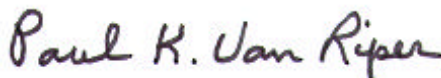


Department of the Navy  
Marine Corps Combat Development Command  
Quantico, VA

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*A Concept for Future Military  
Operations on Urbanized Terrain*

The tide of expanding urbanization in the developing world has increased the likelihood that Marines will again be called upon to operate in urban areas. Such evolutions will pose many challenges. *A Concept for Future Military Operations on Urbanized Terrain* addresses these challenges by exploring the application of the tenets of *maneuver* warfare to an environment which has traditionally been characterized by *attrition-style combat*. By combining this new intellectual approach with emerging technology, Marines will exploit the unique characteristics of urban settings. *A Concept for Future Military Operations on Urbanized Terrain* will guide the process of research and experimentation by which we will discern required operational capabilities and potential solutions.



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# **A Concept for Future Military Operations on Urbanized Terrain**

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## **INTRODUCTION**

### **CITIES AND WARFARE**

Traditionally, military planners have viewed cities as “centers of gravity.” Cities are population centers, transportation hubs, seats of government, sources of wealth, centers for industry, and key nodes for communication and information networks. These characteristics are likely to remain as important in the future as they have been throughout history, and will perhaps grow even more important as human society becomes increasingly reliant upon the technologies which are the trademark of city life. It is thus evident that, as urbanization increases, the military significance of cities will likewise increase.

By their nature as focal points of population, commerce, and government, cities are likely points of interface between US interests and the interests of foreign governments or non-state entities. In the still-emerging post-Cold War international security environment, cities have proven to be a locus for US military intervention. American forces have conducted major operations in Panama City, Port-Au-Prince, and Mogadishu, and noncombatant evacuation operations in Tirana, Kinshasa, Monrovia, and Freetown. Clearly, the likelihood is high that in the future, the National Command Authorities will again commit Marines to missions in urban areas.

### **TRENDS IN URBANIZATION**

According to United Nations estimates, the urban population of developing countries worldwide increases by about 150,000 people each day, with the most pronounced growth occurring in Africa and Asia. By the year 2025, three-fifths of the world’s population—*five billion people*—will live in urban areas.

	1950	1990	2015
<b>"MILLION CITIES"</b> [pop.>1 million]	50	270	516
<b>"MEGACITIES"</b> [pop.>8 million]	New York London	Worldwide: 21 Developing World: 16	Worldwide: 33 Developing World: 27

[Source: *World Resources 1996-97, A Guide to the Global Environment*]

As cities become physically larger and more populous, urban terrain grows more complex. Buildings increase in number, as well as in size. Road networks become more extensive, to include heavy-duty, multi-lane highway systems. Subterranean infrastructure expands as subways and storm sewers reach out to service broader areas. Urbanization spreads like an oil stain, creating broad and complex "transition zones" consisting of suburbs and industrial areas which separate the city core from its rural surroundings.

In some developing nations, the pace of urban population growth may exceed the development of city services. Housing, water, and jobs will be in short supply, giving rise to poverty, disease and crime. Overcrowded conditions will create an environment of social and economic tension which might eventually find an outlet in the form of violence.

## THE CHALLENGE

Added to the friction, uncertainty, fluidity and disorder which characterize war, the demands peculiar to the urban environment are especially challenging. Urban terrain is an extraordinarily intricate blend of horizontal, vertical, interior, and exterior forms superimposed upon the landscape's natural relief, drainage, and vegetation. The average city includes many styles of construction using a multitude of different building materials, each with its own texture and strength. Urban terrain influences the conduct of military operations to a greater degree than does any other terrain type. Unique to MOUT is the phenomenon that the conduct of operations can radically alter the physical nature of the terrain in ways and to an extent not experienced in other environments. Some buildings suffer damage, with collapsed walls or roofs, while others are razed completely, leaving only a pile of rubble. These effects can be militarily significant, as some key terrain features disappear altogether and fields of fire open and close.

