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URBAN CLOSE AIR SUPPORT AND NON-LETHALITY

by

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A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

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04 February 2002

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## Abstract

### URBAN CLOSE AIR SUPPORT AND NON-LETHALITY

Global urbanization is rapidly changing the face of the world and guarantees that combat will occur in urban areas. Enemies of the United States will utilize the complex infrastructure of cities to asymmetrically counter the technological superiority of U.S. forces. The density of non-combatants in urban areas and the intricate infrastructure present monumental challenges to the U.S. military, particularly with regard to collateral damage and non-combatant casualty. These challenges are evident in the Russian experience in Chechnya. This urban conflict is emblematic of the security challenge the U.S. military will face in the future, and is reviewed with a focus on the implications for the employment of Close Air Support (CAS).

This paper examines the use of CAS during military operations on urban terrain (MOUT) and the potential benefit of the use of non-lethal weapons (NLW) from CAS platforms. The combination of CAS and NLWs enhances the combat effectiveness of ground forces while minimizing non-combatant casualty and collateral damage. When used synergistically with lethal weapons, NLWs can increase the lethality of U.S. forces, and also provide a graduated response capability to the commander for any combat situation.

CAS and NLWs are not fully incorporated into MOUT training and doctrine. Commanders must develop robust, joint MOUT training to integrate all elements of the combined arms team in the urban environment, and the effects of NLWs must be fully incorporated into mission planning and execution. The time is now to prepare for the challenging and inevitable urban battlefield.

## Introduction

*Kind-hearted people might of course think there was some ingenious way to disarm or defeat an enemy without too much bloodshed, and might imagine this is the true goal of war. Pleasant as it sounds, it is a fallacy that must be exposed: war is a dangerous business that the mistakes which come from kindness are the very worst.<sup>1</sup>*  
Carl von Clausewitz

As global urbanization continues, the difficulty of urban warfare will continue to complicate the future for United States forces. The density of non-combatants and infrastructure in the urban environment present a context that does not permit the unrestrained use of highly destructive and lethal weapons.<sup>2</sup> The desire to minimize civilian casualty and collateral damage imposes significant restraint on the military commander.\* The use of precision ordnance addresses the problem partially, but still provides only limited options to the commander conducting military operations on urban terrain (MOUT). Non-lethal weapons (NLW) provide additional options. The effects furnished by NLWs give the commander a variety of capabilities that allow a graduated response to combat situations of various intensity. This capability gives the commander force application options that can be used before conventional weapons are appropriate, or synergistically with conventional weapons. During MOUT, NLWs can minimize collateral damage, civilian casualty, and fratricide, while maximizing combat effectiveness when used in conjunction with conventional, lethal weapons.

Some challenges remain even with the proper mix of lethal and NLWs. Urban terrain effectively compartmentalizes and shrinks the engagement area between friendly and enemy forces. In this close context, seamless integration and cooperation must exist between the services to provide accurate and timely fire support to small units who will potentially be

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\* Commander refers to the Theater Commander-in-Chief (CINC) or Joint Force Commander (JFC); this generic term will be used throughout.

outnumbered and potentially surrounded. The three-dimensional infrastructure of a city, however, frequently prevents or limits the effectiveness of traditional fire support from artillery or direct fire systems. Aircraft, on the other hand, can maneuver freely in all dimensions above the city, and have inherent advantages that can fundamentally alter the outcome of a conflict regardless of its intensity. Operationally, aircraft offer considerable firepower and flexibility to the commander in MOUT where close combat with small units is expected. Close Air Support (CAS) capability is crucially important to these small units, and must be utilized in the joint combined arms team.

“The challenge for the commander is to integrate and synchronize the wide range of capabilities at his disposal to achieve his operational or strategic objective.”<sup>3</sup> Currently, however, CAS and NLWs offer capabilities that are not fully integrated into the joint combined arms team or MOUT training. An innovative use of CAS assets with NLWs will contribute significantly to the commander’s ability to be successful in MOUT while exercising restraint. The combination of CAS and NLWs, when used in conjunction with lethal weapons, significantly enhance the ability of the commander to apply force immediately and decisively during conflict of any intensity.

### **The Urban Environment: Reality of the Future**

*The political object is the goal, war is the means of reaching it,  
and means can never be considered in isolation from their purpose.<sup>4</sup>*  
Carl von Clausewitz

World urbanization trends indicate that by 2015, over 60 percent of the world’s population will live in urban areas,<sup>5</sup> with a large percentage in littoral regions.<sup>6</sup> Urban globalization is a defining characteristic of the future and will continue to present the U.S.

military with one of its most difficult challenges: fighting in cities. Recent history indicates that future military engagements will increasingly occur in the urban environment. Figures 1 and 2 clearly depict the urbanization trend and our consistent recent involvement in MOUT.

Urban Population in Selected Countries			
<i>Country</i>	<i>Percent of population</i>		
	1975	1995	2015
Former Yugoslavia	41	58	74
Mexico	63	75	86
Pakistan	26	35	57
South Africa	48	51	69
Colombia	61	73	84
South Korea	48	81	94
Turkey	42	69	87
Iran	46	59	75
United Nations Demographic Yearbook 1995			

Figure 1. Urban Population in Selected Countries<sup>7</sup>

Recent Military Operations in Urban Areas
Panama City (1989)
Baghdad (1991)
Kuwait City (1991)
Mogadishu (1991, 1992-1993)
Sarajevo (1992-1996)
Port au Prince (1994)
Monrovia (1996)
Freetown (1997)
Tirana (1997)
Belgrade (1999)

Figure 2. Examples of Recent Military Operations in Urban Areas<sup>8</sup>

Currently, the United States remains unchallenged by any adversary around the world with regard to its ability to conduct conventional warfare. American information and

technological superiority combined with the ability to mass firepower put any enemy at a qualitative, if not also quantitative, disadvantage on any battlefield. The exception is the compact urban environment. Here, the narrow urban canyons, dense electronic clutter, and preponderance of non-combatants, or "decoys", mitigate many of the advantages enjoyed by the United States. The problems and constraints that the city and its congestion present thwart the U.S. military. Forces conducting MOUT often do so in the context of various restraining factors that preclude the indiscriminate use of force.\*

The U.S. military is unparalleled in its ability to create the conditions for success with airpower. This has been the American approach to recent conflict and will likely be our initial response to military crisis. Precision weapons dominate these operations, and are largely successful at selective targeting to avoid excessive collateral damage and casualty, even in urban areas. However, when U.S. ground forces enter a city and the engagement phase<sup>9</sup> begins, the use of airpower becomes problematic due to the proximity of friendly forces. Once again, the city levels the battlefield for the adversary, providing an asymmetric approach to American technological superiority. The Russians found themselves facing the asymmetric urban challenge in Chechnya as the 20th century drew to a close. As the U.S. military looks to the future, it must be ready for its own version of Russia's war in Chechnya, and prepare to fight in the city as the Russians failed to do.

