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COMBAT IN HELL

A Consideration of Constrained Urban Warfare

Russell W. Glenn

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PREFACE

Armed forces are ever more likely to fight in cities as the world becomes increasingly urbanized. Accordingly, public and moral concerns about the costs of war borne by noncombatants increase as well. This report is a study of urban warfare and its challenges for U.S. armed forces constrained by having to minimize noncombatant casualties and collateral damage.

America's armed forces are likely to have to confront the hell of urban combat. They have the potential to do so successfully. However, this environment's challenging character is unalterable; it will consume any force that fights unprepared.

This study was conducted under two of RAND's federally funded research and development centers, the Arroyo Center and the National Defense Research Institute (NDRI). The Arroyo Center is sponsored by the United States Army; this research was conducted in the Force Development and Technology Program for the Assistant Secretary of the Army (Research, Development and Acquisition). NDRI is sponsored by the Office of the Secretary of Defense, the Joint Staff, and the defense agencies; this research was part of the Advanced Concepts for Light Forces project, sponsored by the Defense Advanced Research Projects Agency under NDRI's Acquisition and Technology Policy Center. The author carried out this research while spending a year at RAND as the senior Army Fellow.

This study will be of interest to armed forces personnel planning for or conducting operations and training in urban areas. Other governmental and nongovernmental agencies considering policies involving dedication of military assets in urban contingencies will

likewise find material of value in determining the risks and potential costs of such policies.

CONTENTS

SUMMARY

Historical and much of modern guidance are consistent: avoid urban warfare if possible. Numbers of casualties are very high; consumption of ammunition and other supplies far exceeds that in most other environments; leader control of combat operations is limited. Yet the world becomes increasingly urban. The economic, social, and political character of cities makes urban areas lucrative targets for a force wanting to control or influence a nation.

Urban combat poses extensive challenges for U.S. military forces. Cities include some of the world's most difficult terrain in which to fight. Constraints imposed by stringent rules of engagement exacerbate a commander's problems. FM 90-10, *Military Operations on Urbanized Terrain (MOUT)*, the U.S. Army's keystone urban warfare manual, relies on World War II tactics generally ill-suited to situations requiring minimization of noncombatant and infrastructure losses. Political and public pressures render such doctrine increasingly outmoded. The United States requires changes to doctrine, training methods, and technologies to provide its forces with the capabilities necessary to effectively conduct future urban combat.

Efforts to improve tactical readiness for urban combat have increased in number in recent years, but conflicting priorities for training time, fund restrictions, and deficiencies in experience and doctrine limit effectiveness. Extant urban training sites lack the heterogeneity and size necessary to test commanders' and units' mettle in the areas of sustained operations, logistical support, and appropriate use of joint forces. Increased emphasis on urban environment computer replications has resulted in improved simulations, but

these too fall significantly short of models that provide trainers with a comprehensive training system. None make adequate provision for maneuver in city streets or within buildings while accurately depicting enemy capabilities, noncombatant involvement, logistical constraints, and other environmental factors.

Historical repetitions of mistakes in urban fighting are notable for their frequency. Suez City, Khoremsharr, and most recently Grozny all demonstrate the dangers of failing to use combined arms teams of infantry and armored units in attempting to take an urban area by *coup de main.* History is similarly littered with dead soldiers whose commanders undertook such fighting ill-prepared to do so. While tactical training is limited, preparation for urban operations at the operational level of war is nearly nonexistent. Further promulgation of the skills critical to successful planning and execution of campaigns involving metropolitan areas is essential.

Urban terrain confronts military commanders with a synergism of difficulties rarely found in other environments. The density of potential enemy positions and both city-inherent and emplaced obstacles rapidly exhaust soldiers while enhancing the potential for friendly casualties. Structural heterogeneity below, above, and at ground level provide fighters with ever-changing constraints on soldiers and their weapons. Reaction times and engagement ranges are compressed to an extent found only in exceptional circumstances on other terrain types.

These factors have a mitigating effect on weapons and command-and-control systems as well. Tank main gun tubes are not always able to depress or elevate sufficiently to engage targets in cellars or on upper floors. Attack helicopters find it difficult to coordinate their missile launch locations with those from which other aircraft can laser designate specified targets. Radio ranges are drastically reduced. Global positioning systems may not function due to building screening effects. Combined with these and other difficulties is the constant concern about noncombatants found throughout the battlefield, civilians a commander must avoid injuring unnecessarily and whom he will likely find to need food, shelter, and medical attention, overtasking his support capabilities.

Those same environmental factors make fighting in urban areas exceptionally fatiguing and dangerous. Short-range engagements provide little time to take evasive action. Ubiquitous debris causes more injuries and deaths than does enemy fire. Use of obvious approaches such as streets increases the risk of personnel losses. The alternative is labor-intensive "mouse holing": creating holes in walls of adjacent rooms to allow units to move through buildings concealed and under cover. The physical effort necessary to make such holes is complemented by the repeated stress of having to ensure each room entered is first cleared of enemy and that all windows, doors, or other potential enemy approaches are covered as units move forward. Again, these efforts are executed with the ever-present potential of finding noncombatants in any part of structures used.

The objectives of this monograph are: (1) to describe the conditions a ground force would confront during urban combat when constrained by requirements to minimize noncombatant casualties and collateral damage; (2) to provide an overview of current U.S. armed forces capabilities to undertake such missions; and (3) to determine current shortfalls and forward possible remedies for same. Capabilities, shortfalls, and potential solutions are presented in three topical areas: doctrine, training, and equipment.

Doctrine writers have begun to make progress in moving beyond the virtually unrestrained tactics of World War II with FM 90-10-1, *An Infantryman's Guide to Combat in Built-up Areas* (notably Change 1, published October 3, 1995). In light of increased demands to limit collateral effects, further approaches must be developed that reflect greater recognition of constraints on noncombatant and property losses. Such a rewriting, or creation of a complementary doctrine for use in constrained environments, is long overdue.

Similarly, more study of rules of engagement (ROE) and their use in environments with an adaptive adversary is essential. ROE not only need to address weapons use; they must also consider a greater scope of interactions, to include how to recruit and pay informants and otherwise gain noncombatant support for friendly operations.

Training for successful urban combat demands more than the U.S. Army and Marine Corps can provide given facilities on hand, budget

constraints, and current technologies. The size and complexity of available tactical training sites are inadequate for preparation of units above battalion size. No sites provide the scope needed for operational-level planning. Available computer simulations might one day provide adequate training at the tactical or operational levels. Preparation of individuals and units will likely require a systems approach to training that includes utilization of currently available limited assets, benign use of actual cities, and improvement of military simulation software.

Approaches to addressing capability shortfalls include technological enhancements in addition to doctrinal and training adaptations, but technologies offer both frustrations and promise. Many valuable technologies such as hand-held lasers and fiber optic sensors are available but remain unissued to most military units likely to fight in urban areas. Use of lasers in Mogadishu confirmed their value as navigation aids for ground and air forces and as a means for directing fires. However, limitations on the types of units receiving them (e.g., special forces units only) or on funding preclude wider distribution. Further, procurement procedures sometimes cause overspecialization in development of weapon systems, thereby denying beneficial secondary uses in city fighting. Bazookas, light antitank weapons, and recoilless rifles have been of great benefit in creating openings in walls and buildings during movement through urban areas. Top-attack antitank systems will be virtually worthless in this regard, leaving the dismounted infantryman no effective means to remotely create passageways through obstacles.

Means of locating enemy and noncombatants, and identifying them as foe or neutral upon location, is critical to reducing collateral loss of life. Advances in nonreflective x-ray, unmanned reconnaissance aircraft, and fiber optic technologies offer promise in this arena. Knowing the location and tracking the movement of friendly forces is also essential to avoiding fratricide incidents. Remotely piloted vehicles acting as retransmitters for radio and positioning systems could address some shortcomings. A lightweight means of creating "mouse holes" for passage through buildings and walls is essential. Once in position, forces need to destroy or otherwise neutralize their targets. Selective-capability munitions would provide a means of compensating for differing structural types and noncombatant proximity to targets. Increased munitions accuracy and use of non-

lethal weaponry similarly offer solutions to problems involving noncombatant losses or extremely short-range situations in which friendly forces may be endangered by current fire-support technologies. Survivability of friendly elements can also be enhanced by improved personal protection and vehicle design. Limited visibility enhancements able to rapidly adjust to changes in light levels are critical to units moving in and out of structures or otherwise suffering varying light levels during maneuver. Systems aiding in communication with noncombatants and in controlling their access to high-risk areas is necessary if reduced civilian losses are to be realized. Several nonlethal technologies such as markers or building denial foams can help achieve the latter. Voice translators and more exotic image and sound projection capabilities offer hope for improvement in directly communicating with urban residents.

No recommendations can eliminate the difficulties presented to commanders by urban environments. Cities and other built-up areas will remain costly locales in which to wage war or fight in engagements short of war. It is possible, however, to mitigate the negative military and political effects of fighting in urban environments. It is the objective of this monograph to provide the tools to do so.

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ABBREVIATIONS

APC	Armored personnel carrier
APDS	Armor piercing, fin-stabilized, discarding sabot
BCTP	Battle Command Training Program
CAEN	A British urban combat computer simulation. CAEN is not an acronym.
CALL	Center for Army Lessons Learned
CBU	Cluster bomb unit
CCDECSIM	Close combat directed energy simulation
COL	Colonel
CPT	Captain
CS	o-chlorobenzalmalononitrile, a riot control agent
FIBUA	Fighting in built-up areas (British)
GPS	Global Positioning System
HEAT	High explosive, antitank
HEP	High explosive, plastic
HESH	High explosive, squash head
IPB	Intelligence preparation of the battlefield
JRTC	Joint Readiness Training Center

LAW	Light antitank weapon
LI	Light infantry
1LT	First lieutenant
2LT	Second lieutenant
LTC	Lieutenant colonel
LTG	Lieutenant general
M203	Weapon system in which a grenade launcher is affixed below the barrel of a M16 rifle, thus providing the user the capability of using either rifle or grenade munitions.
MAJ	Major
MOUT	Military operations on urbanized terrain
MSG	Master sergeant
NLOS	Non-line-of-sight
OOTW	Operations other than war
ROE	Rules of engagement
RPG	Rocket propelled grenade
RPV	Remotely piloted vehicle
SFC	Sergeant first class
SGT	Sergeant
SOF	Special operations forces
UCCATS	Urban combat computer assisted training system
URBAT	Urban battle, a British urban warfare simulation
USASOC	U.S. Army Special Operations Command
VTD	Voice translation device

Chapter One

INTRODUCTION

> In a race with death, which had no trouble in catching up with us and was wrenching its victims out of our ranks in great batches, the army was increasingly pressed into a narrow corner of hell.
>
> —Joachim Wieder, *Stalingrad*[1]

BACKGROUND

Armed forces are ever more likely to fight in cities as the world becomes increasingly urbanized. Accordingly, public and moral concerns about the costs of war borne by noncombatants increase as well. This report is a study of urban warfare's character and its challenges for U.S. armed forces constrained by having to minimize noncombatant casualties and collateral damage.