Urban terrain is highly restrictive, limiting observation distances, engagement ranges, weapons effectiveness, and mobility. These factors tend to force extremely close combat with troops fighting from building to building and from room to room. Command and control is difficult, because small unit leaders cannot see their troops and radio communication is subject to interference caused by the presence of structures. Historically, urban combat has called for a high degree of initiative by small unit leaders operating with near-autonomy.



**"What was needed was for us to act so that every house in which we had even one soldier became a fortress against the enemy. All would be well if every soldier fighting in a basement or under the stairs, knowing the general task facing the army, stood his ground alone and accomplished the task on his own. In street fighting a soldier is on occasion his own general. He needed to be given correct guidance and, so to speak, the trust of the generals."**

**-Marshal Vasili I. Chuikov, Hero of the Soviet Union and Defender of Stalingrad.  
Quoted in The Battle for Stalingrad**

In the future, the urban environment will present Marines with situations requiring the conduct of many different categories of military activities.

Humanitarian assistance operations, peace operations, and full-scale, high-intensity combat may occur simultaneously in different neighborhoods. Integrating and coordinating these varying evolutions, each of which has its own peculiarities, will challenge Marines to use their skill and determination in innovative and imaginative ways. The presence of large numbers of noncombatants and the potential difficulty in distinguishing these noncombatants from hostile forces will further complicate the task of operating in the urban environment.

**"When Marines deploy into urban areas today and in the future, they will need the flexibility to address a wide variety of crises. In one city block, a Marine will provide food, care, and comfort for an emaciated child. In the next block, you will see this Marine with outstretched arms, separating two warring tribes. Then, in a third city block, this same Marine will engage in intense house-to-house fighting with hostile forces."**

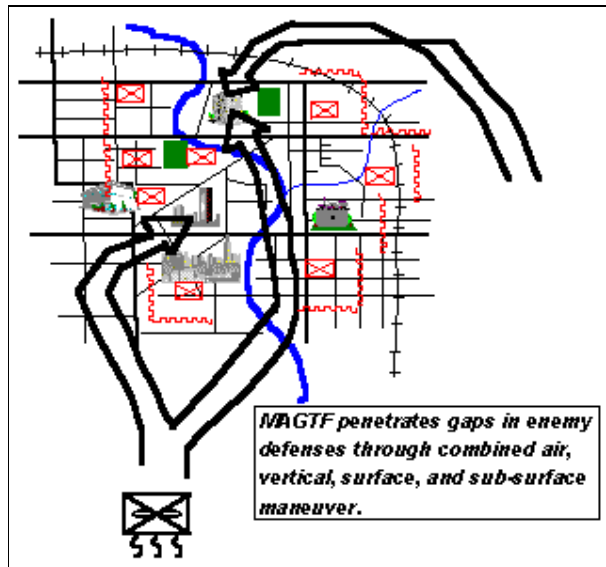
**-General C. C. Krulak, USMC  
31st Commandant of the Marine Corps**

## THE VISION: FUTURE MOUT

### MOUT AND MANEUVER WARFARE

Historically, operational artists and tacticians have viewed MOUT as *attrition* style warfare, which is characterized by the application of firepower to achieve the cumulative destruction of the enemy's materiel assets. The extreme granularity of urban terrain has limited conventional mobility and tended to "absorb" relatively large numbers of personnel. Unit frontages have been dramatically diminished, with advances or withdrawals measured in terms of single buildings or blocks. Troops expended extraordinary quantities of ammunition in efforts to destroy by firepower enemy forces protected by the cover of structures and rubble. Attackers systematically bludgeoned their way from building to building, while their opponents doggedly defended every cellar and room. Fierce and continuous close combat resulted in great material destruction, property damage, and high casualties among combatants and noncombatants alike.

Such attrition style combat can exact a toll in casualties and destruction which is inconsistent with both our system of values and our philosophy of warfare. This is reflected in rules of engagement which typically restrict our use of lethal firepower. While such restrictions heighten the challenge inherent in urban combat, they are integral to the employment of military power in defense of national interests



and will remain a fundamental feature of the circumstances in which we will operate.

The near certainty that the National Command Authorities will again deploy Marines to urban environments, combined with the mandate to reduce casualties and collateral damage, requires that our concept for future MOUT address a new vision for these evolutions. Through an understanding of the reasons why MOUT has typically devolved into attrition-style warfare, we can overcome existing limitations so that in the future, Marines will apply *maneuver* warfare to MOUT.