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\* The sources of restraint are beyond the scope of this discussion, but urban doctrine is replete with caution concerning collateral damage and non-combatant casualty. A partial list of restraining factors includes: American and international support considerations, coalition or alliance factors, and post-conflict restoration and reconciliation considerations. Additionally, restraint is often required by the Laws of Armed Conflict (LOAC) and Rules of Engagement (ROE). Fratricide avoidance is also a significant consideration.

## **Chechnya and the Implications for Urban CAS**

*By failing to prepare, you are preparing to fail.<sup>10</sup>*  
*Benjamin Franklin*

Russia's war against Chechnya\* is an instructive example of likely future combat operations and the security challenges that the United States will likely face in the years ahead. Though the overall readiness of the Russian military bears little resemblance to the current readiness posture of the U.S. military, the lack of overall success with respect to air operations in the urban environment deserves examination. In general, the performance of the Russian military, and specifically the Russian Air Force, fell well below expectations for a former superpower against a roughshod group of rebels with the minimum equipment needed for modern combat. Among the many MOUT challenges, terrain, weather, and aging equipment significantly hampered the operations from the air.<sup>11</sup> More importantly though, it was the lack of doctrinal vision, inadequate training, and the shortage of firepower options that contributed most directly to the Russian Air Force's difficulties. Significant improvements were made as the conflict progressed, but the innovations and adjustments made by pilots did little to minimize civilian casualty or prevent excessive collateral damage.<sup>12</sup> In fact, in the effort to find the correct mix of weapons and tactics to make airpower viable, lethality and civilian casualties increased. In the end, the Russians were forced to destroy the city they intended to save, and further alienated the population they intended to incorporate. The asymmetric advantages of the city of Grozny allowed the Chechens to deal the former superpower a severe blow as they stumbled into the urban

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\* There were three battles for Grozny, the capital city of Chechnya. The first, from December 1994 to January 1995, resulted in a costly Russian victory; the second, in August 1996, was a Chechen victory; and the third, in January 2000, resulted in another Russian victory. The third battle involved heavy, indiscriminate artillery and air bombardment in response to the urban threat.

environment. In desperation, the Russians turned to the use of airpower to overcome weakness in doctrine and training that left the ground forces near total defeat.\*

Like U.S. MOUT doctrine, Russian doctrine called for combined arms operations in urban terrain. Their training, however, did not make possible a functional joint effort, especially with regard to CAS. The primary training focus for the Russian military was on conventional, high-intensity, maneuver warfare in relatively unrestricted terrain. This focus left them woefully unprepared for the Chechen situation. Despite huge losses, the Russians overcame their initial failures as they modified operations and training to account for the new challenge that MOUT provided. Unfortunately, they learned the lesson the hard way, and sustained an extremely heavy blow before acquiring the impetus to change.

Integration of aviation assets with ground forces was a crucial weakness for the Russian MOUT effort. It was rarely done successfully and significantly hampered the potential for successful close support of ground troops. The most common response by the Chechens to the increasingly powerful Russian indirect and aerial firepower was “hugging” the Russian unit.<sup>13</sup> The hugging tactic caused Russian commanders to terminate fire support to prevent fratricide, which effectively isolated the infantry unit at its most vulnerable point, surrounded and unsupported. The success of this tactic, and the Russian inability to integrate fires had significant detrimental operational effects on the outcome of conflict. One Russian aviation commander noted that forward air controllers (FAC) were poorly trained for their jobs at the unit level, which sometimes led to disastrous results, including fratricide.<sup>14</sup> The solution to this problem was simple, yet counter-productive. Indiscriminate firepower was

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\* Russian leadership was hesitant to use the best of their ground attack machinery, especially modern strike helicopters, due to the vulnerability of rotary-winged aircraft while conducting MOUT in Chechnya. Accordingly, an analysis of air operations over Chechnya will provide an incomplete picture of the effectiveness of rotary-wing CAS platforms, where only the older, expendable equipment was employed.

delivered by (primarily fixed-wing) CAS platforms and artillery while ground units waited to sift through the rubble following the attack. In short, massive firepower was substituted for integration and coordination with ground forces.

Statistically, helicopters performed poorly in the fire support role in Chechnya and proved to be very vulnerable to even unsophisticated enemy air defense, including the RPG-7 (an unguided, rocket-propelled grenade anti-tank weapon). Fixed-wing ground attack platforms fared significantly better under attack due to their speed and armor, and may be more useful for MOUT due to their increased survivability and versatility.<sup>15</sup> Overall, the Russians were satisfied with the performance of the infantry, but weakness was continuously noted with regard to the combined arms team.<sup>16</sup> Additionally, there were several petitions for NLWs, but none were ever used.<sup>17</sup> Tranquilizer gas and riot control measures were recommended for future use and a method of distinguishing combatants from non-combatants (post-engagement) was necessary. The Russians frequently resorted to searching the pockets of civilians for military equipment, checking shoulders for bruises from firing weapons, and to sniffing them for the smell of gunpowder and gun oil.<sup>18</sup>

Recent investigations into the effectiveness of U.S. Joint CAS (JCAS) operational effectiveness suggest some similarities to the Russian lack of preparedness, albeit on a much smaller scale. The Joint Test Force (JTF) of the Office of the Secretary of Defense (OSD) was chartered with the task of evaluating the baseline operational effectiveness of Joint CAS and conducted extensive evaluation of this capability at the U.S. Army's National Training Center (NTC). In short, the results indicate that the lack of integration between fire support elements (FSE) of U.S. ground forces and tactical air control parties (TACP) of U.S. air forces significantly deteriorated the effectiveness of CAS.<sup>19</sup> Overall, the FSE/TACP team

achieved only one-third of the ground commander's desired effects for CAS during combat exercises.<sup>20</sup> The central problem revolves around the lack of integration at the small-unit level (battalion level and below) where MOUT will be conducted. While the JCAS evaluation occurred in a desert environment, the problems encountered will only be magnified during MOUT. The JTF assessed that training issues are at the heart of the integration problem.<sup>21</sup> CAS training is conducted predominantly in the absence of maneuver forces on the ground, on familiar ranges, with familiar targets, and primarily without exercising the required integration with ground elements. Consequently, the U.S. joint integration ability in MOUT is unsettled.<sup>22</sup>

