular Crowd Control Munition. A nonlethal claymore-type mine which disperses blunt impact ordnance for crowd control purposes [373].

Projectile, Muzzle Launch Ordnance [MLOj. MLO MA/RA 88 less-than-lethal shot for the M16A2 Rifle. Must disorient targets at effective ranges of 30-70 meters, not create shrapnel, and be of minimal hazard [338,373].

Projectile, Ricochet-Soft Plastic. Polyethylene pellets 1/16" in diameter delivered from a standard 12-gauge shotgun aimed to ricochet. Available in larger sizes [529].

Projectile, Ring Airfoil Grenade, Launcher. Launcher Adapter, M234 Designed for attachment to M16A1 rifle. Uses blank cartridge (M755) to propel either Soft Ring Airfoil Grenade (M742) or Sting Ring Airfoil Grenade (M743).

Projectile, Ring Airfoil Grenade-Soft. Soft RAG, M742. A rubberized donut shape with airfoil cross-section that is launched spinning from M234 adapter attached to M16A1 rifle. A series of cavities in the projectile body contain packets of CS powder. Target impact opens the CS packets and disseminates the chemical (powder). This system has been replaced by the Non-Lethal 40mm Sponge Grenade.

Projectile, Ring Airfoil Grenade-Sting. Sting RAG, M742. A rubberized donut shape with airfoil cross section that is launched spinning from the M234 adapter attached to M16A1 rifle. Intended as an initial deterrent via kinetic energy impact. Can also be used as a training round. This system has been replaced by the Non-Lethal 40mm Sponge Grenade.

Projectile, Rock Salt. Large salt crystals fired from shot guns. Crowd dispersal method.

Projectile, Rubber. These projectiles can be solid (homogeneous) or clad (composite). Solid rubber projectiles can be further classified by density, ranging from high density (hard), to soft (foam). The shape of the homogeneous projectiles varies from a right cylinder (35mm diameter by 3 inches long) to a cylinder with a hemispherical nose, to short cylinders (35mm diameter by 1 1/2 inches long-multi-projectiles, soft foam) to hard, finned shape projectiles (12 gauge), and balls about 5/8 inch. The large cylinders fired to strike the ground in front of the target individuals, bouncing up to hit them. Depending on the distance from the ground impact to the target, the impact point can range from the knees to the head, producing different results. Past experience with this method of firing has shown that.

Projectile, Shards-Ceramic. Fired against aircraft to disable their engines or to degrade their stealth capabilities [16].

Projectile, Splatt-Thixotropic. Special Purpose Low Lethality Anti-Terrorist. Any projectile that deforms at impact, without penetrating the body. One materiel preparation designed to accomplish this action is described in the patent. The whole projectile is made of this substance, not just the tip. The older usage of this term referred to any caliber shotgun shell with grease or soft putty on the tip which would deform at impact [529].

Projectile, Sponge Grenade. 40mm nonlethal projectile developed for the M203 grenade launcher made out of spongy material. Can either be used as a kinetic weapon or with the inclusion of a CS or marking dye wafer. Potentially fatal within 25 meters or if an eye shot occurs. Successor to the discontinued Soft/Sting Airfoil Grenade System.

Projectile, Water Stream. Mobile unit which projects a continuing stream of water for riot control purposes [529].

Projectile, Water Stream-Electrical. See *Electrical, Water Stream.*

P. Reactants

Reactant, Acetylene, Grenade. One pound bomb containing calcium carbide and water. Upon detonation, forms a bubble of acetylene gas seven feet in diameter. When sucked into the air intake of a diesel at concentrations as little as one percent, the gas would cause the fuel in each cylinder to ignite prematurely, with enough force to break piston rods [144,387].

Reactant, Chemical Compounds. Chemical compounds which are magnitudes more powerful than hydrofluoric acid. A mixture of hydrochloric acid (HCI) and nitric acid (H_2NO_3) will dissolve most noble metals, such as gold and platinum, and organic compounds. Could be delivered by binary weapons to attack structures, armored fighting vehicles, roads, roof tops and

optical systems [16,246,356]. Also known as supercaustics, superacids, supercorrisive bases, C+, and tire eaters.