Maneuver warfare is the warfighting philosophy of the Marine Corps. In maneuver warfare, we apply our strength against the enemy's weakness, using tempo as a weapon to shatter his cohesion, organization, command and psychological balance. We maneuver in time, as well as in space, to achieve decisive superiority. In future MOUT, Marines will leverage the peculiarities of the urban environment to develop and maintain *tempo*, thereby creating a cascading, deteriorating effect upon the enemy. This will require new ways of thinking about operations in cities, as well as the exploration of new technologies to facilitate the conduct of maneuver warfare in urban conditions. Marines must have the technical capability and the operational acumen to identify the enemy's positions of strength and his critical vulnerabilities, *as they exist in the context of a city*. In the attack, instead of grinding their way from house to house, Marines will deftly maneuver through built-up areas, using new and unorthodox mobility techniques to avoid surfaces and exploit gaps. They will bypass and isolate the enemy's centers of resistance, striking killing blows against those enemy units, positions, or facilities upon which his force depends. In the defense, instead of focusing efforts on the creation of heavily defended strongpoints, Marines will drive the enemy into killing zones, and then will use enhanced mobility in the urban domain to deliver counterattacks which will unhinge enemy plans.

When future MOUT occur in the context of military operations other than war, the philosophy of maneuver warfare will remain an appropriate approach. Depending on the specific type of such operations, the enemy might be ill-defined or nearly invisible, yet Marines will still apply the fundamental notion of developing tempo to control the pace of the unfolding situation. In urban military operations other than war, Marines will face uncertainty and friction, just as in high-intensity combat, but often with missions that are far more complex and with latitude to apply force that is far more constrained.



The Marine Air-Ground Task Force (MAGTF) is well-suited for the conduct of future MOUT. With a balanced blend of ground combat power, aviation combat power, and combat service support, linked together under a single commander, the MAGTF will readily adjust to the intricacies of urban evolutions. In future MOUT, Marines at every level will employ the flexibility of the MAGTF to overcome the inherent “friction” of urban combat, thereby building tempo and controlling the pace of evolutions.

## **ENHANCING OPERATIONAL CAPABILITIES**

The granularity of urban terrain and the presence of noncombatants will combine to create friction which can potentially erode the effectiveness of basic operational capabilities. We will explore means for enhancing capabilities so as to overcome this erosion. Our efforts must address seven capability areas:

***Command and Control.*** Command and control systems must adapt readily to urban terrain. Communication devices must function in multi-dimensional urban surroundings, ensuring reliable communications between structures, streets, and sewers. Under circumstances in which unit boundaries will most likely include a vertical component in addition to the traditional horizontal limits, commanders must have a mechanism for identifying appropriate features and expressing plans to subordinates in three-dimensional terms.

We must overcome the restrictions urban terrain imposes upon the ability of unit leaders to monitor and direct the activities of subordinates. Marines must be able to determine and report locations in three-dimensional terms, with sufficient precision to identify individual rooms in a building, or even specific locations within rooms. Command and control mechanisms must display three-dimensional terrain in formats which enhance understanding and provide the user a “feel” for the ground. Computer-generated map products will provide a graphic representation of urban terrain, reflecting in near-real time changes caused by combat action (e.g., collapsed structures, flooded subways). Such products will be data-intensive; command and control hardware must be ca-

pable of retrieving, exchanging, storing, displaying, and manipulating these data in large quantities and at a very-small unit level.

Despite advances in technology, future MOUT will remain clouded by the fog and friction of war. Commander's intent, mission tactics, and implicit communications will remain fundamental to achieving the application of maneuver warfare to the urban environment. Command and control procedures and systems must be flexible and adaptive to account for the uncertainty inherent in combat.