Historical advice is consistent. Sun Tzu counseled that "the worst policy is to attack cities. Attack cities only when there is no alternative."[2] Post–World War II Soviet doctrine reflected similar thinking:

> Fighting in cities is neither a preferred tactic nor strategy for the Soviet armed forces. Soviet tactical doctrine, in the broadest sense,

[1]From Trevor Royle (ed.), *A Dictionary of Military Quotations*, New York: Simon & Schuster, 1989, p. 91.

[2]Sun Tzu, *The Art of War*, Samuel B. Griffith (trans.), New York: Oxford University Press, 1982, p. 78.

> provides that if possible, the attack or defense of cities is to be avoided in warfare.[3]

The U.S. Army's current capstone urban warfare manual reflects analogous guidance:

> Tactical doctrine stresses that urban combat operations are conducted *only* when required and that built-up areas are *isolated* and *bypassed* rather than risking a costly, time-consuming operation in this difficult environment.[4]

Unfamiliarity with the environment, large numbers of noncombatants, a high political profile, short engagement ranges, devastating casualty rates, a dense battlefield, rapid consumption of ammunition stores: these are but a sampling of urban warfare's historical offerings. The list is far from comprehensive. Fighting in urban areas presents many challenges to soldiers and governments, the impacts of which are often magnified relative to combat in other environments. Commanders generally have little desire to expose their forces to the potential ravages offered them by the world's cities.

Yet world demographics ensure that cities will become future battlegrounds. Increasing global urbanization is a predominant post–World War II trend. In 1920, the only nation with more than 50 percent of its population in cities or towns of over 20,000 was the United

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[3]John C. Scharfen and Michael J. Deane, *Soviet Tactical Doctrine for Urban Warfare,* Arlington, VA: Stanford Research Institute, December 1975, p. 4. The historian John Erikson explains the origins of this policy; Soviet doctrinal policy to avoid built-up areas had its roots in the country's World War II experiences:

> In Stalingrad, the 95th Rifle Division arrived in the city in late September 1942 with a strength of approximately 7,000 men. By 8 October the division had 3,075 men remaining; on 14 October the division was evacuated with roughly 500 men. The 37th Guards Rifle Division arrived the night of 2–3 October 1942 with 7,000 men and was removed from fighting in the tractor factory on 15 October. Strength when evacuated was 250 men.

John Erikson, *The Road to Stalingrad,* quoted in unpublished draft article by Todd Milton, undated, p. 2.

[4]Department of the Army, *Military Operations on Urbanized Terrain (MOUT),* Field Manual 90-10, Washington, D.C.: U.S. Government Printing Office, August 15, 1979, p. 1-1. Emphasis in original.

Kingdom. By 1960, one in every four people on Earth lived in urban areas. Ten years later, 12 percent of the world lived in cities with populations over 500,000.[5] The world had 286 cities with over one million inhabitants at the end of 1993.[6] It is estimated that between 40 and 44 percent of the world's population will reside in urban areas by the year 2000.[7]

This trend is even more pronounced in the Third World. Only three of the world's ten largest cities were in developing nations five years after World War II. By 1990, seven of the top ten were Third World cities. In late 1993, seventeen of the twenty-five most populous cities in the world fell into that category.[8] The inability of some governments to handle the social, infrastructure, cultural, and myriad other problems inherent in modern urban environments makes their cities potential sources of unrest. Further, some Third World cities dominate their nations to the extent that a majority of urban citizens live in the country's primary metropolitan area. The resultant concentration of population and political, economic, and other functions makes such entities potential centers of gravity. This is especially noteworthy when possible adversaries have weapons of mass destruction.

The topography of urbanization has also changed. Expanding conurbations can inhibit or preclude mechanized and armored maneuver. One analyst writing in 1983 noted that

> the Rhur-Dutch Randstad area [forms] a 300 kilometer "urban wall" which would have frustrated the von Schlieffen plan of World War I. The pattern is likewise evident in Germany's Hamburg-Bremen, Hannover, and Rhein-Main areas. It has been said that whereas it once would take 4 to 6 hours for a mechanized force to bypass

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[5]Joseph F. Coates, *The Nature of Cities—Background Notes to the Study of Low Level Combat,* Arlington, VA: Institute for Defense Analysis, May 1970, p. 9. Hereafter cited as Coates.

[6]"The Destroyer," *The Economist,* Vol. 329, No. 7843, December 25, 1993–January 7, 1994, p. 50.

[7]Coates, p. 18.

[8]"Cities," *The Economist,* Vol. 329, No. 7837, November 13, 1993, p. 123.

> Frankfurt, it would now take 4 to 6 days and, in the future, it will be impossible.[9]

A comparison of urban populations for two cities in which the United States conducted 20th-century combat operations suggests the enhanced difficulty such operations would involve today (see Table 1). These population increases are accompanied by similar expansions in urban sprawl.

Ports and airfields essential to the entry of military forces deploying into a theater of operations are also frequently located in metropolitan areas. Projection of combat capability may be impossible without seizure of these assets, a seizure likely to require urban combat.[10]

Such demographic impulsions find a complement in the benefits offered by urban warfare to nations confronting better-equipped forces. The battle for Hue lasted only 24 days in a war of more than seven years of major U.S. involvement. In those 24 days, the North Vietnamese army laid waste to U.S. military claims of impending enemy collapse and inexorably shifted U.S. national policy toward disengagement. Lieutenant General George R. Christmas, looking back

Table 1

Population in Millions

City	1950	1975	2000
Manila	1.5	4.4	12.8
Seoul	1.0	7.3	18.7

SOURCE: Defense Science Board, *Conflict Environment Task Force (Implications of Third World Urban Involvement)*, Washington, D.C.: Office of the Under Secretary of Defense for Research and Engineering, May 1986, p. 4.

[9]John J. Mahan, "MOUT: The Quiet Imperative," unpublished study project, Carlisle Barracks, PA: U.S. Army War College, May 20, 1983, p. 8.

[10]Frank Boynton, *Power Projection Operations and Urban Combat: An Avoidable Combination?* Fort Leavenworth, KS: School of Advanced Military Studies, December 14, 1995, p. 1.

on the battle in which he fought and won the Navy Cross, concluded that "Hue was the turning point of the war. It was the Gettysburg."[11]

Somalia's clan leaders similarly recognized the benefits of bringing a better-equipped adversary into an urban area and used this knowledge to manipulate U.S. policy in favor of their political objectives. Eighteen U.S. soldiers died on or as a result of wounds received on October 3–4, 1993, in Mogadishu. The engagement was not coincidental; it was the fruition of an opportunity seized. One of clan leader Aideed's militia commanders, Colonel Aden, "felt growing confidence" as he moved forces into the engagement area near a downed U.S. helicopter and established ambushes along likely UN relief force avenues of approach:

> This claustrophobic battleground, in Aideed's stronghold, was where Aden had hoped to fight. Other militia platoons, he knew, would be rushing from the north, south and east. The Americans were not supermen. In these dusty streets, where combat was reduced to rifle against rifle, they could die as easily as any Somali.[12]

The resulting engagement, not even a battle, precipitated the executive decision to withdraw U.S. forces from Somalia.

There are therefore multiple factors that make it increasingly likely that future U.S. armed force contingencies will involve combat operations in urban areas. It is also probable that U.S. forces will be precluded from destroying the urban area during the execution of their assigned missions. The prevalent case may well entail operations in cities with requirements to minimize both civilian casualties and collateral damage. Political pressures to minimize subsidiary effects of combat could take precedence over accomplishment of traditional military missions.

U.S. armed forces have not had to conduct such large-scale constrained urban operations in the past; they lack the doctrine and capability to do so now. Like the United States, other armed forces'

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[11]LTG George R. Christmas, interview with author, Camp Pendleton, CA: First Marine Expeditionary Force, December 14, 1993. Hereafter cited as Christmas.

[12]Rick Atkinson, "Night of a Thousand Casualties: Battle Triggered the U.S. Decision to Withdraw From Somalia," *Washington Post*, January 31, 1994, p. 1.

doctrines continue to depict the conduct of urban warfare in a manner reminiscent of World War II. The Israelis in 1982 Beirut, the Soviets in Afghanistan during the 1980s, and the Russian 1995–1996 operations in Chechnya are but three examples.

Though the counsel of history advises against involvement in urban warfare, more recently published U.S. Army doctrine recognizes that its forces may not always have the option of following the dictates of the past. Field Manual 90-10-1, *An Infantryman's Guide to Combat in Built-up Areas* (Advance Copy), states:

> The increased population and accelerated growth of cities have made the problems of combat in built-up areas an urgent requirement for the US Army. This type of combat cannot be avoided.[13]

OBJECTIVES

> Among the shortcomings of U.S. forces in [the battle for Hue] were a lack of training in urban combat, shortages of special munitions, difficulty in projecting the dramatic increases in Class V [ammunition] consumption, and refugee control . . . Hue reaffirmed the lesson that massive use of artillery could not neutralize defenders and often enhanced their fighting positions through the effect of rubble.[14]

This study has three primary objectives. The first is to describe the conditions confronting a ground force fighting under the constraints of minimizing noncombatant casualties and collateral damage, along with the difficulties of fighting under such conditions in urban areas. The second is to identify U.S. armed forces' current capabilities and ongoing efforts to enhance these capabilities. The final objective is to determine current shortfalls and present potential remedies for identified vulnerabilities. Consideration of such solutions will include analysis of feasible changes in doctrine, training, and tech-

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[13]Department of the Army, *An Infantryman's Guide to Urban Combat,* Field Manual 90-10-1 (Advance Copy), Washington, D.C.: U.S. Government Printing Office, May 12, 1993, p. 1-1. Hereafter cited as FM 90-10-1.

[14]Lloyd Sherfey, "Light Infantry in the Defense of Urban Europe," unpublished monograph, Fort Leavenworth, KS: School of Advanced Military Studies, October 26, 1986, p. 13.

nologies that would give regular U.S. forces the capability to successfully perform constrained urban operations.