Reactant, Cloud Seeding. Silver iodide dropped into clouds over the Ho Chi Minh trail during the Vietnam War in order to promote additional rainfall which would degrade Viet Cong logistics [434]. See also *Reactant, Operation Popeye.*

Reactant, Combustion Alteration. This technology consists of chemical additives that either contaminate or change the viscosity characteristics of fuel to degrade standard engine performance. The additives may be ingested as a vapor through air intakes, mixed with fuel during the intake cycle or applied directly to a fuel source causing almost instant engine failure [302:13,16].

Reactant, Liquid Metal Embrittlement [LME]. Agents operate by altering the molecular structure of base metals or alloys and could significantly interfere with the operation of the aircraft, vehicles, metal treads and bridge supports to which they were applied. LMEs are clear and have little or no perceptible residue, whether sprayed on or applied with felt-tip markers. Some ambiguity exists because LMEs may refer to both liquids and liquid metals [16,302,356].

Reactant, LME Graffiti. Graffiti used to mask an LME strike against a bridge or other target. Great potential for terrorist use. Example, phone call to law enforcement stating that an LME strike has been conducted against one of a number of bridges in a city using red LME graffiti.

Reactant, Operation Popeye. The cloud-seeding campaign conducted by the U.S. military during the Vietnam War. 2,602 Popeye flights were flown through 1972 in hopes of interdicting the flow of Communists troops and supplies along the Ho Chi Minh Trail [434].

Reactant, Pyrophoric Particles. Particles which when ingested in a combustion chamber give off heat and thus overheat the chamber which causes thermal failure. Caesium would be one likely candidate [144,356]. Also known as polystyrene peanuts.

Q. Riot Control Agents

Riot Control Agent, Area Dispensers. RCA dispensers mounted in the walls and ceilings of prison facilities. They provide law enforcement personnel the ability to move groups out of or from one area to another through CS and OC dispersement [385].

Riot Control Agent, CA. 4-Bromobenzylcyanide. CA was one of the first tear agents used. It is not as effective as CN or CS and is obsolete. CA produces a burning sensation of the mucous membranes and severe irritation and tearing of the eyes with acute pain in the forehead [584:52]. Also known as BBC,

larmine, and camite.

Riot Control Agent, Chemical Mace. Small spray can containing a 0.9 per cent solution of agent CN in a variety of petroleum based carriers including a mixed freon/hydrocarbon solvent. First introduced in 1966. CS-Mace then developed in 1968 by suggestion of the U.S. Army [2:213-214,165].

Riot Control Agent, CN. Chloroacetophenone. A lacrimator that causes irritation to the upper respiratory passages and may cause irritations to the skin. On average, it incapacitates for approximately 3 minutes. Discovered by the German chemist Graeber in 1869. Replaced for most purposes by CS [13:19,529].

Riot Control Agent, CR. Dibenz-(b,f)-1,4-oxazepine. Newer riot control irritant developed in England in 1962 by the British chemists Higginbottom and Suchitzsky. About 5 times more effective than CS. In addition, CR is much less toxic than CS. CR is not used in its pure form (a yellow powder) but dissolved in a solution of 80 parts of propylene glycol and 20 parts of water to form a 0.1-percent CR solution. It is used in solution as a riot control agent. Eye pain, discomfort and excessive tearing occur with sometimes painful sensitivity to strong light or temporary blindness. Symptoms can persist for 15 to 30 minutes. Dubbed "fire gas" by the media because of the burning sensation it caused to the skin of rioters when used in Northern Ireland from 1973-1974. Authorized U.S. Army use in 1974 [2:180,67,584:59].

