STRATEGIC ASSESSMENT:

NON-LETHAL WEAPONS

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Background

In the late 1980s, scientists at the nuclear labs and at DARPA began developing concepts for weapons that came to be called "non-lethal." Beginning in 1990, Ray Cline, chairman of the Global Strategy Council (and formerly DDI at CIA) sent a series of letters to the President, the Secretary of Defense, and the Under Secretary for Policy, urging that DoD aggressively pursue non-lethal weapons (NLWs). Secretary Cheney became interested in the subject, and in the Spring of 1990 commissioned a Nonlethal Strategy Group to formulate an approach to the issue. OASD(SO/LIC) participated in this group. In 1991, the group released its report, which was coordinated with ASD(SO/LIC). The major findings of the group were that NLWs

- Are operationally attractive
- Are legally and morally defensible
- Can be force multipliers when used in conjunction with traditional means... and are consistent with the military principles of economy of force and mass
- Are technically feasible
- Are affordable.

The group also found that a "comprehensive management approach" was needed to "better focus supporting programs such as intelligence and targeting, integrate available capabilities into military service doctrine and inventories, and guide future investment into research and development of promising capabilities."

At the same time, the Global Strategy Council proposed that a National Security Decision Directive (NSDD) be issued by the President, and even submitted a draft for one to the Secretary of Defense (this was not pursued). A substantial amount of publicity for NLWs was generated, mostly by proponents at the Global Strategy Council and at the national labs. Elements of the OSD policy cluster, together with DARPA, were very actively pursuing NLWs. Also in 1991, Congress sent a list of questions to DoD asking about the Pentagon's intentions regarding NLWs, and OSD sent non-committal responses back.

A proposal was developed by OSD officials to create a high profile Non-Lethal Technology Initiative, and to have USD(P) and JCS prepare an acquisition implementation strategy, including promulgation documents, policy statements, and a public initiative. The proposal was turned down by the USD(P) in September 1991 and apparently never reached the Secretary of Defense. The reason officially given was that the existing approach was adequate. Apparently there were also disagreements at senior levels of OSD Policy on what overall approach should be taken. Some time thereafter, these officials concluded that the matter should be held in abeyance, and directed their staffs to drop the issue. Since then, no office in Policy has picked up the lead.

The Army appears to be the Service with the strongest interest in NLWs. TRADOC's pamphlet on AirLand Operations [U.S. Army, 1991] states:

> "...situations will arise where the destructiveness of conventional weaponry is too much and diplomacy is not enough... A major opportunity exists in nonlethal technologies... with potential for development into weaponry that can disable or destroy an enemy's capability without causing significant injury, excessive property destruction, or widespread environmental damage."

The Army has gone so far as to draft an operations concept for disabling measures [U.S. Army, 1992]. This concept

> "...serves as a basis for developing doctrine, training, leader development, organizations, and materiel requirements and solutions for developing disabling measures capabilities. It provides a framework to understand disabling measures and how they may be employed to expand and enhance current military capabilities... it identifies key technological areas having the potential of meeting Army requirements for disabling measures." [NOTE: Formal Army requirements do not exist yet. The Army expects them to be derived from the operations concept after it is approved.]

The types of disablement identified in this concept include:

- Impair human capabilities
  - temporarily dazzle or overcome human operators with intense light
  - disperse crowds using transient-effect generators which produce a frequency or sound to temporarily immobilize or disorient humans
  - calm people or put them to sleep
  - stun or incapacitate personnel

- Defeat materiel systems
  - blind optical sensors and targeting devices
  - destroy or inactivate electronics, including electronic ignitions, detonators, communications, and radars
  - cause vehicles to stop or keep aircraft from flying
  - ignite/destroy reactive armor
  - cause computer driven systems to malfunction or induce operating errors

- Attack strategic and tactical materiel support systems
  - weaken or change fuels and metals
  - contaminate or plug water pipeline
  - defeat modern materials (i.e., composites, polymers, alloys).

The Air Force staffed the NLW issue in the Fall of 1992, and has adopted the position that it will start a program for NLWs if it is directed to do so by OSD, but will not take the initiative on its own. (One exception is the non-nuclear EMP weapon discussed below.) The Navy appears to have ignored the question entirely.

