

Non-Lethal Technologies: Progress and Prospects

Council on Foreign Relations
October 27, 1999

FOREWORD

Since the end of the Cold War, the United States has faced an important strategic question as to whether and how to intervene in civil and ethnic conflicts. Our entire approach to these conflicts-how we think about them and what actions we take-is enormously affected by our capabilities to quell them by diplomatic, economic, and military means. To date, the United States has been trapped between classic diplomatic table-thumping and indiscriminate economic sanctions on the one hand, and major military intervention on the other hand. But there may be a new and effective middle option in the future, one that could lend weight to U.S. crisis diplomacy and offer new capabilities for pressuring adversaries or fighting wars with minimal loss of life. This potential new option could come in the form of nonlethal warfare and weaponry.

Nonlethal weapons (NLW) are designed to disable enemy forces or incapacitate combatants and others without killing them or causing permanent harm. Familiar examples are rubber bullets, tear gas, and communications jamming. But capabilities that are far more fantastic fall within the nonlethal weapons arsenal. Rapid-hardening foam can deny access to buildings and block combustion of machine engines. Anti-traction chemicals and objects can make roads and bridges impassable. Microwave technology can disable electronic equipment, and cruise missiles armed with carbon-fiber payloads can short out electrical grids.

To explore this potential and its impact on policy, the Council sponsored an Independent Task Force on Nonlethal Technologies in 1995, headed by Malcolm H. Wiener. (The 1995 Task Force Report has been reproduced in the Appendix.) That report recommended prompt action by the U.S. government to explore NLW options and policy. Four years later, little movement has been evident, which prompted the Council to convene a second Independent Task Force. Under the chairmanship of Council Senior Fellow Richard L. Garwin, this distinguished new group of civilian officials, diplomats, and military officers has assessed the current status of nonlethal weapons development and policy.

The Task Force found that while the military services and parts of the Pentagon have been examining nonlethal possibilities for years, weapons development and thinking about usage has been very slow. Nonlethal warfare has received low priority in the Department of Defense (DoD), as evidenced by insufficient research and development funding, inadequate attention to the implications for military doctrine, barriers to information transfer among the military services and between the DoD and the relevant civilian agencies, and DoD resistance to complying with legislative direction. Bureaucratic inertia and the lack of civilian leadership, despite some efforts from the

National Security Council staff, have compounded the problem, according to the Task Force Report.

The Task Force recommends that the Clinton administration take three urgent steps: first, set clear guidelines for working through the pros and cons of when and how these weapons might be employed; second, provide substantial new funds for research and development so that the military services will take these tasks seriously; and third, ensure better leadership and coordination of this process within and among the military services. Until the administration pushes ahead on these fronts, and the DoD engages in a much more serious and systematic evaluation process, the Task Force judges that policymakers will be in no position to determine how useful nonlethal weapons might be and to set policy accordingly.

Nonlethal weapons might turn out to be largely fantasyland concoctions, or they might be an important new tool for dealing with conflicts in the post-Cold War world. While the Task Force recognizes that nonlethal weapons will never be a panacea, and that any new capability presents problems as well as opportunities, the Task Force concludes that it is very important to determine whether these weapons represent a viable new and useful option for U.S. national security.

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ACKNOWLEDGMENTS

The Task Force Chairman and Project Director acknowledge with gratitude the many contributions of the participants in the work of the Independent Task Force. The detailed critical comments on various drafts of the report were particularly helpful. We are also grateful for the cooperation of the leaders of the Joint Nonlethal Weapons Directorate. Special thanks go to Council Research Associate Greg Loyd for his help in Task Force administration and preparation of the report.

EXECUTIVE SUMMARY

Introduction

The 1999 Independent Task Force on Nonlethal Weapons (NLW) was sponsored by the Council on Foreign Relations to assess the current status of nonlethal weapons development and availability within the Department of Defense (DoD), in light of their potential to support U.S. military operations and foreign policy.

The Task Force found that the DoD has made only limited progress developing and deploying nonlethal weapons since 1995, when a previous Council Task Force studied the issue. This shortfall results from a continued lack of appreciation for NLW among civilian and military policymakers. It will take stronger leadership to overcome the traditional reluctance of individual military services to share information with each other and create a truly joint program in nonlethal weapons and technology. Until this happens, the administration will continue to lose key diplomatic and military opportunities.

In situations in which the decision has not yet been made to use lethal force, nonlethal weapons could give policymakers a more potent weapon than economic sanctions, which

tend to be both indiscriminate and ineffective. Used alone, NLW could penalize civilian economies without high civilian casualties. NLW could also add weight and credibility when used in conjunction with economic sanctions, thus strengthening America's diplomatic hand.

A new emphasis on nonlethal weapons would reinforce current American information warfare and psychological warfare capabilities. It would also enhance the tactical ability of U.S. forces to control crowds and focus firepower on troops or paramilitary, rather than on noncombatant civilians.

Senior civilian and military leaders should make NLW development a priority. Once developed, these weapons must be deployed coherently, in synergistic coordination with information/psychological warfare technologies and conventional weaponry. Finally, various NLW programs dispersed throughout the individual services should be coordinated by the existing Joint Nonlethal Weapons Directorate (JNLWD).

NLW and the Kosovo Crisis

Recent Balkan history illustrates the pressing need for a new range of nonlethal weapons. Despite weeks of bombing in the spring of 1999, NATO failed to prevent the expulsion of nearly one million Kosovar Albanians. The Task Force does not suggest that nonlethal weapons by themselves could have prevented this tragedy. But consider how nonlethal capabilities could have been used in the early stages of the conflict, as Serbian troops and paramilitary forces began the grisly work of ethnically cleansing Kosovo:

- NATO could have jammed Serbian TV broadcasts, replacing them with respected independent news sources such as the BBC. In this way, the Serbian public would have been informed about atrocities against Kosovar Albanians. NATO could also have used this channel to air statements designed to mitigate Serbian feelings of victimhood.
- At the same time, NATO could have used nonexplosive means to turn off the electricity in Belgrade and keep it off, with occasional respites to allow reception of NATO television.
- NATO could also have issued unobtrusive film or video cameras to Kosovars and NATO agents for recording war crimes in Kosovo, along with appropriate means for transmission out of Kosovo. The images could have been used in the information campaign and in war-crime prosecutions.
- Electromagnetic pulse and radio frequency weapons could have disabled Serbian air-defense and other military electronic systems.
- Serbian military headquarters and other sensitive buildings might have been rendered temporarily unusable by the precise delivery of revolting smells.
- Instead of bombing key bridges, thereby blocking commercial shipping on the Danube, NATO could have blocked military traffic over the bridges via repeated, precision deliveries of "stick'em" and "slick'em."
- Meanwhile, NATO blockade efforts could have been enhanced by using super-strong cords to entangle ship propellers.

- In the event that ground troops had been introduced or major destructive measures taken in consonance with a largely nonlethal campaign, NATO could have launched an extensive campaign of deception, propaganda, and communications warfare.

Combined with precision delivery of explosives such as laser-guided bombs, or Global Positioning System-guided bombs and cruise missiles (which have done a remarkable job in destroying identified targets with minimal civilian casualties), nonlethal weapons could have allowed earlier and potentially more effective intervention.

During the Kosovo conflict there was graphic television coverage of the few civilians killed by NATO bombs. But there were virtually no television images of Serb atrocities against Kosovar Albanians. This contrast helped rally Serbs to support Slobodan Milosevic, and it threatened the cohesion of the NATO alliance. With heavy emphasis on nonlethal weapons and well-executed communications warfare, NATO might have avoided this propaganda debacle.

What Are Nonlethal Weapons?

The Department of Defense defines nonlethal weapons as "discriminate weapons that are explicitly designed and employed to incapacitate personnel or material, while minimizing fatalities and undesired damage to property and the environment."

Nonlethal technologies also include communication, information, and psychological warfare. Communication warfare can involve jamming, interrupting, or destroying enemy communications, and transmitting desired radio and television programs. Information warfare generally refers to destroying or interfering with computer systems, including financial and credit facilities. Psychological warfare is the use of propaganda and other psychological actions to influence the opinions, emotions, and behavior of hostile populations in support of national objectives.

Examples of NLW include:

- Blunt projectiles designed to incapacitate individuals temporarily. The JNLWD is currently developing a command-detonated Claymore mine that projects hundreds of blunt-impact rubber balls.
- Traction modifiers to impede vehicle or foot traffic. In addition, four-pronged spikes (caltrops) can be used to puncture tires.
- Nets or rapid-hardening rigid foam for denying entry to buildings or preventing use of machines.
- Radio frequency or microwave technologies to stop vehicles or disable electronics.
- Highly obnoxious smells capable of inducing immediate flight.
- Acoustic and directed-energy technology designed to interfere with local communications, to disorient, to set up buffer zones, to deny access, or to repel mobs.

These weapons can be used to support peacekeeping, peace enforcement, and combat at the tactical level. Nonlethal weapons can also be deployed at the theater or strategic level. In general, strategic NLW would target the enemy's political leadership or military capability as a whole, far beyond the tactical area of operations. The term also covers the long-range delivery of NLW to the region of confrontation or combat.

Examples of the strategic use of NLW include large radio-frequency or microwave generators on aircraft or powered by explosives, which might disable military communications over a large area; and the use of carbon fiber delivered by missile or aircraft to disable aboveground electrical transmission and distribution systems.

It is not the primary purpose of nonlethal weapons to prevent death or major injury to opposing troops. Instead, they are intended to increase the lethality of force used against combatants, while reducing death and injury among noncombatant civilians. For example, NLW can prevent a crowd from approaching closely enough to be a serious threat to U.S. forces. They can also unmask snipers or other combatants in a crowd of civilians, opening a field for U.S. lethal fire. In short, NLW are important because they permit military engagement at a lower level of violence. And in political terms, less violence equals more acceptability.

The Task Force does not suggest that nonlethal weapons guarantee bloodless battles. Nor do NLW preclude the use of lethal force. To avoid conflicting and false expectations, it is essential that military commanders, policymakers, and the American public understand the real capabilities and limitations of nonlethal technologies in the hands of real troops. To this end, responsible officials in the Nonlethal Weapons Directorate, in the services, and in the Department of Defense should pay much greater attention to integrating nonlethal technologies with lethal technologies. This must be worked out in emerging doctrine, in exercises, and in combat plans.

NLW since 1997

Responding to direction in the National Defense Authorization Act for fiscal year 1997, the DoD designated the commandant of the Marine Corps as executive agent "for joint service research, development, test, and evaluation of nonlethal weapons and nonlethal technologies."

The executive agent was placed in charge of the new Joint Nonlethal Weapons Directorate, his action office for day-to-day activities. Since 1997, DoD and the services have interpreted the congressional mandate to require that the JNLWD handle only joint-service nonlethal weapon programs. They have excluded from its responsibility nonlethal weapon programs within a single service, along with joint-service nonlethal technologies programs other than weapons.

This rather tortured interpretation of congressional direction has contributed directly to the current fragmentation of capabilities and to the inability of the executive agent and the entire government to assess, balance, and advocate the full range of effective nonlethal technologies.

The JNLWD has a staff of 15 and a budget that is currently set at about \$25 million per year for the next 5 years. In its first two years of activity, the directorate made progress in developing close-range nonlethal weapons to support U.S. military forces in situations ranging from peacekeeping to open conflict. Procurement of these tactical nonlethal

weapons is just beginning, averaging about \$5 million per year each for the Army and for the Marine Corps.

So far, the directorate has had no authority or responsibility for large-scale (operational or strategic) applications of nonlethal weaponry. And until January 1999, the directorate essentially had no access to joint programs in information warfare or psychological warfare. Nor did its brief extend to Air Force and Navy programs in nonlethal weapons.

To reduce barriers between the Joint Nonlethal Weapons Directorate and what are said to be "large programs" in psychological warfare, information warfare, and nonlethal weapons with strategic potential, a so-called insight program was established. As a result, a few individuals in the directorate now have an overview of these programs. This initiative by no means places the "large programs" under the directorate's control. But if implemented at a substantially increased level of funding and staff, the insight program should foster better information sharing. Improved mutual understanding, in turn, would enhance NLW development and coordination.