Riot Control Agent, CS. Ortho-chlorobenzalmalononitrile was made the standard riot control agent by the Army in 1959. The term "CS" is derived from the two scientists, B.B. Carson and R.W. Sloughton, who first prepared it in 1928. First used by U.S. civilian law enforcement in 1968 during the riots in Washington D.C. While an effective riot control agent, which incapacitates on average from 5 to 10 minutes, decontamination and cross-contamination is a considerable problem in urban environments [13:19,82,337].

Riot Control Agent, CS1. Specially formulated to prolong persistency and increase the effectiveness of CS. Unlike CS, CS1 is a free-flowing (micropulverized) agent powder consisting of 95-percent crystalline CS blended with 5-percent silica aerogel. This formulation reduces agglomeration and achieves the desired respiratory effects when dispersed as a solid aerosol [584:59].

Riot Control Agent, CS2. CS blended with silicone-treated silica aerogel, which causes it to repel water. This treatment improves the physical characteristics of CS by reducing agglomeration and hydrolysis. This form of CS prolongs the effectiveness for both immediate and surface contamination effects. When disturbed, CS2 reaerosolizes to cause respiratory and eye effects. A cloud of waterproofed CS can be kicked up by people walking in the street or grass two months after it has settled [13:50,584:59].

Riot Control Agent, CSX. A form of CS developed for dissemination as a liquid rather than as a powder. One gram of powdered CS is dissolved in 99 grams of trioctylphosphite (TOF). As with CS, CSX stings and irritates the eyes, skin, nose, throat, and lungs of exposed personnel [584:59].

Riot Control Agent, Disperser-Fogger. Conventional insecticide blower adopted for CS and CN dispensing in Vietnam. Produces a fog-type emission for up to a 15 minute period. Conceptual basis was to fill Viet Cong tunnel complexes with large amounts of the CS agent. Another fogger was a handheld gasoline-operated device which dispenses either CS, CN or inert fog at 0.7 gallon/hour [2:178,165]. Also known as mighty mite (M-106) and pepper fogger.

Riot Control Agent, Disperser-Liquid. An Army riot-control agent disperser visually resembling a man-carried flamethrower. Fully loaded weight is approx. 55 pounds. Disperses CS mixed with a trioctylphosphate solvent. [2:178,165]. Also known as liquid stream projector.

Riot Control Agent, Disperser-Powder. Modified Dry-Powder Fire Extinguisher. Powdered CS and CN dispersal [165].

Riot Control Agent, Grenade Electrically Activated. A riot control grenade with a male, electrically activated screw-in socket connection in place of a standard fuse. This enables the grenades to be incorporated into electrical systems, in fixed installations, where they can be activated by a trip device or switch, at will. This is of special importance in security of buildings, and vital installations, providing a dependable, economical protective system that can be locally installed. This system, with variations, is now in use in commercial security systems, as well as in U.S. government and embassy installations [2:133].

Riot Control Agent, Grenade-M73A. Army riot control grenade in use prior to the M47-Type CS Grenade. As of 1992, the M7A3 was still in use because of technical problems with the M47 [67].

Riot Control Agent, Grenade-M47 CS. Basic riot control grenade employed by the Army. Its contents are expelled as a vapor from a taped-over port in the grenade body, causing the grenade to "skitter" around on the ground, making it difficult for rioters to throw back. As of 1992, it has not seen tactical action [67].

Riot Control Agent, Homemade Face Filters. Wet rags and other devices made by prison inmates to counter the effects of riot control agents [385].

Riot Control Agent, Lacrimator. A riot control irritant that will cause blinding tears upon contact with the eyes [444]. Also see *Riot Control Agent, CN.*

Riot Control Agent, Launcher-Handy Andy. U.S. Army hand-hold type throwaway munition consisting of an aluminum tube with a hand-activated striker in the base. On ignition, the E24 propels a cylindrical rubber projectile containing 50 grams of CS burning formulation to distances of 70-100 yards [2:179].

Riot Control Agent, Launcher-Riot Gun. A weapon designed specifically to fire tear gas munitions of 37-mm diam. [444:2]. Also known as 1 1/2-in gun, 38-mm gun, gas gun, and tear gas launcher.