A substantial amount of interest in NLWs has continued outside of DoD. The national research labs and various contractors have been pursuing the technology, articles are continuously appearing in the open literature, conferences and workshops have been held, and the Global Strategy Council, together with the Center for Strategic and International Studies, has been keeping up the pressure and commissioning studies and reports. The R&D arm of the Department of Justice has also expressed strong interest in taking advantage of DoD efforts. In November 1993, a large conference on NLWs will be held at the Applied Physics Laboratory of Johns Hopkins University. It is significant that the Attorney General will address the conference, in addition to E.C. Meyer, Edward Teller, and several active duty three-star flag and general officers.

Importance to OASD(SO/LIC)

NLWs are significant to OASD(SO/LIC) because they:

- Potentially could benefit SOF in carrying out assigned missions
- Fit the unique character of SOF missions and equipment
- Have significant applicability at the lower end of the conflict spectrum
- Are attracting considerable and growing interest growing in the defense community
- Show promise of providing new alternatives for conducting LICs
- Could influence U.S. policy for LICs.

In addition, SOF traditionally has been on the leading edge of key innovations, and would be a natural home for new NLWs just becoming operational.

Objectives

The objectives of this strategic assessment are to:

- Analyze important NLW issues from a SO/LIC perspective
- Recommend a policy position on NLWs
- Recommend a course of action.

Terminology and Definitions

The term "non-lethal weapons" appears to have been the original phrase coined to describe the class of weapon concepts under discussion, and is still in widespread use. Los Alamos' definition of this term [Alexander, 1993] is:

> "Weapons that disrupt, destroy or otherwise degrade functioning of threat materiel or personnel without crossing the 'death barrier.'"

Another definition of non-lethal weapons developed by OSD [OSD, 1991] is:

> "Instruments used in combat which are designed to achieve the same tactical or strategic ends as lethal weapons, but which are not intended to kill personnel or inflict catastrophic damage to equipment."

The use of the word *intended* signifies that the weapons can in fact kill personnel or inflict catastrophic damage to equipment. The recognition that the term "non-lethal" might overstate the capabilities of the systems led to the creation of a variety of alternate terms in an attempt to more accurately describe them. The term "disabling systems" was later coined by OSD and has proliferated in the community. The Army defines a "disabling weapon" [U.S. Army, 1992] as:

> "Any instrument designed and employed with the intent to disable personnel or equipment while avoiding killing personnel or physically destroying equipment or facilities."

Other terms in use are "low-lethal," "less-than-lethal," "soft kill," and "mission kill." The Army describes "nonlethal operations" somewhat expansively [U.S. Army, 1992] as:

> "Military action involving the integration of strategy, tactics, weapons, and devices with the primary objective and intent being to avoid loss of life or physical destruction while eliminating an adversary's ability to perform its mission."

For the sake of simplicity, the term non-lethal weapons (NLWs) will be used throughout this paper.

Technology Push vs. Policy Pull

NLWs have been offered primarily by the technical community of scientists, engineers, and weapon manufacturers as valuable additions to U.S. military capabilities. It is recognized that some in this community, particularly the national labs, have seen their customer base and their very *raison d'etre* erode with the disappearance of the Cold War and the deemphasis on

nuclear weapons and warfare. The labs have thus been looking for ways to remain relevant and useful, and they see NLWs as one of those ways. And commercial interests, of course, are always at play when the possibility exists for acquisition of new weapon systems. There is thus an element of "a solution in search of a problem" with regard to NLWs. The question might be asked, "What problem are they solving?" Which CINC has declared, "I must have NLWs in order to accomplish my mission"? Commanders and policy makers have not generated a requirement for NLWs; nor has the JROC considered such a requirement. The current draft of the SOCOM Technology Investment Plan, considered a general roadmap rather than a set of hard requirements, includes the following passages [USSOCOM, 1993]:

> "SOF requires the capability to selectively damage and/or immobilize personnel and/or critical equipment/systems. To render key personnel ineffective for a selectable period of time, without their having memory of the events that transpired and to incapacitate the enemy's capability to manufacture, transport, emplace or employ war materiel. These systems/weapons will fill the vacuum between diplomacy and lethal force in regional conflicts...
>
> "SOF requires the capability to engage selected targets with Non-Lethal, Soft-Kill, Anti-Materiel, Low-Collateral Damage or System Disabling Measures. This variable effects system will provide the option, based on the mission and sensitivity, to destroy and/or immobilize personnel and/or critical equipment/systems..."