***Mobility/Counter-mobility.*** Future MOUT will call for “multi-spectral mobility,” that is, the capability to move combat power rapidly through three-dimensional urban terrain. *Surface* movement will include not only conventional methods of negotiating roads and reducing obstacles, but also the means to create -- using special breaching capabilities -- new lines of communications or avenues of approach *through* structures which might be fully or partially intact. *Sub-surface* movement will exploit sewers, subway tunnels and other forms of urban subterranean infrastructure. *Super-surface* movement will allow Marines to create and use of lines of communications and avenues of approach via the upper stories of buildings, perhaps without the aid of aircraft. *Vertical* movement will be conducted between the surface, sub-surface, and super-surface zones. Finally, multi-spectral mobility in future MOUT will in-



clude *air* movement by assault support aircraft. Although a conventional method of movement, its use in future urban combat environments will call for special considerations in the selection of landing zones and routes.

The freedom to conduct movement within and between these zones will be critical to our ability to adapt maneuver warfare to the urban environment. Marine units will need enhanced mobility characteristics to facilitate—

- rapid breaching of steel-reinforced concrete walls,
- vertical movement inside structures without the use of existing staircases,
- vertical movement on the outside of structures,
- horizontal movement between structures *above ground level*, and
- penetration of pavement and building foundations for movement between surface and sub-surface zones.

Units moving in or between zones must be able to navigate effectively, and to coordinate their activities with units in other zones, as well as with units moving outside the city. This navigation and coordination capability must be resident at the very-small-unit level, perhaps even with the individual Marine.

Marines will conduct countermobility evolutions to limit or deny the enemy's freedom to maneuver along urban avenues of approach, which might include streets, subways, or passages through buildings. In the attack, when Marine units bypass enemy centers of resistance, they will use countermobility means to contain the enemy within his positions and to seal potential avenues of approach which might facilitate enemy counterattacks. In the defense, countermobility systems and procedures will form an integral part of the overall plan, limiting the enemy's maneuver options and channeling him into killing zones.



Marines must examine mobility in urban terrain as it impacts evolutions at different levels of war. For example, at the operational level, a MAGTF commander will be concerned with the capability to exploit a major urban transportation network.

On the other hand, at the tactical level, squad leaders will focus on procedures for movement through a small portion of the same major network.



**Measured Firepower.** Future MOUT will call for “measured firepower.” Structures and rubble will provide increased cover, requiring greater firepower to achieve desired effects against the enemy. At the same time, the potential presence of noncombatants will simultaneously demand reduced lethality in weapons employment. Measured firepower must enable Marines to deny the enemy the protection he will seek to gain from the urban environment. Marines must have the flexibility to attack targets located within buildings or rubble, and to conduct engagements from surface to sub-surface, and vice versa. Measured firepower must provide reasonable certainty of achieving the desired effect on the enemy, but with reduced risk of injury to noncombatants. In some situations, for example, Marines might be required to “implode” large buildings defended by the enemy, without seriously damaging surrounding structures. In other situations, they might employ nonlethal weapons to clear structures shared by enemy forces and noncombatants.

The nature of urban terrain will present challenges in employing fires. Limited visibility will affect targeting, fire support coordination, and battle damage assessment. Tall structures will become intervening crests for surface-delivered fires. The cover afforded by the terrain will affect penetration characteristics and fuze functioning, reducing weapons ef-



fects below the threshold for successful engagement. The fire support system must adapt to these conditions by providing for target location and designation in three-dimensional terms, extremely precise ordnance delivery (e.g., to a specific room in a building), munitions with variable penetration and explosive characteristics, and the coordination of lethal and nonlethal fires against different targets near one another. Marines must fully understand the expected effects of ammunition when used against different combinations of building materials. The capability to call for and adjust supporting arms in an urban environment must be resident at the very-small-unit level, perhaps the squad, and Marines at every level must understand the integration of fire and maneuver in urban terrain.

**Survivability.** Urban combat has historically resulted in high casualties, particularly among units attempting to maneuver through streets forming narrow and exposed avenues of approach, against enemy units entrenched in the rugged terrain of the city. Marines will use force protection measures adapted for future MOUT to facilitate maneuver with reduced risk of casualties. Individual and collective protection might serve to lower the incidence of some types of casualties.