Riot Control Agent, Mine. An anti-personnel mine filled with a riot control agent. For perimeter use around detention camps or secured facilities.

Riot Control Agent, OC. Oleoresin Capsicum. A food product obtained from chili peppers which are dried and ground into a fine powder. When mixed with an emulsifier such as mineral, vegetable, soy oil or water, it may be sprayed from a variety of dispensers and used as an irritant for safely controlling violent persons or vicious animals and/or restoration and maintenance of order.

Riot Control Agent, Ring Airfoil Grenade-Soft. See *Projectile, Ring Airfoil Grenade-Soft.*

Riot Control Agent, Sponge Grenade. See *Projectile, Sponge Grenade.*

Riot Control Agent, Tear Gas-Invisible. Invisible tear-gas clouds are produced by blast munitions loaded with dust or liquid agents. Invisible tear gas cannot be seen by rioters once it first emerges from a grenade or mechanical dispenser and therefore produces a greater psychological panic-producing effect than tear smoke [2:161-162].

Riot Control Agent, Tear Gas-Visible. Visible tear-gas clouds (tear smoke) emanate from burning grenades and projectiles. Tear smoke is highly visible and plainly indicates the area covered to police and rioter alike [2:161-162].

II. Nonlethal Weapons Concepts

A. Ethical

Ethical, Biological Weapons Convention [BWC], 1972. This convention prohibits the development, production, stockpiling or retention of microbial or biological agents for use as weapons. Would likely preclude the use of biodegrading microbes [16,508].

Ethical, Blinding Laser Ban, 1995. The Department of Defense prohibits the use of lasers specifically designed to cause permanent blindness of unenhanced vision and supports negotiations prohibiting the use of such weapons. However, laser systems are absolutely vital to our modern military. Among other things, they are currently used for detection, targeting, range-finding, communications and target destruction...accidental or incidental eye injuries may occur on the battlefield as the result of the use of legitimate laser systems. This prohibition was initiated by the United States in concurrence with other, mostly Western, nations [457].

Ethical, Certain Conventional Weapons Convention, 1980. Prohibits or restricts weapons which are deemed to be excessively injurious or to have indiscriminate effects. Microwave, radio-frequency radiation, and visible light pulsing at brain-wave frequency may violate this convention [20:49-54,508:45]. Also known as Inhumane Weapons Convention.

Ethical, Chemical Weapons Convention [CWC], 1993. This convention, while not in force, precludes the use of toxic chemicals as a method of warfare. A toxic chemical is one which 'though its chemical action on life processes can cause death, temporary incapacitation or permanent harm to humans or animals.' How supercaustics would be interpreted within this convention is unknown [16,508].

Ethical, Environmental Modification Techniques Ban, 1977. Found in Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (ENMOD). Bans any technique for changing- through deliberate manipulation of natural processes- the dynamics, composition or structure of the Earth, including its biota, lithosphere, hydrosphere and atmosphere, or of outer space which will have widespread, long-lasting or severe effects as the means of destruction, damage or injury to any other State Party [20:68-69].

Ethical, Geneva Protocol, 1925. Whereas the use in war of asphyxiating, poisonous or other gases, and of analogous liquids, materials or devices, has been justly condemned by the general opinion of the civilized world; and Whereas the prohibition of such use has been declared in Treaties to which the majority of Powers of the world are Parties; and To the end that this prohibition shall be universally accepted as part of International Law, binding alike the conscience and the practice of nations. Extended to bacteriological methods of warfare. The United States has interpreted the Protocol of 1925 as

not prohibiting the use of riot control agents [20:57-58].

Ethical, New Martyrdom. A potential form of martyrdom arising from the long-term incapacitation capacity that some nonlethal weapons provide. Examples are permanently blinding or disrupting the nervous systems of opposing soldiers. Those living, rather than dead, would represent a new form of
martyr. References to the horrors of the gassings of the First World War would undoubtedly be made [149:10-11].