These statements were composed by the SOF R&D community with inputs from the SOF operational community. They have not been formally validated, and the word "requires" in the first paragraph is to be taken in an informal sense.

Notwithstanding these factors, it would be premature to dismiss NLWs as serving no useful purpose. Part of the reason why commanders and policy makers have not articulated a need for NLWs could be that the concepts and technology are so new. People are not fully aware of the potential of these systems, and it is natural for their possible utility to be unappreciated. And many of the proposed NLW technologies themselves are embryonic.

NLWs could make two types of contributions. One would be to improve the execution of *current* types of missions -- allow them to be accomplished faster, cheaper, with fewer resources, at lower risk, with less of a national commitment, with less collateral damage, or with fewer casualties. Another contribution would be to allow our military forces to undertake *new* types of missions -- those that would not be operationally feasible with current systems, except at very high cost. A detailed analysis of how NLWs could facilitate the conduct of a broad spectrum of specific military missions has not be performed, according to available information. However, a very recent study by the Institute for Defense Analyses [Biddle, et al, 1993] has identified shortfalls in current capabilities to accomplish certain types of missions, and has evaluated the potential contributions that NLWs could make. The emphasis of the study is not on NLWs, but on technological ways of solving problems, including but not limited to NLWs. The study also focuses on missions that we currently

have only marginal capabilities to accomplish, such as storming a major nuclear weapon development complex, and excludes consideration of how NLWs could facilitate missions that we can currently accomplish, such as peacekeeping. The follow-on to that study, to commence shortly, may expand its scope somewhat (in ways that have not been clearly determined thus far), and the sponsor in OSD has agreed to consider inputs from OASD(SO/LIC) for the new task order. It is clear, however, that the follow-on will remain broad in scope and will consider NLWs as only one of many types of possible resources. It is also possible that future analytic work on the Military Technical Revolution, a study project that the Secretary of Defense has approved, will examine these issues in broader terms.

Technological and Operational Issues

Proposed NLWs span a broad spectrum of technological maturity. Some are nearly operational or might be made operational fairly readily, and others are merely concepts. Most of them are still in the laboratory. Proponents have given assurances that the proposed systems are technically feasible, and only need development funding to make them happen. However, NLW concepts have thus far not been subjected to a rigorous, objective, critical scientific evaluation by a group of subject area experts. The important questions of their technical feasibility, their development risk, and their acquisition cost remain unanswered and, in general, unasked. It is not known how affordable or cost-effective any of them might be.

A number of extremely exotic technologies have been proposed by developers. One of these, "acoustic psycho-correction," is claimed by its Russian and American proponents to be able to influence individuals by inserting thoughts in their minds through subliminal suggestion. During during the Waco crisis the Department of Justice requested DoD help in identifying and possibly obtaining the device being marketed by the Russians. Another proposed technology is "intelligent micro-robots," that when unleashed in large numbers against enemy equipment, would autonomously locate and destroy electronic control systems and power supplies.

If NLWs are in fact technically feasible, their operational feasibility would also need to be determined. It is generally not known how well the technologies could be weaponized, that is, packaged into a form that is suitable for storage, handling, and employment in the field with an acceptable level of reliability and margin of safety. The safety requirement refers to the need to protect our own personnel and materiel from the effects of the weapons. The degrees of proficiency that would be required of operators, and the amount of training they would need, are also largely unknown. Successful employment of NLWs could also necessitate extremely precise coordination and C^3, and for some types of NLWs could depend on favorable weather. It has been suggested by one of the proponents that separate non-lethal warfare units be formed within operational commands, since the weapons would be highly sophisticated and their users would require very substantial preparation. If this is the case, it would be among the factors discouraging their adoption; a widely held point of view is that new systems should be made to adapt to their human users, rather than the other way around. It would be understandable if the military were reluctant to adopt systems that require

changes in force structure.

Even if NLWs are technologically and operationally feasible, it is possible that some of them would have serious negative side effects that if known, would discourage their use. Some possible examples:

- If a nursing home happened to get within line of sight of a non-nuclear Electromagnetic Pulse (EMP) weapon we are trying to aim at enemy electronic systems, the weapon could short-circuit pacemakers, killing noncombatants.

