ATTACK HELICOPTER OPERATIONS IN URBAN TERRAIN

A MONOGRAPH
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Today's Army faces an environment much different from that which it prepared for in the Cold War. Massed armor battles, for which the Army was trained and equipped, have become much less likely while involvement in smaller and more limited conflict has become more probable. Future conflict is more likely to resemble Grenada, Panama, or Somalia than Desert Storm. As world demographics shift from rural to urban areas, cities can not be avoided as a likely battlefield, and have already played a prominent part in Army combat operations in the last decade.

To keep pace in this changing environment, the Army must look to the cities when developing doctrine, technology, and force structure. Attack helicopters are inextricably woven into the fabric of combined arms operations. But for the Army to operate effectively as a combined arms team in an urban environment, both aviators and the ground units they support must understand the capabilities and limitations attack helicopters bring to the battle. To avoid the high casualties and collateral damage likely in an urban fight against a determined opponent they must train and prepare *before* they fight. This paper presents an historical perspective of how attack helicopters have already been used in this environment. It also discusses the factors that make city fighting unique, and the advantages and disadvantages for attack helicopter employment in an urban environment, as well as implications for future urban conflicts.

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ABSTRACT

ATTACK HELICOPTER OPERATIONS IN URBAN TERRAIN by MAJ Timothy A. Jones, USA, 60 pages.

Today's Army faces an environment much different from that which it prepared for in the Cold War. Massed armor battles on the plains of Europe, for which the Army was trained and equipped, have become much less likely while involvement in smaller and more limited conflict has become more probable. Future conflict is more likely to resemble Grenada, Panama, or Somalia than Desert Storm. As world demographics shift from rural to urban areas, the cities will increasingly become areas of potential conflict. They can not be avoided as a likely battlefield, and have already played a prominent part in Army combat operations in the last decade.

If the Army is to keep pace in this changing environment it must look to the cities when developing doctrine, technology, and force structure. The close battlefield of Mogadishu or Panama City is much different from the premier training areas of the National Training Center or Hohenfels, yet aviators have been presented the dilemma of training for the latter environment and being deployed to the former. For most aviators facing urban combat, it is a matter of learning as they fight. To avoid the high casualties and collateral damage likely in an urban fight against a determined opponent, however, Army aviation must train and prepare *before* they fight.

Attack helicopters are inextricably woven into the fabric of combined arms operations. But for the Army to operate effectively as a combined arms team in an urban environment, both aviators and the ground units they support must understand the capabilities and limitations attack helicopters bring to the battle. This paper presents an historical perspective of how attack helicopters have already been used in this environment. It also discusses the factors that make city fighting unique, and the advantages and disadvantages for attack helicopter employment in an urban environment, as well as implications for future urban conflicts.

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Introduction

From the time attack helicopters were first introduced into the force structure of the U.S. Army in the early 1960's, they have been an integral part of the combined arms team. They have been employed in combat and non-combat operations in every large-scale military conflict since the Vietnam War. In each case, they have fought to some degree on an urban battlefield. Yet in each case the soldiers planning, leading, and executing these operations have had to do so without the benefit of doctrine and training oriented on operating in this most difficult of environments. For nearly as long as they have been around, the doctrine for employing attack helicopters in an urban environment has essentially remained unchanged: stay out. Fight on the outskirts to isolate and destroy reinforcements, but avoid combat in the city itself. This complies nicely with Sun Tzu's dictum: "The worst policy is to attack cities. Attack cities only when there is no alternative."[1] However, if we are going to follow our doctrine of staying out of the cities, we must find an enemy willing to do the same. Unfortunately potential enemies, whether they be conventional or guerrilla forces, may very well be influenced by another of Sun Tzu's teachings: "Seize something [your opponent] cherishes and he will conform to your desires."[2] Because we can not always choose where we will fight our enemies, we must be prepared to fight them anywhere. What part attack helicopters will play in that fight, however, is a choice the Army can make. This study will examine what role

attack helicopters may play on the urban battlefield and, if there is a mission for Army attack aviation, whether current training and doctrine can support that mission.

Roots of Attack Aviation and Historical Precedence

Army attack aviation has become an integral part of the combined arms team. It traces its roots back to the close air support (CAS) provided by the Army Air Corps in World War II. This function is defined as "air action . . . against hostile targets which are in close proximity to friendly forces and which require detailed integration of each air mission with the fire and movement of those forces."[3] The CAS mission was assumed by the Tactical Air Command following the war with the creation of the Air Force as a separate branch of the armed forces. In the post war years, however, the Strategic Air Command came to dominate the Air Force at the expense of the Tactical Air Command. When Air Force close air support in the Korean War proved to be less than desirable, especially when compared to the Marine Corps air arm, the Army determined to further exploit the success it was having with its rotary wing aviation.

Although the technology was still in its adolescence, helicopters had been used in growing numbers throughout the war in Korea, mainly in liaison, reconnaissance, logistical and casualty evacuation roles.[4] This was the first test of the helicopter in conventional warfare, and it proved its survivability in a hostile environment. GEN Hamilton H. Howze, appointed

in 1954 as head of the Army Aviation Office, considered the helicopter at the time to be "a machine that could go neither fast nor far nor high, and could not even carry much. It was comparatively expensive and comparatively unreliable. It had a single redeeming virtue: agility."[5] It also had another virtue: the Army had helicopters on hand and, in Howze's words, "technology had arrived at a point that justified the Army's having organic to it a small portion of the close air support it needed."[6] The Army emerged from its experience in Korea with an idea of the helicopter's potential, although its offensive potential as a fire support platform had been somewhat eclipsed by the helicopter's success in the medevac role. A few visionaries did, however, see the possibilities. Seeking a solution to the problem of mobility on a greatly expanded and dispersed Cold War battlefield, Army Aviation advocates pushed the concept of the Sky Cavalry, a tactical airmobile organization that was to become the basis in the early 1960's for the air assault division.

Early experiments in arming helicopters began at the U.S. Army Aviation School in the mid-1950's. Under the direction and supervision of BG Carl Hutton, the commandant of the school, helicopters previously used primarily for reconnaissance, logistics, and troop movement were outfitted with machine-gun, cannon, and rocket systems and tested in a ground support role.[7] Parallel armed helicopter development and doctrinal planning was done at the Infantry School at Fort Benning, and an experimental Sky Cavalry unit formed to match the one at Fort Rucker.[8] A "roles and

missions" debate between the Army and the Air Force over which service had proponency for armed aircraft on the battlefield and the mission for close air support of ground units threatened early development. The Air Force side of this debate asserted that arming Army helicopters was an unnecessary redundancy with an inferior weapons platform that already had a low probability of survival on the battlefield. As such, it represented a drain on already limited budget resources. The Army maintained that its armed helicopter program would only serve to complement the close air support offered to the ground commander by the Air Force and other services. Further, it drew a distinction between CAS, which would provide "large volumes of ordnance on call of the ground commander," and aerial fire support, which was conducted "with aerial vehicles capable of discriminatory firepower in close proximity to ground combat elements."[9] This distinction continues today.