Ethical, Tennessee vs. Garner. A 1985 court case (475 U.S. 1) which held that the use of deadly force to apprehend an apparently unarmed, nonviolent fleeing felon is unreasonable seizure under the Fourth Amendment. Stimulated law enforcement interest in less-than-lethal weapons.

B. Functional

Functional, Bouchon. The complete metal fuze assembly of a diversionary device or similar grenade, usually consisting of a safety pin, safety "spoon," and a percussion type ignition device.

Functional, Deflagrate. To burn; consume; to burn rapidly with intense heat and dazzling light.

Functional, Deflagrating Canister. A canister which is designed to burst or burn. When used with a diversionary device, this type of canister is designed to burst or burn at a low enough pressure to prevent the bouchon from being thrown.

Functional, Deflagrating Explosive. Any explosive which deflagrates rather than detonates. Also called a "low" explosive, it is characterized by relatively slow burning processes with progressive reaction rates and buildup of pressure which creates a heaving action.

Functional, Deployment Sequence. The first of three functions when a diversionary device is deployed. It refers to the manner and place in which a diversionary device is deployed. See also *Functional, Ignition Sequence* and *Functional, Firing Sequence.*

Functional, Detonate. To explode violently and noisily; also called a "high" explosive it is characterized by very rapid chemical reactions, thus causing tremendously high pressure and brisance (shattering action).

Functional, Detonating Explosive. Any explosive which detonates rather than deflagrates. Also called a "high" explosive, it is characterized by very rapid chemical reactions, thus causing tremendously high pressure and brisance (shattering action).

Functional, Firing Sequence. The second of three functions when a diversionary device is deployed. It refers to the mechanical action of the bouchon, (fuze assembly). See also *Functional, Deployment Sequence* and *Functional, Ignition Sequence.*

Functional, Fuse. A narrow tube filled with combustible material, or a wick saturated with such material, for setting off an explosive charge. A pyrotechnic device which serves as the initiator to an explosive charge (e.g. M-3A1, friction type fuse).

Functional, Fuze. Any of various devices for detonating bombs, projectiles, or explosive charges. A mechanical device used as the initiator to an explosive charge (e.g. M-201A1, percussion type fuze).

Functional, Hybrids. Weapons that can be switched from "lethal" to "nonlethal" by a simple mechanism, having multiple barrels, or using ammunition which can be switched at launch (single barrel, lightened logistic chain) [529].

Functional, Ignition. Setting a thing on fire, to cause something to burn.

Functional, Ignition Sequence. The third of three functions when a diversionary device is deployed. It refers to the events which take place during the burning of the charge. See also *Functional, Deployment Sequence* and *Functional, Firing Sequence.*

C. Operational

Operational, Brevity Code. A one or two word phrase which, when transmitted on a radio, carries a much larger meaning. Used to keep transmission time to a minimum without unduly tying up valuable "air time." Usually repeated twice to ensure understanding.

Operational, Denial System. Components of a security system that prevent an intruder or adversary from completing an intrusive hostile act on a fixed sight [359].

Operational, Dirty Battlefield. A battlefield operational environment in which civilians and other noncombatants are mixed in with combatants [56].

Operational, Environmental Warfare. A form of attack based on purposeful environmental degradation by a state or non-state group against an opponent. An early example would be the salting of the fields of Carthage by the Romans. The most recent example would be the blowing up of 732 oil wells in Kuwait and the releasing of oil into the Persian Gulf by Iraq in 1991.

Operational, Immediate Action Drill. Any action, technique or procedure which is initiated by an event rather than a signal [5].

Operational, Lethal-Nonlethal Coordination. A process by which hardkill and softkill weapons are made to enhance the effects of one another rather than degrade each others' performance. Applied to the defensive systems of a warship [570].

Operational, Long Term Disablement. The outcome of the application of nonlethal force that affects the opponent beyond duration of the confrontation or conflict. Blinding, maiming or psychologically deranging the opponent represent forms of long term disablement. This form of disablement burdens a society and is anathema to the Western definition of nonlethality.