- Genetically engineered microbes intended to coagulate gasoline supplies, making them unusable, could mutate into a deadly plague.

- A "calmative agent" is sprayed on enemy troops to reduce their capacity to fight, and five or ten years later everyone who was exposed could come down with lung cancer, creating another Agent Orange situation. (Do we need FDA approval for NLWs?)

- An "infrasound" device used to disorient enemy troops could cause strokes and heart attacks because it is placed at too strong a setting.

Not all of these examples are necessarily likely, but they illustrate the ways in which NLWs could "backfire." Some other problems suggested by IDA in their report:

- Sticky foams would suffocate exposed individuals if it gets on their noses and mouths. Although the foam itself is nontoxic, cleanup requires the use of toxic solvents.

- A "plasma shock" weapon, intended to stun victims with a Taser-like electric shock generated over an area by a plasma shock wave, could scorch crops or generate forest fires, and could explode any collocated munitions.

Until an independent scientific review of NLWs as described earlier is accomplished, the possible detrimental side effects of NLWs will not be well understood. These effects would not necessarily negate the utility of the weapons, but they must be known before the weapons are acquired and employed. In particular, it is imperative that policy makers considering the use of NLWs in a given situation be aware of the possible negative consequences, especially if the weapons are to be advertised to Congress, our allies, or the public as "non-lethal" or "environmentally safe."

The question of enemy countermeasures is very important. If the existence and nature of U.S. NLWs becomes generally known, future adversaries might be able to easily implement countermeasures that would defeat them (or some of them). For example, over time a state with aggressive intentions could procure and distribute to its military thousands of sunglasses

that protect against high intensity light at specific frequencies, if it knows about a U.S. weapon that uses blinding light. Other kinds of NLWs could prove to be "silver bullets" that could be used effectively only once; that single use would alert current and future adversaries about their characteristics and allow them to acquire systems or adopt practices that negate them. The potential for countermeasures does not appear to have been thoroughly examined.

NLWs that are technologically and operationally feasible, produce no undesirable side effects, and have no reasonable countermeasures, could have unrealistic or impractical intelligence requirements. The intelligence needs of NLWs, and the feasibility of satisfying them, have not been addressed in any depth. It should be noted in this regard that having difficult or stringent intelligence requirements would not necessarily invalidate a proposed NLW, if the effect it can achieve would be extremely valuable to us.

Some NLWs have been proposed by individuals or organizations that do not have significant military operational experience, and who cannot always correctly judge their utility. For example, an entanglement device has been proposed that would snare a boat propeller in cheap steel cable, preventing it from rotating. According to SO/LIC staff (a SEAL), within minutes a diver from the ship would be able to find the problem and free the propeller; the correct way to attack a ship would be to use a small charge to break the metal brace holding the propeller rotor, forcing the ship into drydock for at least several days. The entanglement device would not be very useful in denying an adversary the use of his ship, and the SEAL who applies it would be subjected to a risk that is not commensurate with the effect. It is possible that other proposed NLWs would be found to be of limited utility if they were critically reviewed by competent military personnel.

Missions

The Army concept document sketches a very wide variety of offensive and defensive missions that could be accomplished with the aid of NLWs. These include (condensed from U.S. Army, 1992):

- Peacekeeping/Conflict Avoidance Operations
  - Riot/Mob Control
  - Sanctions
  - Interdiction of Tactical/Strategic Resources
  - Conflict Intervention

- Non-lethal Operations
  - Hostage Protection/Retrieval
  - Military Incursions
  - Counterdrug/Terrorist Operations

- Conventional Operations
  - Large-Scale Operations
  - Military Operations in Urban Terrain
  - Defensive Operations

One noteworthy example of the Army's thinking on these missions is Military Incursions [U.S. Army, 1992]:

> "U.S. forces may be required to go into a country to accomplish a single objective, such as the destruction of a chemical weapons production facility or the capture of nuclear weapons. Disabling measures could be employed to slow the arrival of that country's military forces before they could effectively intervene in the operation. U.S. forces could be extracted without a major engagement."