With the U.S. involvement in the war in Vietnam and the widespread use of helicopters in the air assault role, attack helicopters became increasingly important to provide fire support to ground maneuver elements that had been inserted beyond the range of friendly artillery support. They also served as a means of applying direct fires against enemy forces in contact with friendly elements with relative precision. They effectively bridged the gap between artillery and CAS with a responsiveness that was at times exceptional. Consequently, ground commanders came to consider

organic attack helicopters "to be continuously available and immediately responsive."[10]

Attack helicopters soon became an integral part of the fire support plan. The forerunner of the attack helicopter battalion was, in fact, known as aerial rocket artillery. Three batteries of twelve aircraft each made up the aerial rocket battalion organic to the divisional artillery of an airmobile division. According to an Army study on airmobility in Vietnam, "aerial rocket artillery was so effective in the 1st Cavalry Division that the artillery commanders had to constantly remind the infantry to use tube artillery when appropriate rather than call automatically for aerial rocket artillery support."[11] Throughout the war a close bond was formed between the infantry units on the ground and the attack helicopters that provided them fire support. Ground and air units developed and refined Standing Operating Procedures (SOP's) and coordinating measures to improve command and control between the two elements, improve support, and reduce the potential for fratricide.

Vietnam also saw the first use of attack helicopters in urban combat. First attempted in the battle for Hue, helicopter gunship attacks were driven back by the high density of fire from light antiaircraft and machine-guns. Helicopters proved much more effective during the 1972 North Vietnamese Easter Offensive. Although American involvement in the war was drawing down, attack helicopters from Task Force Gary Owen, one of the last remaining U.S. combat units in South Vietnam, played an important part in

defeating the enemy attack on the city of An Loc. During the initial North Vietnamese Army (NVA) assault, Cobra gunships proved to be "particularly effective in hitting the tanks in the close confines of the city streets."[12] Cobra attacks against the armor spearhead knocked out several tanks, "effectively stopping the attack in its tracks."[13] To negate the effectiveness of CAS, the NVA adopted "hugging" tactics by staying too close for the defenders to call in air support without risking friendly casualties. The Cobras were able to operate within this danger-close area with miniguns and rockets to provide the necessary support.[14] Understanding the necessity of maintaining control of the air, the NVA saturated the area with antiaircraft weapons. SA-7 surface-to-air missiles, used here for the first time in significant numbers, as well as 23mm, 37mm, and 57mm guns, downed several Cobras during the 5 day battle for the city and the 66 day siege.[15] The battle of An Loc demonstrated two things: attack helicopters could fight effectively and decisively in the city; and they were vulnerable to air defense systems that were becoming increasingly more sophisticated.

Following the U.S. withdrawal from Vietnam, and in the aftermath of the 1973 Arab-Israeli war, Army aviation's focus shifted from ground force (primarily infantry) support to defeating massed armor formations on a modern battlefield, specifically a *European* battlefield. Aviation MOUT doctrine was neglected. In fact, most military thinkers and planners in Western Europe in the 1970's simply chose not to address the possibility of urban fighting, preferring instead to focus on combat in the open countryside.

This is what they were structured, trained, and equipped for; MOUT was discounted as "the other thing we shouldn't, we can't, and we don't prepare for."[16]

A lack of doctrine and training emphasis placed on conducting attack helicopter operations in an urban environment has made no difference when it comes to their actual employment, however. As an integral member of the combined arms team and an important element of fire support available to the commander, attack helicopters have been deployed and used in virtually every large military operation since the Vietnam war. In the U.S. intervention in Grenada in 1983, a total of 25 Army attack helicopters were deployed. However, they arrived in country after most hostilities had ended. During the follow-on peacekeeping operation, they provided aerial reconnaissance and were available for fire support for ground patrols. Had enemy resistance continued they would almost certainly have been used in combat operations.

The Marine Corps did, in fact, employ attack helicopters in the opening hours of the operation in support of both Army and Marine ground elements. On the north end of the island, a Marine Amphibious Unit (MAU) had the mission of conducting an early morning air and amphibious assault to secure Pearls Airport and the port of Grenville, and neutralize any opposing forces in the area. Marine AH-1 Cobras covered the initial seizure of Pearls Airport, knocking out antiaircraft positions with cannon and rocket fire to cover the air assault and providing early airborne reconnaissance to

Marine forces engaged on the ground. The four Cobras belonging to the MAU were then ordered south to the Salines area to provide support to Army forces. In one action on the south end of the island, a forward air controller (FAC) attached to the 1st Ranger Battalion directed a flight of two Marine Cobras onto a 90mm recoilless rifle position located in a house in the Salines area. The Cobras engaged with 20mm cannon and TOW missiles, destroying both the house and a support vehicle.[17] Further action in that area oriented on Fort Frederick, an old masonry fort that dominated the St. George's area from high ground to the east. According to a Marine report, "Although the fort was a more suitable target for naval gunfire, fear of damage to the heavily settled areas near the fort caused Admiral Metcalf to select an attack by the Cobras."[18] The report goes on to indicate that inordinate aircraft exposure times caused in an effort to avoid collateral damage to houses surrounding the fort subsequently led to the loss of one Cobra to antiaircraft fire. Another Cobra was shot down as it provided covering fires for the downed aircraft.[19]

When the United States again deployed troops for combat action, this time in Panama in 1989, the attack helicopter was to play an even greater role. One lesson taken from Grenada was that attack helicopters could deliver precision fires against urban targets with a minimum of collateral damage. However, they once again demonstrated their vulnerability to antiaircraft and automatic weapons fire. In the night assault against Noriega's Panamanian Defense Force (PDF), planners hoped cover of

darkness would reduce this vulnerability of aviation and fixed wing assets while capitalizing on U.S. military superiority in night-fighting technology. The U.S. attack was planned to strike 27 separate targets simultaneously to decapitate PDF command and control and paralyze the PDF's ability to react to U.S. actions throughout the country.[20] Most of the targets were in built-up areas; several were located in Colon and Panama City, large cities with populations of over 80,000 and 389,000 respectively.[21]

Attack helicopters played a major role in fire support in virtually all of the assaults conducted against primary targets in the initial hours of the invasion. Due to restrictions on employing mortar and indirect artillery fire in the Rules of Engagement (ROE), attack helicopter support was often the only additional fire support available. Near the small town of Gamboa, one H-Hour mission was to seize a military prison known to be holding political prisoners. As assault helicopters landed in the prison compound, an AH-1 Cobra engaged the guard barracks which overlooked the prison with rocket and cannon fire. In downtown Panama City special operations attack helicopters (AH-6's) and AH-64 Apache's suppressed antiaircraft and sniper positions around the Comandancia, the main PDF headquarters complex. Apaches and AH-6's also suppressed antiaircraft positions that could pose a threat to the C130's and C141's dropping paratroopers onto the Tocumen and Rio Hato airports.

Attack helicopter escort was planned for each of the major air assaults to be conducted on D-Day. Although all these assaults were to have been

conducted under cover of darkness to enhance surprise, an ice storm at Fort Bragg, NC delayed the departure of many of the soldiers who were to make those assaults. Beginning at 0700 hours the following morning, 82nd Airborne Division soldiers were assaulted by UH-60 Black Hawks into landing zones (LZ's) in the vicinity of the PDF garrisons at Panama Viejo, Tinajitas, and Fort Cimarron, all of which were located either within the city or in its suburbs. Cobras and Apaches escorted each assault. At Panama Viejo, the assaulting troops were engaged by automatic weapons fire from the PDF compound and civilian houses surrounding it. The attack helicopter pilots were severely limited in their ability to return fire, however, by the many Panamanian civilians gathered in the area to watch the assault unfold. The few PDF soldiers who continued to resist after the assault began often ducked into the crowd of civilians after they had fired, using them as human shields.[22]

The air assault at the Tinajitas barracks proved to be more heavily opposed. Black Hawks carrying the assault troops received heavy fire as they made their approach and landing into the small LZ. Apache's in overwatch positions received ground fire from civilian buildings near the objective, but did not return fire for fear of hitting civilians.[23] Cobra's escorting the flight of Black Hawks found themselves similarly constrained, but were able to engage some PDF positions with rockets and cannon when they didn't pose a threat to civilian lives and property.