Protective measures required for future MOUT will also include special medical capabilities. Individual Marines will be exposed to a wide variety of infectious diseases which breed in the close and heavily populated environment of a city. This exposure might be limited through means such as anti-biotic body-covering ointments or personal air filtration systems which could reduce the probability of inhalation or absorption of disease-carrying organisms. The nature of the terrain will result in a greater number of accidental injuries than are normally encountered in other operating environments: Marines will fall from heights, they will suffer cuts from glass and other sharp objects, and they will be hit by falling debris. Marines might be wounded while in locations from which it is difficult to evacuate them: a flooded subway or sewer, a major intersection swept by enemy fire, the 30th floor of a 40-story building in which the enemy

### **Force Protection Measures**

- ☐ **Body armor** optimized for maximum protection in close-range engagements, yet light and flexible to permit unconstrained movement.
- ☐ **Uniforms** designed to protect the wearer from minor injuries resulting from contact with abrasive surfaces or sharp, jagged objects.
- ☐ **Vehicle modifications**, or even **special vehicles** with additional armor protection on the top (due to the increased likelihood of top-down engagements in "vertical" terrain), multiple exits for embarked Marines, increased capability to dispense multi-spectral obscurants.

holds many upper and lower floors. Systems must be in place to provide for prompt and effective care of the wounded under such challenging circumstances.

**Adaptability.** Urban terrain will absorb large quantities of manpower because units will disperse vertically, as well as horizontally, reducing the lateral frontages they would normally occupy. Additionally, limited visibility and engagement ranges will combine to reduce the ability to cover by fire the areas between adjacent units. Given the extraordinary size of some modern urban areas, it is unlikely that Marine Corps forces will be deployed to a future MOUT situation in sufficient strength to operate in such traditional fashion. These evolutions will call upon Marines to employ *economy of force*, operating in ways which will reduce the tendency of urban terrain to absorb manpower.

Adaptability is the quality which will enhance our ability to create task organized combat formations. Marines operating in a city must be trained, organized, and equipped in such a manner as to facilitate smooth and rapid transition from one task organization to another. This characteristic will help us to control the tempo of operations and maintain the initiative. While task organization is a standard practice, it must be carried to the very small unit-level when applying maneuver warfare in an urban battlespace. Platoon commanders and squad leaders exercising initiative in pressing the battle against the enemy might find their units separated from adjacent units or higher headquarters. Small-unit leaders must be capable of planning and executing independent operations involving employment of special capabilities, as well as integrating supporting arms.

All units must be capable of readily disassembling into a number of independently functioning component parts and reassembling again, *without losing momentum*. Most important, adaptability calls for the capacity to rapidly change the organization and capabilities of any unit to gain maximum advantage as the situation ebbs and flows.

A MAGTF conducting future MOUT will be like a chameleon, effortlessly altering its characteristics to best blend with the operational situation. The MAGTF commander and subordinate leaders at every level will anticipate the flow of operations, and will adjust the composition of

units accordingly. Squad leaders and platoon commanders will command mini-task forces which might include tailored packages of dedicated support assets: tanks, artillery, combat service support, even aviation. As operations progress, these forces will change shape as special assets shift from one unit to another. In this way, leaders will smoothly adjust the focus of effort to maintain pressure against enemy critical vulnerabilities, while bypassing and isolating the enemy's positions of strength.

**Awareness.** Urban terrain will provide superb concealment for units occupying or moving through structures, subways, sewers, alleys, or narrow streets. Not only will this characteristic increase the difficulty of detecting the enemy, but it will also render our command and control efforts more challenging by screening friendly units from their commanders' observation.

“Awareness” is the ability of an individual Marine or a unit to sense the battlespace and to accurately assess information regarding the terrain and the presence of friendly, enemy, and noncombatant personnel. Enhanced awareness will allow Marines in a built-up area to gather information despite the presence of masking terrain features.

A particularly challenging aspect of urban terrain is the fact that much of the “volume” of a major city is actually *interior* -- the space found inside structures or under the ground. Marines need the capability to “sense



through walls” and to detect the presence and shape of tunnels and sewers. Sensors should provide for three-dimensional interior rendering, with the capability to display, store, and transfer information between units. For example, a patrol operating at surface level should be able to identify and report the extent and

shape of the subways and sewers running under their patrol route at the sub-surface. Other systems should provide a capability for *remote* interior sensing, perhaps using equipment mounted on aircraft of the aviation combat element.