ORGANIZATION

The bulk of the report is in Chapter Two, which consists of three primary sections: "Urban Warfare Doctrine," "Training the Force," and "Equipping the Force." Each section includes a presentation of the current state of U.S. armed forces capabilities, extant deficiencies, and possible resolutions for the identified shortfalls. "Training the Force" includes consideration of individual training factors and training facilities. The longer "Equipping the Force" is organized into the following categories:

- Leadership, command, and control
- Reconnaissance and target discrimination
- Acquisition and engagement
- Logistics and transport
- Survivability
- Additional constraint considerations.

Nation-specific terms such as MOUT (military operations on urbanized terrain, a U.S. term) and FIBUA (fighting in built-up areas, the British doctrinal term) are avoided in favor of more generic references such as "urban warfare." Though every armed force is constrained in conflict, references here to constrained urban warfare imply the constraints previously identified, i.e., the minimizing of collateral damage and noncombatant casualties.

ANALYTICAL APPROACH

This monograph is the culmination of an in-depth literature research and over 120 interviews with members of the U.S. and British armies, the City of Los Angeles SWAT team, and veterans of urban military operations in Vietnam, Panama, Northern Ireland, and Somalia.

Chapter Two

CONFRONTING THE CHALLENGES

> Urban operations present unique and complex challenges to Army forces. Urban operations can occur in any of the geographical environments. They can constrain technological advantages; they impact on battle tempo; they force units to fight in small, decentralized elements; they also create difficult moral dilemmas due to the proximity of large numbers of civilians. Commanders must enforce discipline in their operations to minimize unnecessary collateral damage and civilian casualties.[1]

OVERVIEW

Urban areas are the densest combat terrain on earth. The jungles of southeast Asia and Germany's Huertgen Forest cannot match the three-dimensional complexity of a city. Extreme heterogeneity accompanies this density. Subterranean and multiple-story structures provide numerous locations for ground forces to fight below, on, and above the earth's surface. Not only snipers use the high (or low) ground, as is frequently the case in forested areas; entire units make use of these terrain features.

Urban heterogeneity presents both attacker and defender with numerous engagement conditions. Line-of-sight varies from a few feet to several thousands of meters. Acquisition and engagement of the enemy are far more likely to be at the lower end of this spectrum:

[1]Department of the Army, *Operations*, Field Manual 100-5, Washington, D.C.: U.S. Government Printing Office, June 14, 1993, p. 14-4. Hereafter cited as FM 100-5.

only 5 percent of the targets in urban operations appear at over 100 meters range; 90 percent are confronted at ranges of 50 meters or less. Human (enemy soldier) targets are generally acquired at 35 meters or less.[2] Soldiers therefore often have very limited time to acquire and engage before being engaged themselves. Targets rarely present themselves for more than a few seconds; frequently only a small part of an individual or vehicle is exposed. The danger from ricochet and fragmentation from rounds striking structures is much higher than in other environments. More urban combat soldier casualties are caused by rubble and other building debris than by enemy direct fire.[3] Similar secondary dangers exist for noncombatants. Terrain heterogeneity offers noncombatants concealment and cover; they may thus be hidden from adversarial forces and become inadvertent casualties.

Weapons characteristics can be decisive in these short-range engagements. A weapon may have a minimum arming distance too great for close targets. Some systems also have "dead space" within which an operator cannot engage a target due to elevation or depression limits of the weapon's barrel.[4] Height and proximity of buildings cause further dead space problems; targets may be difficult or impossible to engage with supporting artillery systems, as rounds are not able to clear obstacles and reach targets without striking other edifices. Buildings can similarly interfere with aircraft engagements. Structures may interrupt flight paths of missiles and laser designation efforts. Clear flight paths can be difficult to deter-

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[2]FM 90-10-1, p. 8-1.

[3]Christmas. Selection of weapon systems and tactics will influence the level of danger resulting from such subsidiary effects.

[4]Russian armor units in 1995 Grozny experienced this problem:

> Soviet and Russian tactics specified that tanks would lead the assault in city fighting followed by infantry fighting vehicles and dismounted infantry. Tank columns would move in herringbone formation along city streets. This proved disastrous in Grozny where the high density of antitank weapons threatened armored vehicles, while the depression and elevation limitations of Russian tank guns kept them from engaging targets located in basements or in the upper floors of multi-storied buildings.

Lester W. Grau, "Russian Urban Tactics: Lessons from the Battle for Grozny," *Strategic Forum*, National Defense University Institute for National Strategic Studies, No. 38, July 1995, p. 3. Hereafter cited as Grau.

mine, as many missiles do not fly straight paths between launch and terminal points. Terrain characteristics not only tend to neutralize firepower advantages; they also increase the probability of inadvertent noncombatant casualties due to munitions impacts on other-than-intended targets.

What is evident from both a survey of written sources and the repeated assertions of those interviewed is that effective urban warfare requires special considerations yet manifests many of the same characteristics as successful warfare in other environments. Basic principles of tactics and leadership remain viable despite the fundamental differences in environment and greater risks of friendly casualties: synchronization of combined arms is essential; unity of command facilitates success; a unit must train as it will fight. Equally evident is the frequent lack of adherence to these and other principles by forces preparing for and conducting combat in urban areas in the past.

URBAN WARFARE DOCTRINE

> There was no such thing as danger close . . . You can use every weapons system you have. You have to be imaginative and aggressive.[5]

Written U.S. tactical urban warfare doctrine currently lags the de facto doctrine applied in training and combat. U.S. forces have not used uninhibited World War II–style urban combat tactics since the Korean War (though in the latter stages of 1968 Hue it was the weather rather than the rules of engagement that limited the use of air power to full effect). Minimizing unnecessary civilian and infrastructure losses was characteristic of operations in the Dominican Republic in 1965, in Beirut, Grenada, Panama, the Persian Gulf War, and Somalia. Individual and squad tactics in the field are resultantly being modified to more closely replicate those of special operations and SWAT forces. Soldiers serving in 1993–1994 Somalia received training from special operations units prior to actions in Mogadishu and other Somali urban areas.[6] The U.S. Marine Corps includes dis-

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[5]Christmas.

[6]CPT Phil Parker, interview with author, Fort Leavenworth, KS: Center for Army Lessons Learned, February 10, 1994.

criminate fire techniques in its training of infantry units.[7] Although modifications are under consideration, current written doctrine fails to address the demands of constrained urban warfare and adaptations being made by units in the field.

Junior leaders and individual servicemen ultimately determine an armed force's success or failure in accomplishing a mission. These individuals must be proficient in room-to-room clearance, urban maneuver, and the other skills that prepare them to both defeat an enemy force and preserve an urban area and its inhabitants. Use of discriminate fire techniques in lieu of the doctrinal "spray and slay"[8] method of clearing a room provides friendly forces with a technique conducive to both survival and noncombatant protection. These initiatives expand U.S. ground force capabilities, but standards, techniques, and capabilities will differ within the military until the new procedures are formally introduced in doctrinal manuals and integrated into centralized training.

Nor is the only concern the dismounted infantryman's tactics. History validates the need for infantry, artillery, and other arms to work together in the conduct of urban warfare. Narrow streets and densely packed buildings were favorable sites for acts of resistance against the established order in 18th- and 19th-century Paris. Fighters behind street barricades repulsed unsupported infantry in 1792, 1795, 1830, and again in 1848. Baron Haussmann addressed the problem with town planning efforts initiated in 1853:

> It was an idea of genius. The "improvements" . . . transformed the old, dirty, criminal, revolutionary city into the world's capital. Wide boulevards broke up the old conglomerations of mean hovels, breeding-places of crime and sedition. They attracted and facilitated a vast increase of traffic, and, simultaneously, their width and their macadam surface rendered impossible the raising of the old "spontaneous" paving-stone barricades. They opened a magnifi-

[7]Christmas.

[8]"Slay and spray" refers to techniques of room clearing where little attention is given to checking the room before attacking into it, e.g., throwing a grenade through a door and following with automatic weapons fire directed throughout the enclosure.

> cent field of vision; they opened an equally magnificent field for artillery and cavalry charges.[9]

These 19th-century French observations on the value of combined arms during urban fighting were repeatedly validated by allied actions in cities during World War II. Israelis later learned the lesson once again in Suez City:

> On 24 October 73, the Israeli armored brigade, reinforced with a battalion of half-track mounted paratroops, launched an attack on two axes to take Suez City. In their haste to seize the city, the decision was made to attack with tanks leading. The main column proceeded without incident until it reached the first Egyptian gunners [who] destroyed the three leading tanks with RPGs. Simultaneously, the last vehicles in the column were hit, trapping the attackers. The attackers, realizing they had been ambushed, attempted to escape into the side streets, only to run into other kill zones. After about an hour, the Egyptians had damaged or destroyed all of the column's vehicles.
>
> The second column ran into a similar fate in a number of small armor kill zones instead of one big zone. However, the results were essentially the same. When the Israelis withdrew, they left 28 tanks and half-tracks in the town; Egyptian losses were negligible. Other attempts to penetrate the city met with the same results—the Egyptians in control of the city and the Israelis continuing to lose tank[s]. The Egyptians were still in firm control of the city at the end of the war.[10]

Israeli efforts to take the city with armored and mechanized forces without effective light infantry support precipitated the loss of 80–125 soldiers in addition to the 28 armored vehicles destroyed.[11]

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[9]Patrick O'Sullivan and Jesse W. Miller, *The Geography of Warfare,* London: Croom Helm, 1983, p. 128. Hereafter cited as O'Sullivan. Also Frank Jellinek, *The Paris Commune of 1871,* London: Victor Gollancz, 1937, p. 40.

[10]John R. Kennedy, "Players or Spectators? Heavy Force Doctrine in MOUT," unpublished monograph, Fort Leavenworth, KS: SAMS, December 2, 1985, pp. 17–21.

[11]"Military Operations on Urbanized Terrain, Book 1," Fort Knox, KY: U.S. Armor School, April 1986, no page number. Hereafter cited as Armor.