Existing legislation clearly extends the role of the directorate to all DoD and service programs in nonlethal weapons and nonlethal technologies: "that all nonlethal weapons technology research and development be consolidated into a single program element, with management and oversight of the program conducted by the Marine Corps, as Executive Agent." In a Memorandum of Agreement (MOA) adopted June 23, 1999, the services agreed to "coordinate and integrate the development of all nonlethal weapon programs and activities through the DoD nonlethal weapons Executive Agent." While this seems to be progress, the new MOA codifies restrictions-e.g., "insight, not financial oversight"-and limits access-e.g., "monitor status of service-unique programs through annual status briefings from the responsible service." This is neither responsive to congressional direction nor adequate to the task.

Recommendations

The Task Force concludes that there is a high probability of major benefit from a large, urgent investment in nonlethal weapons and technologies, carried out under the commandant of the Marine Corps as the executive agent of the Department of Defense.

The executive agent should also coordinate additional NLW programs within the services. To jump-start the development and acquisition of nonlethal weapons and technologies, the Clinton administration must provide forceful and continuing leadership to ensure that these capabilities are understood and fully exploited. Three key actions are urgently needed:

1. The Office of the Secretary of Defense, together with the armed services, must ensure that the Joint Nonlethal Weapons Directorate becomes the single focal point for all NLW activity. While the directorate has existed since 1997, it has not been permitted to live up to its mandate.
2. The Department of Defense must seek and the Congress must provide substantial additional funds for research and development. The armed services and the technologists should not sacrifice specific existing procurement or development programs to fund what promises to be a highly effective investment in nonlethal weapons and technologies.

3. The development and procurement community and the regional military force commanders in chief (CINCs) must consult with one another via the Joint Nonlethal Weapons Directorate to determine how future nonlethal technologies will be employed.

Without consultation, development will be seen as creating tools for which there are no customers. But without research and development, there will be no tools to deploy.

These actions should be taken by the Secretary of Defense. Alternatively, they could be initiated jointly by the members of the National Security Council (NSC): the president, the vice president, the secretaries of defense and state, and appropriate others. In either case, they should be authorized by a Presidential Decision Directive or its equivalent, with a mechanism for monitoring its implementation.

A representative of the executive agent should be posted to the Office of the Deputy Secretary of Defense for one year, to ensure that current NLW programs in the DoD and military services are either merged with the existing joint nonlethal weapons program within six months or properly coordinated according to the executive agent's best judgment.

DoD should pay more attention to synergies between nonlethal weapons and information/psychological warfare, along with counterterrorism applications. Where these are not the direct responsibility of the Joint Nonlethal Weapons Directorate and the executive agent for nonlethal technologies, special measures should be taken within the Department of Defense to ensure close coordination of these programs. Management and technical staff from the directorate need full access in order to begin coordination and collaboration. This means full access-not annual, or even quarterly, briefings.

The NSC should ensure that the Department of Defense responds fully and promptly to legislative requirements. Each month, the executive agent should brief the NSC, the president, the vice president, the secretaries of state and defense, and their deputies on the goals and status of the nonlethal weapons and technology program.

The NSC should further ensure that the interagency process (which includes the Departments of State, Justice, and Defense) supports the development and fielding of nonlethal weapons, and that planning for effective action goes forward. In appropriate situations, finally, NATO allies should understand these capabilities and should contribute to their acquisition.

The Task Force emphasizes the urgency and likely benefits to U.S. foreign policy goals of making the commitment and investments required for rapid acquisition and employment of nonlethal weapons and technologies.

REPORT

INTRODUCTION

The end of the Cold War has brought no end to conflicts involving the United States, although it has fundamentally changed the nature of those conflicts. On the one hand, U.S. forces have acquired highly accurate and discriminating cruise missiles and guided

bombs that have greatly improved their ability to selectively destroy buildings and installations that can be located, and these weapons are improving apace. First launched from combat aircraft over Kosovo in March 1999, multiple bombs, independently guided to their targets by enhanced Global Positioning System (GPS) signals, provided increased capability for precision engagement. Primarily nonlethal weapons turned off power in Kosovo and Serbia at a critical moment in this conflict. Nonlethal payloads and suitable delivery systems offer the promise of additional means of destroying or denying use of enemy war-making material, with few noncombatant casualties and little damage to civil infrastructure.

In contrast to the great strides realized in precision strikes, U.S. ground forces involved in peacekeeping operations and as monitors have remained directly at risk from forces adverse to their mission in Somalia, Haiti, and Bosnia, and perhaps soon again in Kosovo. In support of such operations, nonlethal weapons (NLW) offer the possibility to provide a more effective response than exclusive use of traditional weaponry. This applies over the entire range of needs, from relatively passive crowd control to responding to riots and attacks on U.S. personnel, and to deterring or countering terrorist attacks on U.S. territory. In addition, nonlethal weaponry may provide the local commander the option of acting sooner or more effectively than would be the case if lethal force alone were the only option. Importantly, nonlethal weapons and lethal force can be combined to create a powerful synergy to further enhance U.S. troops' ability to safely complete their mission. As an example of this synergy between nonlethal weapons and lethal force, nonlethal weapons can disperse crowds used as shields or to mask snipers or paramilitary, thus deterring some threats while allowing more effective force protection against those that are not deterred.

Nonlethal technologies can also be useful in enhancing U.S. capability to defeat and destroy the enemy in conventional warfare; for this purpose they would be used because of their contribution to mission accomplishment and not because of their lack of lethality. Even so, the ability to minimize collateral damage and civilian noncombatant casualties is highly desirable.

Today we face new challenges to our security and our humanity. To many of these, neither conventional economic sanctions on the one hand nor a Gulf War-type response on the other provides an appropriate answer. The recent examples of Bosnia, Somalia, Haiti, and Rwanda, as well as the threat of state-supported terrorism, show the need for new options and credible deterrents. Scientific and technical advances in non-lethal technologies, which cover an array of capabilities from crowd and point control to the disabling of a society's communications, mobility, and power, address this need.

Thus began the report of the 1995 Independent Task Force sponsored by the Council on Foreign Relations, *Non-Lethal Technologies: Military Options and Implications*. In view of the urgency of developing and deploying capabilities to achieve these goals, the Council has again sponsored an Independent Task Force on Nonlethal Weapons to update the 1995 report.

The present Task Force began with a review of:

- The report of the 1995 Independent Task Force on Nonlethal Weapons;

- Progress and problems in the U.S. government in developing and integrating nonlethal weapons into the military forces; and
- Relevant studies and analyses of the role of nonlethal weaponry in U.S. diplomacy and in U.S. military and coalition operations ranging from peacekeeping to large-scale theater combat.

The Task Force had the cooperation and participation of the Joint Nonlethal Weapons Directorate (JNLWD) of the Department of Defense. It benefited also from a Nonlethal Weapons Policy Study requested by the National Security Council and sponsored by the Department of Defense, which produced a final briefing on January 28, 1999; the mandate of that study was to examine the need for a national policy on nonlethal weapons.

Based on these primary inputs, this Chairman's Report represents the collective judgment of the Task Force on the status and prospects of the field of nonlethal technologies in support of U.S. military and foreign policy goals.

Nonlethal technologies include, but are not limited to:

- Blunt projectiles designed to strike individuals-with the goal of temporary incapacitation or distraction, rather than lethality;
- Traction modifiers to impede vehicle or foot traffic;
- Movement-inhibiting foams and nets;
- Acoustic and directed-energy technology to interfere with communications, to disorient, or to set up buffer zones to deny access or to repel mobs;
- Highly obnoxious smells capable of inducing immediate flight;
- Radio frequency (RF) or microwave technologies to stop vehicles, deny electrical power, or disable electronics; and
- Means for stopping vehicles and vessels mechanically or by disabling their engines.

Despite the current dichotomy in the Department of Defense that has largely isolated "pure" nonlethal weapons from psychological, communications, and information warfare, it is evident that there is military benefit in nonlethal technologies that permit disabling or controlling the computers of the other side-whether to stop a truck or a ship, or to reset warning criteria or recognition levels.

Communication Warfare, such as the jamming or destruction of communications, and the transmission of television and radio programs of one's choice (potentially useful for reducing inflammatory or genocidal messages, or for isolating murderous rulers from armed forces and populace) and Information Warfare (such as the destruction of or interference with computer systems, including financial and credit facilities) are important nonlethal activities related to nonlethal weapons, but not categorized as such by the Department of Defense.

There is a strong potential synergy and support from Psychological Warfare (psychological "operations" in current parlance) that would enhance the effectiveness of each of these measures.

Operations involving nonlethal weapons must draw on conventional logistics and on novel capabilities, such as unmanned vehicles capable of video and real-time radar surveillance, and accurate delivery of supplies (e.g., communications equipment, forged currency) to allies or agents.

The Task Force reviewed the potential applicability of nonlethal weapons to recent conflicts:

- In Somalia, the use of foamed barriers and flight-inducing smells and sounds might have offered significant alternatives and assistance in achieving political goals, by substituting for or augmenting deadly fire from helicopter gunships.
- In Rwanda, a U.N. or ad hoc coalition could have authorized communications interdiction and augmentation. This might have nullified radio broadcasts urging genocide. Moreover, the ability to deny access to buildings and bases could have made intervention effective, thus permitting a reasoned decision to intervene.
- In Bosnia, the capability to interdict movement on roads as well as communication warfare aimed at isolating the leadership from the people could have permitted an early intervention, thus reducing hostilities. In Macedonia, malodorous and dyed foam could have helped to identify those who did violence to the U.S. embassy; nonlethal personnel-capturing nets could have impeded access.
- In Kosovo, persistent riot-control agents could have inhibited paramilitary and partisan forces' access to the towns they had purged of their inhabitants. Also, earlier and better information to the Serbian public would have done much to legitimize the NATO operations in Kosovo and Serbia, avoiding some of the adverse reaction there and in Russia. This could have been achieved by substituting NATO factual information for and denying Serbian government access to TV broadcasts. Rapid-hardening foam could have impeded access to weapons and communications centers. Such measures would not replace intervention with lethal means, but would increase the effectiveness of such intervention.
- In support of the Kosovo Force (KFOR), blunt projectiles, personnel dye markers, movement-inhibiting foams and nets, and other tactical nonlethal weapons have much to offer in suppressing violence against Serbs and in aiding in the demilitarization of the Kosovo Liberation Army (KLA).

The Task Force considered the requirements of coalition warfare. Despite the common tendency to retain sole use of the most modern weaponry, if the United States were involved in coalition warfare, U.S. allies should have access to selected nonlethal weapons for offensive and defensive purposes. The United States should make available selected weapons, training, and doctrine to its traditional allies and to those involved with it in coalitions. The United States should be open to ideas and to preliminary NLW

development from its allies, and it should consider joint production where appropriate. Weapons whose effectiveness depends on secrecy would not be suitable for sharing broadly within a coalition.

The Task Force reviewed potential strategic applications of nonlethal capabilities. In addition to the application at the tactical level of direct engagement, nonlethal weapons can provide an important contribution at the theater or operational level, and potentially at the strategic level.[1] Indeed, long-range delivery of nonlethal weapons of tactical influence may constitute an important element of nonlethal capability, such as a ship-launched cruise missile of a few hundred kilometers' range that could be delivered with an accuracy of meters to provide tons of traction modifiers, combustion inhibitors, and the like. Large-scale application of tactical-level nonlethal weapons could also have an operational influence on the outcome of the conflict in the entire theater of operations. If masses of vehicles in large-scale operations can be reliably immobilized, it may be to the political and military advantage of the United States to allow the enemy troops to abandon the equipment, which could then be destroyed. Railroads are an appropriate strategic target for nonlethal weapons.

While the above exemplifies the potential of a tactical nonlethal weapon at the strategic level, a strategic nonlethal weapon may similarly provide an important contribution at the tactical level. An example is a cruise missile dispensing carbon fibers that can short out a substantial segment of a nation's electrical power grid—a crushing blow unless that nation's combat military forces have the equipment, doctrine, and experience in backup power generation.

In the strategic realm, information warfare, or high-powered RF, or other nonlethal capabilities that might be used to destroy computers in a specified area, could act on the enemy's central authority without immediate impact on the conflict itself. Such weapons offer important potential for strategic application. Whether a tool is tactical or strategic in origin, however, is less important than whether it is useful, as evidenced by the B-2 strategic aircraft delivering multiple GPS-guided bombs. Short-range cruise missiles launched from ships against U.S. cities would be an example of strategic use of a tactical weapon.