**Sustainability.** Maneuver warfare is based on *tempo*, and *tempo* is tied closely to logistics. Logistics sets the bounds for what is operationally possible. In future MOUT, the logistics system must adapt to the characteristics of the environment to enhance *tempo*. The two distinguishing features of urban operations -- the terrain and the presence of noncombatants -- will both impact logistics. Measures which contribute to overcoming the logistics challenges of the urban battlespace can be said to enhance “sustainability.”

At the tactical level of war, we will conduct combat service support (CSS) as a subset of logistics operations. Our CSS system must provide for supply, maintenance, transportation, health services, engineering, and services under the special conditions of future MOUT. MAGTF Combat Service Support Elements (CSSEs), as well as unit-level CSS organizations, must be able to locate and reach dispersed elements of supported units in “vertical” urban terrain. Functions which occur routinely under field conditions will take on new dimensions in future MOUT: salvage and repair of an armored vehicle in a narrow street, evacuation of wounded Marines from the upper portion of a skyscraper, resupply of units operating in a storm sewer. The complexity of the environment will lead to thousands of permutations.

In some cases, the urban environment itself might be subject to exploitation for purposes of CSS. Water, fuel, rations, construction materials, and medical supplies might be available, either for use by Marine units or to provide for the needs of noncombatants or enemy prisoners of war. Local facilities and infrastructure which remain reasonably intact could serve the needs of the MAGTF: hospitals, vehicle maintenance depots, and communications systems, for example. Civilian vehicles and heavy equipment may serve to supplement those of the MAGTF. Subject to security considerations and the Laws of Armed Conflict, local residents with special expertise might be able to provide some assistance. The capability to extract resources from the urban environment must be built in to the CSS system.

## **FUTURE DIRECTIONS**

Meeting the challenge of future MOUT will be a multi-step process requiring an examination of our doctrine, organization, training and education, equipment, and support systems. First, we must study and understand the nature of the urban environment and its implications for operational- and tactical-level evolutions. This must include consideration of the terrain, as well as the impact of noncombatant civilian populations on operations in an urban battlespace.

Second, we must determine the techniques, tactics, and procedures required to apply maneuver warfare to the urban environment. This process will call for a shift in thinking. No longer will Marines systematically conduct reconnaissance, isolate the city, secure a foothold in the city, then clear the built-up area. Instead, they will use appreciation of the terrain to identify enemy centers of gravity and critical vulnerabilities as they appear in the urban venue, then they will conduct evolutions aimed at unhinging the enemy's ability to act. Similarly, Marines must learn to organize and integrate ground and aviation combat power in the city, and to design and execute the sustainment schemes which will build and maintain tempo.

Third, we must explore new technologies that will facilitate the conduct of maneuver warfare in future MOUT. Advanced sensing, locating, and data-display systems can help Marines to leverage information in ways which will reduce some of the masking effects of built-up terrain. New weapons and ammunition can provide the flexibility to engage enemy forces in urban cover, while limiting noncombatant casualties and collateral damage. Mobility enhancement devices might assist Marines in negotiating the complex, three-dimensional terrain found in a modern city.

Fourth, we must enhance our ability to train in urban environments. Effective training for future MOUT must include operational- and tactical-level evolutions which highlight the many challenges posed by urban terrain. Innovative approaches might include computer simulations or exercises on actual modern urban terrain. Tactical exercises without troops will aid commanders and staffs in understanding the nature of the urban environment. With proper coordination, Marines might conduct small-

unit exercises in subway systems, abandoned buildings, or on closed military bases.

Fifth, we must consider potential organizational solutions to the challenges of future MOUT. The unique characteristics of these operations may require changes to the composition of some units, or possibly even the creation of new units.

Finally, we must integrate our approach to the development of our capabilities for future MOUT. There is no single solution -- technological, doctrinal, organizational or otherwise -- which will fulfill our requirements for operations in urban terrain. Only through a blending of many emerging ideas, will we attain a mature capability to carry maneuver warfare to the city.