In the days following the initial assaults, attack helicopters were active throughout the country, providing support for ground forces engaged in clearing Panama City and Colon of PDF and paramilitary forces known as "Dignity Battalions." As light infantry moved door-to-door throughout the city, attack helicopters orbited above, prepared to provide suppressive fires immediately if necessary, while scout aircraft conducted aerial reconnaissance and served as communications relays. These missions were often assigned according to aircraft capabilities. Cobras generally provided on-call fire support during daylight hours, with the Apache's flying at night to take advantage of their superior night optics capability.

The mere presence of attack helicopters had psychological value. This is demonstrated by an incident that occurred in Colon. According to one infantry battalion S-3 whose unit was operating in the city, clearing teams were often hampered by sniper fire. After one sniper was engaged by a Cobra, sniper incidents dropped off dramatically. Additionally, the battalion saw an immediate increase in the number of PDF and Dignity Battalion personnel looking to surrender themselves and their weapons.[24]

The United Nations operations in Somalia (UNOSOM II) again saw attack helicopters deployed and operating in an urban environment. Operating from the Mogadishu International Airport, AH-1 Cobra attack helicopters participated in cordon and search, reconnaissance, and air assault escort missions throughout Mogadishu and Somalia.[25] Aside from the infantry battalion's organic mortar assets, the eight Cobras were the only

assets immediately available to provide fire support to the Task Force commander. Because of ROE restrictions on the use of mortars, they were at times the only fire support available to employ against urban targets, as was the case in Panama. In an effort to reduce collateral damage, the Cobras' 20mm cannons were fitted with an AIM-1 laser designator which was boresighted to the gun. This allowed the gunner to get first round hits at night, when the laser was visible to night vision goggles, and made the cannon a point weapon system instead of an area weapon. TOW missiles also proved effective at isolating damage to the target area.[26]

Typical of attack helicopter operations in Mogadishu was a raid conducted by the 10th Mountain Division's 2-14 Infantry. The targets of the raid were clan members responsible for killing four American soldiers a week earlier. Attack helicopters first reconned the route through the city the ground assault force was to use, then provided overwatch as they moved toward the objective area. As the ground force assaulted the target, the Cobra's remained available to provide immediate suppressive fire.[27] Another time Cobra gunships fired sixteen TOW missiles into a Mogadishu residence where Somali clan leader Mohammad Farrah Aideed and his top aides were meeting. Somali accounts indicated that 73 persons were killed, including top elders of one of Aideed's subclans.[28] Other operations included security and route reconnaissance for convoys and security for ground cavalry elements conducting weapons search missions.[29] TOW missiles and cannon fire proved very effective against unarmored technical vehicles known as

"technicals", which were generally nothing more than pickup trucks with heavy weapons mounted in the beds.

Somali defenders fought back with every weapon they had: small arms, crew served weapons, rocket propelled grenades (RPG's), and 57mm rockets. RPG's particularly were in abundance. The first recorded instance of their use against U.S. helicopters in Somalia was 25 August 1993. One month later, RPG's scored their first U.S. kill, a UH-60 Black Hawk belonging to the Quick Reaction Force (QRF). Eight days later, on 3 October, two Black Hawks belonging to Task Force Ranger were also brought down by RPG's, sparking an eighteen hour fire-fight between Aideed loyalists and U.S. soldiers. Throughout the night, special operations AH-6 gunships operated continuously, providing fire support for the soldiers of TF Ranger pinned down in the center of the city as well as for the QRF troops trying to come to their relief. When U.S. troops finally succeeded in disengaging on the morning of 4 October, they suffered 18 Americans killed. Over 300 Somali militia lay dead, most the victims of helicopter gunships.[30]

MOUT and Attack Helicopter Doctrine

Since Vietnam, attack helicopter doctrine development has focused its orientation overwhelmingly on the European theater and the Warsaw Pact-based armor threat. Attack helicopter doctrine has changed little since the Army's doctrinal publications shifted to a narrow European focus with the 1976 edition of FM 100-5. Despite its roots as a ground maneuver fire

support platform, a type of "aerial artillery," the attack helicopter battalion's role has become one of maneuver against massed armor formations. The mission of the attack helicopter battalion as currently defined by the latest edition of FM 1-112, *The Attack Helicopter Battalion*, is to "destroy massed enemy mechanized forces and other forces with aerial firepower, mobility, and shock effect. . . . the [attack helicopter battalion] is most effective against massed, moving targets and least effective against enemy forces that are in prepared, well-camouflaged positions."[31]

This emphasis on a NATO-Warsaw Pact orientation continues with the current aviation doctrine on MOUT. According to FM 1-112, "the [attack helicopter battalion] operates best over open, rolling terrain, which is also favored by mechanized forces . . . . Attack helicopters are not well-suited to fight over urbanized terrain."[32] Army Aviation's capstone doctrinal manual, FM 1-100, acknowledges that army aviation "will conduct and support operations in urban areas."[33] However, it does little more than identify some unique difficulties imposed by the terrain on aviation operations.

Current aviation doctrine, however, simply echoes and amplifies Army doctrine. The current Army manual on the subject of MOUT, FM 90-10, was published in 1979. The manual addresses in general terms attack helicopter operations in support of the ground commander's scheme of maneuver. The manual is a product of it times, however, and is now somewhat dated. The text is devoted to a description of European-style urban terrain and focuses on an enemy that uses Soviet doctrine. It emphasizes the difficulties

encountered in combat in an urban environment, and 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." (emphasis in original) [34] But it also acknowledges that "adherence to [this precept], though valid, is becoming increasingly difficult as urban sprawl changes the face of the battlefield."[35]

The doctrinal concepts FM 90-10 provides the soldier, however, are incomplete. U.S. Army tactics center around defeating the enemy with overwhelming firepower by bringing all combined arms to bear, including artillery, CAS, and attack helicopters. Though suited to a relatively unconstrained atmosphere of urban warfare as typified in the Second World War, many of the tactics, techniques, and procedures are not applicable to the nature of combat the Army faces today in many areas of the world. Changes in American politics and foreign policy have emphasized the need to minimize noncombatant casualties and damage to buildings and infrastructure not considered essential to the defeat of the enemy, or what has otherwise come to be known as collateral damage. In addition to the tactical difficulties it creates, non-essential property destruction may also negatively impact strategic political and economic objectives by alienating the citizenry and laying waste the economic base needed for a return to pre-hostility normalcy, a task the United States has tended to assume responsibility for in recent years.[36] Advances in weapons technology, especially in precision munitions, has helped to make possible this changing

nature of conflict by allowing engagement and destruction of urban targets with little or no damage to surrounding structures. Despite the constrained nature of urban combat the U.S. Army employed in Grenada, Panama, and Somalia, the Army has not updated its primary manual for MOUT (FM 90-10) since its appearance in 1979.

