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MASTER OF MILITARY STUDIES

***TITLE*:**

Marine Corps Assault Support and the Urban Century

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Executive Summary

Title: Marine Corps Assault Support and the Urban Century

Author: Lieutenant Colonel Robert F. Hedelund, USMC

Thesis: As the new century unfolds, there are significant challenges awaiting Marine Corps Assault Support in the urban environment. Are the technological advances of the latter 20th Century and early 21st Century a key to winning battles in the urban littorals? Or, will Marines and Joint Forces be better served by assault support in an urban environment by relying on refined tactics and training? What method would bring about the best results?

Discussion: Many military professionals, particularly in the Marine Corps, see the rapidly developing urban littorals as potential areas of great conflict in the near future. With the burgeoning of technological advances in recent years, many challenges for the future, from small unit tactics to command and control, lie in the ability to incorporate these advances effectively into daily operations in all environments without relying too heavily upon them. The urban environment however, brings these daunting challenges into sharp focus and may prove more than a match for technology. Tactics and training must be factored into the equation to get an accurate picture of the whole issue.

This paper studies and explores the unique challenges, inherent difficulties and poses some possible solutions to the conduct of helicopterborne assault support operations in support of ground forces within an urban setting. First, the paper looks at the tenets behind, and requirements for, effective assault support. This includes a rationale as to why the Marine Corps would want to employ helicopters in the urban arena and how Marine assault support fits into the picture, especially in the future concepts of OMFTS and STOM. Secondly, an examination of two historical cases reveals some lessons from past urban assault support efforts. Cases studies of Task Force Ranger in Somalia and the Russian – Chechen conflict of 1994-1996 are reviewed from an assault support perspective.

In a search for answers, advances in technology at times are relied upon to solve problems in new areas of concern. It is clear however, that technology alone will not win our future urban battles for us. Even impressive future capabilities like the MV22, cannot be viewed as a single answer to such a complex problem. A renewed emphasis on the refinement of tactical fundamentals, adequate aircrew training, and combined arms integration must be implemented to ensure success of assault support missions on the urban battlefield. Finally, generic mission profiles for low and medium intensity urban assault support operations are presented that provide a baseline for future mission planning and execution.

Conclusion(s) or Recommendation(s): No single gadget, tactic or training evolution will ease the difficulties inherent in urban assault support operations. A combination of these elements must come together to assure victory in future urban chaos. To discard fundamental skills for the sake of information superiority or technological advances is foolhardy in the face of a determined urban enemy. Therefore, the warrior, whether on land, at sea, or in the air, must be the focus of overcoming the urban challenges that face future U.S. forces. Training must provide a solid foundation for action. Rarely will an urban battle go as planned; but the pilot or ground force that has good urban warfare fundamentals, based on rigorous training, on their side will have the ability to adapt to changes without endangering themselves or the mission. Templated tactics that ignore the threat's strengths will fail. Solid tactics, employed by thinking operators, and supported by a vigorously planned and executed fire support plan, whether lethal or non-lethal, will carry the day.

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Preface

Urban combat has gripped our Corps' attention in recent years. Scenes from the troubled country of Somalia and the far off Chechen Republic bring chills when viewed in comparison to the clean precision of Desert Storm. It became apparent that little was being done with regard to how Marine Assault Support would confront the urban question. While recent Marine Corps focus seems to be on OMFTS and STOM, traditional urban operations tend to fly in the face of the OMFTS and STOM tenets. Thus, the need was identified to delve into the topic, especially considering the investment the Marine Corps was making in new end items to support the future concepts.

This work would have been impossible without the help of many who took the time to listen when I needed a sounding board and a rudder steer. Former Marine and urban intelligence expert, Mr. Dave Dilegge at MCIA in Quantico kept me informed almost daily as to the developments in urban parlance. Major Floyd "Yoda" Usry, already a legend for his tireless work at MAWTS-1 on "Yodaville," the Urban CAS Study, and the Urban CAS Assessment initially gave me the impetus to start this work even before I came to Command and Staff College. Captain Jon "Blade" Hackett, Aviation Requirements, MCCDC lent me his broad knowledge on attack helicopter operations and weapon systems experience. Also, Major John "Saint" Langford, Marine Corps Warfighting Lab, allowed me to tag along as the Lab explored the puzzle of urban fighting and how to

teach TTPs for MOUT. Finally, the patience and guidance of my mentors fostered this work to fruition.

Chapter 1

Assault Support and the Urban Century

Everything in war is simple but the simplest thing is difficult.