The Russians eventually took Grozny, the capital city of Chechnya, by utilizing the World War II annihilation approach to urban combat. They flattened the city with artillery and air strikes and then slowly pushed their way through the remaining rubble only to find that their political objective was attainable only at unacceptable cost. The only option available to the Russian commander was the unrestrained, imprecise use of lethal firepower in an attempt to counter the threat posed by the Chechen rebels. The lack of preparedness and integration found in the Russian military instrument only contributed to the costly outcome. As a result, brute force was used to compensate for an inadequately trained and equipped combined arms team. The outcome could have been markedly different if the Russian commander had at his disposal various additional force application options, to include NLWs. The effects provided by NLWs may have allowed the Russians to address some of the urban challenges without destroying the city, alienating the population, and allowing many of the Chechen defenders to escape.

## **The Effects of Nonlethal Force Application**

*The degree of force that must be used against the enemy depends on the scale of political demands on either side.<sup>23</sup>*  
*Carl von Clausewitz*

Typically war has been defined by the use of deadly force. Since World War II, however, the United States has been confronted with limited conflicts where the use of force must be minimized in order to maintain destructive effects within tolerable limits. The limited political objectives sought necessitate the limited use of force. The international community and American leadership often expect that the U.S. military will be able to utilize the advantages of technological superiority in order to mitigate excessive damage and non-combatant loss of life.

Today, US policy makers and military leaders are searching for ways to maintain the moral high ground -- and public support -- as they commit American forces to military operations around the world to achieve national policy objectives. In an age where every use of US military force is intensely scrutinized by the media, the American public, and the international community, military operations are severely constrained. In order to gain and hold the moral high ground, rules of engagement for US forces now stress minimizing the number of casualties, both American and that of our adversaries, and limiting the amount of destruction caused by US military operations.<sup>24</sup>

NLWs effects provide a capability to the commander that allows a graduated response to a combat situation that requires restraint. NLWs fill the gap between lethality and diplomacy, and increase the effectiveness of both.

The concept of NLWs is relatively new to the U.S. military. The genesis of the program can be traced to a 1991 decision by the Secretary of Defense to direct the formation of a DoD Non-lethal Strategy Group to assess non-lethal defense strategies.<sup>25</sup> Later, in 1996, OSD published Department of Defense Directive (DODD) 3000.3, Policy for Non-Lethal Weapons. This document designated the Commandant of the U.S. Marine Corps (USMC) as the Executive Agent for the DoD NLW program<sup>26</sup>, and further specified the Unified

Combatant Commanders should ensure that procedures exist for the integration of NLWs into operational mission planning.<sup>27</sup>

DoD defines NLWs as "discriminate weapons that are explicitly designed and primarily employed so as to incapacitate personnel or material while minimizing fatalities, permanent injury to personnel, and undesired damage to property and the environment."<sup>28</sup> The effects of NLWs (see Appendix) fall into two broad categories: counterpersonnel and countermaterial. The goal of counterpersonnel NLWs is to provide the commander with a standoff capability against personnel with a graduated force application option. "Unlike conventional lethal weapons that destroy their targets principally through blast, penetration and fragmentation, NLWs employ means other than gross physical destruction to prevent the target from functioning."<sup>29</sup> One example of a counterpersonnel NLW is the use of acoustics or malodorants to cause extreme nausea in enemy troops. The goal of countermaterial NLWs is to render equipment inoperable or unusable, but ideally without destroying the apparatus. The intent is to eliminate the ability of the enemy to use the equipment without a lethal effect on the crew. An example of countermaterial NLW application is the use of an electromagnetic weapon to destroy the electrical components of enemy equipment or a combustion modifier to burn out the cylinders of a tank's engine.

Clearly the effects of NLWs demonstrate high regard for life and moral position that values the limitation of destruction. Unlike their lethal counterparts, NLWs are designed to have reversible effects and can have a variety of influences on different objects.<sup>30</sup> Any personnel or material impairment caused by NLWs should be readily reversible with the passage of time or modest repair. DoD policy states that NLW effects will be designed to "reinforce deterrence and expand the range of options available to commanders", and to

enhance the capability of U.S. Forces to accomplish their objectives.<sup>31</sup> It is not the primary purpose of NLWs to prevent death or major injury to opposing troops. Instead, they are intended to provide a military alternative where lethal force is not the preferred option, to protect our forces, and to decrease the post-conflict costs of reconstruction and reconciliation.<sup>32</sup> When used in conjunction with lethal weapons, NLWs can increase the lethality of force used against combatants, while reducing death and injury among non-combatants.

The topic of non-lethality is still in its infancy and the use of NLWs represents a major shift in thinking for many. Not surprisingly, progress has been slow with regard to the fielding and employment of non-lethal capabilities in training and combat. DoD is not completely unfamiliar with the use of NLWs. Missions such as communications warfare, information warfare, and psychological warfare indicate a willingness to address the enemy on other than lethal terms. However, an apparent dichotomy exists, as mechanical NLWs and their physical effects have not met with the same enthusiasm as their intellect-oriented counterparts. Likewise, the use of airpower to deliver the effect of NLWs is not new to the U.S. military. The unique capabilities of aircraft, such as speed, range, and carrying capacity, have long been utilized with the “softer” forms of NLWs. Aircraft are equally suited for the delivery of the counterpersonnel and countermaterial effects of NLWs, and are particularly useful in urban terrain. Aircraft are inherently flexible as they utilize the vertical third dimension and are often uninhibited by buildings and other urban obstacles, unlike many methods of fire support.

The use of NLWs does not restrict the commander from the traditional methods of force application. NLWs can be used synergistically with lethal weapons to augment current

U.S. military capabilities, and in fact provide quantum improvement in capability to the commander. This additional instrument of power allows the use of force where lethal force would be too much and inaction would be unacceptable. Military leaders must understand that NLWs will never be a panacea, nor will they provide a perfect remedy for the problems that MOUT presents to the commander, but their employment may allow military engagement at a much lower level of violence than current weapons permit. In the potentially sensitive urban environment, NLWs provide the commander with an ability to act decisively sooner and more effectively than would be the case with only lethal weapons.