Aviation doctrine has similarly failed to keep pace. Although Rules of Engagement (ROE) severely restricted the role indirect artillery and mortars could play in Operations JUST CAUSE (Panama), PROVIDE COMFORT (Somalia), and RESTORE HOPE (Haiti), attack helicopter doctrine current at the time of each operation still specified that "in an urban environment, mortars and artillery are much more effective than attack helicopters."[37]

The Infantry School at Fort Benning, Georgia has remained much more current in its approach to MOUT doctrine, with its addition of an infantry supplement to FM 90-10. FM 90-10-1, *An Infantryman's Guide to Combat in Built-Up Areas*, is designed to "[provide] the infantryman with guidelines and techniques for fighting against a uniformed enemy in built-up areas who may or may not be separated from the civilian population." The manual recognizes that in the future "the probability is great that United States forces will become engaged by enemy forces who are intermingled with the civilian population."[38] This manual expands the discussion of the urban threat beyond Europe and includes the tactics, techniques, and procedures for fighting in the city. Although written for the infantryman, it provides a good overview of combined arms and joint operations in built-up areas.

Joint publications do not address MOUT directly. However, Joint Publication 3-09.3, *Joint Tactics, Techniques, and Procedures for Close Air Support*, identifies the primary purpose of Army attack helicopter operations as "the destruction of enemy armored and artillery units." While they can perform a CAS function for cross-component support, Army attack operations are distinguished from CAS by how the aircraft are employed. Army attack helicopters are employed as maneuver units, while traditional fixed wing CAS is employed on a sortie-by-sortie basis.[39] As a maneuver element, it is "employed as a battalion and conducts supporting attacks which aid, protect, and complement other maneuver forces." The supporting attack it conducts "must be integrated into the commander's tactical maneuver plan along with other maneuver units."[40]

U.S. Marine Corps doctrine acknowledges that urban terrain is a very difficult environment to fight in. However, the rapid increase in population density in the littoral regions, as well as Marine involvement in Beirut, and Grenada has focused some attention on urban combat operations in Marine Corps journals. The Marine Aviation Weapons and Tactics Squadron (MAWTS), the proponent for Marine rotary-wing TTP, publishes an aviation MOUT handbook that provides Marine aviators an overview of the urban environment and a reference book for planning operations. Marine aviators appear to have a good head-start on their Army counterparts.

The two services employ their attack helicopters differently, however. Marine attack helicopter support more closely resembles Vietnam-era aerial

rocket artillery than it does modern Army attack aviation. Attack helicopters are normally assigned to the aviation combat element (ACE) of a Marine Air-Ground Task Force (MAGTF), which is a task-organized combat force structured to accomplish a specific mission. Depending on the size of the MAGTF (they range in size from reinforced battalion to division level), the ACE may vary in size from a reinforced helicopter squadron to one or more Marine air wings. It is task organized to provide any or all of the functions of Marine Corps aviation: air reconnaissance, antiair warfare, assault support, offensive air support, and electronic warfare.[41]

Marine fire support doctrine considers attack aviation (fixed and rotary wing) as an integral part of the overall fire support component for the MAGTF commander. Offensive air support allows the commander "to focus firepower at the decisive place and time to achieve local combat superiority."[42] Marine offensive air support consists of two components: close air support (CAS) and close-in fire support (CIFS). The primary difference is in aircraft type; fixed wing attack planes conduct CAS, while attack helicopters conduct CIFS. Both missions are used to deliver fire against targets located close to friendly forces. CIFS is seen as "provid[ing] the MAGTF commander with the capability to cover gaps between ground weapons systems and CAS."[43] Attack helicopters are employed, however, much like fixed wing aircraft. Scout helicopters are not used. The attack helicopter pilot receives the same mission brief from a terminal controller or FAC as that given to a fixed-wing CAS pilot. This brief includes a detailed

target description and location, location of friendly units in the area, the attack position (AP) from where the helicopter will begin the attack, and ingress and egress routes to the target.

Special Operations Aviation (SOA) attack doctrine is similar to that of Marine Corps aviation. Although SOA attack helicopters are sometimes required to operate autonomously against enemy forces, they are more often employed in direct support of special operations ground elements. Due to the nature of special operations, they are often the only fire support assets, other than organic mortars, available to special operations forces. Pilots are called in to a target by a ground observer who marks friendly and enemy unit locations when possible. When the pilot has a positive identification of the target, he makes the attack. The attack helicopters reattack the target until they achieve the desired effects. Fire adjustments can be made by the ground observer or the attack crew. Special operations doctrine requires SOA attack assets to "be capable of assaulting urban targets."[44] Unit SOP's and training plans cover urban operations in detail.[45]

Urban Terrain and Its Impact on Attack Helicopter Operations

The nature of a particular urban environment bears directly on how combat operations in that environment will be conducted. A brief description of the types and common characteristics of urban areas will more readily illustrate this.

Urban areas present a formidable obstacle to movement and combat, but the degree to which they impact military operations can vary greatly. FM 90-10-1 classifies built up areas into four categories: villages, with a population of less than 3,000; strip areas, which are built up areas along roads connecting towns and cities; towns and small cities, with populations of up to 100,000; and large cities, with populations of sometimes in the millions, and often covering hundreds of square kilometers.[46] Within these different types of urban areas are different types of terrain, which may range from sparse single-story dwellings to densely spaced high-rise apartment and office buildings.

The different types of terrain are characterized by Army doctrine as one of five types.[47] Dense, random construction is typical of the city core of many older cities. Prior to 1700, most cities were constructed with a defensive objective in mind, both against external invaders and internal insurrection. Many large cities in Europe and the Middle East have grown up around these cities first founded in ancient and medieval times.[48] The older part of the city is usually the city center. Streets here are relatively narrow, and are crooked and baffled as a further defensive measure to confuse ancient attackers. Buildings are typically densely packed and constructed primarily of masonry or stone, providing some protection against machine gun, cannon, and rocket fire. Some city centers that have been rebuilt following war or natural disaster may have buildings of lighter construction. The narrow streets and random development restricts line of

sight and fields of fire to less than 100 meters at ground level and low altitudes, and limits the ability of direct fire weapons. Antennas and power lines around and between buildings pose a hazard to flight. The danger of fire increases because of the age and proximity of the buildings.[49]

The second type of pattern is closed-orderly block. These areas are commonly found in the central areas of newer towns and cities, or on the periphery of older cities, and consist of residential and commercial type buildings with fairly uniform heights of 2 or 3 stories in small towns, 5 to 10 stories in large cities. The streets are wider and are usually laid out in a rectangular grid, with buildings often forming continuous fronts. Fields of fire along streets average 350 meters. Tall buildings limit long-range observation, and clothes and power lines between buildings may limit flight operations, especially at night. All roads can be assumed to have power lines running alongside.

As the distance from the city center increases, buildings become more dispersed, becoming what is known as dispersed residential terrain or residential sprawl. These areas consist of rowhouses 1 to 3 stories tall or single dwellings with yards, parks, and other open areas. Street patterns are rectangular or curving. Observation and fields of fire may be limited to 250 meters at ground level due to winding streets and trees, fences, and shrubbery around buildings, but may be much better at low altitudes. The more dispersed nature may permit multiple firing positions to engage the same target. Since 1945, most residential and commercial development has

been in low-density suburbs with a good transportation network.[50] Population density increases in these areas, leading to a larger number of civilians to contend with.