CURRENT POLICY

In 1996, the Department of Defense directed the commandant of the Marine Corps to serve as the executive agent for the department's nonlethal weapons program. This occurred in response to a mandate in the National Defense Authorization Act for fiscal year (FY) 1997 directing the secretary of defense to designate an executive agent "for joint service research, development, test, and evaluation of nonlethal weapons and nonlethal technologies." As a result, the Joint Nonlethal Weapons Directorate was created in 1997 to serve as the action office for the executive agent's day-to-day activities. This program has a staff of 15 and a budget that in the Future-Years Defense Programs is scheduled at about \$25 million per year.

Pursuant to a 1997 Joint Services Memorandum of Agreement, the directorate has focused on so-called tactical-level, not strategic, nonlethal weapons. This focus has led to

a good start at training and doctrine, and has established substantial programs for development, test, and evaluation of nonlethal weapons.

Nevertheless, despite good progress on militarizing nonlethal weapons, the Task Force believes that U.S. military capability has suffered because during most of its brief existence, the directorate has had little or no access to extensive programs in radio frequency, high-power microwave, and other directed-energy technologies that exist in the military services. Nor is there evidence that the directorate has yet been able to evaluate and enhance the potential synergy between nonlethal weapons and information warfare or psychological warfare. Because the Task Force was not granted access to such related DoD programs, it is unable to determine the totality of information available to the directorate in these technology areas, although access has reportedly improved since January 1999.

Since early 1999, there has been a substantial evolution in the implementation of policy toward nonlethal weapons. Most notably, in a successor Memorandum of Agreement, signed June 23, 1999, the services "agree[d] to coordinate and integrate the development of all non-lethal weapon programs and activities through the DoD NLW Executive Agent. . . ." This appears to move the services toward the legislative direction in the Defense Authorization Conference Report for the FY 1999 National Defense Authorization Act, in which the conferees remain concerned that the Department of Defense and the military services continue to conduct research and development on NLW activities that benefit all services, outside the purview of the established NLW program, and without oversight by the executive agent, the Marine Corps. The conferees endorse the position expressed in the Senate report (S. Rept. 105-189) that "all" non-lethal weapons technology research and development be consolidated into a single program element, with management and oversight of the program conducted by the Marine Corps, as Executive Agent.

To further reduce barriers between the Joint Nonlethal Weapons Directorate and what are said to be "large programs" in nonlethal weapons with strategic potential, and in information and psychological warfare, an "insight" program is being established that will provide a few individuals in the directorate with information on these programs.[2] This initiative by no means places the "large programs" under the directorate's control, but rather enables information sharing and a greater mutual understanding that should lead to improved nonlethal weapons development and coordination.

It is the responsibility of the Department of Defense to explore and develop a range of weapons and tools to address the problems that the military forces may encounter, and military operations other than war are an increasing part of this responsibility. But the department has not yet effectively ensured that the executive agent for nonlethal weapons and its Joint Nonlethal Weapons Directorate have adequate access or influence even to prescribe, let alone to ensure a "fully integrated and coordinated NLW program . . ." as is its stated goal. Specifically, the 1997 Services Memorandum of Agreement has impeded the directorate's involvement in strategic-level nonlethal weapons and information warfare. Although it does not carry the weight of a DoD policy directive, the June 1999 memorandum in principle removes this impediment. Only if it is fully implemented, however, will it be the beginning of a move toward a fully integrated program,

overcoming classification barriers and using service competition constructively to provide a capability that is understood by those who would need to use it.

There is a troubling phrase in the 1999 Joint Services Memo: "to include, as appropriate, classified NLW programs within the DoD that meet the intent of Congress. . . ." The memo also proposes that "For service-unique systems across the spectrum of conflict [i.e., not just for strategic applications], the Directorate will maintain insight, not financial oversight. . . ." And according to the memo, the directorate will "monitor status of service-unique programs through annual status briefings from the responsible service." The Task Force judges that annual insight is insufficient and that access should be more frequent, full, and less formal. If a frequency must be specified, it should be monthly.

The congressional directive and the DoD's acceptance thereof constitute de facto defense policy on nonlethal weapons. Full implementation of this policy would be aided by a six-month assessment and integration effort performed by a dedicated representative of the Marine Corps commandant (who is DoD executive agent for nonlethal weapons), posted for a year to the Office of the Deputy Secretary of Defense, with full access to programs for tactical and operational NLW, strategic-level NLW, information warfare, and psychological warfare. This position would be under neither the domain of the under secretary for acquisition and technology, which controls much of information operations and the Joint Nonlethal Weapons Directorate, nor that of the under secretary for policy, which controls the Office of Special Operations/Low-Intensity Conflict (SO/LIC). Among the questions to be addressed is whether an officer of rank higher than colonel should lead the Joint Nonlethal Weapons Directorate.

A National Declaratory Policy Regarding Nonlethal Weaponry?

To date, the president and the National Security Council have not issued a policy on nonlethal weaponry. Some look to such a national policy statement as a means of speeding the development of effective nonlethal technologies and their incorporation into U.S. military forces, thus raising the level of awareness of nonlethal weapons at the diplomatic and national security leadership level in the United States and abroad.

On balance, the Task Force judges that a national policy statement at this point would be premature. A national policy might well be necessary if the goal were, for example, an immediate tenfold expansion of the nonlethal weapons program, but the data that would justify such an expansion do not yet exist. After strategic-level nonlethal technologies and those at the tactical and operational levels are integrated into the U.S. military, the question of a national policy statement should be reconsidered. Nevertheless, the Task Force judges that policy interest and support for nonlethal weapons by the principals of the National Security Council is essential, in view of the potential contribution of such means to the national security. Nevertheless, it is the Office of the Secretary of Defense that can and must take the required actions.

A national policy statement might be appropriate after major nonlethal technologies have been acquired and practiced, and doctrine for their use established. Under these circumstances, a national policy statement might serve further to deter aggression by hostile forces, to inform friendly powers and publics of the capability and role of nonlethal weapons, and to inform and guide the high levels of the government through this statement itself and the interagency process leading up to it.

A statement of national policy now might be unduly constraining, might lock the United States into approaches that will become obsolete, and, if taken in the absence of good data from analysis and exercises involving nonlethal weapons, might increase, rather than reduce, the likelihood of aggression.

PRINCIPAL FINDINGS

1. The Independent Task Force fully endorses the findings of its 1995 predecessor: that "non-lethal weapons have the potential for providing new strength for diplomacy, new credibility for deterrence, new flexibility for the military, new strategic options for policymakers." It is still true that there is a lack of focus in the Defense Department for nonlethal weapons, and that "senior officials in the State Department and NSC display little knowledge of non-lethal options."
2. The DoD and the services have not yet made the investment required to realize the benefits that nonlethal weapons offer. Funding for nonlethal weapons acquisition has been disappointingly low. Procurements by the Army and Marine Corps are just beginning, and the Navy and Air Force have no procurement scheduled for any product of the joint directorate.
3. The DoD joint nonlethal weapons program has made a good start on making these capabilities available to U.S. forces at the tactical level, and in ensuring that training, doctrine, and exercises are conducted to increase awareness and demonstrate the viability of such weapons. This constitutes progress toward providing NLW as a real military option.
4. Nonlethal weapons will be able to make a major contribution to the capability of U.S. military forces across the entire spectrum of conflict, including protection of observers, prevention of terrorism at home and abroad, peacekeeping and peace enforcement, and large-scale military operations. To realize the full potential of nonlethal weapons will require attention to operational-level use of some of the tactical capabilities and to nonlethal weapons with strategic potential (as exemplified by carbon-fiber payloads).
5. Department of Defense policy for nonlethal weapons is inadequate in practice. The substantial barriers that exist between the Joint Nonlethal Weapons Directorate, with its focus on research and development for tactical applications, and the apparently larger Air Force and Navy classified programs constitute an impediment to the desired single, optimum nonlethal weapons program that is required to exploit the full potential of these weapons and that is mandated by Congress.
6. If the DoD NLW effort is to realize its potential in greater and more usable military capability, U.S. military leaders-including the regional CINCs-must have a sound assessment of the utility of NLW as they become available to their forces. Leaders must understand that nonlethal weapons significantly reduce the risk to their forces-for instance, by decreasing casualties, by reducing the number of confrontations or minimizing their lethality or destructiveness, or by mitigating adverse public reaction. At the diplomatic level, the benefits of NLW will be

attained only if U.S. diplomats and negotiators are familiar with the capability of NLW and the situations in which they can be employed.

PRINCIPAL RECOMMENDATIONS

Nonlethal weapons policy exists in legislation, accepted by the Department of Defense, requiring "that all non-lethal weapons technology research and development be consolidated into a single program element, with management and oversight of the program conducted by the Marine Corps, as Executive Agent."

1. The Task Force recommends that the National Security Council ensure that this direction is implemented following the letter of the law.

The National Security Council should further ensure:

- That it is briefed each month by the executive agent on the goals and status of the nonlethal weapons and nonlethal technologies program;
 - That the interagency process (which includes the Departments of State, Justice, Defense, and Intelligence) supports the development of nonlethal weapons, and that the planning for effective action goes forward, including the use of nonlethal technologies;
 - That the president, vice president, secretaries of defense and state, and their deputies are regularly briefed; and
 - That allies, where appropriate, have knowledge of these capabilities and contribute to their acquisition.
2. It is likely that the executive agent will continue to have the Air Force and Navy manage large programs in this field, as is the case at present, but these must be coordinated with the Joint Nonlethal Weapons Directorate. To establish this consolidation, a six-month assessment and integration effort should be undertaken by a dedicated representative of the executive agent, posted for a year to the Office of the Deputy Secretary of Defense, with full access to programs for tactical and operational NLW, strategic-level NLW, information warfare, and psychological warfare.
3. Tactical NLW should continue to be identified, developed, and fielded by the Joint Nonlethal Weapons Directorate. In addition, the Directorate should be responsible for payloads for strategic-range delivery of nonlethal weapons and should also be thoroughly apprised of related capabilities with strategic potential, such as information warfare.
4. More attention needs to be paid to synergy between nonlethal weapons and information warfare and psychological warfare, as well as to the application to counterterrorism. Where these are not the direct responsibility of the Joint Nonlethal Weapons Directorate and the executive agent for nonlethal technologies, special measures should be taken within the Department of Defense to ensure the close coordination of these programs. Full access to such programs by management and technical staff from the directorate is necessary to begin coordination and collaboration. This means full access-not annual, or even

quarterly, brief-ings. The Department of Defense should allocate appropriate resources to the U.S. Marine Corps, as executive agent for nonlethal weapons, for a program of exploration, development, experimentation, demonstration, and training to provide meaningful integration of information warfare, psychological warfare, and strategic nonlethal weapons, at a level expanded to some \$100 million per year. Funds for such an expansion from the present focus on tactical point and crowd control should be provided by the Congress.

5. Serious attention should be paid to intra-alliance benefits of nonlethal weaponry at the tactical, operational, and strategic levels. This includes not only traditional NATO allies, but also a plan for cooperation with other less-permanent members of a future coalition.

SUBSIDIARY RECOMMENDATIONS

1. A zero-fatality expectation should not be established for nonlethal weapons. It is essential that military commanders at every level, policymakers, and the American public understand the real capabilities, and limitations, of nonlethal technologies in the hands of real troops, so as to avoid conflicting and false expectations.

2. Measures should be developed to protect U.S. and allied forces against possible "friendly fire" situations involving nonlethal weapons. Potential NLW countermeasures should be investigated as the nonlethal weapons themselves are developed.

3. On occasion, U.S. security might be improved by a modification to a treaty such as the Chemical Weapons Convention or the Biological Weapons Convention. In that case, the DoD should propose such a step to the National Security Council and the interagency mechanism involved, to ensure due evaluation of the overall benefits, costs, and the feasibility of the proposed change.

4. After-action reports (and field trips from the JNLWD team) are essential if NLW are to be improved by selection and modification. Such reports often pose a problem of second-guessing local commanders, but they are necessary.

5. Precision-guided lethal weapons, such as laser-guided bombs and GPS-guided cruise missiles and bombs, should be modified to self-destruct in the air if guidance is lost, so that they will not strike a mistaken target.