### **Doctrine and Training**

*We are what we repeatedly do. Excellence, then, is a habit.*<sup>33</sup>  
Socrates

Several obstacles stand in the way of U.S. joint combined arms effectiveness in MOUT. First is the expectation that military operations will incur few casualties and minimum collateral damage. As urban fighting is inherently dangerous and destructive, this expectation “compels American leadership to avoid the potential quagmire of urban warfare...”<sup>34</sup> Second, the U.S. military carries a doctrinal aversion to urban warfare that is firmly established in our military thought.<sup>35</sup> This disinclination toward MOUT has subtly influenced the U.S. military to focus on mass, maneuver, and firepower and is reflected in the preponderance of U.S. doctrine and training.

MOUT doctrine was largely overlooked until 1998, which was a tremendous year for urban doctrine in the U.S. military. A DoD Joint Urban Working Group (J8 UWG) was formed that year and began the arduous process of examining doctrine, training, and capabilities (among other issues) for MOUT. In May 2000, it published the Handbook for

Joint Urban Operations, and has completed (though not yet published) JP 3-06, Doctrine for Joint Urban Operations. Both publications provide operational guidance to commanders and their staffs for the conduct of MOUT in all spectrums of urban conflict. As the Government Accounting Office (GAO) points out, however, no significant *joint* urban exercises have been conducted in the last five years and none have been planned for the near future.<sup>36</sup> (emphasis added) Accordingly, the ability of the U.S. military to conduct joint MOUT remains suspect because of the lack of focused, coherent, and multi-service training opportunities.

Individual services are working hard to improve their capabilities in MOUT, starting with the development of new doctrine for the task. The Marine Corps has characteristically led the way by publishing MCWP 3-35.3, Military Operations on Urbanized Terrain in April of 1998. The U.S. Army followed suit, and completed and published the final draft of FM 3-06, Urban Operations, in May 2001. Conversely, the U.S. Navy and the U.S. Air Force do not have urban specific doctrine, yet both will be key players in a MOUT scenario.<sup>37</sup> Joint CAS doctrine does exist though; JP 3-09, Doctrine for Joint Fire Support, dated 12 May 98 and JP 3-09.3, Joint Tactics, Techniques, and Procedures for Close Air Support (CAS), dated 1 December 1995 provide guidance and procedures for CAS, but fail to focus on the unique problems of MOUT. The concepts for employment of NLWs are still in their infancy, and doctrine for NLWs has yet to be developed.\*

The new MOUT doctrine clearly acknowledges many of the difficulties associated with the urban environment, and the individual services are gradually accepting the realities of MOUT, reflected by their research efforts and training programs.

Perhaps the best-prepared force to deal with precision urban operations is the USSOC [U.S. Special Operations Command]. Controlling their own resources, USSOC devotes substantial time and resources to preparing for precision missions in urban settings based on their requirements to meet future threats...However, given USSOC size and other mission requirements, these forces are unsuited for protracted and sustained combat operations in urban areas.<sup>38</sup>

The USMC has aggressively plunged into the problems of urban warfare. Multiple iterations of the “Urban Warrior” experiments are attempts to learn the difficult lessons of urban combat in training. The U.S. Army conducts small-scale training at the Shugart-Gordon complex at the Joint Readiness Training Center (JRTC), but rarely incorporate fixed-wing CAS or other combined arms into the scenario. In 1999, the U.S. Navy conducted Fleet Battle Experiment Echo (FBE-E) concurrently with the USMC Urban Warrior, focusing on the asymmetric urban threat. FBE-E results indicated that naval surface precision fires were rarely used as the weapon of choice in a city, and that a different weapons mix was required, including a call for experimentation with NLW.<sup>39</sup> Interestingly, the use of CAS is not discussed in FBE-E. For their part, The U.S. Air Force has recently completed a two-year long urban CAS Tactics Development and Evaluation (TD&E). While the detailed results are classified, the unclassified lessons learned confirm the need for more joint combined arms training for MOUT, and that the urban conflagration requires new thinking in terms of doctrine, training, and resources, including NLWs.<sup>40</sup>

Clearly, the topics of MOUT, CAS, and NLW are beginning to gain favor among the individual services, and doctrine is beginning to provide necessary guidance, with the notable exception of doctrine for NLWs. Training efforts for MOUT remain incoherent and lack focus. The ability of U.S. forces to act as an effective, joint team remains questionable in

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\* Electronic search indicated that of the more than 100 Joint Tactics Techniques and Procedures (TTP) and doctrinal publications, none contained more than limited reference to the use of NLWs, and none covered the subject in detail. Two resources were used to conduct the search: Chairman of the Joint Chiefs of Staff, Joint Doctrine Hierarchy (Joint Electronic Library); <<http://www.dtic.mil/doctrine/index.html>>; [18 January 2002], and the Joint Electronic Library CD-ROM, (Washington, DC: Joint Chiefs of Staff, 15 September 2001).

part because urban training areas are woefully small and inadequately represent today's modern urban sprawl<sup>41</sup> and exercises usually lack the required emphasis on integration of joint combined arms, particularly CAS.

### **Recommendations**

*The reason a lot of people do not recognize opportunity is because it usually goes around wearing overalls looking like hard work.<sup>42</sup>*  
*Thomas A. Edison*

The United States cannot afford a disconnected approach to the monumental task of preparing for MOUT. Coherent and decisive action must be taken to ensure success in MOUT. We stand at a crossroad of opportunity to modify our warfighting focus to prepare for the most likely future threat.

Any discussion advocating the force application of NLWs stems from the assumption that the United States is committed to the use of NLWs in certain situations and under certain conditions. With that assumption in mind the commander should begin to aggressively solicit non-lethal doctrine and NLWs to begin training and familiarization with the effects of NLWs. Though non-lethal technology is necessary to achieve the operational effects highlighted in this paper, without doctrine it is likely that NLWs will not take root in the military thought process. The preponderance of non-lethal technology is still regarded as a future capability, but the commander should not wait for NLWs to fully mature prior to addressing the critical question of how to employ them.