Operational, Mobile Security System. Area/fixed site denial or delay systems that are portable, leveraging on nonlethal technology and minimal installation costs [402].

Operational, Mobile Tactics. A procedure used against rioters in which an anti-riot team is embarked on vehicles, rapidly driven near rioters, whereupon they quickly disembark and rush toward the crowd, followed by another team which repeats the procedure and exploits the momentum gained by the original team.

Operational, Nonlethal-Lethal Effect. A nonlethal attack which purposefully sets up an opposing soldier or vehicle for a fatal attack. Example, a soldier struck to the ground by a stick'em' and then shot by a conventional round or killed by an artillery barrage.

Operational, Nonlethal Weapons, Non-Western. Weapons which are designed to cause long-term disablement to military personnel and civilians. These weapons may be employed by either non-state forces or non-Western nation-states. Forms of nonlethal non-Western weapons include blinding lasers, disease organisms, and genetic alteration [149:3].

Operational, Nonlethal Weapons, Western. Weapons that are explicitly designed and primarily employed so as to incapacitate personnel or materiel, while minimizing fatalities, permanent injury to personnel, and undesired damage to property and the environment. Unlike conventional lethal weapons that destroy their targets principally through blast, penetration and fragmentation, non-lethal weapons employ means other than gross physical destruction to prevent the target from functioning. Non-lethal weapons are intended to have one, or both, of the following characteristics: a. they have relatively reversible effects on personnel or materiel, b. they affect objects differently within their area of influence [229:1-2].

Operational, Passive Deterrents. A genre of nonlethal weapons that does not affect the physiology of the target individual. Includes dyes, personal alarms, and scent sprays.

Operational, Rules of Engagement [ROEs]. Generally, rules that provide implementation guidance on actions to exercise 1. the inherent right and

obligation of self-defense and 2. the application of force for mission accomplishment by national/multinational military forces in international not domestic situations. The many boundaries to ROE's include international laws and treaties, national policy and custom. Standing Rules of Engagement refer to those generally intended for all situations, but tailored ROE's for specific situations may augment those standing rules. This is a general, not legal, description.

Operational, Second Order Effect. A nonlethal attack ultimately resulting in an unintentional death. For example, a pilot, blinded by a laser unable to safely land his or her aircraft or a patient dies because the power to an incubator or iron long in a hospital is cut off due to the destruction of a power plant.

Operational, Short Term Disablement. A form of disablement which has relatively reversible effects on personnel or materiel [230:1].

Operational, Tailored Weaponry. Alternative, and likely more accurate, term for nonlethal weaponry. Such weaponry is qualitatively advanced over traditional firearms and munitions because it allows for precision control over the application of politico-military force. Rather than killing (100% force) or not-killing (0% force) an opponent these weapons offer new capabilities in the 1-99% range between no action and lethal force.

D. Physiological

Physiological, Acetylcholine Effect. The temporary effect an organism experiences after long periods of high stress, characterized by a total emotional surrender. Derived from an overabundance of the compound acetylcholine which is active in the transmission of nerve impulses.

Physiological, Diversion. A diversion which acts directly on a person by affecting one or more of the five senses.

Physiological, Impulse Noise. Noise which lasts less than one second.

Physiological, Lag Time. The physiological time lag which occurs between the time a stimulus is perceived until the body responds. In a healthy, well-rested human, this takes about three-quarters of a second.

Physiological, Rhodopsin. A purplish protein pigment, contained in the rods of the retina, that is transformed by the action of light and is necessary for vision in dim light.

Physiological, Sensory Overload. A temporary inability of an organism to correctly interpret and appropriately respond to life's stimuli because of the volume of input.

Physiological, Ulster Techniques. Psychophysiological techniques employed by the British in Northern Ireland based on sensory deprivation which can lead to long-lasting post-traumatic neurosis. Methods used included hooding, masking noise, wall standing, inadequate diet, sleep deprivation and some physical brutality [532].