This need for combined arms was reinforced during U.S. actions on October 3–4, 1993, in Mogadishu. The penalty for not having a U.S. heavy unit available for rapid reinforcement of light infantry and aviation forces was all too evident. The Russians reconfirmed the need for combined arms in their initial attempts to seize Grozny:

> When the Russians first attempted to seize Grozny the last day of 1994, they tried to do it with tanks and personnel carriers but without enough supporting infantry . . . Tanks and personnel carriers, in the city without dismounted infantry support, were easy targets to antitank gunners firing from the flanks or from above. The initial Russian armored columns were swallowed up in the city streets and destroyed by Chechen gunners.
>
> After losing 105 of 120 tanks and personnel carriers the Russians fell back to consolidate for the long, building-by-building battle.[12]

Current doctrine recognizes this oft-forgotten need for the use of mutually supporting arms during fighting in cities. However, combined arms is more than infantry, artillery, and tanks working together. Special operations and regular units might well find themselves operating in closer proximity in built-up areas than is normally the case elsewhere. Perhaps the most notable recent example of special operations forces (SOF)–regular forces cooperation was the October 3–4, 1993, fight in Mogadishu. The element of surprise so well used by the Rangers gained them access to objective areas; extraction was a more difficult matter. The enemy will often have the advantage of knowing better the battleground and access and the egress routes, as it did in Somalia. The adversary can therefore establish ambushes along avenues of approach for both dismounted and mounted elements, as happened in Mogadishu, or he can allow an extraction force to reach inserted elements and then ambush the combined group as it attempts to withdraw. The Mogadishu engagement and similar actions in Panama provide several additional lessons learned. Providing time for proper planning and the conduct of rehearsals requires that regular forces supporting special operations units be given early warning of upcoming missions, despite the risk of having increased numbers of people "in the know." Command-and-control arrangements require considerable im-

[12]Grau, p. 2.

provement; the density of friendly forces in many urban actions suggests that fratricide could become a problem if regular forces are not aware of special operations element locations and vice versa. Doctrine should incorporate these lessons in future writings.

Combined arms fighting in urban areas will likely also require integration of units historically not considered front-line support elements in other environments. Civil affairs and psychological warfare units are generally seen as elements whose tasks limit their periods of proximity to enemy forces. Successful urban combat demands reconsideration of this mind-set, especially if friendly commanders want to minimize noncombatant losses or obtain civilian help in facilitating mission accomplishment. Civil affairs and psychological warfare personnel can influence civilian behavior in ways conducive to both abetting friendly force effectiveness and aiding noncombatants caught on an urban battlefield. For example, during operations in Somalia, an infantry force stood poised for an assault into a village. Its mission was to find and neutralize a sniper who had been harassing friendly forces. A civil affairs team went to the village elder to explain what was about to happen and describe the risks such an operation posed to the village. The elder directed that the sniper be dragged out of hiding and given to the Americans. It was subsequently found that the sniper was the village elder's son.[13]

U.S. armed forces fought *tactical* urban engagements in Korea, Vietnam, Panama, and Somalia. They have not had to execute large-scale *operational*-level missions in urban areas since World War II. Experience with the latter among serving service members is nil; doctrine for guiding actions at the operational level of war is similarly virtually nonexistent.

Urban warfare doctrine focuses on the tactical level. Individual soldiers learn techniques for maneuver and room clearing; units focus on defending or attacking small built-up areas or seizing large cities

[13]CPT Fred Swope, interview with author, Fort Leavenworth, KS: Center for Army Lessons Learned, February 10, 1994. CPT Swope was an infantry officer representative on a CALL team sent to derive lessons learned from U.S. forces operations in Somalia.

incrementally through "the attack of smaller built-up areas."[14] There is little doctrinal guidance for a commander confronted with the need to seize a large city, either as an action in and of itself or as part of a larger campaign. U.S. military doctrine has yet to confront the necessity of pacifying a major city while protecting its citizens.

Conducting campaigns involving one or more major urban centers would require resource allocation and planning decisions different from those for other environments. The Soviets dedicated up to 50 percent of their artillery to direct fire support during World War II urban fighting. U.S. commanders would have to consider similar reallocations of combat, combat support, and logistics assets to balance the very different needs of forces fighting within cities and those outside of urban areas. Allocation of units to meet the combat requirements in the city, for the force isolating the city, and those needed for actions addressing other exigencies in the theater will demand expertise in understanding the types and numbers of various organizations required at different stages in each facet of an operation. Operational depth in a predominantly rural environment is generally measured in the tens or hundreds of kilometers; in a city, such depth might be no more than several city blocks. Key terrain features could include the tallest buildings or a single power, water distribution, or command-and-control complex. When the area of operations is a metropolis, it does little good to define the center of gravity as the city itself. The operational-level commander and his staff must instead determine the center(s) of gravity within that urban area. Current doctrine provides little guidance in this regard.

Doctrine should also include more consideration of rules of engagement (ROE) appropriate to force capabilities and strategic objectives. The need to develop and promulgate clear, flexible ROE is critical. After-action comments on U.S. involvement in Somalia stated that "ROE must preclude the indiscriminate use of deadly force while simultaneously allowing soldiers sufficient latitude to defend themselves . . . Soldiers must believe they can survive within the rules."[15]

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[14]Department of the Army, *Military Operations on Urbanized Terrain (MOUT),* Field Manual 90-10, Washington, D.C.: U.S. Government Printing Office, August 15, 1979, p. 2-8.

[15]"Draft Center for Army Lessons Learned Newsletter," September 24, 1992, p. 2.

Defining what is a legitimate target for the soldier may be difficult, but the soldier who knows his leader's intent is more confident in his actions than the one sent out with his mission ill-defined. ROE can be frustrating for both the leaders who create them and the men who apply them with weapon in hand. They are nonetheless essential in distinguishing between acceptable and other targets.

Changing conditions and the adaptability of the enemy require constant review of and an inherent flexibility in ROE. One British officer with extensive experience in Northern Ireland believes that well-defined, well-understood ROE are the key to successful urban operations in both war and peace.[16] ROE in Northern Ireland were frequently reviewed and modified to meet changing demands despite the British having conducted operations there for years.[17] Somali adversaries closely observed U.S. and coalition forces to discover patrol patterns and the timing of maneuver operations.[18] Observation also allowed them to determine the limits of American ROE. An enemy in wartime will likewise seek to use opponents' ROE to their advantage. Flexibility in application and adaptation precludes ROE from becoming unfeasible and, therefore, ignored. And even the best ROE can not cover all contingencies. Leaders must allow for imperfect but well-intentioned soldier judgment.[19] Maintenance of morale and force effectiveness disallows an environment wherein the soldier fears punishment should the instantaneous decision demanded by survival not be a perfect one.

Just as ROE require adaptation over time, doctrinal tactics, techniques, and procedures need adjustment as well to enhance both combat effectiveness and reduction of collateral losses. Conducting after-action review sessions ensures that better ways of conducting operations gain maximum exposure. U.S. personnel in Mogadishu found after-action reviews extremely helpful in improving unit effectiveness and in avoiding dangerous mistakes made by others. Exper-

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[16]LTC Pat Butler, interview with author, Copehill Down, UK, October 11, 1993.

[17]CPT Morris, unpublished information paper, "Subject: Notes from Conversation with COL Wilson, British Special Operations Liaison, British Consulate," April 26, 1993.

[18]TRADOC Combined Arms Assessment Team Operation RESTORE HOPE briefing narrative, undated, no page numbers.

[19]Mark S. Martins, "Rules of Engagement for Land Forces: A Matter of Training, Not Lawyering," *Military Law Review*, No. 143 (Winter 1994), pp. 1–160.

imental methods of breaching walls initially included use of explosive-packed U-shaped pickets placed against a target. Resultant injuries to U.S. soldiers at a distance of 100 meters led to development of safer and less structurally damaging methods.[20]

Command-and-control doctrine needs to address considerations critical to success in urban actions. Unity of command abets dissemination of critical information, to include the changes to ROE and after-action observations discussed above. Intelligence on the locations of enemy and noncombatants, enemy movements, and other perishable information is also more effectively passed to subordinate units under a single commander than if separate commands operate within the same urban area. Intelligence preparation of the battlefield (IPB) procedures need expansion to account for the special demands of constrained urban warfare. The process must not only include analysis and war gaming of friendly and enemy actions; a complete IPB should also take third-party noncombatant groups into account. Intelligence, demographic characteristics, and noncombatant templating will assist commanders and staffs in planning for minimizing collateral losses, just as similar actions increase combat effectiveness in accomplishing more traditional military missions.

Leadership doctrine has to address the specialized demands of urban fighting. Leaders must position themselves well forward on the battlefield where they can experience and guide subordinate actions. The compartmented nature of built-up areas denies any semblance of direct control over a unit's operations to any but the forwardmost tactical leader. Marines in 1968 Hue found that their controlling headquarters, Task Force X-ray, "had no earthly idea of the situation" in the city; company commanders rebelled against its unrealistic guidance.[21] A leader with command experience in 1989 Panama found that command and control "breaks down in an urban area. Leaders have to be forward . . . Company commanders have to be forward . . . There's none of this 200 meters back. He's probably one

[20]CPT Drew B. Meyervitch, interview with author, Fort Drum, NY: A Company, 2-14 Infantry Battalion, 10th Mountain Division (LI), April 19, 1994. CPT Meyervitch was Commander, A Company during that unit's deployment to Somalia.

[21]Christmas.

clearing team back."[22] Even given the advanced position of leadership, "control is your greatest problem . . . Once you go house to house, once you go room to room, it is a squad leaders' war."[23] Noncommissioned officers at the squad and lower levels will operate out of sight and out of radio communication with senior leadership. Their understanding of plans and their commander's intent have to be sufficient to provide them with the basis for correct operational decisions. They must be able to execute tasks (such as calling for indirect and aviation fire support) normally left to higher-ranking individuals. Success in the urban environment demands better preparation and training of leaders at every level. Decisions by these same leaders may have strategic implications in modern, high-visibility military actions.

Perhaps the greatest challenge to combat leaders will occur when friendly units receive casualties while operating under constraints developed to protect civilians and property. Soldiers in Saigon fighting during 1968 Tet were directed to keep civilian and collateral building losses to a minimum. One unit adhered to the constraint until they took losses that were perceived to be related to their modified tactics. Thereafter, restrictive ROE were discarded.[24] Some U.S. soldiers were less concerned with differentiating between enemy and noncombatant Somalis after eighteen Americans were killed or mortally wounded during the actions of October 3–4.[25] Several soldiers admitted that they would personally have difficulty adhering to such constraints after seeing fellow soldiers killed or wounded, but one platoon sergeant noted that leaders "set the pace for that. If we take the attitude that we're going to go out and wax every [enemy or noncombatant] we see, our soldiers are going to [follow our

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[22]COL John Brooks, interview with author, Fort Monroe, VA: TRADOC, March 23, 1994. Colonel Brooks was Commander, 4-17 Infantry Battalion, 7th Infantry Division (Light) during Operation JUST CAUSE. Hereafter cited as Brooks.

[23]Christmas.

[24]Alderman.

[25]This observation was repeated by several Somalia veterans in multiple interviews.

example]."[26] Leaders, forward on the battlefield, will determine whether discipline perseveres.