6. The creation of a scientific advisory panel would benefit the JNLWD. Its responsibilities would differ from those of contractors in that it would not be given specific tasks, but would contribute analyses, which could impact, positively or negatively, the technologies under consideration. The feasibility and utility of acoustic technologies is one topic that would benefit from such a panel. Another function could be to consider the requirements and benefits of a capability that is already clearly achievable-e.g., vehicle-stopping barriers-while looking specifically at ways to make it cheaper or better. Innovation and product refinement come rapidly in the competitive consumer product field; but in the

military field, with years between engagements, multiple cycles of analysis and exercises must occur outside of combat situations. Interservice competition can be an important engine of change, and it is helpful if the equivalent of a market operates to select among competing programs.

7. While inspiration is always to be prized, modeling, experimentation, and exercise are required to guide both the acquisition of nonlethal weapon capability and the development of doctrine. Specifically, deeper analysis is required of the utility on a strategic scale of nonlethal technologies that have been developed for use in tactical confrontations. A start could be provided by a summer study of the Defense Science Board, focused on this area.

SUPPORTING MATERIAL

BACKGROUND

The 1995 Independent Task Force, sponsored by the Council on Foreign Relations and chaired by Malcolm H. Wiener, concluded that nonlethal weapons possess the potential to provide new strength for diplomacy, give credibility for deterrence, and allow greater flexibility for the military, as well as create new strategic options for policymakers. It judged that nonlethal weapons cannot be regarded as a panacea and that they require careful management. The report noted a lack of focus in the Department of Defense for nonlethal weapons, and that "senior officials in the State Department and NSC display little knowledge of non-lethal options."

In January 1997, the Department of Defense designated the commandant of the Marine Corps as the executive agent of a joint program to develop and field nonlethal weapons, with the responsibility for program recommendations and for stimulating and coordinating requirements for nonlethal weapons, ensuring an operational focus for development, service testing, and evaluation.

The joint program is subordinate to the Under Secretary of Defense for acquisition and technology. A Joint Nonlethal Weapons Directorate is the action office for the day-to-day activities of the joint NLW program. Each of the two oversight committees-the Integrated Product Team and the Joint Coordination and Integration Group-has five voting members, one from each service and one from the Special Operation Command (SOCOM), as specified in the Joint Services Memorandum of Agreement.

The program is pursuing six core capabilities as the Joint Nonlethal Weapons Concept: for counterpersonnel, the capability to control crowds, to repel or incapacitate individuals, to deny access, and to clear facilities and structures; and for countermaterial, the capability to deny area (land, sea, air space), and to disable or neutralize equipment or facilities.

CURRENT DEPARTMENT OF DEFENSE POLICY FOR NONLETHAL WEAPONS

The following italicized paragraphs reflect the current DoD policy regarding nonlethal weapons, as stated in DoD public affairs guidance. Unitalicized sections are editorial summaries of policy statements.

Definition

Nonlethal weapons are defined as discriminate weapons that are explicitly designed and employed so as to incapacitate personnel or materiel [i.e., equipment], while minimizing fatalities and undesired damage to property and the environment.

Unlike weapons that permanently destroy targets through blast, fragmentation or penetration, nonlethal weapons have one or both of the following characteristics:

- They use means other than physical destruction to prevent the target from functioning.
- They have relatively reversible effects, so that it is cost effective to render the target fully operational again rather than replacing it.

Utility of Nonlethal Weapons

One of the main purposes for having nonlethal weapons in our arsenal is to provide commanders and policy-makers additional options between no use of military force at all and the use of lethal military force. Because this third option can provide a more humane, discriminate, and relatively reversible means of employing military force, with more precisely tailored and focused effects, they may be more appropriate for some missions than lethal weapons. The 'non-lethal' option can potentially play a role across the spectrum of conflict, from low-intensity conflict through major regional engagements. . . . In total, these factors strengthen deterrence, by making potential adversaries aware that we can thwart aggression and achieve humanitarian aims in ways that do not entail prohibitive political costs, thus enabling us to act earlier, more freely, and more decisively.

However, the United States is not obligated in any way to use only non-lethal weapons, or to try non-lethal weapons before resorting to more lethal means, in any military operation. Appropriate use of nonlethal weapons will be authorized solely at the discretion of our military leadership in such a way as to minimize risk to our military personnel in the field. Therefore, authorization to use lethal force for self defense against deadly threats would be unaffected by use of nonlethal weapons for achieving mission objectives. It is also recognized that many situations require overwhelming lethal military force as the most appropriate means to accomplish a mission. The addition of non-lethal weapons to our arsenal does not signify a major shift in the way we fight, nor does it imply that we believe in 'clean' conflicts or a 'bloodless battlefield.' They merely provide additional means of achieving our security objectives.

Oversight

DoD is providing increased high level attention to non-lethal weapons for the following reasons:

- Growing conviction about their potential military utility
- Political sensitivity

- New constraints imposed by arms control
- Increasing interest by the White House, Congress, U.S. allies, and outside organizations concerned with international security
- Recent advances in enabling technologies related to non-lethal weapons
- Emerging missions needing better non-lethal solutions, such as crowd control and urban operations
- . . . use of human shields to prevent the use of precision guided munitions
- 'CNN Factor' [i.e., the instant availability to the public of graphic portrayals of death, injury, or humiliation, and the impact on that public and its representatives in the United States or in foreign countries].

THE JOINT NONLETHAL WEAPONS DIRECTORATE

The First Two Years

The Joint Nonlethal Weapons Directorate, created in 1997, is headed by a colonel of the U.S. Marine Corps. According to the director, the guiding principles of the joint nonlethal weapons program are to "leverage high technology, enhance operations, augment deadly [lethal] force, provide rheostatic capability [i.e., one tunable in magnitude], and to focus on tactical applications," with capabilities that are "expeditionary and acceptable," and that have "relatively reversible effects."

The directorate has 15 staff (3 military officers, 1 military enlisted, and 11 civilian), overseeing a budget that for FY2000 will be about \$24 million, with a gradual increase to \$28 million in FY2005. The corresponding procurement funding for nonlethal weapons averages some \$11 million per year for this period, about equally divided between Army and Marine Corps. The June 1999 Memorandum of Agreement increases the staff to 26 by the end of October 1999.

The directorate's brief is to develop and field nonlethal weaponry. It is also tasked with providing leadership in joint service training, including tactics, communications, crowd dynamics, weapons and munitions, and rules of engagement, and in the development of doctrine and policy. It is responsible for providing information and understanding to policymakers in the services and in the DoD about nonlethal weapons. The directorate also sponsors all NLW experimentation, along with the inclusion of nonlethal weapons in the advanced concept technology demonstration (ACTD) of military operations in urban terrain.

In terms of experimentation, for the near future, the directorate is looking at canister-launched area denial systems, nonlethal Claymore mines (command-detonated explosive systems that project hundreds of small hard-rubber balls), and a nonlethal vehicle trap, among others. For the mid-term to 2004, it is exploring bounding nonlethal munitions (i.e., those that leap into the air before firing their pellets, dye, malodorants, or the like), the antimateriel use of rigid foam, and capabilities for stopping naval vessels. As it develops each new technology, the directorate explores also its deliverability and logistic feasibility.

In the longer term to 2010, the directorate is seeking means for disabling or stopping vehicles at a distance, and launching nonlethal weapons from unmanned air vehicles. It will also investigate means for preventing vehicle mobility, such as high-powered microwave systems to disable engine electronics.

Many thousands of individual NLW items have been provided to the field since 1995, ranging from nonlethal projectiles (rubber, foam, or sponge) to flash-bang projectiles (used to distract and disorient forces to enable rescue of hostages), to personnel dye markers. Defense Planning Guidance FY2000-2005 concludes: "Non-lethal weapons have proven useful across the range of operations, including both conventional combat operations and the many categories of military operations other than war. . . . Current efforts to study and understand the use of non-lethal weapons from the strategic to the tactical levels must be integrated into all future military and interagency concepts and operations."

The vision of the directorate in regard to nonlethal weaponry is of a great range of type and size; to develop, institutionalize, and field integrated capabilities; to have these new military capabilities understood at all levels; and to have nonlethal weapons integrated into policy, into the operational planning of the CINCs, and into operations. To make progress on this vision, the directorate has contingency plans to expand to 20 to 25 staff, developing and administering a program of about \$100 million per year; the growth in staff is provided, but it remains to be seen if the corresponding funds are made available.

Moving to the Future

The January 1997 Joint Services Memorandum of Agreement, creating the joint nonlethal weapons program, responded to the direction of the under secretary of defense (acquisition and technology) to the commandant of the Marine Corps to serve as the NLW program executive agent. The purpose was also to implement Public Law 104-106, Section 219, Nonlethal Weapons Study, which stated that ". . . the Secretary of Defense shall assign centralized responsibility for development . . . to a military service as the executive agent." The objective of the agreement (as stated in the February 1998 report of the Chairman of the Joint NLW Integrated Product Team) is ". . . to develop and recommend to the USD (A&T) a fully integrated and coordinated NLW program, to include as appropriate classified NLW programs within the DoD that meet the intent of Congress and provide the best NLW technologies and equipment to support our operating forces."

The Joint Nonlethal Weapons Directorate has accomplished much during its brief existence, with its focus on nonlethal weapons at the tactical level. By no means, however, has it yet been enabled to "develop and recommend a fully integrated and coordinated NLW program. . . ."

JNLWD Progress since January 1999

Adding to its record of accomplishment of fielding nonlethal weapons in FY98, the directorate has initiated the "insight" program that will supply it with some information on highly classified single-service (i.e., not "joint") strategic-level nonlethal weapons. It has become an active member of the Defense Joint Radio Frequency Technical Integration Group, with resulting visibility into high-power radio frequency and microwave programs. And it has made progress in developing a programmatic planning

strategy for developing and emerging technologies. Notably, the June 1999 Memorandum of Agreement revises and expands the charter for the Joint Nonlethal Weapons Directorate, as well as for the Joint Nonlethal Weapons Integrated Product Team that advises the executive agent on all NLW activities. The memorandum also restates the charter for the Joint Coordination and Integration Group to support the Integrated Product Team.

Four areas deserve comment: strategic nonlethal weapons, information warfare, human effects of nonlethal weapons, and scientific support for the Directorate.

What about Strategic Nonlethal Weapons?

In general, strategic NLW target directly the political leadership or the military capability as a whole, far beyond the tactical area of operations. The term also covers the long-range delivery of NLW that would be operative in the region of confrontation or combat.

Examples of strategic use of NLW include large radio frequency or microwave generators on aircraft or powered by explosives, which might disable military communications over a large area; or the use of carbon fiber delivered by missile or aircraft to disable aboveground electrical transmission and distribution systems.

Beyond its membership in the Joint Radio Frequency Technical Integration Group, insight into other highly classified programs that are based neither on radio frequency nor on high-power microwave generators has been achieved through access by a very limited number of directorate staff. The Task Force judges that the directorate would not be able to provide the integration expected of it in the nonlethal weapon field without such access and insight; at least two management and two technical personnel from the directorate should have full access to these programs.

But access is synonymous with neither control nor influence; the directorate has had neither with respect to these programs, and the Task Force has not been able to determine that integration and coordination has occurred in the Department of Defense as specified by Congress. Instead, a phrase in the 1999 joint services memo states, "to include, as appropriate, classified NLW programs within the DoD that meet the intent of Congress. . . ." The memo also proposes that "for service-unique systems across the spectrum of conflict [i.e., not just for strategic applications], the Directorate will maintain insight, not financial oversight. . . ." And according to the memo, the directorate will "monitor status of service-unique programs through annual status briefings from the responsible service." The Task Force judges that annual insight is insufficient and that access should be more frequent, full, and less formal. If a frequency must be specified, it should be monthly.

The Task Force recommends that the directorate play a more powerful integrative role in regard to programs for strategic nonlethal weapons and for information warfare.