High-rise areas are dominated by multi-storied buildings that vary greatly in height. Modern city cores often contain high-rise areas, but they have also come to dominate some more newly developed outlying areas. Buildings are generally separated by wide streets and large open areas such as parks and parking lots that offer improved fields of fire, especially at higher altitudes. Tall buildings offer the possibility of lateral masking for attack helicopters operating at higher altitudes, and provide good references for navigation. Mutually supporting firing positions may be available.

The fifth type of urban terrain is the industrial/transportation area. These areas consist primarily of low (1 to 3 story) factory buildings, warehouses, supply depots, airports, and railroad yards. Older industrial/transportation areas may be found in the city core or core periphery, but newer areas are located on the outskirts of towns and cities. Fields of fire are good, and weapons may be employed at standoff ranges in some cases. Mutually supporting firing positions are generally available, although cover and concealment is often limited. Buildings are generally of light frame construction, vulnerable to machine-gun, cannon, rocket, and missile fire.

In addition to the five terrain types recognized by Army doctrine, a sixth type of urban terrain has become increasingly common in recent years,

especially in developing nations. Shantytowns and squatter villages have grown up on city peripheries and in poorer urban sections with the migration of the rural populations to the larger cities and towns. Population density is very high in these areas of narrow streets and alleys separating lightly constructed houses patched together with corrugated metal, cardboard, and plastic. Electricity and public utilities are usually minimal or nonexistent.[51] Visual references are often difficult to discern. Because most buildings are low, fields of fire are generally good above ground level with few obstacles to flight, but cover and concealment are poor.

Urban Attack Helicopter Operations

The urban battlefield offers unique challenges to attack helicopter employment, as well as opportunities attack aviation can capitalize on. The effectiveness of attack helicopter engagements in the city depends on the nature of the target and the tactics employed, as well as the type of weapon and munition used.

Perhaps the most difficult aspect of the engagement is the process of acquiring the target. Rapid acquisition results in lower exposure time for the firing platform, increasing survivability. Positive target identification results in greater weapons effects on the target, reduced collateral damage, and less chance of fratricide. The attack helicopter can acquire and attack a target autonomously, but that is not normally the case. Scout helicopters or other attack helicopters performing the aeroscout role usually first acquire the

target, make positive identification, and hand off the target to the helicopter gunship making the attack by radio transmission or databurst.

Modern target acquisition systems are a great help to the pilot in finding and identifying the target. Acquisition systems vary among the Army's inventory of attack helicopters, with some types better equipped than others. Conventional attack helicopters (AH-1 Cobra, AH-64 Apache, AH58D Kiowa Warrior) all feature an image enhancing/magnification system integral to the gunner's sighting device, although they vary in capability. The Cobra's telescopic sight unit features a 13X magnification. Sensors on the AH-58D have a magnification of 25X, while the day television system, or DTV, on the AH-64 magnifies the target up to 127X. Special operations attack helicopters currently do not have that capability, and are limited to the pilots' eyesight alone. The Apache and Kiowa Warrior, along with special operations helicopter gunships, mount thermal imaging sensors (also known as Forward Looking Infrared, or FLIR) which detect infrared energy (heat). This system can prove critical in an urban area at night. Around lighted buildings and street lights, the pilots' night vision goggles can be degraded by the excess light. FLIR helps the pilot and gunner overcome this degradation and more easily identify reference points and targets. Night vision enhancement in the Cobra is limited to night vision goggles worn by the crew. During JUST CAUSE, the aviation Task Force assigned missions when possible based on the strengths of the aircraft available. The limited number of Apaches available flew primarily at night, when they could exploit

their superior night optics. Cobras, which have a limited night weapons engagement capability, were assigned daytime missions.

The flight profile of the aircraft also affects target acquisition. An aircraft flying at lower altitudes will have a more difficult time acquiring targets at ground level because the line of sight to the target is masked by buildings and structures. Navigation within the city is similarly affected, since checkpoints may not be visible until the aircraft is almost over the top. The vertical development, or height of a structure, plays an important role when flying at terrain flight levels (below 100' above ground level, or AGL). Checkpoints with a high degree of vertical development such as high-rise buildings and towers will be much easier to see at lower altitudes. Higher altitudes provide a much larger view of the terrain, although with less detail. When the surface-to-air missile (SAM) threat will allow flight at higher altitudes, a technique used in both Panama City and Mogadishu was to split the flight, with one or more aircraft operating at higher altitudes to provide scope as well as detail.

Urban background clutter has considerable impact on target acquisition. A Marine Corps study on urban CAS indicated the degree to which clutter impacted acquisition was based on the type of urban structure found in the target area. The high-rise area presented the most difficulties in target acquisition, even though the target location in the study was characterized by very distinctive structures which should have provided good visual cues to the pilots. The study indicated, however, that the richness of

visual cues could often lead to "information overload," with the pilot unable to filter and process data in time to conduct a successful attack. Target acquisition in residential areas characterized by houses of similar shapes and sizes, with fewer distinctive landmarks, was the next most difficult.[52]

Target acquisition can be much easier, however, if a ground observer is available. Located in a protected position where he can see the objective, an observer can mark it with smoke, a laser designator, or tracer fire, talk the pilot in to the target, or simply describe the target and its surroundings. These additional cues help the pilot to find and positively identify the target more quickly in the urban clutter, shortening the exposure time of the aircraft as well as reducing the risk of fratricide. Joint CAS doctrine requires an observer, such as an air liaison officer (ALO), forward air controller (FAC), or fire support officer (FSO), to "ensure that the correct target is attacked and to reduce the possibility of fratricide due to the close proximity of friendly forces."[53] The attack helicopter commander may fill this role when helicopters are providing the supporting fires.[54]

Many aspects of the actual target engagement are similarly affected by the urban environment. When attacking the target, attack helicopters may employ hovering fire, running fire, or diving fire. The type of attack selected depends on the threat, type of target, weather, terrain, the weapon to be fired, and the weapons effects required on the target.

Hovering fire is the most common method of engagement when firing TOW or Hellfire missiles. Because the aircraft is less stable at a hover,

cannon and rocket fires are less accurate. The stability of the aircraft increases with forward movement, however, making running or diving fire more accurate for gun and rocket engagements. Because of the lessened effects of rotor downwash, diving fire is the most accurate method of engagement for unguided munitions. Discounted as a viable technique when the proliferation of shoulder-fired SAMs worldwide made aircraft survivability above terrain flight altitudes questionable, diving fire made a comeback in the late 1980's as light division aviation brigades saw its utility in situations with a reduced air defense threat. The reduced size of the ordinance impact beaten zone reduces the chance of munitions landing outside of the target area, minimizing the chance for unwanted collateral damage.