There is a need for further development of doctrine providing guidance on interactions with noncombatants in urban areas. Civilians responsive to friendly force dictates are more likely to follow guidance at times when such responsiveness could determine the survival or destruction of large numbers of the noncombatant population. Consistency in methods used in dealing with noncombatants affects civilian willingness to support friendly intelligence-collection and population-control efforts. Combat, civil affairs, psychological warfare, combat service support, and all other elements operating in a given area should maintain similar standards of behavior, vigilance, and compassion. Unity of command facilitates this consistency, which in turn facilitates effective friendly force–noncombatant relations. Inconsistencies in offering money for information, treatment of suspected sympathizers, distribution of aid, or other activities lead to civilians playing one friendly force element off another or fearing contact due to the unpredictability of the response. This is true in joint and coalition operations as well as during national or single-service activities. For example, UN Ethiopian forces found they could not match their predecessor's monetary outlays to local civilians after they assumed an area of responsibility from Italian forces in Somalia. This caused considerable difficulties in dealing with noncombatants accustomed to compensation for certain behaviors.[27]

TRAINING THE FORCE

> For marines whose whole combat experience in Vietnam had been stomping the bush or occupying rural firebases and base camps . . .

[26]SFC Herman Dozier, interview with author, Second Platoon, A Company, 2-87 Infantry Battalion, 10th Mountain Division, (LI), April 20, 1994. SFC Dozier was platoon sergeant for his unit during operations in Somalia.

[27]LTC James Sikes, interview with author, Fort Drum, NY: 2-87 Infantry Battalion, 10th Mountain Division (LI), April 20, 1994. LTC Sikes was Commander, 2-87 IN during that unit's deployment to Somalia.

the sounds and sights of battle were somehow more intense, more troubling than anything else these men had yet experienced.[28]

Human Factors

One urban combat veteran put it succinctly: urban fighting "is extremely fatiguing both due to stress and physical activity."[29] The close nature of the terrain requires attackers' and defenders' constant alertness for an enemy who may suddenly appear at point-blank range and fire. The fire may come from above, below, or on level with the soldier and from multiple directions at each level. The extreme level of alertness demanded by such terrain quickly exhausts unit members. Were this psychological fatigue not enough, an attacking unit must dash between covered and concealed positions and across exposed stretches of open street or rooftop. It is difficult to maneuver over rubble, walls, and other obstacles. Units moving through buildings must move up and down stairs, dart into doorways, and dig their way through walls. Urban combat siphons off unit combat effectiveness through fatigue, high casualty rates, and the need to leave soldiers behind to secure cleared rooms or defend the many potential avenues of approach.[30]

Unless routes through structures are available, soldiers must expose themselves during rushes across open areas as they move about the battlefield. These rushes take them onto ground in which they may be unable to determine the availability of cover or concealment until after initiation of movement. The compartmented character of the urban landscape works to soldiers' disadvantage: fellow soldiers are frequently unable to suppress enemy fire on the far side of walls or within buildings while their comrades attempt to move. A soldier therefore bounds into an area having to seek cover while also having

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[28]Eric Hammel, *Fire in the Streets: The Battle for Hue, Tet 1968,* New York: Dell, 1991, p. 105. Hereafter cited as Hammel.

[29]Christmas.

[30]Grau notes Russian problems in Grozny: "Since the battle for a city continues nonstop, the Russians learned that they needed fresh troops and adequate reserves. Soviet doctrine called for a 4:1 advantage in troops for urban combat. Some 60,000 Russians and 12,000 Chechens fought in Grozny, yet the Russian 5:1 advantage was sometimes not enough, because they had to guard every building that they took." Grau, p. 3.

to remain constantly vigilant for the appearance of targets at very close range. The available target may be enemy. It may be otherwise. The fatigue is exacerbated by the carrying of extraordinary amounts of ammunition necessitated by the difficulty of resupply during urban combat. Such combat rapidly exhausts unit members physically and mentally.

Units should train as they will fight. The previously addressed necessity for use of mutually supporting arms in urban fighting demands that the mounted and dismounted soldier train together. Urban warfare necessitates task organization of disparate elements to lower levels than is normally the case in other environments. Tanks habitually operate in section or platoon formations; tank communications procedures are designed for this norm.[31] Support of a dismounted unit in a city, however, often involves only single or paired armored vehicles. Tanks might be assigned to units as small as a squad. The lack of an exterior means of communication with dismounted units (the M1 has no "grunt phone" like that on the M60 tank[32]) necessitates dedication of one radio frequency to the soldiers on the ground. Armor leadership must revise normal radio frequency allocations. The changes this precipitates should be practiced.

Junior leaders must be aware of dangers inherent in positioning indirect fire weapon systems on rooftops (which can cause structures to collapse) or within enclosed areas (concussion can kill or wound gunners).[33] Urban force-on-force and live-fire training similar to that currently conducted at national training centers will teach both attackers and defenders lessons that will serve soldiers well in combat. Integration of simulation, urban training site exercises, and the use of actual urban terrain into tactical- and operational-level intra- and interservice training is essential to force preparedness.

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[31]LTC R. Olsen, interview with author, Fort Leavenworth, KS: Center for Army Lessons Learned (CALL), February 11, 1994. Hereafter cited as Olsen. LTC Olsen led a CALL group in Somalia tasked with deriving lessons learned from operations in that country.

[32]CPT Eric Allee, interview with author, Fort Stewart, GA: Task Force 1-64 Armor, 24th Mechanized Division, March 22, 1994. CPT Allee was a battle captain and S3 (Air) for his unit during operations in Mogadishu.

[33]Thomas H. Whitley and Carl W. Riester, "Mortars in MOUT," *Infantry*, September–October 1983, pp. 1077–1081.

Units moving to relieve besieged American forces in Mogadishu on October 3–4 traveled in Malaysian armored personnel carriers. Communications were convoluted due to language and technical differences.[34] Though training with many UN forces may be difficult in peacetime exercises, commanders confronting deployment must plan to familiarize their soldiers with friendly forces from other nations with whom they are likely to conduct operations.

The need for combined arms in urban operations is well established, yet recent American army task organizations for overseas deployments have violated history's lessons regarding habitual support, unity of command, and effective command and control. Units that train together are better prepared to fight together. The post–World War II General Officer's Board made the following comments in discussing engineer support for American maneuver units. The observation applies regardless of the type of unit involved:

> Organic battalions provided better teamwork with other elements of the division than strange supporting battalions. One of the greatest assets of any team of combined arms in a joint action . . . is confidence in one another, a familiarity with the limitations and capabilities of one another. With the organic engineers in the division, this necessary teamwork, confidence and knowledge of personalities was soon developed; with the everchanging, strange supporting engineers, it was not.[35]

Attempts to achieve an effective force mix during Operation JUST CAUSE in Panama brought light forces from Fort Ord, California, airborne forces from Fort Bragg, North Carolina, mechanized support from Fort Polk, Louisiana, and units stationed in Panama itself together for the first time. Tenth Mountain Division (Light Infantry) units in Somalia received tank and mechanized support after the events of October 3–4, 1993; the unit came from Fort Stewart, Georgia. The units had never trained together.

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[34]1LT James K. Haynes, interview with author, First Platoon, C Company, 2-14 Infantry Battalion, 10th Mountain Division (LI), April 19, 1994. 1LT Haynes was a platoon leader during his unit's deployment to Somalia.

[35]Department of the Army, *The General Board: Study No. 71: Engineer Organization,* U.S. Forces, European Theater, 1945, p. 19.

Peacetime structuring and training (and, if possible, stationing) should support habitual relationships. The aforementioned need to train with allies upon arrival in an area of operations further validates the requirement to train with other U.S. arms and services prior to deployment. Operational demands will preclude all but the most cursory familiarization training after arrival; expecting to have sufficient time to train with coalition and U.S. forces is naive. Expecting forces unfamiliar with each other to become fully integrated after arrival in theater reflects a lack of understanding of the operational demands confronting such units. The difficulty of constrained urban operations in urban areas suggests that either

- more frequent light-heavy training be executed (a minimal amount occurs now at the National Training Center, the Joint Readiness Training Center, and other facilities, but its effects are very limited with regard to the number of units trained, the duration of the training, and the comprehensiveness of training completed), or
- consideration be given to modifying current U.S. division and/or brigade structures such that they contain organic heavy, light, aviation, and support components.

Training Facilities

Steps are under way to improve urban warfare training and technological capabilities. The Joint Readiness Training Center at Fort Polk, Louisiana, has a Third World urban area replica for training. Even so, facilities do not exist for effective U.S. urban warfare training at the brigade, division, or higher tactical levels, much less at the operational level where a large metropolitan area may be only part of an area of operations. Even the largest (ex-Soviet) urban training facilities lacked the magnitude to allow a higher-level commander to develop expertise in defending a megalopolis with multiple potential enemy avenues of approach, or to attack a city after selecting the approaches offering the greatest opportunity for success. Commanders can conduct training using maps, models, and terrain walks, but nowhere can they exercise combined arms forces at greater than battalion or brigade size in an urban training environment. Construction of massive urban training sites is unfeasible. Computer simulation is one solution increasingly utilized as large-scale field

exercises become less feasible. Currently, however, no fully satisfactory large-unit or operational-level urban warfare simulation exists. Tactical-level simulations are limited, generally exercising leaders with regard to maneuver and fires in the streets, but not allowing detailed planning and execution of movement, maneuver, or fighting through and within buildings.[36] Simulation requirements also exist for operational-level contingencies short of war. The frequently complex nature of urban warfare (e.g., Mogadishu with multiple clans, several UN members in the coalition force, noncombatants ranging from sympathetic to active clan supporters, and the varied terrain typical of any urban area) challenges the creators of such software. Yet even imperfect simulations would assist in the development of an expertise now lacking in western militaries. Integration of tactical- and operational-level simulations with programs similar to the Battle Command Training Program (BCTP) could significantly upgrade U.S. readiness for urban conflicts. Economic constraints will likely dictate a hierarchical training system in which operational and large-unit tactical training is simulation-based, while lower-level units and individuals use urban training villages for skill development.

Training in actual urban areas is essential for the operational-level commander, his staff, and those at tactical levels. Aviators, for example, must modify tactics developed for use in rural environments. Tactics used to select covered approaches must be adapted to urban fighting in which buildings take the place of valleys or ridge lines in providing cover and concealment during aircraft movements.[37]

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[36]Various urban combat simulations replicate aspects of fighting in built-up areas, but none includes all necessary conditions or maneuvers. The British Army's URBAT assists leaders and staffs in planning operations at that army's tertiary urban warfare training facility in the United Kingdom, Copehill Down. A more sophisticated simulation, Close Combat Directed Energy Combat Simulation (CCDECSIM), has been developed as an interim capability until CAEN, an improved and more user-friendly version, is fully developed as a replacement for URBAT and for other training uses. CCDECSIM and CAEN are notable among urban simulations for their ability to replicate fighting in limited visibility or night conditions. Neither can replicate third-party (e.g., noncombatant) participation. John Galloway, telephone interview with author, White Sands, NM: JANUS Lab, January 14, 1994. The British also looked at the U.S. UCCATS simulation used in Berlin, but sought a more detailed and capable simulation. Jill Saunders, telephone interview with author, January 28, 1994.