E. Theoretical

Theoretical, Environmental Security. The recognition that the natural environment in which humans exist must be protected for their continued benefit. Because of the magnitude of many environmental problems, they require regional not national level solutions.

Theoretical, Fourth Epoch War. Strategic level theory of war utilizing an energy paradigm of Western civilization. The magnitude of change forecast is equivalent in scale to the Dark Ages, 378-732, and the European Renaissance, 1346-1648. During these transformations a new energy source is demonstrated on the battlefield, the dominant polity form "fails," the non-state soldier achieves dominance on the battlefield, crime and war blur, a new economy emerges, social classes shift, and advanced forms of battlespace and weaponry develop [633:23-25].

Theoretical, Fourth Generation Warfare. Operational level theory of warfare which views military change based upon advances in either technology or ideas. The emerging "idea based" fourth generation is thought to be based on terrorism and low intensity conflict [633:19-21].

Theoretical, MTR. A military technical revolution was declared by the Soviets to be taking place back in the 1980s. This revolution is based on emerging technologies, electronic and information systems and non-nuclear deep strike munitions, and will qualitatively alter the conduct of future war. The MTR is the conceptual forerunner to the revolution in military affairs (RMA) [640:2]. See also *Theoretical, RMA.*

Theoretical, New Gunpowder Revolution. The perception that the wide scale application of nonlethal technology on the battlefield will be as significant as the fielding of gunpowder based firearms during the European Renaissance [149:9].

Theoretical, Nonlethality. The theory that overwhelming nonlethal force could be used to defeat lethal force [418:24].

Theoretical, Post-Engine, Mechanical, Energy. For more advanced forms of nonlethal weaponry such as lasers and acoustics to properly function post-engine (mechanical) forms of energy will be required [149:7]. See also *Theoretical, Fourth Epoch War.*

Theoretical, RMA. Revolution in Military Affairs. Operational level theory which views military technical, doctrinal, and force structure changes now

taking place equivalent in magnitude to the 1920's and 1930's when armored warfare, strategic bombing, and amphibious and carrier operations developed. The RMA is generally accepted by the U.S. Armed Forces and Office of Net Assessment [640].

Theoretical, RPMA. Fourth Epoch War theory perception that a revolution in political and military affairs (RPMA) is taking place. Far larger than a revolution in military affairs (RMA), this historical transition will result in the eventual demise of the nation-state, the blurring of crime and war, and the rise of new competing polity forms [633]. See also *Theoretical, Fourth Epoch War.*

Theoretical, Sixth Generation Warfare. Soviet (Russian) view of future warfare based upon faulty historical modeling which does not differentiate between strategic and operational level change. The current military revolution is said to be equivalent in magnitude to the 1920s & 1930s or the 1950s & 1960s. Attributes of the new form of warfare developing will include the ascendancy of aerospace operations, the growing importance of electronic warfare and the computerization of armed combat [634]. See also *Theoretical, MTR.*

Theoretical, Third Wave War. Theory of future war modeled on "waves" of economic based civilizations. First wave civilizations are agricultural, second wave civilizations are industrial and emerging third wave civilizations are informational. Future warfare will be informational based with the Gulf War representing the first of these conflicts. Magnitude of current change now taking place viewed as equivalent to that of the Industrial Revolution [633:21-23].

Theoretical, Twenty-First Century Politico-Military Force Matrix. Nonlethal technology, when coupled with traditional forms of lethal weaponry, allow for the application of short-term incapacitation, long-term incapacitation, and deadly force against the physical and mental/perceptual attributes of human targets and the hardware and software attributes of machine targets. This advanced form of politico-military force application can be expressed in a matrix [149:4].

Theoretical, War, Clausewitzian. A struggle between nation-states or their coalitions over the preservation and extension of national sovereignty.

Theoretical, War, Post-Clausewitzian. A struggle between competing forms of social and political organization over which the eventual successor to the nation-state will be built [633:27].

Theoretical, Weapons of Mass Protection. Nonlethal, antilethal, and information warfare weapons [418:16].

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