A combination of running and diving fire is routinely practiced by special operations helicopter gunships and is applicable to all attack helicopter types. The aircraft starts in a terrain flight mission profile to provide protection from SAM and other air defense threats. As he approaches the target area, the pilot initiates a maneuver called a bump, which is a slight climb to a higher altitude to bring the target in sight and begin the engagement. The bump altitude is dependent on the nature of the target and its surroundings, but should establish a clear line of sight/line of fire for a diving fire attack on the target. This technique was practiced by 7th Infantry Division pilots in Panama initially. When it became clear that the only air defense threat was from small arms, the Cobras maintained

racetrack holding patterns over possible target areas at 1,500 feet, which is outside the air defense range of most small arms weapons.[55]

Another common attack technique that requires modification is in the use of weapons standoff. Attack crews are trained to use standoff engagements to enhance their self-protection. Ranges of 3,750 meters for the TOW and 8,000 meters for Hellfire missiles support the use of standoff.[56] However, such engagements are unlikely in the MOUT environment. Depending on the type of urban terrain, numerous obstructions such as buildings, towers, and power lines will likely interfere with both the line of sight between firing platform and target and the flightpath of the missile at long ranges. A moving target is especially difficult to engage at long ranges. According to the Army's gunnery manual, the guidance wires that control the TOW missile can droop 12-18 feet at a range of 2,000 meters. Any contact between the control wires and high-voltage power lines or water "could cause uncontrolled missile flight and/or damage to the TOW system."[57] When using Hellfire, the abundance of reflective surfaces such as glass or shiny metal found in built up areas may degrade the effectiveness of laser designators significantly, as can smoke and haze.

Standoff weapons engagements can still be conducted in MOUT. Cities commonly contain large open expanses around industrial/transportation areas, and streets may be wider and straighter in some parts of the city than in others. But helicopter gunship crews must be prepared to engage targets under the least desirable conditions as well.

Training and experience are necessary to overcome doctrinal biases oriented more toward the open plains of Europe or the National Training Center than the narrow city streets of Africa or Central America.

Attack helicopter engagements are normally made from one or more battle positions. Within these battle positions are multiple firing positions which allow the attack element to mass fires against the target. Among other characteristics, appropriate battle positions should have adequate maneuver area, favorable engagement ranges, good fields of fire, and cover and concealment.[58] Finding battle positions that fit this description may very well be difficult if not impossible in an urban environment. . According to an aviation observer sent by the U.S. Army Center for Army Lessons Learned to Somalia,

> Standard tactics used by aviators don't apply to cities. 99.9% of the time a city provides only one gun line to a target, so tactics designed for the massing of aviation fires are useless. Tactics involving stacking aircraft in battle positions to the right and left of an objective and then massing fires on the objective don't work. It is much more important to cycle aircraft into battle than mass aircraft. . . . Battle position solutions are predicated by one thing: a clear gun-target line for laser designation and firing.[59]

In MOUT operations in Panama and Somalia, attack helicopter companies routinely broke down into two or three aircraft sections. This allowed the aircraft more room to maneuver in the battle position, while still allowing for mutually supporting positions when the target allowed.

Advantages of Attack Helicopters in MOUT

Despite the limitations fighting in urban terrain places on attack aviation operations, attack helicopters can bring a substantial advantage to the battlefield if used properly. Urban warfare is infantry intensive. Light forces are required to clear and hold buildings, man checkpoints, and control refugees. Other combat arms such as armor, artillery, and aviation, can also contribute significantly to the urban fight with their ability to provide direct and indirect firepower. Air Force, Navy, and Marine close air support provides an additional capability. Although modern helicopters such as the Apache are much more survivable than the older Cobras they replace, air defense weapons and small arms fire still present imposing threats. Electronic countermeasures (ECM) and terrain flight techniques have reduced their effectiveness, however, and Helicopters have by no means been driven from the urban battlefield. Unless the entire battlefield is swamped with air defense systems, attack helicopters are capable of delivering the same, and oftentimes superior, weapons effects on the target.

As mentioned previously, direct fire weapons systems often face severe restrictions on their range in urban areas. This is perhaps most revealing in the employment of anti-tank guided missiles (ATGM's). Based on studies and historical analysis of urban combat, FM 90-10-1 indicates that "only 5 percent of all targets are more than 100 meters away. About 90 percent of all targets are located 50 meters or less from the identifying soldier. Few personnel targets will be visible beyond 50 meters and usually occur at 35

meters or less."[60] While these close ranges may have little effect on light weapons such as small arms and light anti-tank weapons (LAW's), they have considerable impact when a heavier weapon is required to engage armored vehicles or fortified positions. Currently, the heaviest weapon organic to the light infantry battalion is the TOW missile.

Yet ground forces may have few opportunities to employ this weapon. In a line of sight distribution study of two European cities, Patrick O'Sullivan determined that in Bad Hersfeld, 60 percent of the measurement of maximum lines of sight in dispersed residential areas were less than the minimum distance required to arm the TOW missile while in Schweinfurt, 52 percent of the measurements were below this range.[61] In the case of these two cities, heavy ATGM weapons engagement may be prohibited over 40 to 50 percent of the terrain. While this is not indicative of all cities, it certainly illustrates one of the problems associated with using ATGM's in a close environment.

Another problem facing the ATGM gunner is where to place the firing position. An elevated position will usually give superior observation and fields of fire. However, maximum and minimum elevation limitations of the ground TOW may present problems with dead space, and weapon backblast concerns will impose other restrictions on firing emplacement positioning. Obstructions in the missile's line of flight are also a concern. Wire guided missiles need a vertical clearance along the line of flight of 11 meters to clear walls, fences, parked vehicles, and other obstructions commonly found in

towns and cities.[62] Live power lines in the line of flight pose the threat of damage to the weapons system and injury to the gunner if guidance wires cause a short circuit. TOW guidance wire is insulated to withstand 100 volts; voltages of power lines in Germany, for example, range between 8,000 and 100,000 volts.[63]

When they are available, tanks and armored fighting vehicles may be able to use their main guns to provide the heavy punch that is sometimes needed by light forces. However, close urban terrain restricts mobility and, at times, the ability to traverse the turret. Tanks may not be able to elevate their main guns sufficiently to engage targets on the upper floors of buildings.[64] Also, vehicles that are not adequately supported by light infantry are vulnerable to attack by mines, infantry anti-tank weapons, and improvised munitions such as molotov cocktails. And, according to a Defense Department report commissioned to determine the effect of different weapons in city fighting, "as was learned and relearned in many city battles, . . .when infantry learns to rely on their supporting tanks, attacks tend to stall as soon as the tanks are stopped."[65]

Close air support also faces severe employment limitations in urban terrain. In addition to the navigation and target acquisition problems imposed by urban clutter, the aircraft attack and ordinance delivery profiles present additional trouble. According to the Marine study,

> non-guided bombs intended for low-level attacks "poses problems where vertical development is great ... to achieve acceptable release parameters for accurate impact safely." If forced to release the weapon

> above 1,000 feet in order to avoid buildings in the aircraft or bomb's line of flight, "the accuracy of the weapon is severely reduced and its effectiveness for CAS greatly diminished." Because laser guided bombs (LGBs) are released at longer slant ranges than "dumb" bombs and essentially glide to the target, "in high-rise areas there is a possibility of the LGB line-of-sight to the target becoming masked during the fall of the LGB because of drift effects, coupled with the severe vertical development of the urban area."[66]

During Operation El Dorado Canyon, Air Force F-111's engaged urban targets in Libya with LGB's. Despite detailed planning and excellent intelligence on the targets, 2 of the 12 aircraft involved were unable to drop their bombs due to problems acquiring the targets; 3 missed their targets due to guidance problems when the laser broke lock because of building interference and smoke obscuration; and one dropped its bombs on a residential neighborhood, having misidentified its offset aiming point.[67]

Attack helicopters are faced with many of the same constraints that ground forces must contend with. Some of the same TOW missile limitations apply to missiles fired from attack helicopters, and helicopters are vulnerable to antiaircraft and sniper fire. However, an advantage attack helicopters have over ground weapons systems is their ability to maneuver around the battlefield to select the best line of fire and engage targets from a variety of aspects and angles. Their greater mobility allows them to reposition quickly to engage new targets or avoid a threat.