Second, the commander should fully integrate the joint fire support team. The most dramatic improvements to CAS effectiveness will come from effective integration of the TACP and the FSE or the equivalent elements in the various services. To begin, the

commander should require detailed and repeated interaction between these elements to foster a habitual working relationship conducive to the cooperation required for integration of CAS into the ground order of battle. The fire support process must be integrated into the planning and decision-making process to guarantee the operational effectiveness of CAS.

Finally, and of primary importance, the commander should identify, develop, schedule, and conduct large-scale joint MOUT field training. This training must include sufficient air, naval, and ground forces to require in-depth coordination efforts approaching what would be required in MOUT. This effort will necessarily require a shift in focus away from the dominant maneuver emphasis of current joint and national training center scenarios. MOUT training should include non-traditional roles that U.S. Armed Forces will be asked to perform in MOUT such as crowd/riot control, NLW employment, and restoration activities at the conclusion of hostilities. The combination of CAS and NLWs must be incorporated into large-scale training and exercises to provide all participants with necessary exposure to the advantages and limitations of this combination.

Ideally, doctrine drives training, and training determines how we will fight. Today we are faced with a potential reversal of that dynamic. Many have correctly forecasted an American weakness in MOUT, and the enemy is aware of this weakness. Accordingly, we must immediately change the way we train for MOUT to minimize the impact of our vulnerability in the urban arena. CAS must be integrated completely into MOUT training, and we must not wait for non-lethal doctrine before incorporating the benefits of the effects of NLWs. We must improve until MOUT excellence is the dominion of the U.S. military.

## Conclusion

*Nothing will ever be attempted if all possible objections must first be overcome.<sup>43</sup>*  
*Samuel Johnson*

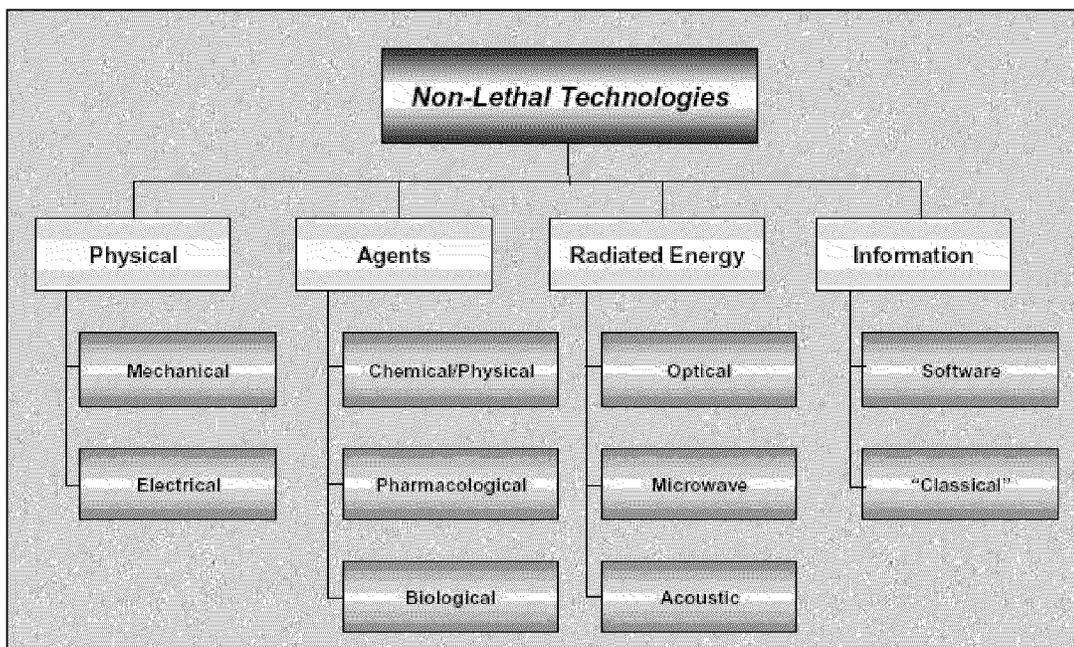
Urban warfare is a challenge that the U.S. military will confront. The U.S. military recognizes this reality, but much work remains to be done. Disciplined and well-trained servicemen, units, staffs, and leaders are crucial to successful mission accomplishment. Joint operations are inherently complex and difficult, and are only made more challenging by the context of urban terrain. Arduous training and repetition are the key to success in MOUT. Only through realistic training can the difficult task of joint fire integration occur. Additionally, the force must be properly equipped with a responsive variety of weapons for the amorphous urban environment. The Russian experience in Chechnya demonstrated that failure in these areas can lead to appalling results in combat.

The impediments and challenges that MOUT presents to the commander require a joint, combined approach to the urban environment, including the use of CAS assets. Airpower of any type is not a panacea, but it offers capabilities to the operational commander that are uniquely important in the urban environment. The mobility, flexibility, and firepower that fixed-wing assets bring to bear during MOUT are largely unrecognized in MOUT training. Despite growing joint doctrine, service capabilities may leave the commander desiring additional options. When operational or political constraints require minimization of physical destruction and preservation of non-combatant life, non-lethal force application may be required.

Operations in Afghanistan demonstrate, by extrapolation, the difficulties of urban combat. U.S. forces stopped conspicuously at the gates of the cities throughout the country and waited as Northern Alliance troops entered the conundrum of MOUT. Three factors are

apparent that contribute to our decision to avoid MOUT in Afghanistan. First, the political sensitivity of urban warfare and the potentially high cost in lives and material subtly influenced our decision to refrain from combat in the cities of Afghanistan. Our traditional aversion to urban warfare remains intact. Second, though not frequently acknowledged, there is an understanding within the U.S. military that the individual services lack the ability to smoothly integrate and synchronize CAS into the ground order of battle and the fire support plan. This contributes to our reluctance to enter cities. Third, we lack firepower options between the very lethal and inaction. The challenges of the urban environment in Afghanistan epitomize the sensitivity to unintended death and destruction. Therefore, our only available course of action in Afghanistan was to refrain from MOUT. These challenges relegated the U.S. military to an observer role, at least temporarily, as conflict in Afghanistan moved into cities. This is an uncomfortable position for Americans, and fortunately our combat partners were willing to bear the load. We cannot afford to remain impotent in this area. CAS and NLWs multiply the effectiveness of ground units when used synergistically with conventional lethal force application. NLWs reduce the violence that causes unacceptable collateral damage and loss of life, they minimize fratricide potential to properly equipped friendly troops, and they communicate to the enemy that the United States can and will respond to contingencies throughout the spectrum of conflict. CAS platforms are able to overcome many of the physical limitations that urban terrain imposes on traditional fire support methods, and are well suited for the delivery of NLWs. The U.S. has made a doctrinal shift to prepare for urban warfare, but there is room to grow with respect to CAS and NLWs. The likelihood of our success in MOUT will be in proportion to our willingness to train for MOUT and to incorporate CAS and NLWs into the joint combined arms team.