The report of the Strategic Studies Group XVII of the Chief of Naval Operations (CNO-SSG), August 1998, treats 10 scenarios relevant to Navy and Marine missions and especially to those involving ship-based and land-based fire support. It recommends that information warfare be included in the nonlethal-weapons basket ". . . because there is a synergy that comes from using these capabilities simultaneously and, if required, in conjunction with lethal means." The SSG provides five recommendations and conclusions, which are summarized here:

1. A series of nonlethal war games should be run incorporating technologists, analysts, and warfare specialists;
2. Follow-on concept evaluation and experimentation should be conducted on the operational employment of nonlethal weapons;
3. An organization should be designated the Navy's focal point for nonlethal weapons to act as the naval component to the joint nonlethal weapons program;
4. Modeling and simulation of nonlethal weapons effects is a must if nonlethal weapons have any hope of becoming mainstream; and
5. Set a target date for a specific Fleet Battle Experiment in which one of its primary objectives would be the use of nonlethal weapons.

The Independent Task Force notes that the creation of a Navy focal point for nonlethal weapons, with a more extensive view of Navy mission and requirements than the present focus on Navy special warfare, would allow the Navy to engage more fully with the directorate and the joint NLW program. Analogous interfaces in the other services (beyond the focus on base security or force protection) would enable the directorate to more readily serve as a center for development, evaluation, and sharing of experience on nonlethal weapons. It is important that the directorate have the capability to influence service choices, but not to suppress service initiatives.

Interaction with Information Warfare

Information warfare generally refers to destroying or interfering with computer systems, including military and financial facilities. This is a nonlethal capability that might be expected to be subsumed under the nonlethal weapons program, as is specifically recommended by the CNO's Strategic Study Group Report. Perhaps because large programs in information warfare were already in existence in 1996, they have been kept separate from the joint NLW program and the directorate appears to have had no access to these capabilities. To the extent that this observation is correct, the likelihood exists that the NLW executive agent in interacting with the area CINCs will have incomplete information that may result in inadequate CINC and staff familiarity with available capabilities, as well as in unnecessary NLW developments. In addition, synergy between NLW and information warfare may well be lost, to the detriment of force effectiveness.

Human Effects

A major uncertainty in the use of nonlethal weapons is the question of human effects, both of the antipersonnel and of the antimateriel technologies. The directorate recognizes that in some cases children and older people are being used as shields or may otherwise be subject to the effects of nonlethal weapons, and adequate information is lacking for planning purposes or for making judgments as to rules of engagement. The directorate has set up a human effects advisory panel to guide the acquisition of information adequate to this task. The human effects of nonlethal weapons directed against material (such as internal combustion vehicles) are also of interest. Because people are "breathing machines," NLW aerosols capable of penetrating air filters or destroying gasoline or diesel engines must be analyzed and tested to permit an informed judgment of their impact on people in the region.

Some human-effects information is available through the Department of Justice—specifically from the National Institute of Justice's Less-Than-Lethal Technology Program, with which the directorate is in good contact. But for those technologies not widely used in law enforcement, human effects and side effects are difficult to evaluate.

As is emphasized in the DoD policy, it is not required that nonlethal weapons cause no fatalities. If the alternative to the use of NLW is the use of lethal weapons, it is likely that more people will be killed or wounded by using lethal weapons than by using NLW. If the alternative to the use of NLW is increased loss of life to U.S. forces, that is a powerful additional argument in support of NLW. The requirement is not that NLW have zero lethality and be completely reversible, but that the damage that NLW cause to various elements of the population be sufficiently well understood to enable establishment of doctrine and rules of engagement.

Because many of the NLW capabilities to be developed by the United States will become available to adversaries, the decision to develop and acquire specific weapons should be analyzed in the NLW program and in the joint staff to ensure that the United States derives net benefit from the development.

Beyond the necessary limitation of NLW to those that comply with the treaties to which the United States is party, considerable uncertainty remains as to the effectiveness and side effects of any given NLW and regarding the tactics for its use. After-action reports (and field trips from the JNLWD team) are essential if NLW are to be improved by selection and modification; such reports pose a problem of second-guessing local commanders, but they are needed, nevertheless.

The Task Force Reviewed Risks Inherent in the Development and Use of Nonlethal Weapons

- Will the use of nonlethal weapons seem so attractive and effective that the United States will intervene in the expectation of bloodless battles and an early resolution of the problem? It must be clearly understood that the use of nonlethal weapons would not preclude the use of lethal force. Nonlethal technologies may prevent a crowd from approaching closely enough to be a serious threat to U.S. forces; they may also serve to unmask snipers or combatants in a crowd of noncombatant civilians, opening a field of view for U.S. lethal fire. A zero-fatality expectation should not be established, however. It is essential that the real capabilities, and limitations, of nonlethal technologies in the hands of real troops be understood by military commanders at every level, by policymakers, and by the American public to avoid conflicting and false expectations.
- Will the United States develop technologies to which it is uniquely vulnerable? For most nonlethal technologies, U.S. forces are better protected than the potential opponents. In the case of radio frequency or high-powered microwave weapons for disabling electronics ubiquitous in U.S. equipment, modeling and exercises should be conducted to show whether the U.S. and coalition forces are vulnerable to their own use of such technologies in the theater. Measures should be developed to protect U.S. and allied forces against such possible "friendly fire" situations involving nonlethal weapons. NLW countermeasures should be developed along with the weapons themselves.

- Will nonlethal weapons lead the United States to violate treaties, such as the Chemical Weapons Convention or the Biological Weapons Convention, to which it is a party? Some capabilities such as riot control agents are forbidden for use "as a method of warfare" but are permitted in important cases such as the rescue of downed pilots from nonmilitary captors, quelling riots in prisoner-of-war camps, or controlling crowds of noncombatant civilians. Because these are important military functions, such weapons should be available for these purposes, and the compliance review mechanism of the Department of Defense should ensure compliance with relevant treaties. On occasion, U.S. security might be improved by a modification to a treaty; in that case, the DoD should propose such a step to the National Security Council and the interagency mechanism involved, to ensure due evaluation of the overall benefits, costs, and feasibility of the proposed change.

Increased Scientific Support to the Directorate

The JNLW Program is the focus of many proposals-some of them technically complex and requiring substantial development. In some approaches, the direct effect may be certain, but how to achieve it is not. Combustion inhibitors fall into this category. In other fields, both the magnitude of the effect and the means of achieving it are unclear. An example is infrasound, inaudible low-frequency sound intended to disorient or cause distress to people. Proposals for creating and transmitting intense beams of infrasound, and preferably focusing them in a small region, may or may not be valid. This is one example of proposals for which the JNLWD would benefit by having a cadre of scientists and engineers on which it could call for competent, unbiased evaluation of such proposals. Within the Department of Defense, there is a great deal of scientific capability, beginning with the Defense Science Board. The Task Force recommends both a major Defense Science Board study and also the creation by the directorate of a small science advisory panel on which it could call to provide analyses that would help to guide the program.

THE 1999 NONLETHAL WEAPONS POLICY STUDY

In late 1998, the Office of the Secretary of Defense, at the request of the National Security Council, commissioned a nonlethal weapons policy study conducted at the Center for Strategic and International Studies (CSIS). The directorate funded the study. The objective was to examine the need for a national policy on lethal weapons, and if it was determined that such a policy was required, to outline its nature. The CSIS policy study provided a final unclassified briefing on January 28, 1999, from which the following information is abstracted.

The study took as its scope possible long-range, large-scale nonlethal weapons and their political, military, diplomatic, arms control, legal, and intelligence dimensions. Because nonlethal weapons are still far from having reached their potential, the study relied in part on "Tabletop Games" and also on the nonlethal weapons study of the Strategic Study Group of the Chief of Naval Operations, quoted above.

The CSIS study considers strategic use of nonlethal weapons for large-scale or long-range attacks on combat elements, for attacks on targets that are not combat elements but that are central to the political or military viability of the adversary, or for attacks that are of great political significance or have a transforming effect on the situation. The study considered a number of case studies ranging from Haiti and Rwanda, to activities in a failed state with a complex emergency, to U.S. war with Iraq, to the collapse of North Korea, and, of course, to Kosovo.

This policy found that nonlethal weapons can help the United States act against the leadership of a nation while clearly sparing the citizenry, achieve limited objectives, preserve the stability of the status quo, act preemptively where necessary, meet alliance concerns, and respond to ambiguous situations. It suggested that nonlethal weapon capability might be most valuable in preventing deadly conflict.

The CSIS study judged that uncertainties in regard to the magnitude and duration of desired effects of nonlethal weapons, and in regard to the ability to minimize undesired effects, the potential for countermeasures, and the immaturity of the key technologies, make it impossible, at present, to define a balanced program for strategic applications or to recommend with confidence the acquisition of major weapon systems.

The study recommends that the executive agent (the commandant of the Marine Corps) should be tasked to establish and manage a three-year program to conduct expanded science and technology activities to address these issues for the leading technologies, to analyze alternatives for an unpiloted air vehicle as a platform for nonlethal weapons, to facilitate development of statements of mission need, and to establish concept exploration activities if appropriate. The CSIS study estimated roughly the level of effort required as \$100 million per year for three years.

KOSOVO AND NONLETHAL WEAPONS

The actions in Kosovo and Serbia have overtaken, and at the same time increased the urgency of, this Task Force's work. The highest precision delivery of explosives cannot in itself prevent atrocities on the ground, and television coverage of the few errant or misdirected munitions in Serbia helped to rally Serbs to Milosevic and imperiled the legitimacy of NATO intervention. Had images of mass murder in Kosovo and the terror-driven expulsion of ethnic Albanians been inescapable in Serbia as soon as such activities began, such crimes against humanity might have been countermanded under the impact of largely nonlethal measures against Serbia.

Not only would television broadcast in Serbia have been necessary, but so would measures to equip the local population in Kosovo with numerous film or video recording cameras and covert channels for egress of images have been necessary. The messages beamed to Serbia and to the world at large could have been, "Our actions are not directed against the Serb people or nation. We remember and honor our joint struggle against the Nazis. We are acting to stop the crimes against humanity committed by Milosevic and his supporters, who stain the honor of Serbia throughout the world. We are about to impose, with regret, the loss of electricity, power, and communications, and pledge to help restore normal life when the horrors cease permanently."

Without the threat of intervention with ground forces, such an approach might not have succeeded, but it would probably have helped-if it could have been done within days of the initiation of terror in Kosovo.

According to media reports, attempts to broadcast television in Serbia were largely unsuccessful, using inadequate equipment available in the theater. The recommendations of the Independent Task Force in Non-Lethal Technologies: Military Options and Implications, issued in 1995, remain vital today.

ADDITIONAL VIEWS

The Council on Foreign Relations is to be commended for taking a second substantive look at nonlethal weapons, one of the most critical and contentious areas of emerging technology and policy options for the 21st century.

The fight for nonlethal weapons will continue to be contentious until and unless a national nonlethal weapons policy is enacted, whereby the secretary of defense is directed to develop and maintain a robust nonlethal weapons capability to use alone and to enhance conventional warfare when used in conjunction with lethal weapons to limit casualties, destruction, and environmental damage. Without such a policy, steadfastly resisted by those who will not benefit from it monetarily, nonlethal weapons may slowly be squeezed out of existence by rival bureaucracies fearing their utility and the diversion of money into other channels.

It is unlikely that any "NSC oversight" as suggested in the body of this report will be helpful short of the equivalent of a national policy or a National Security Decision Directive, because without such an unequivocal mandate the NSC will possess no more ability to enforce compliance than does the congressionally mandated executive agent.

What is needed to make nonlethal weapons a robust capability is a reasonable budgetary commitment of at least \$100 million to several hundred million dollars per year for the next five years. And Congress cannot be expected to pony up year after year through unbudgeted authorizations and appropriations if the president, or the services, do not request this money.

Christopher Morris

Janet Morris

DISSENTING VIEW

The first "final" report of the Council's Task Force on Nonlethal Weapons (NLW) was primarily based on the three meetings of the Task Force. It was focused on what one might call the tactical use of NLW, that is, as an additional but specialized set of tools in the tool box to supplement other instruments more commonly used, mainly much more lethal and destructive ones. The issues examined and recommendations made on how to improve research, development, and utilization of NLW were perhaps a bit plebeian rather than visionary but were soundly based on substantial military experience and carefully conducted experimentation. Much of this solid work has been retained in the second final report, which is being published.