[37]CPT Jeff Mowery, interview with author, Fort Leavenworth, KS: Center for Army Lessons Learned, February 10, 1994. CPT Mowery was the Aviation School represen-

Aviators must also overcome difficulties in finding a clear gun line or navigating to an urban landing zone. Helicopter units will rarely be able to use the tactic of positioning multiple aircraft in a battle position and then simultaneously launching missiles. It is far more likely that they will find it necessary to cycle aircraft through the one or two locations from which there is an acceptable gun line for both laser designating aircraft and those firing missiles. Finding positions for both within the constraints of maximum relative angle[38] between the two platforms may be impossible; a single platform may have to single-handedly perform the roles more frequently in an urban environment than would elsewhere be the case. The limited number of feasible engagement locations also facilitates enemy positioning of air defense weapons. Selection of favorable battle positions and coordination of aviation, ground forces, and counter–air defense systems will require extensive training and coordination by commanders and staffs.

Training in the proper application and adaptation of decisionmaking processes such as intelligence preparation of the battlefield will assist both defending and attacking commanders in dealing with aviation issues. Selection of key rooftop or other landing zones may require an attacker to secure the area and preclude direct-fire threats prior to insertion of a force. A defender, on the other hand, would want to emplace antihelicopter mines along aerial approaches to such critical locations and otherwise deny their adversaries access to these sites (or use same for ambushes). Similar training is essential to practice planners in selection of terrain critical to reconnaissance or counterreconnaissance operations, the siting of weapon systems, or the use of smoke to conceal movement. (Smoke was found to be the most effective means of reducing friendly casualties during urban operations in Vietnam.[39])

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tative on a CALL team sent to derive lessons learned from U.S. forces operations in Somalia.

[38]The maximum relative angle limits the lateral distance allowable between a laser designating source and the aircraft firing a missile that will home in on the laser spot. The missile must be within a specified number of degrees of the laser designator, or acquiring the target is not possible.

[39]Mr. Joe C. Alderman, interview with author, Fort Bragg, NC: U.S. Army Special Operations Command, October 26, 1993. Hereafter cited as Alderman. Unfortunately, the enemy quickly recognized the threat and fired into the concealment to deny U.S.

The U.S. Army Infantry School's Ranger Course has long had mountain, swamp, and (more recently) desert phases. Though planners must guard against relying too heavily on the last conflict while preparing for the next, recent Ranger and light infantry deployments in Panama, Somalia, and the lack of large-scale involvement by these forces in the 1991 Gulf War support consideration of adding an urban phase to the Ranger Course at the expense of a less likely deployment contingency. The primary difficulty would be site selection; a standard MOUT training facility would be of limited value. Replication of a major city or use of an actual metropolitan area is necessary (until virtual reality makes simulation a viable option).

EQUIPPING THE FORCE

Overview

> The scariest mission I had was when I had to walk down an alley with only six inches on either side of me. Somebody could have jumped out and killed us all. We need some sort of radar that tells me something is moving up there.[40]

Several ongoing Department of Defense initiatives (to include the Force XXI Land Warrior program and the Objective Individual Combat Weapon project) will eventually provide improvements in individual soldier firepower, survivability, and communications capabilities with many applications for fighting in built-up areas. Equipment improvements specifically for fighting *constrained* urban warfare are receiving less attention. These are the focus of the remainder of this study. Urban combat technologies are broken into six functional areas for the purposes of this review:

- Leadership, command, and control
- Reconnaissance and target discrimination
- Targeting and fighting

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forces safe passage. See *Combat in Cities Report, Volumes I–II,* Fort Benning, GA: U.S. Army Infantry School, 1972, pp. 26–27.

[40]SFC Billy B. Arnold, interview with author, A Company, 2-87 Infantry Battalion, 10th Mountain Division (LI), April 20, 1994. SFC Arnold was a platoon sergeant during operations in Somalia.

- Logistics and transport
- Survivability
- Additional constraint considerations

Although the focus is on constrained urban warfare, many of the points discussed will favorably impact force readiness regardless of whether the force has limitations imposed with regard to noncombatant and infrastructure considerations.

Leadership, Command, and Control

> In city fighting every street and square is a miniature battlefield, requiring special attention and special organization of combined operations by every commander.[41]

> The only thing that survives the first bullet is the graphic control measures.[42]

The same infrastructure that interferes with flight path, lasers, and munitions trajectories disrupts FM radio communications, denying tactical leaders their primary means of directing subordinates and receiving information. Placing antennas on rooftops may assist maintenance of communications. Preliminary planning can often identify those structures whose capture is key to successful communications during operations. During the 1991 Gulf War, signal teams moved into Kuwait City retransmission locations even before the critical buildings had been cleared of enemy in order to rapidly establish communications nodes.[43] Units having to establish command posts on the lower floors of buildings, however, cannot locate

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[41]Vasilii I. Chuikov, *The Beginning of the Road,* London: MacGibbon & Kee, 1963, p. 307.

[42]CPT Phil Parker, interview with author, Fort Leavenworth, KS: Center for Army Lessons Learned, February 10, 1994. Graphic control measures include unit boundaries, phase lines, and other notations put on maps to delineate areas of responsibility and assist in coordinating operations.

[43]SFC Patrick O'Brien, interview with author, Fort Bragg, NC: U.S. Army Special Operations Command, October 26, 1993.

standard antennas more than two to three stories above them, as longer lengths of cable cause too great a loss of signal strength.[44]

Dispersion on the urban battlefield also precipitates increased requirements for passage of information, which in turn necessitate distribution of individual communications systems down to at least the squad-leader level. Defending units habitually develop wire and courier communications regardless of the terrain in which they are operating. In urban environments, even attacking units may find reliance on these methods essential. Direct voice communications at the lowest tactical levels might prove ineffective. Echoes and the compartmented character of urban areas make verbal communication difficult; hand or other visual signals may be needed. Potential backup systems also suffer degradation; smoke used for signaling ground and air elements is frequently dispersed by swirling eddies, especially in intersections. Signal smoke is also often indistinguishable from the large quantities of smoke from burning structures, weapons firing, or other sources that accompany combat operations. The end result is difficulty in maintaining links with both organic and supporting units. Development of effective non-line-of-sight (NLOS) systems is therefore critical for control of forces fighting in urban areas. The pending introduction of soldier heads-up display monitors and wrist-borne communications systems will require NLOS capability if they are to be effective in urban environments.

Global positioning systems (GPS) suffer similar shortfalls. Soldiers within structures or in the proximity of tall buildings may find GPS performance degraded.[45] As accurate targeting demands precise location information, GPS improvements are critical.

Use of an airborne relay or retransmission element (for communications and GPS purposes) can abet maintenance of links between echelons. An enemy antiaircraft threat may make it lucrative to develop a retransmission system borne by a remotely piloted vehicle (RPV). However, even airborne links can not ensure constant communications (e.g., from within buildings); need dictates eventual development of effective non-line-of-sight systems.

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[44]Armor, p. 11.

[45]FM 90-10-1, p. 5-40.

The conditions that inhibit communications and navigation exacerbate the already difficult control issues confronted by military leaders. Reporting will have to be more frequent in urban areas. The need for small frontages in both offensive and defensive actions means that units will generally operate with other friendly units in close proximity. A leader must ensure that he knows the location of adjacent elements and that his location is known to them for both operational success and antifratricide purposes. This was aptly demonstrated during U.S. Marine Corps 2/5th Infantry Battalion operations in 1968 Hue. An officer exercised initiative and considerable innovation in bringing an E-8 gas launcher (a system capable of firing 64 35mm tear gas grenades) forward to dislodge the enemy from an especially well-fortified position. Although this use of CS gas abetted a local tactical success, unwarned members of 1/1 Marines on the southeast flank of 2/5 were unprepared for the gas bombardment and unimpressed by their neighbor's inventiveness.[46]

Reconnaissance and Target Discrimination

Constraints requiring minimization of collateral losses require not only finding and engaging targets, but confirming that such targets are indeed hostile and that engagement is feasible without unacceptable subsidiary effects. Such situational awareness requires effective combat intelligence.

Current individual night vision devices depend on ambient light amplification. Thermal devices are free of this requirement, but present models are too heavy and lack the resolution of better light-amplification goggles.[47] Both types of systems deprive users of depth perception. An improved night vision capability is needed that provides the resolution necessary to instantly distinguish between enemy and other potential targets. Such a system must have the capability to adjust to varied light conditions. Soldiers moving from the bright, sunlit streets of Mogadishu into dark buildings had to wait pressure-filled seconds while their eyes adjusted. Conversely, a

[46]Hammel, pp. 166–168.

[47]Development of a thermal, personal night vision system that overcomes these problems is in progress.

weapons discharge or sudden exposure to a light source blinds the wearer of current night vision goggles.

Ideally, a force would have the capability to scan a structure's interior to determine if it was occupied, where any occupants were located, and whether and how they were armed. Systems exist that can meet some of these needs, but none can now effectively interrogate a large area or structure. Reflective x-ray (x-ray technology not requiring installation of a reflective surface behind the object being analyzed) could begin to address this critical shortfall, but its near-term capabilities are likely to limit use to inspection of wall sections or similarly small areas.

RPVs and robots have search potential. The U.S. Marines used the Pointer RPV system during the 1991 Gulf War. This hand-launched, propeller-driven aircraft had a video camera to provide both real-time and taped viewing of target areas. The resulting intelligence was provided to multiple users simultaneously. Though this particular system was vulnerable to winds and had a limited range, its small size and range of uses foretell of future applications of RPV technology, e.g., small RPVs or flying robots that could deliver intelligence-collection systems to interrogate targets. Such systems could emplace acoustic sensors on walls or windows of buildings, deliver other robots with specific intelligence (or combat targeting) capabilities, or seed a target area with sensors.[48] These sensors would then provide information on target movement, chemical composition (a "sniffer" ability that could detect the presence of explosive substances or delineate between humans of differing cultures based on chemical signatures), or other characteristics.