## APPENDIX



**Non-lethal Fire Support Options<sup>44</sup>**

### NON-LETHAL TERMS<sup>45</sup>

**Acoustics/Sound.** A class of weapons that emit a high power, very low frequency (infrasound) or very high frequency (ultrasound) beam. These weapons can be used to interfere with communication, to evacuate an area, and can be tuned to incapacitate personnel in buildings or underground facilities. Their use can result in the shattering of metal or composites in machines or building materials.

**Airborne tactical laser (ATL).** ATL provides ultra-precision engagement with graduated effects on target and capabilities to support non-lethal engagements. It is also used for surveillance to detect and identify aimpoints, engagement selection or assessment, and battle management and control. The ATL uses a lightweight, low-altitude laser with a sealed exhaust.

**Antitraction substances.** Substances that can be aerosol applied, poured, or painted on any surface, rendering it slippery or boggy. Some of these substances will lubricate the surface, preventing traction of people and machines, others will soak into the surface on which they are applied, making a chemical mud that prevents movement of personnel or equipment.

**Anti-fratricide 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.

**Area denial.** To deny or render an area unexploitable or temporarily uninhabitable to other groups or forces.

**Bounding non-lethal munition (BNLM).** Non-lethal 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.** Varieties of chemical substances that are designed to temporarily incapacitate personnel.

**Caltrops.** A personnel and vehicular barrier device with four projecting spikes so arranged that when three of the spikes are on the ground, the fourth points upward.

**Canister launched area denial system (CLAD).** A rapidly dispensed nonlethal area denial system. The launcher dispenses riot control agents, non-lethal bounding munitions, or marker munitions.

**Combustion modifiers.** Various gases, foams, or liquids that are designed to choke internal combustion engines. 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 temperature, and burn out cylinders and cylinder piston rings. Also included in this category are additives that will corrode the internal components of any engine that aspirates the substance.

**Directed energy weapons.** Any coherent or concentrated energy source (e.g., lasers) used to cause burning, cracking, distortion, or impairment of conventional or unconventional machines. When used against personnel, these weapons can cause stammer, confusion, coma, or death depending on the intensity of the energy source.

**Dyed foam.** Foams, usually the aqueous variety, are seen as possible carriers for such non-lethal 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.

**Electromagnetic weapons.** Weapons that use high-powered microwaves to disrupt brainwaves, communication, or any electronic component of a machine. Their use results in confusion, stupor, or coma in people or animals and the disruption, scrambling, or jamming of electronics.

**Entanglers.** NLWs that use polymers, fibers, or wire to entrap personnel or vehicles in a net, foul propellers, and/or stop fan blades.

**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 and disorientation in the immediate vicinity of the flash.

**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.

**Frangible mortar.** The objective is to produce a 120mm non-lethal mortar munition using non-traditional materials to limit collateral damage from residual fragmentation of the projectile. Current study investigates potential structural materials to be used for mortar projectiles. Material candidates include combustible felted fiber and other combustible composites.

**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.

**Microencapsulation.** The microencapsulation project identifies the best-suited encapsulation techniques for anti-materiel and anti-personnel NLWs related to area denial and vessel stopping. Encapsulated techniques being pursued will release and spread a variety of chemical payloads upon pressure, contact with water, or at a specific temperature.

**Modular crowd control munition (MCCM).** A non-lethal variant of the Claymore mine. The lethal fragmentary payload is replaced with numerous rubber ball blunt impact munitions for use in crowd control or similar applications.

**Non-lethal 81mm mortar.** The non-lethal 81mm payload round will deliver and dispense NL payloads up to 1.5 km, and are designed so that payload and round components are non-lethal at terminus. Made of composite materials for weight reduction and interior ballistics requirements. Innovative fuzing techniques are designed to dispense submunitions above target and reduce kinetic energy. Aerodynamic stability is required for round accuracy.

**Non-lethal 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.

**NLW guided projectile.** The JNLWD has tasked Raytheon to conduct research and development of non-lethal technologies, to include the feasibility of employing the Extended Range Guided Munition (ERGM). Recently the scope of investigation has focused not only on ERGM as a viable means to deliver non-lethal payloads (such as foams and irritants), but to include existing long range delivery vehicles such as mortars, shoulder launched weapons, artillery, missiles, guided bombs and UAVs for potential non-lethal missions such as area denial and clear facilities.

**Odorous substances.** Substances that are repulsive to the point of effecting behavior and bodily function. Substances could also be used in a deceptive manner to indicate something

significant, such as a leak of a flammable material. Can be used for riot control, to clear facilities, to deny an area, or as a taggant, and can be delivered with a variety of techniques.

**Overhead liquid dispersal system (OLDS).** The OLDS canister is fired overhead of target and deployed using an existing CLADS launcher. It provides the ability to rapidly disperse non-lethal chemical agents over large areas. The project is currently confirming that the dispersal pattern demonstrated in a static test could be performed while the system is in motion and that it can safely disperse agent and survive the launch load.

**Personnel dye markers.** A device that can be activated in 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.

**Pulsed chemical laser.** Proposed to produce a non-lethal 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.

**Taser landmine.** A non-lethal area denial device that is effective against dismounted targets. It fires small darts attached to wires that deliver an incapacitating electrical current. Physiological studies have demonstrated that the "pulse" from a single Taser is not only capable of rendering its target incapacitated for several minutes, but is also well below the lethal threshold with no lasting effects. Taser is currently used by law-enforcement agencies.

**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) non-lethal 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.

**66mm non-lethal munitions.** Short-range, indirect fire, crowd-control area denial non-lethal capability that can be deployed from the existing vehicle-mounted 66mm smoke-dispensing system. The system can disperse a blunt trauma munition or a distraction flash-bang round.