However, the brand-new executive summary and some other parts of this second final report were not based on the deliberation of the Task Force. To be more relevant, perhaps, they have drawn on the experiences of Kosovo (in some instances incorrectly), which took place well after the first final report, and have extended the conclusions into an entirely new dimension not founded on past experience or careful experimentation. They have moved NLW into what one might term the strategic realm, investing it to

some degree explicitly, and very much so implicitly, with the power to wage politically correct warfare; that is, a war in which one can defeat an opponent while inflicting little material damage and largely, if not totally, avoiding loss of life. This carries the Clinton desire of casualty avoidance to yet a greater extreme of unreality when it comes to the effective conduct of war. It resembles the hype which some accorded the concept of "information warfare" when it came into vogue some five years ago, claiming for it the capability of winning wars without firing a shot. This is akin to the practice of alchemy in the Middle Ages.

Robert B. Oakley

[Editor's note: A "draft final Chair's Report" was distributed to Task Force participants and reviewers on April 7, 1999, "for their formal review but not yet endorsement. . . . [S]uggestions will then be incorporated into the final version for Task Force contributors to endorse, endorse with an additional or dissenting view, or decline to endorse the report."

On June 18, 1999, the "draft final Chair's Report" was distributed with a cover letter reading in part, "We received a large amount of positive feedback. In response, the Task Force Chair, Richard L. Garwin, has prepared a draft final Chair's Report providing his analysis and judgment which he believes to be compatible with the views of the majority of the Task Force members (see attached). The substance of the report is now final; however minor changes will occur in style and format. Any errors that you or the reviewers flag will be corrected. We would now like to invite you to endorse the statement and be listed as a signatory."

It is that report and executive summary, distributed June 18, 1999, which has been endorsed by the vast majority of Task Force members. It is published here with only minor editorial changes. These reviewers have all provided their signature endorsing the general thrust and judgments of the report.]

TASK FORCE ORGANIZATION

This report is the "Chairman's Report" of the Nonlethal Technologies Task Force's findings, written by Richard L. Garwin. All Task Force contributors' opinions and suggestions were considered, with additional and dissenting views presented.

Task force participants served in one of three different roles:

1. Task Force Members: individuals who attended Task Force meetings and provided assistance and feedback concerning the draft report;

2. Task Force Report Reviewers: individuals who did not attend the Task Force meetings, but provided significant comments and suggestions after reviewing the Chairman's Report; and
3. Observers: government or military personnel who cannot serve as Task Force members, but whose views are valued and comments were taken into consideration.

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Note: Institutional affiliations are for identification purposes only. Reviewers endorsed the general thrust and judgment of the report.

GLOSSARY

Acoustics-Sound: high-level sound in the audio range to interfere with communication or to evacuate an area. Infrasound: very low frequency sound generators that might be tuned to incapacitate personnel, at least in buildings or underground facilities.

Advanced Concept Technology Demonstration (ACTD)-ACTDs are designed to rapidly transfer technological solutions to warfighting requirements from the developer to the

warfighter in the field. Pairing the warfighting CINC with the technology developer during product development helps ensure the product has military utility and fulfills an identified operational shortfall.

Antifratricide Measures-Actions that are taken to avoid and/or minimize the chances of military forces accidentally wounding or killing either a member of their own force or allies, or of damaging their own equipment.

Bounding Nonlethal Munition (BNLM)-Nonlethal tactical area denial munition for site security and perimeter defense. It is employed in a layer manner with three different munitions: blunt trauma (rubber ball), a sting net, and a personnel dye marker.

Calmative Agents-Chemical substances that are designed to temporarily incapacitate personnel.

Canister Launched Area Denial System (CLAD)-A rapidly dispensed nonlethal area denial system. The launcher is a cut down Volcano launcher rack that dispenses riot control agents, nonlethal bounding munitions, or marker munitions.

Combustion Modifiers-Could be delivered in aerosol form, as a cloud against a motorized convoy or an armored column. They would be sucked up into the air intake, raise the combustion level, and burn out cylinders and cylinder piston rings.

Communications Warfare-Can be considered a subset of information warfare and refers to the targeting and disruption and/or manipulation of command and control systems and equipment.

Dyed Foam-Foams, usually the aqueous variety, are seen as possible carriers for such nonlethal payloads as combustion inhibitors, riot control agents, and possibly dyes. In certain scenarios, such as in Grozny during the Russian assault, it is very desirable to know whether a person had been in a certain area; the use of dye markers could fulfill this need.

Flash-Bang Projectiles-Projectiles that produce a loud audible report and a bright flash of light when fired. The flash and bang that is produced provides a distraction.

Foamed Barriers-A coordinated series of obstacles constructed from foams (either rigid or aqueous) that are designed or employed to channel, direct, restrict, delay, or stop the movement of an opposing force and to impose additional losses in personnel, time, and equipment on the opposing force.

Global Positioning System (GPS)-A device that determines location by receiving signals from at least three of the GPS satellites, thus deriving the position from the differences in distance to the satellites.

Ground Vehicle Stoppers (Electric)-A device that delivers electromagnetic radiation at a high-power level from a ground-based microwave source.

High-Power Radio Frequency (RF)-High-power RF when used in the context of a weapon refers to the use of electromagnetic energy within a broad frequency range of approximately 100 MHz to 100 GHz at power levels sufficient to create the desired effect. Because information about specific frequencies is often guarded information, the term high-power RF serves as a generic term for this class of weapon.

Information Warfare (IW)-Information operations conducted during a time of crisis or conflict to achieve or promote specific objectives over a specific adversary or adversaries.

Modular Crowd Control Munition (MCCM)-A nonlethal variant of the Claymore mine. The lethal fragmentary payload is replaced with numerous rubber ball blunt impact munitions for use in crowd control.

Nonlethal Crowd Dispersal Cartridge (NLCDC)-Intended to fire a nonlethal cartridge for the M203 40-mm grenade launcher for crowd control. The cartridge contains rubber ball projectiles that allow the targeting of an individual by a blunt trauma direct fire means.

Odorous Substances-Substances that are repulsive to the local populace, while other substances would perhaps be attractive or merely indicate something significant, such as a leak of a flammable material.

Personnel Dye Markers-A hand-held device that is tossed into a crowd and sprays dye in all directions for marking individuals for identification at a later time.

Portable Vehicle Immobilization System (PVIS)-Deploys in a manner similar to an aircraft arresting gear system. The system provides security forces the capability to deny approach to a restricted area such as a checkpoint or entryway to high value assets or facilities.

Psychological Warfare-The planned use of propaganda and other psychological actions for the primary purpose of influencing the opinions, emotions, attitudes, and behavior of hostile foreign groups in such a way as to support the achievement of national objectives.

Pulsed Chemical Laser-Proposed to produce a nonlethal effect on personnel at a range of hundreds of meters. The effect is the equivalent of delivering a massless, "shrapnel-less" blunt impact on the surface of the target.

Rigid Foams-Designed to seal off doors, windows, culverts, or other access points to keep people out of certain facilities or areas.

Slippery Foams-Designed to deny or delay pedestrian traffic in open areas. This foam could also deny or delay vehicles by causing them to lose their traction.

Stick 'em and Slick 'em-Slang reference to traction modifiers which are used to change the friction of a particular surface, either to increase friction (stick 'em) or to decrease friction (slick 'em).

Traction Modifiers-Devices that are used to change the friction of a particular surface. An increase in friction makes it difficult to move things, and a decrease in friction makes it difficult to stop things that are moving.

Unmanned Aerial Vehicle (UAV) Nonlethal Payload Delivery System-A platform that delivers payloads that include tear gas, malodorants, pyrotechnics, and caltrops.

Vessel Stopper System-A nonlethal method of halting suspicious vessels at sea without injuring those onboard.

66-MM Nonlethal Munitions-Short-range, indirect fire, crowd- control area denial nonlethal capability that can be deployed from the existing vehicle-mounted 66-mm-bore

smoke-dispensing system. The system can disperse a blunt trauma munition or a distraction "flash-bang" round.

APPENDIX

Text of 1995 Independent Task Force Report on Nonlethal Technologies

Non-Lethal Technologies: Military Options and Implications

Report of an Independent Task Force

Sponsored by the Council on Foreign Relations

1995

Malcolm H. Wiener, Chairman

EXECUTIVE SUMMARY

Today we face new challenges to our security and our humanity. To many of these, neither conventional economic sanctions on the one hand nor a Gulf War-type response on the other provide an appropriate answer. The recent examples of Bosnia, Somalia, Haiti, and Rwanda, as well as the threat of state-supported terrorism, show the need for new options and credible deterrents. Scientific and technical advances in non-lethal technologies, which cover an array of capabilities from crowd and point control to the disabling of a society's communications, mobility, and power, address this need. The following report by an Independent Task Force sponsored by the Council on Foreign Relations analyzes these new options and the steps needed to realize them while limiting the prospect of retaliation or abuse.

Non-lethal technologies include:

- jamming or destruction of communications, together with the ability to transmit television and radio programs of one's choice, potentially useful for reducing inflammatory, sometimes genocidal, messages or separating murderous rulers from army and populace;
- "slickums" and "stickums" to impede vehicle or foot traffic;
- movement-inhibiting foams and nets;
- highly obnoxious sounds and smells, capable of inducing immediate flight or temporary digestive distress.

The Task Force report considered the applicability of non-lethal weapons to recent conflicts.

- In Somalia, street and point control through the use of incapacitating foams and flight-inducing smells and sounds could have offered significant advantages over deadly fire from helicopter gunships in achieving political goals.

- In Rwanda, where radio broadcasts urging total genocide are thought to have increased the scope of horror, communications interdiction and augmentation (as was employed in Cambodia, where a radio station preaching a message of reconciliation was credited with lowering violence), plus point and movement control agents, would have been appropriate had a decision to intervene been taken.
- In Bosnia, combining technologies, including communication warfare aimed at separating leadership from people, movement interdiction efforts on roads, the use of offensive smells and sounds to disrupt or punish local efforts at ethnic cleansing, and "enhanced sanctions" directed at Serbia, together with lethal precision targeting of heavy armaments used to shell urban areas, would have offered obvious advantages had an early decision to intervene been taken.

The Task Force considered a number of risks inherent in the development and use of non-lethal weapons, and evaluated those risks.

- The "slippery slope." The use of non-lethal weapons may seem an attractive option, but might lead to further unintended and unwanted involvement, including the large-scale use of lethal weapons.
 - Widespread understanding of the capabilities and limitations of non-lethal weapons; acknowledgment of the need for careful identification of the adversary; coherent, integrated plans of action, and the practice of early congressional consultation should limit the risk of entry onto the slippery slope.
- Retaliation. Since the United States is highly dependent on technology, we may be opening the door to a form of warfare to which we are most vulnerable.
 - Coping with such vulnerability is essential whether or not we deploy non-lethal weapons. In cases where the United States is likely to be the only developer of a particular type of non-lethal technology, the decision as to whether the advantages of the technology outweigh the impetus given to the efforts of others requires careful consideration.
- Proliferation. Much military research and development is based on mimicry. If we take the lead in developing non-lethal technologies, other countries will follow and renegades will eventually acquire them. As second generation non-lethal technologies are developed, first generation technologies will filter down into less responsible hands.
 - U.S. restraint will not prevent development of all non-lethal weapons by others. Russia, the United Kingdom, France, Italy, and Israel are said to have made significant efforts to develop non-lethal capabilities. Some non-lethal weapons can be assembled from components commercially available to terrorists as well as to governments. Research and development of non-lethal technologies will contribute to knowledge of defenses and antidotes. Some research and perhaps deployment should be

undertaken in secret, both to attempt to limit proliferation and to retain the benefits of surprise.