— Carl von Clausewitz

Nothing can make urban warfare easy.[1]

— Russell W. Glenn

The Urban Problem

> America's armed forces are likely to have to confront the hell of urban combat. They have the potential to do so successfully. However, this environment's challenging character is unalterable; it will consume any force that fights unprepared.[2]

Even though the overall trend in the world's population is on the decrease, a disturbing trend with ominous implications has emerged. The developing world is in an accelerated trend toward urbanization. This burgeoning growth results from a combination of intense rural-to-urban migration and concomitant increases in population within developing countries. The Marine Corps Intelligence Activity's report on urban trends and its effect on military operations paints an alarming picture.

[1] Russell W. Glenn, *Combat in Hell: A Consideration of Constrained Urban Warfare,* MR-780-A/DARPA (Santa Monica, CA: The Rand Corp., 1996), 43.
[2] Ibid., iii.

> The current rate of urbanization in developing nations cannot be understated. Between 1970 and 1993, the urban populations of developed countries grew by 208 million versus 910 million in the developing world.[3]

Urban sprawl is outstripping many developing countries' ability to provide the necessary infrastructure and support to its citizenry. Generally, the greatest increases in population over the next 15-20 years will occur in places ill equipped to deal with the mushrooming growth. As this trend continues, many believe that conflict will break out as the struggle for resources and basic needs collide.[4] Curiously, the urban canyons of New York or Hong Kong will seldom be the result of this huge flight of migrants to the ever-expanding cities.

The relative lack of city planning, dwindling resources, and high unemployment will nullify regulated, well-organized expansion. More likely, the shantytowns and squatter shacks reminiscent of Mogadishu, Somalia will be the norm.[5] Importantly, the MCIA's report reveals that the rural-to-urban migrants tend to be displaced and unemployed young people, further stressing the meager wherewithal of the already taxed urban social infrastructure.

> Furthermore, young urban populations generate enormous demands for social resources such as education and jobs. The absorptive potential of even the strongest urban economy could not meet the economic expectations of such an influx.[6]

What does this trend toward urbanization in developing countries mean for the United States and its Marine Corps?

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[3] Marine Corps Intelligence Activity, *The Urban Century: Developing World Urban Trends and Possible Factors Affecting Military Operations,* Defense Intelligence Reference Document, MCIA-1586-003-98, November 1997, 1.
[4] Ibid., 1.
[5] Ibid., 3.
[6] Ibid., 2.

Why Will the U.S. Get Involved?

Since the breakup of the Soviet Union, America stands alone as the world's only true military superpower. That distinction however, does little to comfort when trying to secure victory on the urban battlefield. In myriad commitments since the fall of the Berlin Wall, U.S. leadership has opted to employ its armed forces in peacekeeping, peace enforcement, humanitarian assistance missions, non-combatant evacuations and a major theater war. Regardless of the wisdom of such decisions, if the opinion of the American people is swayed, by whatever means, to assist or to fight, the likelihood of that assistance or conflict being joined in an urban arena is on the increase.

The U.S. has recently enjoyed the advantage of standoff weapons capability as evidenced in Operations Desert Storm and Allied Force. Advances in modern weaponry have increased the ranges from which an enemy can be engaged. After the world watched U.S. military power during the Gulf War, it is likely that the lessons of Desert Storm will be remembered by our future foes. For them, there is little to gain by facing the U.S. armed forces toe-to-toe on open terrain. Future conflict may not resemble the clean precision of Desert Storm.

By contrast, the urban battlefield in many ways negates those technological advantages, forcing the combatants into close quarters with reduced visibility and restricted line of sight. Unlike open terrain, high attrition and small unit autonomy characterize urban combat. In the uncertain future, the asymmetrical approach of defending from cities may be used against American fighting forces to neutralize superior weapons technology and shear force size. Many believe that modern armies are not prepared to conduct com-

bat at close quarters.[7] In other words, as witnessed in Somalia, it was no coincidence that the Battle of Mogadishu took place when and where it did.[8]

Therefore, it is reasonable to foresee a future when such urban conflicts exist and where they might take place. If the nature and locale of this discord is such that either the United States' national interests are at stake, or perhaps the U.S. is persuaded to assist in humanitarian efforts, the urban setting will prove to be a grave challenge. Furthermore, the U.S. could find itself embroiled in a mid-intensity conflict that erupts in these growing urbanized regions where local or regional authorities are unable to deal with the crises themselves.

The Marine Corps and the Urban Future

The United States Marine Corps could be uniquely positioned to face conflicts in urban centers. Forward deployed Marines have in the past, and will in the future continue to provide a "force in readiness" to respond to crises worldwide.