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## NOTES

- <sup>1</sup> Carl von Clausewitz, eds./trans. Michael Howard and Peter Paret. On War. (New Jersey: Princeton University Press, 1984), 75-76.
- <sup>2</sup> Joint Chiefs of Staff, Doctrine for Joint Urban Operations (Preliminary Coordination), Joint Pub 3-06, (Washington, DC: 17 April 2001), III-33. "Fires that cause civilian casualties or untoward collateral damage may have results that are significant on the operational or strategic levels."
- <sup>3</sup> Ibid., III-32,33.
- <sup>4</sup> Clausewitz, 87.
- <sup>5</sup> Joint Chiefs of Staff, Doctrine for Joint Urban Operations (Preliminary Coordination), Joint Pub 3-06, I-4.
- <sup>6</sup> Frank J. Murphy, "Littoral Warfare: Adapting to Brown-Water Operations," Marine Corps Gazette, (September 1993): 65.
- <sup>7</sup> Joint Chiefs of Staff, Doctrine for Joint Urban Operations (Preliminary Coordination), Joint Pub 3-06, I-6.
- <sup>8</sup> Joint Chiefs of Staff, Doctrine for Joint Operations, Joint Pub 3-0, (Washington, DC: 10 September 2001), II-23.
- <sup>9</sup> Joint Chiefs of Staff, Doctrine for Joint Urban Operations (Preliminary Coordination), Joint Pub 3-06, II-9. The framework for conducting joint urban operation is provided by the following phases: understand, shape, engage, consolidate, and transition.
- <sup>10</sup> Military Quotations Lkd. "Intelligence Brief: Your Source for Knowledge," <<http://www.intelbrief.com/militaryquotes.htm/>>, [18 January 2002].
- <sup>11</sup> Timothy L. Thomas, "Air Operations in Low Intensity Conflict: The Case of Chechnya," Air Power Journal Vol. XI, no. 4 (Winter 1997), 53.
- <sup>12</sup> Ibid., 53.
- <sup>13</sup> Lester W. Grau and Timothy L. Thomas, "Russian Lessons Learned from the Battles for Grozny," April 2000, <[http://call.army.mil/fmsso/fmsopubs/issues/Rusn\\_leslrn.htm/](http://call.army.mil/fmsso/fmsopubs/issues/Rusn_leslrn.htm/)>, [12 January 2002].
- <sup>14</sup> General Vitaliy Pavlov quoted in Timothy L. Thomas, "Air Operations in Low Intensity Conflict: The Case of Chechnya," 55.
- <sup>15</sup> Thomas, "Air Operations in Low Intensity Conflict: The Case of Chechnya," 56.
- <sup>16</sup> Grau and Thomas, "Russian Lessons Learned from the Battles for Grozny," 3.
- <sup>17</sup> Ibid.
- <sup>18</sup> Ibid., 1.
- <sup>19</sup> Bryan E. Campbell, "Joint Close Air Support (JCAS) Joint Test and Evaluation (JT&E)." The Air Land Sea Bulletin, Issue No. 2001-2-3, December 2001, 6.
- <sup>20</sup> Ibid., 4.

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<sup>21</sup> Ibid., 5.

<sup>22</sup> Benjamin Lambeth, The Transformation of American Airpower, (New York: Cornell University Press, 2000), 127. According to Mr. Lambeth, even in unrestricted terrain, the ability of the U.S. Armed Forces to effectively conduct CAS is largely untested. “United States combat action in the last two decades have rarely tested the ability of the United States military to conduct CAS effectively, even for Marine aviation, whose main combat function is the direct support of Marine forces on the ground. In Desert Storm, though 70 percent of Marine combat sorties were logged as CAS, subsequent analysis indicated that only 14 percent of those flown were conducted inside the fire support coordination line (FSCL), and that even fewer were executed in close proximity to friendly troops. In fact, few situations in Iraq, the Balkans, or other contingencies have truly tested how well CAS assets (fixed or rotary wing) can be integrated and synchronized with the fire support systems of ground units, especially while in close proximity to the enemy.”

<sup>23</sup> Clausewitz, 585.

<sup>24</sup> Gregory P. Cook, “Waging Peace: The Non-Lethal Application of Aerospace Power,” 7.

<sup>25</sup> Joseph M. Perry, “Joint Doctrine for Nonlethal Weapons”, (U.S. Army Command and General Staff College, Fort Leavenworth, Kansas, 04 June 1999): 5.

<sup>26</sup> Department of Defense, Department of Defense Directive 3000.3, Policy for Non-Lethal Weapons, (Washington, DC: 09 July 1996), 1.

<sup>27</sup> Ibid., 4.

<sup>28</sup> Joseph M. Perry, “Joint Doctrine for Nonlethal Weapons”, 1.

<sup>29</sup> Department of Defense, Department of Defense Directive 3000.3, Policy for Non-Lethal Weapons, 2.

<sup>30</sup> Ibid.

<sup>31</sup> Ibid.

<sup>32</sup> Ibid., 2-3.

<sup>33</sup> Military Quotations.

<sup>34</sup> Brooks Wright, “Urban Close Air Support: The Dilemma”, USAF Weapons Review, (Summer 98), 16.

<sup>35</sup> Ibid., 16.

<sup>36</sup> General Accounting Office, Focused Attention Needed to Prepare U.S. Forces for Combat in Urban Areas: Report to Congressional Committees (Washington, DC: February 2000), 9-10.

<sup>37</sup> Murphy, “Littoral Warfare: Adapting to Brown-Water Operations,” 69. “For example, if 4th MEB had actually conducted an amphibious assault against Iraqi forces in Kuwait [City] during DESERT STORM, carrier aviation would have been the only means for CAS as 3d Marine Aircraft Wing assets were dedicated to direct support of the Marine 1st and 2d Division forces attacking on the ground from Saudi Arabia.”

<sup>38</sup> James F. Pike, “Urban Operations in Chechnya: Lessons Learned and Implications for United States Urban Doctrine and Training,” (U.S. Army War College, Carlisle, Pennsylvania, 11 May 2001): 38.

<sup>39</sup> Naval Warfare Development Center, “Fleet Battle Experiment Echo: Asymmetric Urban Threat,” (Newport, Rhode Island, Naval Warfare Development Center, 2000): 12.

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<sup>40</sup> Wright, 17.

<sup>41</sup> Pike, 37.

<sup>42</sup> Military Quotations.

<sup>43</sup> Military Quotations.

<sup>44</sup> Roger D. Kirkpatrick, "The Operational Employment of Non-Lethal Capabilities," (Briefing for Lockheed Martin Missiles and Fire Control, Dallas, TX): 04 November 2000, <<http://www.dtic.mil/ndia/nld4/kirk.pdf>>, [22 December 2001].