- Unrealistic expectations and onerous battlefield requirements. An expectation of bloodless battles is doomed to disappointment and a requirement that non-lethal weapons be employed before lethal means are used could expose U.S. forces to needless dangers.
 - Troops equipped with non-lethal weapons should always have clearly adequate lethal weapons available, together with authorization to use them as necessary. Moreover, in certain circumstances the existence of non-lethal options may increase the safety of U.S. troops and the effectiveness of U.S. actions. Possible examples: 1) when a sniper is hidden in a crowd of women and children, inhibiting U.S. use of lethal fire; 2) when it is desirable to enlist allies who are reluctant to risk causing civilian casualties in an "enhanced sanctions" campaign against terror-supporting regimes; 3) when a hostile regime faces significant internal opposition and the goal of policy is to separate its leaders from the populace and army.
- Comparative cost effectiveness. Many of the casualty-limiting benefits of non-lethal weapons could perhaps be achieved more quickly and at less cost by increasing the precision of lethal arms.
 - In some circumstances weapons perceived to be non-lethal in intent are likely to have marked advantages in limiting opposition, obtaining support, and achieving policy goals. Many of the research costs of some technologies have already been incurred. When compared to the cost-effectiveness of other weapons systems, development, procurement, training, and operation of non-lethal technologies do not in general appear to be costly in relation to potential benefits.
- Restraints of international law. In some cases, the status of non-lethals is ambiguous under broadly drawn international conventions prohibiting the use of certain types of weapons or technologies.
 - It would be ironic if lethal weapons were employed because ambiguities in international law prevented the use of non-lethal weapons. Careful consideration should be given, however, to the definition of what is and is not prohibited under the broad definition of the Chemical Warfare Convention, so as not to appear to loosen its constraints, and to banning the deployment of lasers in a configuration designed to blind troops or non-combatants.

CONCLUSIONS

The ability to employ non-lethal technologies may provide advantageous options to the United States as it enters the 21st century. In many respects non-lethal technologies could be particularly effective in a number of situations of low-level conflict, often involving

nonstate or failed state actors, observed instantly by many publics whose support may be desirable.

Non-lethal options are, however, not a panacea, and require careful management of their potential and perils. At present, communications warfare, other non-lethal weapons options, and economic sanctions analysis are assigned to separate areas of the Department of Defense and other government agencies. Moreover, laboratory-generated technological advances largely drive policy analysis, rather than national policy requirements shaping research. Given the long lead times historically associated with the adoption of innovations in military doctrine and training, the subject of non-lethal technology needs thorough analysis now. A national policy on non-lethal options should come from the National Security Council (NSC), in view of the varied and complex problems presented and the necessity to integrate military, economic, diplomatic, and political strategy.

In sum, non-lethal technologies have the potential for providing new strength for diplomacy, new credibility for deterrence, new flexibility for the military, and new strategic options for policymakers.

INTRODUCTION

As we approach the next millennium, we face new challenges to our security and our humanity. From terrorists with murky state support and increasingly destructive lethal weapons, to the risk of ethnic, religious, or political terror resulting in mass migrations across borders including our own, to the nightly assault on our souls and consciences from televised horrors, some of which could have been prevented by our actions, the new challenges require new thinking. Many of these new challenges involve non-state actors; all call for a willingness to act and new methods of deterrence or response. It is important to close the options gap between a Gulf War-type response, on the one hand, and, on the other, typical economic sanctions of often limited effectiveness. The recent examples of Bosnia, Somalia, Haiti, and Rwanda, together with the World Trade Center bombing and the prospective proliferation of nuclear, chemical, and biological agents as well as advanced conventional weapons, show clearly the need for a wide range of options and credible deterrents, including improved deterrents to state-supported terrorism and genocide.

Simultaneously, we observe strong national and international pressures to avoid casualties. Casualties caused by the bombing of a communications structure also used as a civilian bomb shelter in Baghdad reportedly resulted in changes in targeting policy, and images of "the Highway of Death" in Iraq were said to be a factor in the early (and in the view of some untimely) termination of the Gulf War.

Against this background, the Council on Foreign Relations convened an independent Task Force to consider the subject of non-lethal technologies and optimum force options. Non-lethal technologies involve a wide range of materials and techniques that coerce or deter largely without killing (although unintended deaths may result) and that for the most part will also appear to be intended to limit casualties and destructiveness. (There is no sharp division, but rather a continuum, between non-lethal weapons and precision-

directed lethal weapons that can be used in non- or limited-lethal actions, such as the nighttime or holiday destruction of power, communications, or weapons facilities.)

This report poses a number of questions whose political and technical complexity preclude immediate resolution. The objective here is to highlight aspects of policy regarding non-lethal technologies that deserve closer and more sustained scrutiny than they have yet received in or out of government.

Potential non-lethal technologies include communications elimination and substitution and other forms of information warfare, various "slickums" and "stickums" to impede vehicle or foot traffic, movement-inhibiting foams and nets to ensnare combatants and vehicles, precision kinetic disabling of heavy weapons, computer-assisted precision anti-mortar/anti-sniper devices, obnoxious sounds or smells that cause flight, counter-sensor lasers, and electronic or electromagnetic means of disabling power grids, communications, computers, and credit networks.

Some of the weapons and the technologies exist now; others are ready or close to ready for development and deployment, while still others would require considerable research and development. What may have seemed remote to the general policy community when this study was initiated a year ago has become immediate as a result of the request by the commander of the U.S. operation covering the U.N. withdrawal from Somalia for various types of non-lethal weapons.

In the absence of any national policy on non-lethal weapons, development of non-lethal technologies has been largely driven by various scientific laboratories offering proposals as their nuclear warfare budgets were reduced. In February 1994 the Department of Defense established a Senior Officials Group, now called the Non-Lethal Weapons Steering Committee (NLWSC). In July the Department of Defense circulated for comment a draft directive of policies and procedures governing non-lethal weapons, but explicitly excluding for organizational and budgetary reasons the subjects of precision-targeted weapons and information warfare.

To date there has been no serious effort at the national level to incorporate the strategic and policy implications of non-lethal weapons in foreign policy analysis or planning. The paucity of general analyses may be due in part to the wide range of potential activities covered, which cut across departmental boundaries and include: 1) "enhancing sanctions" (such as interruption of power grids, transportation, credit, and computer systems); 2) conducting information warfare; 3) restraining masses of people or riots; 4) intervening in intrastate ethnic, tribal, or political conflict; 5) engaging in counter-terror and counter-proliferation activities; 6) diminishing the level of violence required in certain conventional military operations; and 7) countering the use of non-lethal technologies (such as computer viruses and carbon fiber attacks on power grids) against both U.S. forces abroad and terrorist targets in the United States.

SCENARIOS AND POSSIBILITIES

The Council Task Force considered a number of scenarios to which non-lethal weapons systems could be applied, both for their individual characteristics and to determine whether such scenarios have significant characteristics in common.

The prospect of economic sanctions enhanced by technology was considered first. Potential benefits noted include the possibility of achieving greater effect than conventional sanctions, with more impact on adversaries as distinguished from the general populace; the greater ease of applying, relaxing, and reapplying, if needed, such technological sanctions; the prospect of effectiveness through U.S. unilateral action; the consequent prospect of greater immediacy of action and result, potentially useful in itself and as a deterrent to further acts by an adversary; the possibility of securing international agreement for a long-term approach (for example, against nations sponsoring terrorism) involving closing international travel, computer, credit, and communication links, and limiting television transmission and power where necessary. Research and development in those areas was deemed promising, subject to the general caveats described below regarding slippery slopes, risks of retaliation, and encouragement of proliferation through mimicry.

Various scenarios involving crowd control, peacekeeping, and lower levels of peace enforcement were considered, and the Task Force noted the potential advantage of non-lethal weapons (for example, to attack snipers moving among crowds or guns placed in sites of high cultural value), particularly where winning the support of the populace is critical. For example, the reported death of an estimated 6,000 to 10,000 Somalis from actions by U.N. forces, many as a result of fire from helicopter gunships, seems inimical to the stated purpose of the intervention even apart from the moral repugnance of needless death. The effect on U.S. forces of firing into crowds including women and children in which snipers are concealed is also relevant. Incapacitating sticky foams, obnoxious and disorienting smells and sounds to dispel crowds, and disabling bullets were among the systems considered in this context.

In respect to the foregoing scenario and all others involving the use of force, it should of course be clear that U.S. military forces should always have adequate lethal means available, along with authorization to use them as needed.

The potential applicability of non-lethal weapons to the war in Bosnia was next considered. The time frame chosen was that of the first reports of ethnic cleansing and detention camps and of the Serb naval shelling of Dubrovnik, when 100,000 people were reported marching in the streets of Belgrade in opposition to the policies of Serbian leader Slobodan Milosevic. In this scenario (which implies an early decision to intervene), emphasis was placed on employing non-lethal techniques that had the potential to detach the populace and army from Milosevic and his cohorts, or at least to avoid to the extent possible driving them together. Among the possibilities considered were shorting out power, communications, air control facilities, and television transmission and impeding transportation north at the river Drina choke points through non-lethal "slickums" and "stickums." Ending the shelling of cities by ships, planes, tanks, or heavy artillery through precision counterfire was considered a possibly important limited-lethal supplement to non-lethal means. It was noted that the outcome of one war game suggested that at the present state of development it is easier to use non-lethal weapons against infrastructure than in direct combat. Intensive further war gaming and modeling of non-lethal weapons systems (including those now available, those whose development is near at hand, and those thought likely to be developed) is strongly recommended by the Task Force.

The question arises as to why power, air control facilities, bridges, roads, and tanks should be rendered inoperable by non-lethal weapons when the task could be performed more readily and reliably by precision-targeted explosives. It is necessary to define in this regard the type of force deemed optimal in light of the stated objectives. The difference in local reaction and in images televised worldwide between tanks, bridges, and people destroyed through precision targeting with explosives and tanks stuck temporarily or repeatedly in "slickum" seems significant. When a primary purpose is to separate leadership from populace and army, while holding a coalition of nations together in an age of instant communication, contrasting reactions to televised images may weigh heavily in policy calculations. In traditional military terms this may be regarded as a problem in avoidance of loss of potential allies or enemy defectors through friendly fire. Moreover, the post-war costs of reconstruction will be lower to the extent non-lethal rather than explosive weapons have been employed.

Information warfare appears to be a critical component of campaigns in many cases (and in military campaigns in general). For example, the ability to deliver a message on Serbian television in the above scenario seems highly desirable. Graphic descriptions of atrocities being committed could have been accompanied by messages stating, "Our actions are not anti-Serb. We remember and honor our joint fight against fascism. Rather we are attempting to prevent the shelling of citizens and towns by any forces. We regret the harm caused by our actions, which are intended to be non-lethal and which will cease as soon as the support for those dishonoring the Serb name in Bosnia ceases."

Similar actions directed against Pale and other Bosnian Serb strongholds could have been accompanied by the additional information that where ethnic cleansing of a town has occurred and the homes of its inhabitants seized, that town and the hometown of those responsible, if known, would be rendered uninhabitable (for example, by some combination of obnoxious smells, disorienting sounds, and sticky foams).

The foregoing Bosnia scenario is intended solely as a graphic illustration of various non-lethal possibilities, some not yet available, and not as a recommendation for current action. A senior U.S. official once remarked, "Every time we look at Bosnia, we think of things we haven't developed."

The examples given involve the use of information warfare. The consensus of the Task Force was that the potential advantages of such capability across a wide variety of situations justifies substantial developmental efforts, particularly since even partial success may be significant. Recent events in Rwanda, where a single radio station urging total genocide is believed to have had a major impact, underscore this point. Conversely, a radio station in Cambodia that preached a message of reconciliation is credited by U.N. observers with a significant positive impact. In the Rwanda case, substitution of a different message, such as that the Tutsi and Hutu are one people wrongly separated by former colonial overlords and those who kill will be punished, would have had obvious advantages over interdiction alone.

Of course information techniques of this nature are not a comprehensive strategy. Any genocidal message heard on television or radio can also be transmitted more slowly by word of mouth, but slowing the spread of such incitements can be critical to stabilizing a particular situation. Communications interdiction or substitution may generally require additional action on the ground to be effective. (For example, in the Rwandan case it may

be that the early deployment of forces capable of countering gangs armed largely with machetes would have been necessary.) In general, there may be very few cases where information warfare alone will be useful. At the same time the critical factor may be the will to employ such methods-evidently absent in Rwanda when they were available and might have proven valuable. What this episode reveals regarding the lack of knowledge and preparedness regarding non-lethal technologies is a question deserving further study.

The point justifies emphasis in view of the risk that a leader skilled in communications might be tempted to engage in communications warfare, if only to give the appearance of action. Interference with broadcasts and/or the airing of opposing messages, however, in most cases will not persuade a terror-sponsoring dictator to desist.