The use of NLWs in counterproliferation could be one of their most important applications. They could be used not only in the defensive mode described above, but also *offensively* to help undermine a nation's indigenous Weapons of Mass Destruction development project, if such an action were consistent with U.S. policy. Counterproliferation is receiving an enormous amount of attention, and conceptually it is caught between the need to be able to intervene in proliferant states' WMD programs on the one hand, and the lack of low-signature means for doing so, on the other. It is quite possible that certain NLWs could help provide those means. From both a political and an operational point of view, a linkage between NLWs and counterproliferation could be a highly potent combination.

Another significant example is Military Operations in Urban Terrain [U.S. Army, 1992]:

> "Access/escape routes can be blocked in buildings with aqueous foam and other measures to prevent surprise approach of reinforcements, channel movement through established firing zones, or protect areas from entry. Urban environments also increase the possibility of comingled combatants and noncombatants. In these areas it would be better to avoid employment of high explosive ordnance and the resultant high level of collateral damage."

Instead of our soldiers taking great risks by going door to door in order to find and disarm combatants, (the current approach), we could put the occupants of a sizable area temporarily to sleep or temporarily disorient them, remove their weapons, and move on.

It is likely that many other possible uses of NLWs would be identified through more comprehensive study.

Strategic Applications

It is generally assumed that NLWs would be employed mostly in close-in tactical situations. However, the practical upper bounds on the *scale* of use have not been determined.

The Army concept recognizes this possibility [U.S. Army, 1992]:

> "...Large-Scale Operations. While much of the focus is on the lower end of the operational continuum, some disabling measures could have a significant effect on larger operations. Strategic interdiction of warmaking necessities such as electricity and POL resources could hasten the end of conflict..."

The scenarios envisioned above imply attacks on *many* relatively *small* targets. However, another possible strategic application could be against *few* relatively *large* targets -- troop concentrations or army groups massing along a national border in preparation for invading their neighbor. If appropriate NLWs could be dispensed in large enough quantities, in a short enough time, without seriously jeopardizing the safety of our own forces, it might be possible to delay hostilities long enough to accomplish important defensive or diplomatic actions. The Army concept document mentions this option [U.S. Army, 1992]:

> "Disabling measures could be employed preemptively before the onset of hostilities or covertly after initiation of open conflict between two countries. They could remove the capability to engage forces in the near term by neutralizing or limiting availability of equipment and supplies. Such measures could target the mobilization capabilities of military forces to provide time for settlment negotiations. Such interventions may be made more acceptable to the countries involved and to the American public if large numbers of U.S. military forces were not used in the intervention."

The Army concept document also recognizes the possibility of using NLWs on a large scale in combat directly involving U.S. forces, to supplement more conventional means [U.S. Army, 1992]:

> "To avoid the destruction of conventional weapons, disabling measures could enhance operational fires with the following capabilities: ...*Defeat enemy-mounted formations over large areas*... Such weapons need to be able to achieve effects similar to nuclear and traditional chemical weapons without crossing the nuclear or chemical thresholds."

The concepts outlined here might not be operationally feasible; but until the practical upper bounds of the possible scale of use of NLWs are determined, they should not be ruled out. On the other end of the scale of conflict, non-lethal strategic attacks using a single weapon or a small number of weapons could also be useful in a LIC environment.

Security Issues

Due to political sensitivity or the need to forestall development of countermeasures, it is possible that important NLW development programs, or even operational NLW systems, exist in a closely held mode. This could be a very legitimate means of retaining the strategic advantage we enjoy by denying potential adversaries knowledge of these systems' very existence. Such systems might also be extraordinarily susceptible to being defeated by enemy

countermeasures, if their characteristics were generally known. If these systems do exist, this analysis would be handicapped by lack of information. It would also be possible that NLW policy adopted in ignorance of these systems could be incompatible with them. More seriously, the potentially valuable contributions that operational NLWs could make to dealing with current conflict situations may be absent from policy options developed to help manage those situations. Although commanders on the scene could use them if appropriate, policymakers might be unaware of their existence if policy development channels lack the necessary information. And depending on how closely held the programs are, any deterrent value from having them could be lost.

Policy Issues

General

NLWs are strategically important enough for there to be a DoD-wide policy statement concerning them. The Non-lethal Strategy Group found during the previous Administration that we should in fact add NLWs to our weapons arsenal, and that finding was affirmed by the USD(P) at the time. While the current Administration has not addressed NLWs in the same depth, it is likely that another high level review would come to the same conclusion, particularly since the Secretary of Defense has continually expressed a strong interest in advanced technology weapons.