The direction from which enemy fire is coming is difficult to determine in any environment. Echoes and the myriad possible firing points available in many urban locales make it especially so for any other than very experienced city fighters. Systems exist, such as counterfire radars and the British Claribel system (which determines

[48]See Stacey Evers, "ARPA Pursues Pocket-Sized Pilotless Vehicles," *Jane's Defence Weekly*, March 20, 1996, p. 3. This article appeared subsequent to the presentation of the concept in the draft version of this monograph.

the direction from which a rifle was fired[49]), that can help in this regard, but their utility in urban environments, especially for dismounted forces, is limited. Further development in this area is necessary.

Equipping soldiers with a fiber optic means of looking into rooms reduces friendly force exposure and enhances target identification. Such systems are currently in use by police and other forces. A silent means of inserting the system's probe would be needed when keyholes or air gaps around doors are unavailable; insertion can be difficult due to varied material composition found in some wall and door designs.[50]

Acquisition and Engagement

> It's up close and personal . . . You see the guy you kill.[51]

After finding and screening a potential target for engagement, confirmed enemy have to be acquired and engaged by friendly capabilities. Some extant technologies can assist regular units in reducing more effectively the negative collateral effects. The technology necessary to provide large-scale, overprinted aerial photographs of urban areas is available. Standard issue 1:50,000 maps are virtually worthless for any type of urban combat. The British use 1:4,000 scale maps for city ground operations.[52] The Berlin Brigade distributed 1:1,500 scale maps for use by mortar and artillery elements.[53] Such detail is unavailable for most cities worldwide, and smaller scales are needed by aviators and other forces whose rapid movement makes 1:4,000 or larger scales impractical. The most responsive way to overcome initial map shortages is to take high-quality overhead photographs that meet the needs of various units. Overlaying a grid

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[49]Michael Dewar, *War in the Streets: The Story of Urban Combat from Calais to Khafji,* Newton Abbott, UK: David and Charles, 1992, p. 153. Hereafter cited as Dewar.

[50]SGT Albert Preciado, interview with author, Los Angeles Special Weapons Team (SWAT), November 8, 1993.

[51]Christmas.

[52]LTC B. W. Barry, interview with author, Shrivenham, UK: Royal Military College of Science, October 14, 1993. Hereafter cited as Barry. FM 90-10-1, pp. I-2 and I-3.

[53]Richard F. Steiner, "Mortars in Urban Combat," *Infantry,* May–June 1988, p. 43.

on these photographs and labeling selected buildings and other terrain gives users the detail required and an effective means of reporting locations or calling for support. Procedures to rapidly provide and produce such products is very important to planners and those executing combat operations. Steps should be taken to overcome classification difficulties that can keep such products out of the hands of the junior leaders who badly need them.[54]

Soldiers require the capability to pinpoint and engage targets while minimizing the likelihood of inadvertently injuring nearby civilians. Hand-held lasers were found notably valuable in this regard during operations in Mogadishu. Helicopter crew members used lasers to guide infantry units through city streets. Infantrymen in turn "painted" targets with laser light to direct helicopter engagements. These lasers were generally not available to infantry units, being reserved for special operations personnel who fortunately shared the asset with 10th Mountain Division troops. Spotting lasers (to assist in aiming weapons) with greater ranges than are now available are under consideration as part of the Objective Individual Combat Weapon project. One such system could weigh as little as a pound, clip on individual weapons, and have a range of 2,500 meters.[55] Though the range is far in excess of that needed by infantrymen in most urban confrontations, it gives users the flexibility to use the system from aircraft or high-rise buildings. Laser capability to penetrate battlefield smoke and linkage to night vision capability is also desirable. Infrared laser technology is one area that provides a potential solution.

Other systems of value in constrained urban combat are available for off-the-shelf purchase but generally unavailable to regular units. These include nonlethal grenades such as those of the flash-bang and stun variety.[56] Shotguns were found to be more valuable than

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[54]2LT Charles E. Pettigrew, interview with author, HHC, 2-14 Infantry Battalion, 10th Mountain Division (LI), April 19, 1994. 2LT Pettigrew was the battalion assistant S2 during operations in Mogadishu.

[55]MAJ Marc Collins, interview with author, Woodbridge, VA: PM Soldier, December 10, 1993.

[56]Some designs are less life-threatening than others. Other characteristics are desirable, e.g., some flash-bang grenade types overcome ear or eye protection, whereas other designs do not. Many such grenades produce too much smoke when

M16s during room-clearing operations in Panama City. Shotgun blast noise stunned persons in rooms and their dispersal of shot reduced both fatalities and penetration of surrounding walls.[57] The aforementioned need for an improved night vision capability has direct application to targeting and survivability as well as target identification. Building interiors may be so devoid of light that even the light-amplifying technologies now used in night vision devices are ineffective; here again, technologies capable of "seeing" in the infrared spectrum may present a solution. Giving selected individuals a weapon-mounted infrared light source would allow them to illuminate enclosed areas without revealing their location, as occurs with the use of white light sources.[58] Such illumination would make identification of enemy or noncombatant possible at reduced risk to the soldier. An infrared tracer round offers similar advantages and could reduce the threat of fires caused by current tracers.

Eyes are especially vulnerable to the lasers increasingly used on battlefields. Soldiers require protection against laser effects. Precluding noncombatant eye damage may be more difficult. Noncombatants, often children, are likely to suffer eye damage. Blindness can be a particularly emotional issue; prime time news footage of civilians blinded by friendly force lasers could have significant impact on public support for military operations.

After pinpointing and confirming a target, forces or fires capable of destroying or neutralizing the target must be brought to bear. It is during the application of this lethal force that noncombatants are at greatest risk. The APFSDS and HEAT rounds used in M1 tanks were designed for defeating enemy armored vehicles; their lethal energy is

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they explode, thereby interfering with the user's ability to see potential targets. LTC William Chadwick, interview with author, Fort Bragg, NC: U.S. Army Special Operations Command, October 26–27, 1993. Hereafter cited as Chadwick.

[57]Brooks and LTC Tom Ryan, interview with author, Fort Leavenworth, KS: February 11, 1994. The latter hereafter cited as Ryan. The M16's copper-jacketed round has greater penetration capabilities than are desirable in many urban combat situations.

[58]Brooks, Ryan. Soldiers used multiple red and blue lens inserts in their flashlights in efforts to create a makeshift infrared light source. 1SG James A. Gorski, HHC, 3-14 Infantry Battalion and SFC William R. Thomas, Third Platoon, B Company, 2-87 Infantry Battalion, interviews with author. The men served as company first sergeant and platoon sergeant respectively when their 10th Mountain Division (LI) units were deployed to Somalia. Both men were interviewed April 20, 1994.

directed forward, and the resultant projectile penetration power is such that they may go through several rooms or buildings before stopping. Hellfire and TOW missiles fired by attack helicopters were similarly designed for antiarmor tasks. Rounds with greater lateral bursting energy, such as HESH or HEP projectiles,[59] would be more effective for fighting in built-up areas. The M2 (Bradley Infantry Fighting Vehicle) 25mm solid shot training round is a highly effective masonry penetrator that provides the additional benefit of eliminating a potential cause of injury: sabot debris from 25mm APFSDS rounds can cause injury up to 100 meters in front of the firing weapon. Use of the 25mm training round would therefore reduce the threat of both fratricide and civilian losses. Munitions with selector switches would allow users to choose an appropriate capability for specific situations. The switch may be nothing more than an on-off selector; the spalling and concussion effect of an inert Hellfire missile fired into a target room has the potential to kill individuals without destroying the remainder of that or adjacent buildings.[60] More sophisticated switch devices would give munitions variable penetration capabilities, explosive distribution characteristics, or a tandem effect to penetrate a barrier before exploding within a target area. Such selection options would provide users with the means to adjust weapons effects to structure type, proximity of friendly and noncombatant personnel, and other pertinent factors. An immediately available means of achieving similar results is available for indirect fire systems; not fusing rounds before firing limits their influence to the consequences obtained from concussion and shock.[61] Increased projectile accuracy already gives forces the ability to engage point targets with minimal collateral effect. The British used a smart bomb to destroy an Argentine artillery piece in Stanley, the Falkland Islands; the Israelis did likewise in Beirut. The accuracy of laser-guided Copperhead artillery rounds and AC-130 systems can be put to similar uses during urban operations.

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[59]Olsen, and MAJ John F. Scott, interview with author, Fort Stewart, GA: 1-64th Armor Battalion, 24th Mechanized Division, March 22, 1994. MAJ Scott was battalion executive officer for 1-64th Armor in Mogadishu.

[60]Barry.

[61]The author thanks LTC Mike Combest for noting this field-expedient method during his review of this document's final draft.

An additional cause of noncombatant injuries is cluster bomb units (CBUs) and similar bomblet munitions. These small explosive devices cause noncombatant losses even after cessation of hostilities.[62] Designing a self-neutralizing munition or otherwise eliminating this hazard would reduce both the noncombatant and fratricidal deaths that are increasingly a characteristic of modern warfare's aftermath.

Training in munitions characteristics can also help in reducing unnecessary damage or death, e.g., use of red phosphorus smoke instead of white for marking or signaling is less likely to start fires due to the former's lower burning temperature.

Nonlethal weapons are the subject of increasing attention. There is little doubt that this area has applications for a force attempting to minimize noncombatant casualties, but developers must recognize the varied needs of potential users. Characteristics of weapons needed by regular forces, SWAT units, or special operations personnel may differ. First, a combat force will engage targets in a wide variety of environments even within a single urban area. They may confront enemy in the streets, in small enclosures, in warehouses, in stadiums, or a myriad of other locations. They cannot afford to carry a different weapon for each potential contingency, and, unlike in many SWAT and special operations missions, they will move from task to task (and therefore location to location) very rapidly. Weapon systems must therefore have a very flexible use profile. A second way in which SWAT/special operations and regular force nonlethal technology characteristics can differ is in speed of effect. The former will likely need an almost instantaneous effect on the target; slow-acting agents may mean hostages or other innocent participants are killed before the target is subdued. Such rapid effect might be less essential for regular forces.

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[62]Israeli forces used precision bombing with CBUs effectively in 1982 Beirut. However, the civilian casualties, especially among children, had significant negative effects with regard to popular support. P. D. McLaurin, et al., *Modern Experience in City Combat,* Aberdeen Proving Ground, MD: U.S. Army Human Engineering Laboratory, March 1987, p. 31.

Logistics and Transport

> Sub-Saharan Africa has the highest rate of urbanization in the world. In any year, five percent of its population moves into shanty-towns on the outskirts of major cities.[63]

Commanders and staffs are also likely to find logistical support a great challenge during urban combat. Manpower attrition and ammunition consumption rates are very high, particularly for antitank weapons such as LAWs and AT-4s, grenades (both hand grenades and those for the M203), and rounds for rifles and machine guns. Defending-unit demands for barrier and other construction materials are likewise much greater than in most other combat environments. Stockpiling may solve some problems in static situations; materials must otherwise be brought forward as far as possible by soft-skinned or lightly armored logistics vehicles and man-carried to forwardmost unit positions. This need for personnel to move supplies is often beyond the capability of logistics elements at battalion and lower levels. The result is loss of combat power as maneuver elements task soldiers to do the job.