> 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.[9]

As stated here, emphasis within the Marine Corps has shifted in recent years to examine conflict in potentially chaotic urban littoral regions. It is in these rapidly growing regions

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[7] MAJ Robert E. Everson, USA, *Standing at the Gates of the City: Operational Level Actions and Urban Warfare,* Monograph, School of Advanced Military Studies, United States Army Command and General Staff College (Fort Leavenworth, KS: May 1995), 9.

[8] Glenn, 5. Mr. Glenn contends that one of Mohamed Farrah Aidid's commanders, Colonel Aden, seized an opportunity to ambush TF Ranger.

[9] Marine Corps Combat Development Command, *United States Marine Corps Warfighting Concepts for the 21st Century,* Concepts Division booklet, (Quantico, VA: MCCDC, 4 January 1996), VII-6.

where many see future clashes and the accompanying asymmetrical threats.

> In the future, the United States is likely to face a number of very different threats to its security, interests, and way of life. Many of these will be associated with the littorals, those areas characterized by great cities, well-populated coasts, and the intersection of trade routes where the land and sea meet.[10]

As the Marine Corps enters the new century, it has renovated its doctrinal missions of amphibious assault and seizing advanced naval bases to incorporate a new concept of Operational Maneuver from the Sea (OMFTS). As the title states, the crux of OMFTS is influencing an operational objective by use of maneuver. To further reduce vulnerability of the naval force, the concept calls for maintaining the majority of that maneuver force and its logistical support sea-based. OMFTS seeks to strike where the enemy least expects, at a critical operational vulnerability, and also seeks to avoid the build up of forces and supplies at the beach line.

The most significant enabling concept within OMFTS is Ship-to-Objective-Maneuver (STOM). STOM relies on the sea as maneuver space. This allows the STOM force commander to delay operational decisions to a much later time. Historically, time, space and logistical factors have driven these operational decisions. This feature is key in that the commander hopes to keep the enemy guessing as to where and when the STOM force might come ashore. This in turn forces him to spread his forces thin in order to protect the entire area that might be influenced by the STOM force. Armed with this approach, an OMFTS force – also recognized as being lighter, faster, more lethal, and situationally aware – could quickly overcome an operationally significant objective before the enemy could react.

[10] MCCDC Concepts Booklet, I-4.

With new equipment such as the MV22 Osprey, Joint Strike Fighter (JSF), and the Advanced Amphibious Assault Vehicle (AAAV) entering the force, the Marine Corps is poised to put into practice the long touted concepts on a large scale and ultimately, apply them to the urban arena. These technologically advanced systems will give the Marine Corps a significant combat capability. There is no doubt however, that the urban battlefield will test the mettle of the concepts and the equipment. Whether or not the concepts fully support urban combat is debatable. The very elements that make OMFTS work in open terrain (smaller, more lethal, more agile, more maneuverable forces) are not necessarily desirable elements for urban combat. Still the Marine Corps has many efforts underway (Capable Warrior, Project Metropolis, and the X Files) that attempt to address the complex urban problem.

Since a good share of these systems will be fielded within Marine aviation, and the mobility and responsiveness necessary for such concepts to succeed in any environment also resides within aviation, breathing life into the concepts in part, will be the job of Marine Corps Aviation.

The Role of Assault Support

Assault support, doctrinally one of the six functions of Marine Aviation, could be the best choice for providing the MAGTF commander, a true STOM capable force. Supported and enabled by the other five functions, assault support uses aircraft to provide tactical mobility and logistical support for the MAGTF. Additionally, assault support assets can move high-priority cargo and personnel within the area of operations, provide

for in-flight refueling, and conduct the evacuation of personnel and cargo.[11] Easily the most agile and flexible option, assault support provides the MAGTF commander the quickest way to disperse forces on the battlefield.

> Assault support enhances the MAGTF commander's ability to concentrate strength against the enemy's selected weaknesses using speed and surprise. The MAGTF commander uses assault support to focus combat power at the decisive place and time and exploit opportunities created during combat. Assault support allows the MAGTF commander to sustain combat power. By conducting assault support operations, the commander can take full advantage of fleeting opportunities throughout the battlespace.[12]

Out maneuvering the enemy is crucial to victory for relatively light Marine forces. If a commander is able to hit the enemy's weakness, avoiding his strengths while protecting friendly strengths, the battle can be turned in his favor. It becomes obvious that on an open battlefield, assault support is a true force multiplier. However, given that the constrained urban battlefield is unlike any other, executing operationally relevant assault support missions to an urban objective area will be a significant challenge. In fact, many experts doubt the feasibility of sending assault support helicopters into the harsh urban environment because of perceived survivability issues associated with the platforms. Questions yet to be answered are whether these new concepts and Marine assault support in particular can provide the MAGTF commander with the same advantages on the urban battlefield? Also, what avenues should assault support advocates pursue to ensure successful assault support employment? Will technological advances, or new tactics, techniques and procedures, or better individual and unit training yield the best return for pre-