However, a number of other first-order policy questions for NLWs have not been clearly stated, and certainly have not been answered. These include:

- What *kinds* of NLWs do we want (beside the electronic warfare systems and PSYOPS apparatus we already use)?
- In what circumstances would they be used?
- How would they be used?
- By whom would they be used?
- Against what classes of targets would they be used?
- How prominent a role should NLWs play in our overall defense posture? Should it be high-profile to maximize deterrence or low-key so as not to stimulate development and proliferation of countermeasures? What public statement should be made (if any) about our operational NLW forces?
- What policy guidance should be issued to the Services and combatant commands for acquiring and fielding NLWs, and for developing doctrine and operations plans

for their operational NLWs?

In general, the implications of NLWs for U.S. national security policy have been addressed only superficially in available literature. A conference on the subject was held by MIT several months ago, and two attendees have independently reported that the subject matter presented was weak. It is clear that thinking in this area is in its infancy, as are many of the weapons themselves.

One of the few cogent discussions appears in the Army concept document [U.S. Army, 1992]:

> "For regional stability and peacekeeping operations to be long-term political successes, the U.S. must control and limit collateral damage and casualties. The Army's chief difficulty is that it has few capabilities suited to this limited damage, limited casualty requirement. The goal in developing disabling measures is to complement the existing arsenal with new capabilities to meet this requirement.
>
> "...Disabling measures capabilities afford expanded crisis and contingency response options. They enhance the Army's ability to meet the requirements of proportionality and discrimination in the application of force during military operations. These measures can produce force multipliers when used at appropriate times with traditional weapons. Some applications can be particularly useful in situations where the threat is not clearly distinguished from the civilian population. In densely populated areas, techniques for disarming or immobilizing hostile forces offer an attractive alternative to the use of conventional weapons. Risks of military overkill, international censure, political repercussions, or media criticism can be reduced."

Over the last several years, experience in military intervention and the evolution of national security politics have led to an increasing number of constraints against future military intervention. Strident objections to intervention and its consequences coming from critics in Congress, the media, the national security community, domestic political groups, and foreign countries, have made it much more difficult for the White House to decide that military intervention is necessary in any particular case.

Effect on Constraints Against Intervention

The constraints against U.S. military intervention abroad stem partly from a growing intolerance for:

- American military, foreign civilian, and even foreign military casualties
- Civilian suffering in the post-conflict phase due to damage to national infrastructure
- Lack of a clear threat to "vital American interests"

- Risking escalation of an already bad situation simply by making ourselves part of it, i.e., "interfering"

- Making a commitment and then having to back away from it, thereby losing face and undermining our international standing and credibility.

From the point of view of a national policy maker, it is useful to think of the utility of NLWs in several dimensions. Once the decision is made to intervene militarily in a foreign situation, NLWs can provide more humane means of doing so. But a very significant implication of having NLW forces available is that they can actually *lower the threshold* at which that decision is made, i.e., *they can make us more prone to act.* By weakening some of the constraints against intervention listed above, they would allow us to be more ambitious in dealing with LICs than we might be otherwise. This bolder, more interventionist posture would be an important change in our national security policy.

An important consequence would be a strengthening of deterrence. If nations contemplating aggressive acts know that the U.S. is likely to oppose them using weapons that are just as effective as conventional ones but which would not precipitate angry domestic calls for us to withdraw, they will be less likely to act.

Uses in Low Intensity Conflicts

If a crisis does begin to develop, covertly delivered NLWs could disable elements of an opponent's military forces without an immediately discernable cause such as explosions, and this could increase his uncertainty, reduce his confidence, and help keep him off balance. There could also be great deterrent value in general if word of American "secret weapons" that could immobilize military forces without killing soldiers spread through the Third World. In local situations, such perceptions could be deliberately spread through a PSYOP campaign.

Another possible context for use of NLWs might be highly ambiguous situations that are not clear enough to justify the use of lethal force, but where it would be desirable to delay hostile actions by the antagonists. NLWs could also be used to frustrate efforts to mobilize military forces from their peacetime posture, without being so prevocative as to precipitate a conflict.