Tenth Mountain Division soldiers in Somalia moved around the battlefield by either foot or truck. The first precluded mutual support between faster tracked vehicles and slow foot-mobile infantry. The second was little better; soldiers mounted in trucks were extremely vulnerable to small arms fire and the ubiquitous RPG found in most Third World forces today. The reaction of the ill-equipped light division soldiers was to request M113 APCs (armored personnel carriers) from Fort Stewart's supporting heavy task force, thus depriving support units of their vehicles. The choice was a mutually exclusive one: either the light infantry was given APCs and rode to a fight with some speed and protection, or the heavy task force had proper engineer, medical, and other support.

If dismounted soldiers must move to a target, they must be able to do so via routes other than surface streets. Travel on streets assures friendly casualties. Rooftop or subterranean movement may not be

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[63]Robert Kaplan, briefing to the School of Advanced Military Studies, Fort Leavenworth, KS, April 12, 1996.

possible. A lightweight and safe means of creating "mouse holes" in walls has been a need since World War II. It remains a need unsatisfied.

Two additional and related problems further impact on logistical support. Many urban areas are de facto deserts should plumbing not function. Units will have to be supplied with water at their many forward nodes, just as they are with other classes of supply. This again requires both a larger number of soldiers to move stores to forward positions and a higher number of small containers to transport water than is the case in most other environments. Secondly, the presence of noncombatants forces the commander to determine priorities for the allocation of water, foodstuffs, medical supplies, clothing, shelter, and other needs common to both soldiers and civilians. The administrative history of General Montgomery's 21st Army Group in World War II northwestern Europe summarized difficulties in this area:

> The campaign confirmed the fact that when operating in civilized countries, the maintenance problems of modern Armies are to a large extent bound up with the maintenance of the civilians living in the operations areas and on the L[ines] of C[ommunications] . . . In order to administer the civilian population the import, manufacture and movement of certain essential stores for civilian use had to continue. These conflicted directly with the maintenance of military forces and priorities had to be decided constantly between the military and civil requirement.[64]

The passage is equally true with the deletion of "civilized" from its first sentence.

A soldier may also have concerns about medical evacuation. The same soft-skinned and lightly armored vehicles that are too vulnerable to enemy small arms and RPG fires for supply delivery can not approach the forward elements to remove wounded to medical facilities. Helicopters may likewise not be a feasible alternative, owing to the vulnerability of aircraft. The wounded must be evacuated by

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[64]Defense Science Board, *Conflict Environment Task Force (Implications of Third World Urban Involvement),* Washington, D.C.: Office of the Under Secretary of Defense for Research and Engineering, May 1986, p. F-1.

fellow combat soldiers, often over a long, convoluted, dangerous route. The evacuation problem is exacerbated by the high percentage of head and neck wounds suffered in urban engagements.[65]

Nor is civil affairs planning a straightforward issue, for the number of noncombatants may grossly exceed the preconflict population of an urban area as citizens flee the countryside for the perceived safety of a city. The influx of new arrivals into Gorazde, Bosnia during fighting around that city in March and April of 1994 reached 150 per hour.[66] A force desiring to burden its opponent with support of such numbers may prevent the departure of noncombatants from an area controlled by its enemy. (The laws of war do not require opposing forces to allow civilians to depart a combat zone.[67]) U.S. forces were confronted by difficulties in efforts to minimize noncombatant casualties in Hue and Mogadishu when the enemy either forced civilians to remain in the combat zone to assist in constructing defensive positions (Hue) or deliberately used women and children as cover while they engaged American units (Somalia).

Survivability

Force protection technologies can both protect friendly personnel and reduce the excess demands for manpower that city fighting often imposes. Many urban combat veterans called for a lightweight, effective protective vest for soldiers. An acceptable vest-helmet protective system would have to be light and capable of stopping small arms projectiles while also protecting the wearer from the effects of debris.[68] Individual protection is essential for the soldier or marine forced to hesitate for the fraction of a second it takes to determine whether his target is enemy or otherwise.

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[65]Dewar, p. 77.

[66]Radio news report, KNX Radio, Los Angeles, 6:34 AM, April 10, 1994. The town's population was reported as 63,000 in the April 11, 1994, issue of *USA Today* ("U.S. Jets Hit Bosnia Serbs," p. 1). Civilians also move to cities to obtain food, water, medical support, and other necessities often unavailable in a war-torn countryside. This migration can be mitigated by positioning distribution points away from urban areas and advertising their locations.

[67]Department of the Army, *The Law of Land Warfare*, Field Manual 27-10, Washington, D.C.: U.S. Government Printing Office, July 1956, p. 20.

[68]Christmas.

Vehicles likewise need additional protection against both small arms and RPG rounds. Enhancements to counter spalling and design improvements like the movement of fuel tanks to the vehicle exterior on recent M113 personnel carrier models are steps in the right direction.[69] Vehicle gunners, however, require better protection than that currently provided by this item of equipment; exposure of the head and upper torso is unavoidable during use of the .50 caliber machine gun. If a vehicle is vulnerable, its occupants' best defense is to pour fire into any possible enemy position as it advances through a city's streets, a tactic undesirable if preservation of noncombatant lives and property is a priority. Reduced vulnerability to mines for this and other vehicles is likewise needed.

Additional Constraint Considerations

Controlling noncombatant behavior is highly desirable to keep such personnel out of harm's way and to otherwise influence their actions in a manner favorable to achievement of friendly force objectives. Human behavior is notoriously difficult to control on a mass scale; to do so with persons of a different culture and with a language different than that of U.S. military personnel can be nearly impossible. Being able to communicate directly with local citizens is essential. The U.S. Army Special Operations Command (USASOC) lists a voice translation device (VTD) as a desirable technical innovation. Such a device would be hands-free operable, pocket-sized, and would translate spoken English into the language and dialect of the local population and vice versa.[70]

Current initiatives include an even more exotic technology: a three-dimensional holograph system capable of projecting both still and moving images with an audio feed.[71] The capability to remotely deliver a sound-image package via cloud reflection or aerial standoff has notable potential. It could be especially effective in influencing members of cultures in which superstition and the occult play signif-

[69]Christopher F. Foss, "Lessons Learned from Somalia," *Jane's Defence Weekly*, November 20, 1993, p. 19.

[70]From briefing slides entitled "CINC's Priorities," provided to the author by LTC Chadwick, USASOC.

[71]Ibid.

icant roles. Weather control also has the potential to favorably affect enemy operations (e.g., creating an ice storm to increase enemy reaction times) or human behavior (causing rain to keep noncombatants inside).[72]

More direct battlefield applications include methods of denying enemy and noncombatant access to structures cleared by friendly forces. Having to leave forces in bypassed buildings is currently necessary to preclude the enemy from infiltrating back into the area and thereafter either interdicting lines of communication or trapping forward units. Civilians may also inadvertently wander into such areas and become unwitting victims in combat actions. Alternative means of denying cleared areas therefore have the dual benefit of preserving force strength and reducing noncombatant losses. A number of nonlethal solutions are feasible. The simplest is the use of markers. Markers reflect when an individual has been in an area in which a marking chemical, powder, or other mechanism has been used. Covering entrances to a cleared building with a phosphorescent powder, for example, would cause anyone who traversed the area to emit a telltale glow where clothing or body parts came in contact with the marking substance, thus allowing security patrols to immediately recognize the trespasser. More effective denial mechanisms could include foaming of structures or using quickly emplaced barbed wire. Quick-hardening "wire in a can" would allow clearing teams to spray and thereby deny cleared areas. Liquid CS has been found effective, and its limited spread to surrounding rooms minimizes damage.[73] Being able to quickly neutralize these substances would be desirable should friendly forces need to traverse the area after emplacement. A significant benefit of such nonexplosive concepts is that they reduce postconflict noncombatant injuries. Proper design could make cleanup less dangerous and costly than is the case with the use of booby traps or mines.

Related to target spotting is target engagement. Providing soldiers with bullets that kill or neutralize a target on impact but do not pene-

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[72]Larry Bryant, telephone interview with author, Fort Dix, NJ: U.S. Army Research and Development Center, November 10, 1993.

[73]Pat Martin, interview with author, Los Angeles Special Weapons Team (SWAT), November 8, 1993.

trate surrounding walls reduces risk of collateral civilian injury or fratricide. Such rounds would ideally also be able to penetrate enemy body armor.[74] Frangible ammunition currently exists that has some of these desirable characteristics, but accuracy beyond 35–40 meters is poor.[75]

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[74]Barry.

[75]Chadwick.

Chapter Three

CONCLUSION

> The city manifests humanity's greatest aspiration toward perfect order and harmony in both its architectural setting and its social ties . . . Corresponding to this desire for physical perfection was the longing for a stable and harmonious society.[1]

Whether in war or operations other than war, urban combat involves potentially very costly and difficult missions. Steps can be taken in training, equipping, and otherwise preparing a force to ensure that its members are better prepared than has been the case in the past. Nothing can make urban warfare easy.

Constraining the force by demanding that noncombatant casualties and collateral damage be minimized only ensures a multifold increase in difficulty, stress, and, possibly, friendly losses. Enhancements can better prepare those that may face an enemy in the streets. Few of them are applicable only to urban warfare; many offer value to commanders having to undertake operations in other environments.

Can U.S. armed forces effectively conduct urban warfare operations while minimizing collateral damage and both friendly and noncombatant casualties with appropriate changes to doctrine, training, and military equipment? The answer appears to be a qualified yes, qualified in considerable part because significant variables impacting on

[1]Yi-fu Tuan, *Landscapes of Fear*, New York: Pantheon Books, 1979, p. 145.

successful achievement of desired end states are only peripherally related to the urban combat itself. For example, continued political support for military operations is essential. If public support is a function of perceived benefits, the probability of success, and expected versus actual costs, political support will be more difficult to maintain should any of these elements weaken. Military progress itself may therefore be insufficient to constitute success if casualties are too high. Speed may be an essential constraint, and sufficient speed without undue costs may be unattainable in urban fighting.

Urban warfare will remain a very difficult undertaking, especially when leaders and forces are constrained with regard to noncombatant losses. But "minimizing" does not mean eliminating. It is the unfortunate nature of conflict, and notably urban warfare, that soldiers and civilians will die. That is an undeniable constant. Leaders can only endeavor to ensure that the numbers lost are no greater than the unavoidable.

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