Attack helicopter battalions are organic to all divisions, as well. Light infantry divisions have borne the brunt of recent MOUT combat operations. However, with the exception of the 82nd Airborne Division, light divisions

have no organic armored vehicles. Incorporating them into the light structure for urban combat will require much more training than would be needed for the gunships in divisional attack helicopter battalions and cavalry squadrons, which are already familiar to the maneuver units they will support.

Perhaps the biggest strength of attack helicopters on the urban battlefield lies in their ability to use precision engagements to destroy selective targets with minimal collateral damage. Urban combat operations are among the most difficult operations the Army is likely to face. It is likely in future fighting in this environment that U.S. forces will have to operate under constraints on their use of firepower. In a study prepared by RAND, Russell Glenn documents a shift in Western attitudes that once saw legitimacy in noncombatant casualties if they benefited friendly force objectives.[68] This shift is reflected in the most recent version of FM 100-5, *Operations*: "The American people expect decisive victory and abhor unnecessary casualties. They prefer quick resolution of conflicts and reserve the right to reconsider their support should any of these conditions not be met."[69]

U.S. engagements in Grenada, Panama, Desert Storm, and Somalia have seen limitations placed on tactical operations and weapons employment in an effort to limit both noncombatant casualties and collateral damage to civilian property and infrastructure. This is especially true in military operations short of war but which still involve combat, where the civilian

population may be neutral or supportive of U.S. efforts, as was the case in Grenada, Panama, Kuwait, and Somalia. These restrictions are normally in the form of rules of engagement (ROE). While not denying the right of self defense, ROE may limit weapons employment and alter the way the military conducts combined arms and joint operations. ROE issued during Operation JUST CAUSE, for example, advocated armed force only as the last resort. It also required the permission of a ground maneuver commander at the rank of Lieutenant Colonel or higher to use "artillery, mortars, armed helicopters, AC-130s, tube or rocket-launched weapons, or M551 main guns against known or suspected targets", and prohibited CAS without approval from above division level, if civilians were in the area.[70]

Such restrictions are effective in reducing collateral damage, although at a potential cost in friendly casualties. Field artillery and CAS have been relied on historically to provide the bulk of fire support but, because the more restrictive ROE, their use in modern urban combat will likely be limited or at least greatly modified from traditional roles. Normally artillery in urban combat is limited in the indirect fire role because of the technical difficulties with target acquisition and adjusting fire, as well as problems with trajectory angles caused by high buildings. In urban fighting since Vietnam it has suffered restrictions in an effort to reduce collateral damage. Artillery and air strikes were prohibited initially in the fight by the Marines to retake Hue in the 1968 Tet Offensive in the hope of preserving historic sites within the city.[71] As seen in the previous ROE for JUST CAUSE, artillery use required

the approval of a battalion commander or higher. In fact, artillery was used in the direct fire mode in Panama against PDF buildings to persuade the defenders to surrender prior to an infantry assault. It proved effective. One incident in Colon against a PDF strongpoint illustrates artillery's effectiveness in this environment. Firing from about 10 meters away, the artillery fire silenced the building's defenders with little collateral damage.[72] The effects of indirect fire are much less precise, however, unless guided munitions are used. As the fighting in Hue became more intense and friendly casualties mounted, the restrictions on artillery and CAS were lifted. When the city was finally retaken after 25 days of fighting, artillery, air strikes, and naval gunfire had destroyed most of the religiously significant sectors. The same firepower, while inflicting heavy casualties on the Viet Cong and North Vietnamese defenders, caused heavy civilian casualties as well.[73]

Attack helicopters have an advantage in a constrained situation over other weapons systems. Because they must first see the target before they engage it, pilots can positively identify enemy forces or hostile activity (such as sniper or mortar fire from an enemy controlled area of the city) before firing. The variety of weapons available at his disposal, from machine guns or cannon to TOW or Hellfire missiles, allows the pilot the opportunity to select the most appropriate weapon for the situation. This flexibility can limit collateral damage caused by large area-fire weapons such as bombs and artillery against targets that could be engaged with point weapon systems.

The helicopter also has the ability to maneuver to a position that allows the optimal engagement for the situation at the least risk to friendly forces or noncombatants.

Conclusion and Implications for Future Urban Conflicts

Events in Panama, Iraq, and Somalia demonstrate that our Army will fight the way it trains, and it trains for employment and synchronization of all combined arms, including attack helicopters. To deny the commander a capability that can help accomplish the mission with fewer friendly casualties while minimizing civilian casualties and collateral damage is both unreasonable and unnecessary. Although the urban environment presents many challenges, the attack helicopter can overcome many of the disadvantages suffered by other fire support means. For many years the Army has denied the need to devote the resources necessary toward preparing to fight in such an environment. This situation is slowly starting to change, however. FM-90-10-1, *An Infantryman's Guide to MOUT*, which has become the definitive U.S. Army reference for MOUT despite its infantry orientation, recently issued a change document that includes an appendix specifically oriented toward the employment of armed helicopters in built-up areas. The appendix includes an excellent description of attack helicopter missions and capabilities in this environment as well as weapons limitations, and provides comprehensive planning considerations for both the ground and aviation commander. It is ironic that the best Army aviation planning

document for MOUT is in an infantry manual, although Army aviation doctrine is beginning to follow suite. FM 1-111, *The Aviation Brigade*, highlights aviation's strengths in close terrain when addressing the employment of ground forces under an aviation brigade headquarters. While heavy battalion task forces are normally employed under a parent brigade,

> ". . . mechanized units are restricted when they encounter urban areas, dense forests, or rugged terrain. In these environments, it may be tactically advantageous to attach these forces to the aviation brigade headquarters to capitalize on the superior reconnaissance and direct fire capability of the aviation brigade's helicopters."[74]

In fact, the aviation brigade *was* the task force headquarters in Somalia for nearly 8 months. With the deployment of an armor task force after the TF Ranger firefight on 3-4 October 1993, the task force reached a peak strength of 30 M-1 tanks, 48 Bradley fighting vehicles, 8 self-propelled howitzers, 50 helicopters, and more than 3,600 soldiers.[75]

The draft for FM 1-112, The Attack Helicopter Battalion, reflects a similar reorientation and, in the area of urban combat at least, is almost a complete reversal of the document it replaces. While acknowledging the difficulties encountered in urban terrain and the limitations it imposes on operations, it also draws on historical lessons learned, saying, ". . . experience has shown that attack helicopters are much more effective and flexible than mortars and artillery in urban operations."[76] This changing doctrine is a start in the right direction, and will undoubtedly help future commanders

plan for attack aviation's proper employment in MOUT, if it does nothing more than dispel doctrinal fixations that limit creative thinking.