<sup>45</sup> Richard L. Garwin, "Nonlethal Technologies: Progress and Prospects," Conference Proceedings, Columbia International Affairs Online, July 1999, <<https://www.cc.columbia.edu/sec/dlc/ciao/conf/gar01/>> [07 June 2000], and Perry, 1. The glossary of terms is a compilation of similar data from these two sources.

## BIBLIOGRAPHY

- Campbell, Bryan E. "Joint Close Air Support (JCAS) Joint Test and Evaluation (JT&E)." The Air Land Sea Bulletin, Issue 2001-2-3 (December 2001): 4-6.
- Clausewitz, Carl von, eds./trans. by Michael Howard and Peter Paret. On War. New Jersey: Princeton University Press, 1984.
- Cook, Gregory P. "Waging Peace: The Non-Lethal Application of Aerospace Power." Marine Corps Command and Staff College, Quantico, Virginia, 22 May 1995. <<http://www.fas.org/spp/eprint/cook.htm>> [26 November 2001].
- Finch, Raymond C. III. "Why the Russian Military Failed in Chechnya." Center for Army Lessons Learned, United States Army Training and Doctrine Command, Fort Leavenworth, Kansas, 27 November 1996.
- Garwin, Richard L. "Nonlethal Technologies: Progress and Prospects." Conference Proceedings, Columbia International Affairs Online, July 1999. <<https://www.columbia.edu/sec/dlc/ciao/conf/gar01/>> [07 June 2000].
- Glenn, Russell W. Combat in Hell: A Consideration of Constrained Urban Warfare. RAND Research Study, California: RAND, 1996.
- \_\_\_\_\_. "Seeking Preparedness for Military Urban Operations." Armed Forces Journal International, (May 1999): 46-49.
- Grau, Lester W. and Thomas, Timothy L. "Russian Lessons Learned from the Battles for Grozny." April 2000. <[http://call.army.mil/fmso/fmsopubs/issues/Rusn\\_leslrn.htm](http://call.army.mil/fmso/fmsopubs/issues/Rusn_leslrn.htm)> [12 January 2002].
- Grau, Lester W. and Kipp, Jacob W. "Urban Combat: Confronting the Specter." July-August 1999. <<http://call.army.mil/fmso/fmsopubs/issues/urbancombat/urbancombat.htm>> [12 January 2002].
- Kirkpatrick, Roger D. "The Operational Employment of Non-Lethal Capabilities." Briefing for Lockheed Martin Missiles and Fire Control-Dallas, TX. 04 November 2000. <<http://www.dtic.mil/ndia/nld4/kirk.pdf>> [22 December 2001].
- Lambeth, Benjamin S. The Transformation of American Airpower. RAND Research Study, New York: Cornell University Press, 2000.
- Lovelace, Douglas C., Jr., and Metz, Steven. "Nonlethality and American Land Power: Strategic Context and Operational Concepts." U.S. Army War College, Strategic Studies Institute, Carlisle, Pennsylvania, 15 June 1998.

McFarland, Robert B., Jr. "MOUT Doctrine and the Third World Threat in 2005-2010: Will it Work?" U.S. Army Command and General Staff College, Fort Leavenworth, Kansas, 17 December 1998.

Military Quotations Lkd. "Intelligence Brief: Your Source for Knowledge." <<http://www.intelbrief.com/militaryquotes.htm/>>. [18 January 2002].

Murphy, Dennis M. "Organizing Nonlethal Attack Assets in Operational and Strategic Organizations." U. S. Army War College, Carlisle, Pennsylvania, April 1997.

Murphy, Frank J. "Littoral Warfare: Adapting to Brown-Water Operations." Marine Corps Gazette. (September 1993), 65-73.

Naval Warfare Development Center. "Fleet Battle Experiment Echo: Asymmetric Urban Threat." Naval Warfare Development Center, Newport, Rhode Island, 2000.

Perry, Joseph M. "Joint Doctrine for Nonlethal Weapons." U.S. Army Command and General Staff College, Fort Leavenworth, Kansas, 04 June 1999.

Pike, James F. "Urban Operations in Chechnya: Lessons Learned and Implications for United States Urban Doctrine and Training." Strategy Research Project, U. S. Army War College, Carlisle, Pennsylvania, May 2001.

Press, Daryl G. "Urban Warfare: Options, Problems and the Future." Conference Summary, Massachusetts Institute of Technology, Security Studies Program, January 1999.

Tate, Frank W. "Army Attack Aviation Returning to the Close Fight: Impact of the MOUT Environment." U.S. Army Command and General Staff College, Fort Leavenworth, Kansas, 01 January 2001.

Thomas, Timothy L. "Air Operations in Low Intensity Conflict: The Case of Chechnya." Air Power Journal Vol. XI, no. 4 (Winter 1997): 51-59.

\_\_\_\_\_. "The Battle of Grozny: Deadly Classroom for Urban Combat." Parameters, (Summer 1999), 87-101.

U.S. Department of the Army, Urban Operations (Final Draft). Field Manual 3-06, Washington, DC: 30 May 2001.

U.S. General Accounting Office. Focused Attention Needed to Prepare U.S. Forces For Combat in Urban Areas. Report to Congressional Committees. Washington, DC: February 2000.

U.S. Joint Chiefs of Staff. Doctrine for Joint Fire Support. Joint Pub 3-09, Washington, DC: 12 May 1998.

- \_\_\_\_\_. Doctrine for Joint Operations. Joint Pub 3-0, Washington, DC: 10 September 2001.
- \_\_\_\_\_. Doctrine for Joint Urban Operations (Preliminary Coordination). Joint Pub 3-06, Washington, DC: 17 April 2001.
- \_\_\_\_\_. Handbook for Joint Urban Operations. Washington, DC: 17 May 2000.
- \_\_\_\_\_. Joint Tactics, Techniques, and Procedures for Close Air Support (CAS). Joint Pub 3-09.3, Washington, DC: 1 December 1995.
- U.S. Marine Corps. Military Operations on Urbanized Terrain. MCWP 3-35.3, Marine Corps Development Command, Quantico, Virginia: 15 April 1998.
- Wright, Brooks. "Urban Close Air Support: The Dilemma". USAF Weapons Review, (Summer 98): 15-19.