Various commentators have pointed out the potential for NLWs to add new options for policy makers in the "gray area" between no application of military force and application of lethal military force. This would make the low end of the spectrum of escalation more of a continuum and would be very valuable to policy makers, since it would enable them to increase the pressure on an adversary more gradually. It should be noted, however, that use of NLWs in the "gray area" could backfire, if the adversary interprets it as evidence of a lack of American resolve, as a puny response to his challenge, encouraging him to act more aggressively than he otherwise might if faced with lethal threats or even with *no* threats. Of course, in such cases, we could then bring lethal threats to bear if appropriate.

Limitations

Other potential limitations of the effectiveness of NLW employment should also be anticipated. It would be possible for a shrewd adversary to defeat an NLW attack strategically, even after it succeeded tactically, by placing many dead civilians around the site of the attack and revealing it the the media. Or, after successful wartime NLW attacks on an adversary's national infrastructure, in the post-war phase the adversary could leave his facilities unrepaired even though they are easy to repair, causing great civilian suffering that could be blamed on the U.S. (Saddam Hussein did this after Desert Storm). Thus even a perfectly executed attack using perfect NLWs could fail politically.

Arms Control and Ethical Considerations

Some proposed NLWs probably violate arms control agreements that the U.S. has signed. IDA believes that "biodeterioration agents" (microbes genetically engineered to eat virtually any substance) may violate the Biological Warfare Convention. IDA also has stated that non-lethal incapacitation by drugs (soporifics, muscle relaxers, and hallucinogens) would violate the Chemical Weapons Convention, which prohibits chemical weapons, including those that only cause temporary effects that disappear within a short time [Biddle, et al, 1993]. The legal status of other proposed biological NLWs should be clarified, such as insect pheronomes sprayed on enemy troops to attract large numbers of local insects to them. It is clear that before the Department approves the acquisition of any new NLWs, an authoritative legal analysis should be obtained.

Use of NLWs, particularly those that produce physiological or emotional effects in humans, can have moral or ethical considerations that must be understood when using them as policy instruments. Similarly, chemical and biological weapons, even if they did not violate arms control agreements, might have detrimental ecological or environmental consequences, and policy decisionmaking would need to account for them as well. Before endorsing the acquisition of NLWs or ordering their employment, policy makers should be aware of these and other objections likely to be raised by critics.

These observations only touch on some very complex and subtle issues. A more thorough analysis of the implications of NLWs for U.S. national security policy would provide valuable insights.

Recommended OASD(SO/LIC) Policy on NLWs

Although the Department of Defense has not adopted a policy on NLWs, OASD(SO/LIC) can, and should, adopt its own. In view of the foregoing discussions, that policy should be:

- Avoid making blanket endorsements or rejections of NLWs as a class

- Remain receptive to the potential that NLWs can have

- Make proponents and developers aware of our concerns, and encourage them to present information that can help allay them

- Support the development and acquisition of NLWs that it appears will be able to satisfy the following criteria:
    - Are technologically and operationally feasible
    - Are affordable
    - Would not violate arms control agreements that the U.S. has signed
    - Would not create serious undesirable side effects when employed
    - Could not be easily defeated by enemy countermeasures
    - Have intelligence requirements that are commensurate with the value of the effect achieved
    - Have tangible political/military utility
    - Could contribute clearly identifiable and significant new options for commanders and policy makers to use in managing conflict situations

- As it becomes apparent that particular types of proposed NLWs could help solve specific policy problems, support the development, acquisition, and fielding of those weapons

- As NLWs become operational, encourage their incorporation in U.S. military doctrine and planning

- As policy options are developed during actual conflict or pre-conflict situations, ensure that the potential contributions that appropriate operational NLWs can make are fully considered.

Recommended Course of Action

In view of the foregoing discussions, it is suggested that the following activities would help OASD(SO/LIC) address important NLW issues effectively.