Weapon's engagement techniques suited to the terrain also bear exploring. Diving fire was not a proscribed training task for attack helicopter pilots prior to Operation JUST CAUSE, and might have become a lost art were it not for a handful of pilots who had used the tactic in Vietnam. This method is now being taught to attack pilots at the Army Aviation Center, and reflects emerging MOUT doctrine for attack aviation, which now states "Consideration should also be given to high-energy, high-altitude tactics, such as diving fire, to overcome the vertical restrictions of built-up terrain."[77] In environments that will allow it, CAS techniques may prove to be the most effective means of MOUT engagements. This type of engagement has long been employed by Marine and Army special operations gunships, and is reflected in a draft aviation manual as close-in fire support.[78] Use of this technique requires a relatively permissive environment regarding enemy air defense systems, however, as well as trained and knowledgeable ground controller or FAC and trained aircrews. Special Operations forces and Marines train for this type of employment routinely, but neither conventional Army ground or aviation forces can be expected to perform close-in fire support safely and effectively without the necessary individual and collective training and SOP's. Special operations forces are required to be proficient in urban tactics, including urban fire support. To maintain that proficiency, ground, aviation, and other fire support assets continually train and refine

tactics as well as develop new techniques. They have found attack aviation fire support to be most effective when it is teamed with a trained, knowledgeable observer on the ground. This observer briefs the attack crew as it is inbound on the target description, location, and location of friendlies, marks the target for the attack helicopter by either overt or covert means, and uses communications as much as possible to talk the helicopter in on the target. Use of the helicopter in this role (essentially as CAS) is a departure from what has become the traditional method of ground force support, as a separate maneuver element in a supporting attack. But in the close and restrictive environment of the city, the close infantry support lessons learned when the attack helicopter first appeared on the battlefields of Vietnam may well be worth relearning.

Whether employed as a separate maneuver force or as close-in fire support, however, the proper training is necessary to reduce friendly and civilian casualties on the urban battlefield. For most of the attack helicopter pilots involved in JUST CAUSE, the first time they flew over a city was in combat. A similar situation faced the pilots of the 10th Mountain Division in Somalia. On the other hand, special operations attack helicopter pilots in both operations had trained extensively over urban areas and were consequently better prepared to act and react in this complex environment. MOUT training complexes in existence now, while suitable for individual and small unit ground training, are simply too small to support aviation operations. While an urban training complex the size of a small city would

obviously be the best solution, it is also unrealistic, and public safety and noise concerns restrict operations in actual cities. However, there are alternatives that can allow air and ground forces to develop the essential skills of urban teamwork. Large urban areas are not necessary to learn and practice the basics of ground-air communications, call-for-fire procedures, and target marking techniques needed for close-in fire support. Larger MOUT sites or unoccupied areas of military posts and depots are adequate initially. As the basic skills are developed, some training should be done in larger urban areas, both day and night, to educate aviation and ground forces on the complexities of target marking and communications. Coordination for this type of training is difficult but possible in certain areas of most cities, although low-altitude flight and simulated attack runs would likely be limited or severely restricted. Aircrews must, at a minimum, learn to navigate and identify reference points in cities. Even if forced to stay above 1,000 feet, crews can experience the difficulties of map navigation in the urban clutter and the problems imposed by city lights on night vision goggle operations. In the absence of actual environmental training, simulator training on digitized urban terrain may provide an alternative. The training must be conducted, however. Commenting on the sometimes faulty cooperation between air and ground forces while conducting reconnaissance operations in Panama City, an infantry battalion operations officer noted, "Quite frankly, the pilots did not seem to know what an infantry force needed."[79] Future commanders should not be faced with the same difficulties.

Army attack aviation suffers from some equipment limitations in a MOUT environment that should also be understood and addressed. Each of the different attack aircraft brings with it different capabilities and restrictions. Apaches can carry a heavy fuel and weapons load that includes Hellfire missiles, rockets, and a 30mm cannon. The AH-58D Kiowa Warrior, however, is much more limited in what it can carry, and is restricted by weapons mounts to a combination of only 2 of the 3 weapons available: .50 caliber machine gun, 2.75" rockets, or Hellfire missiles. Additionally, the machine gun is in a fixed mount – to put the gun on target, the helicopter must be turned in the direction of the target. Turret mounted weapons, such as those on the Apache, Cobra, and the Comanche, allow for more rapid gun engagements in a confined urban area, especially if the helicopter is moving.

The restricted ROE normally imposed in urban combat today adds further limitations. Non-lethal weapons technology is a possible solution to reducing combatant and noncombatant deaths, as well as collateral damage, while still succeeding in the mission. Attack helicopters are not currently capable of non-lethal attacks, but they can employ their weapons in such a way as to reduce the lethality of the munition or restrict its effects to the designated target. Rockets and guns are generally considered area weapons, and therefore pose a greater risk of collateral damage. Some of these drawbacks can be overcome by engagement tactics and techniques and technological innovation. As mentioned previously, diving fire can increase the accuracy of rockets. In Somalia the 10th Mountain Division mounted a

laser sighting system to the 20mm cannon of the Cobras they deployed. This addition increased the accuracy of the cannon to a first round on-target capability. A combination of diving rocket fires and the gun-mounted laser has long been the preferred method of engagement of special operations attack helicopters, and it was used to great effect in Mogadishu, when they were able to place fires as close as 50 meters to friendly forces.[80] Anti-tank guided missiles continue to be the attack helicopter's most precise killers in this environment. In Somalia and Panama TOW and Hellfire missiles engaged both armored vehicles in the streets and snipers in buildings. Apache Hellfires in Panama were so accurate, according to General Stiner, that "You could fire that Hellfire missile through a window four miles away at night."[81]

The effect of the warhead also impacts on the amount of collateral damage to be expected. In Panama, the 30mm cannon was thought by some pilots to be too large for constrained urban fighting. Some crewmen reported instances when they employed the cannon as a show-of-force weapon intended to intimidate rather than kill or wound. In these instances, they sometimes had difficulty finding unoccupied spaces large enough to fire at to avoid collateral damage from the 4 meter bursting radius of the 30mm warhead.[82] While the TOW and Hellfire missiles provide the greatest degree of precision, their explosive effects may be too great for some situations. The concussion effect of an inert missile warhead may be adequate for destroying

a sniper position in a building without the risk of damaging other parts of the building by the blast or fire.[83]

Attack helicopters were not originally designed for urban combat. Their sensors, systems, and weapons are all designed for engaging massed armored vehicles in open terrain, rather than picking off individual snipers in a downtown city center. Pilots train to kill targets several miles distant, yet they must be prepared to close to within a hundred meters if required in a city. Army aviation is finally starting to generate the doctrinal changes necessary to prepare aviators for the inevitable future urban conflict. Leaders at all levels must train to meet the challenges of integrating attack helicopter firepower and maneuverability into the combined arms fight in the city. With the restraints on urban employment that have been placed on artillery, CAS, and armor in the past, attack aviation may be what makes it a combined arms battle rather than a light infantry slug-fest. By preparing properly and training for this type of conflict *before* they are called on to fight, soldiers in the future may be able to avoid relearning *as they fight* the lessons of previous battles. Attack helicopters are inextricably woven into the Army's operations, and must be prepared to support the soldier wherever, whenever, and however they are needed. While training and doctrine are not yet to that point, they are slowly making progress in the right direction.

End Notes

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