The significant role of information warfare in many situations, some involving economic warfare and non-lethal technology as well as lethal weapons, illustrates the importance of involving agencies and individuals encompassing a broad range of knowledge-military, diplomatic, economic, and societal (with a deep understanding of the cultures, mores, and languages of the area in question), as well as specialists from the intelligence community-in planning campaigns spanning the spectrum from counter-terrorism to regional conflict.

SOME IMPORTANT CAUTIONS

The Task Force considered a number of potentially significant obstacles and objections to the development and use of non-lethal weapons systems.

First was the problem of the slippery slope. Non-lethal weapons may create options that appear so attractive, politically and otherwise, that decision-makers will be tempted to use them in inappropriate circumstances and be led into a quagmire. For example, decision-makers responding to televised images of horror and wishing to appear to act might resort solely to information warfare under circumstances where it would be useless, counterproductive, or arouse resentment about interference in other societies. Recognition of this danger, however, should serve to abate it. Congressional oversight is of course also relevant, and congressional leaders normally consulted regarding interventions and the dispatch of U.S. troops should be familiar with both the potential advantages and risks of non-lethal technologies in warfare.

Second is the risk of retaliation. The United States in many ways is the most open, technology-dependent, and vulnerable society. Power grids and computer systems in particular are potential targets. The Task Force concluded that such vulnerability requires independent attention and the development of counter-measures whether or not we field non-lethal systems or weapons. Of course retaliation might well be lethal, with our comparative advantage in technology balanced by the comparative advantage of others in their readiness to resort to terror. Here again a "slippery slope" analysis encompassing suggested subsequent steps in the event of escalation is critical.

A third potential objection, closely related to the second, is the risk of proliferation. U.S. development of non-lethal weapons has already aroused and will continue to excite the interest of others, particularly since much military research and development is based on mimicry. Moreover there is the risk that as second generation non-lethal weapons are developed, first generation weapons will gravitate into increasingly less responsible hands. No U.S. restraint, however, will guarantee against the development of weapons by

others. Reports indicate that Russia, the United Kingdom, France, Italy, and Israel have developed or are developing significant non-lethal capabilities. In general, research and development will also contribute knowledge about defenses and antidotes. Where U.S. vulnerabilities are disproportionately high, as in the area of computer virus warfare, restraint in use as distinguished from development may be particularly appropriate. To the extent that the threat of employing non-lethal technologies, economic warfare, and information warfare may be relevant in deterring state support for terrorism, intelligence estimates that at least 20 nations have or are developing chemical or biological warfare capabilities are worth noting.

A fourth potential objection to a vigorous program to develop non-lethal technologies lies in the fear of creating unrealistic expectations of bloodless battles and the concomitant prospect that U.S. forces would be exposed to danger by a frequent or general requirement that non-lethal force be used before resorting to lethal means. A policy of ensuring that U.S. forces equipped with non-lethal weapons always have lethal weapons available, with authorization to use them as needed, should allay these fears. Moreover, there are situations where availability of non-lethal weapons may increase the safety of U.S. troops, such as a sniper hidden in a crowd of women and children, where a commander would hesitate to order lethal weapons fire. The detailed analysis and war gaming recommended elsewhere concerning situations where employment of non-lethal technologies may be particularly appropriate (such as point and crowd control; "enhanced sanctions" campaigns where the participation of allies is essential; action against fragile regimes or failed states with internal opposition we wish to encourage) may also be relevant with respect to countering unrealistic expectations.

A final related objection is expressed in the proposition that "anything worth doing is worth doing lethally," and that anything less means fighting with one hand tied. But lethal and non-lethal weapons are not mutually exclusive alternatives. As the prior examples indicate, there are times when non-lethal weapons or technologies and limited force options may be preferable for achieving objectives while limiting negative responses or counterproductive consequences.

The costs of non-lethal technologies, including opportunity costs in the employment of top scientific and technological personnel, need to be examined. For example, a comparison of the estimated benefit from using funds that would be earmarked for non-lethal systems for additional development of precision-targeted lethal weapons instead is clearly relevant. However, circumstances exist, as described above, where the advantages of rendering a target inoperable via non-lethal means might well be significant even where precision-directed lethal means exist to destroy the target. Moreover, precision delivery systems may be used for non-lethal as well as lethal payloads, and hence share common costs. Many of the costs of non-lethal weapons have already been paid in the course of developing the relevant technologies. By and large, the costs, based on Department of Defense estimates, of developing non-lethal weapons systems appear proportionate to their benefits even in comparison with other weapons systems, provided there is continual dialogue between policy planners drawn from all relevant backgrounds and the suppliers of weapons, so that sums are not spent developing weapons for which there is no clear requirement or benefit, or which we would not be prepared to use for moral or legal reasons.

The moral and legal implications of international law for various proposed non-lethal systems must be carefully weighed. The Biological Weapons Convention of 1972, ratified by the United States in 1975, might be interpreted to prohibit the development of certain agents designed to embrittle artillery and tanks or degrade lubricants (either through a literal reading or because of the unintended possible effect of human exposure). Quite apart from questions of non-lethal weapons, the rapid rate of development of biotechnology and the increasing civilian use of bioengineered organisms (for example, in the treatment of oil spills) is likely to require periodic updating of the convention.

The recent Convention on Conventional Weapons does not address non-lethal technologies, but they are likely to be considered in a forthcoming review conference on the agreement. There may be proposals to ban lasers that can be used to blind, or alternatively to ban the intentional use of lasers to blind troops or noncombatants permanently. The International Committee of the Red Cross is considering a similar resolution. Nevertheless, since lasers with the capacity to blind have already been deployed in foreign forces, proliferation must be anticipated and we must be prepared for the possible use of blinding lasers against us, for example in terrorist attacks against political leaders. (Lasers of limited power were used by U.S. forces in the Gulf War for range finding and precision target designation.)

With respect to chemical agents developed to provide crowd and point control or retaliatory options to deter atrocities, there exists a gray area of substances banned under the Chemical Weapons Convention (now awaiting ratification by the U.S. Senate), which prohibits the use of chemical riot control agents against combatants in wartime. It would, of course, be a tragic irony if nations used lethal means against noncombatants because non-lethal means were banned by an international convention. Evidence that potential adversaries, including terrorist-supporting states, are developing fearsome chemical weapons supports the interest in such a convention. Further analysis and research should be devoted to the legal aspects of this problem, and to the moral, practical, psychological, and precedential aspects as well.

The Nairobi Convention, to which the United States is a signatory, prohibits the broadcast of electronic signals into a sovereign state without its consent in peace-time. Of course the contemporary world provides many situations between full peace and all-out war. The concept of a "declaration of hostilities" or of a "failed state" may be appropriate in such circumstances, not only with regard to the use of electronic signals but to the use of enhanced sanctions and non-lethal weapons as well.

CONCLUDING OBSERVATIONS

Longer-range questions requiring national consideration include:

1. A declared intent to acquire and, if necessary, to use non-lethal force as an instrument of U.S. national security is worth consideration. By extending the capacity to intervene in situations where lethal force is either infeasible or incredible, such a declared national policy may also help to deter genocide (which we are committed by international convention to oppose). In the longer run a policy of this nature could affect decisions by rogue states regarding costly and/or

treaty-violating acquisition of some types of weapons of mass destruction or advanced conventional capability because of their knowledge that advanced non-lethal capabilities may provide the means of effective retaliation without causing large civilian casualties, thus making such U.S. action credible as a deterrent. Conversely, a long twilight war against terrorist groups and terrorist-supporting regimes may require a level of secrecy to preserve the effectiveness of non-lethal technologies and create uncertainty as to the agent, foreign or domestic, of disruptive events, and the degree of ultimate potential for destabilization or for support of domestic opposition.

2. Throughout history, the capacity for destruction has proliferated; it is now gravitating into increasingly less responsible hands, so that today individuals with little training or support can explode a World Trade Center-type bomb and much worse. Moreover, deadly microbes and substances can be easily manufactured and used. As a consequence, our comparative advantage in technology may in some circumstances be opposed by a comparative advantage in terror. Does this consideration suggest an increasingly cautious approach to foreign intervention of any type, including the use of "enhanced sanctions," communications warfare, or non-lethal weapons? The threat of terrorism has evidently been a factor in causing certain West European countries to reject intervention or cooperation with peace-enforcement measures in the Middle East, the Balkans, and elsewhere. It is worth recalling in this regard that while lethal acts have sometimes brought no immediate response, as in the case of the Israeli attack on an Iraqi nuclear reactor in 1981, conversely, terrorist attacks in the United States may occur no matter how low the U.S. profile, and any inability to respond may invite attack.

3. To what extent and in what manner should non-lethal warfare capabilities be shared with our traditional allies? If the United States is to share peacekeeping, peace-enforcement, anti-genocide, counter-proliferation, and counter-terrorism responsibilities with other nations, the development of common doctrine and training is indicated and the sharing of research and development costs obviously attractive. The NATO Defense Research Group has recently begun a study of non-lethal technologies.

4. What constitutes an act of war in the coming era? An attempt to destroy a funds transfer (banking) system, U.S. or foreign, through the introduction of computer viruses or by other electronic means, assuming state support can be identified? The crippling of power grids? The broadcasting of false reports causing panic and deaths? Support of terrorist actions? Further, what degree of state support for such actions constitutes a *casus belli*? A closely related issue concerns the role of the Congress in approving U.S. non-lethal actions abroad.

5. The problem of national policy coordination, and of getting there from here, requires consideration. A joint project of the Departments of Defense and Justice, instituted at the initiative of the Justice Department, addresses the research and development of technologies with dual potential for domestic law enforcement and national defense. The creation of a Department of Defense NLWSC, following years of organizational uncertainty at the Department of Defense level, is most welcome. The current exclusion from this initiative of precision weapons

and of information warfare, a field in which the Army, Navy, and Air Force maintain separate centers (at a time when there is still no non-lethal weapons center), shows the need for further efforts at the secretary, deputy secretary, and Joint Chiefs levels. It is important that research in non-lethal weapons and information warfare not be limited to the traditional weapons laboratories, but rather take advantage of the full potential of our rich and diverse technological base. An integrated approach to the full spectrum of non-lethal technologies, including information warfare, should guide development and deployment.

The development of military doctrine must of course go hand in hand with the development of weapon systems to produce satisfactory results. Military history teaches that the time elapsing between the introduction of a weapon and its satisfactory incorporation in doctrine is typically 20 years. (For example, the tank was first used by the United Kingdom in World War I but had no profound effect on warfare until it was incorporated into the doctrine of blitzkrieg by Germany in World War II.) The pace of technological change today brooks no such delay. It is accordingly essential that the Department of Defense establish policy, doctrine, and structure covering all aspects of non-lethal conflict. The Department of Defense Draft Directive Policy for Non-Lethal Weapons is a significant step in this direction. The directive, however, has yet to be executed.

At the national policy level, the absence of any overall consideration of the interrelationships between and potential impact of enhanced sanctions, communications warfare, and non-lethal weapons (combined when appropriate with precision-directed lethal weapons) is troublesome. Senior officials in the State Department and NSC display little knowledge of non-lethal options.

The subject of non-lethal technologies appears of sufficient importance for the NSC to play a major coordinating role, in order to ensure that all the relevant departments, agencies, and areas of expertise needed to inform public policy in this challenging area are heard. An NSC directive may be desirable or necessary. The president, vice president, secretary of state, director of Central Intelligence and members of the relevant congressional committees should receive appropriate briefings, updated as required, concerning the expanded range of options for national policy that non-lethal technologies present, together with the caveats concerning their development and employment discussed in this report.

In summary, vigorous exploration of non-lethal technologies is politically, militarily, and morally appropriate, and affordable as well. "Once in a while a door opens, and lets the future in," wrote Graham Greene. With respect to non-lethal conflict, such a door may now be opening.

NOTES

1 Throughout this report, "strategic nonlethal weapons" implies weapons that achieve a strategic objective; they may be tactical weapons used on a large scale, or nonlethal weapons delivered from a distance of thousands of Kilometers, or (perhaps only) weapons that might act primarily on national leaders.

2 Neither the chair nor the director of the Independent Task Force was granted significant access to these programs, despite an explicit request to the deputy secretary of defense and a secret-level briefing by DoD that resulted from this request. In this context, a "large program" might have an annual budget of \$100 million. While such restrictions on access may be intended to support security goals, narrowly defined, they impede useful support and informed criticism that respects security limitations.

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