Technical Feasibility

In order to help OSD objectively judge the potential viability of NLWs, the Defense Science Board (DSB) should be asked to undertake an in-depth review of NLW concepts and technology. This would require ASD(SO/LIC) to send a memorandum to the USD(A&T) outlining the issues and requesting that the DSB conduct a study. Upon acceptance, terms of reference would be developed, specifying the nature and time frame (I suggest 90 days) of the study, and a task force of scientists would be formed. Funding might be provided by USD(A&T), but it is possible that the sponsors would have to provide some funding. The

cost would be roughly $50K for a support contractor, plus any stipends and travel expenses for the task force members, for a total cost of roughly $100K. Opportunities for joint sponsorship with other agencies would be pursued. Personnel in USD(A&T) have indicated a strong desire to co-sponsor a DSB study with us. The Air Force has expressed an interest in doing so, and the Army is considering tasking the Army Science Board to do a similar study. However, no office has made a firm formal commitment to contribute funds, since discussions have been only exploratory thus far. The leader of the task force would brief the findings to the DSB, which would then approve and publish the final report when it is satisfied with the work.

For each candidate NLW type, the DSB would be asked:

- Is the concept technically feasible? i.e., would it work as advertised?
- Can the technology be effectively weaponized?
- Against what kinds of targets could the weapon be used?
- What are the upper bounds on the scale of use?
- How much would it cost and how long would it take to develop and procure the weapon, and how much would it cost to operate and maintain it?
- What technical risks would be involved in development?
- What kind of training would be necessary for users?
- What enemy countermeasures could be developed? Is it a "silver bullet?"
- What is the potential for misuse or unintended consequences of use? Could it "backfire?" Could it have calamitous environmental side effects?

We would expect that OASD(SO/LIC) Forces and Resources would be integrally involved in helping manage this project.

It is important to note that studies of this type might have been done for closely held programs, and we would not be aware of this to due security restrictions. However, it is likely that such cases would have been more narrowly focused on specific systems, rather than considering the very large number of NLW concepts that have been proposed in unclassified and non-closely-held security contexts.

Weapon concepts that the DSB finds technically feasible would be subjected to further consideration in the efforts proposed below.

Operational Employment

This project would help judge the operational utility of proposed NLWs, and would be conducted with the support of a study contractor. A number of actual previous military operations, and hypothetical but plausible operations, would be established as analytic test cases. Each operation would be characterized in detail, focusing especially on which existing lethal systems were/might be used and how they were/might be used. This set would be composed so as to allow examination of as broad a range of scenarios and weapon types as possible, within study resource constraints. Special emphasis would be placed on counterproliferation missions and peacekeeping missions. In each case, we would demonstrate how particular NLWs could be used instead of, or in combination with, lethal ones. We would also judge the operational feasibility of employing them, and gauge their probable effectiveness. In addition, we would carefully define the intelligence requirements for employing the NLWs, and evaluate the fesibility of satisfying these requirements. Of particular interest would be how the use of NLWs might allow each mission to be conducted:

- With fewer friendly, enemy, or non-combatant casualties
- With less collateral physical damage
- With shorter-lived effects
- With a smaller size force
- In a shorter period of time
- With less risk
- At lower cost.

Also of interest in each scenario would be any disadvantages of NLWs, such as:

- Unintended consequences
- Use of enemy countermeasures
- Limited scale or duration of effects
- Dependence on favorable weather.

We would also identify any situations in the set of test cases where NLWs would *not* be applicable.

As with the technical feasibility effort, it is possible that studies similar to this have already

been conducted uniquely on behalf of closely held programs of which we are unaware. However, according to available information from knowledgeable sources, this type of effort has not been conducted comprehensively to cover the broad variety of NLW concepts that have been proposed outside of closely held channels.

It is anticipated that OASD(SO/LIC) Forces and Resources would be heavily involved in helping Policy Planning manage this effort. We would also invite participation by other interested offices in OSD, the Joint Staff, and the Services.

National Security Policy Implications

A comprehensive, in-depth analysis of the implications of NLWs for U.S. national security policy would be conducted, with the assistance of a contractor. This study would focus on the following topics:

- Ways in which NLWs could weaken the constraints against U.S. military intervention overseas
- Types of intervention to which NLWs could make significant contributions
- Possible roles that NLWs could play in dealing with LICs and in crisis management
- Indirect effects of NLWs on U.S. foreign policy
- Contributions NLWs could make to deterrence
- Effects NLWs could have on U.S. counterproliferation policy, programs, and missions
- Effects NLWs could have on U.S. peacekeeping policy, programs, and missions
- Ways in which use of NLWs could backfire politically
- Legal, arms control, and ethical considerations of fielding and employing NLWs.

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