[11] Naval Warfare Publication (NWP) 3-22.5-CH46E, *CH-46E Tactical Manual,* vol. 1 of NAVAIR A1-H46AE-TAC-000 (Washington, DC: Department of the Navy, July 1997), 49.
[12] Marine Corps Warfighting Publication (MCWP) 3-24, *Assault Support,* (Washington, DC: Headquarters United States Marine Corps, August 1999), 2-1.

paring assault support aircrew for the urban battlefield? This paper hopes to find some answers to these questions.

The Assault Support Paradox

> *I am not convinced that helicopters are not too vulnerable in an urban operation.*[13]
>
> — Mr. Randy Gangle, Project Metropolis

As stated in the preceding paragraphs, at first glance it appears that Marine assault support is the right tool for the right job for the OMFTS force commander. However, once superimposed over the formidable urban landscape, several challenges are evident. On today's battlefields, assault support assets rely on several valuable elements for survival and success. From mission planning to aircraft survivability equipment, from combined arms action to joint assets, it takes a combination of many factors to successfully accomplish an assault support mission against a medium-level threat. It will be no different in the urban battle. In fact, it may be even more important that a true combined arms effort be mounted with aviation at the forefront. In *Parameters*, Major Ralph Peters, USA, precisely identified the paradox of aviation's worth and its liability within the urban matrix. "Aviation is vital to mobility, intelligence, and the delivery of focused firepower in urban environments, but, as Mogadishu warned us, present systems and tactics leave us highly vulnerable."[14]

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[13] Randy Gangle, "Project Metropolis Inbrief," brief presented at the Project Metropolis POI Conference, NAB Coronado, CA, 16 November 1999. Mr. Gangle, an advisor to the MCWL on urban ground operations, asserts that there are significant challenges to conducting assault support missions in an urban area. However, one might also assert, given historical precedents that human beings are also too vulnerable to fight in an urban conflict.

[14] MAJ Ralph Peters, USA, "Our Soldiers, Their Cities," *Parameters* 26, no. 1, (Spring 1996): 43-50. Major Peters refers to the 3-4 October 1993, Battle for Mogadishu which will be examined from an assault support perspective later in this paper.

Unfortunately, significant advantages that assault support planners and operators could expect to enjoy for missions in open terrain, cannot be assumed in urban terrain. The sheer complexity and restricted nature of the urban battlespace present airspace management and command and control challenges that are more pronounced than in open terrain. Also, there is perception that these and other factors such as enemy force density may prove to make assault support assets more vulnerable in the urban objective area. Therefore, an interesting dichotomy exists between the value and agility of a helicopterborne or "tiltrotorborne" force and the potential vulnerability of that force in an urban operation. This concern is revealed in a recent Marine Corps Warfighting Lab (MCWL) report.

> The nature of the urban environment and the potential for enemy air defense capabilities will demand the development of appropriate aviation tactics, techniques and procedures. The potential difficulties for conducting air assault in the urban environment dwarf those of the hills, forests, jungles, and deserts of the rural environment.[15]

The MCWL report continues to pin point some of the concerns.

> The variety and complexity of the urban environment presents special challenges to assault support. There are thermal drafts, buildings and structures of various sizes, a constantly changing pattern of light during periods of darkness and, most seriously, an almost unlimited variety of locations in which to conceal anti-air tracking and firing systems. Numerous obstacles to approach and takeoff preclude flight operations from what otherwise might appear to be an adequate landing zone. Development of concepts to increase the survivability of air assaults in the urban environment is another critical aviation issue. Hand-held air defense systems, integrated radar systems, thermal sites [sic] and other sophisticated anti-air assets are available to any potential foe with the means or the methods to acquire them.[16]

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[15] Marine Corps Warfighting Lab, *Urban Warrior Conceptual Experimental Framework, Version 1-5* (Quantico, VA: Marine Corps Combat Development Command, 21 April 1998), 27.
[16] MCWL Urban Warrior CEF, 28.

Vulnerability of helicopters is often a focal point of many that have doubts about assault support's ability to survive on the urban battlefield. These concerns are relevant and must be addressed if helicopters and eventually tiltrotor aircraft are to succeed in urban combat. However, vulnerability concerns seem to have been forgotten on traditional battlefields where helicopters are employed more routinely. Certainly, helicopters are vulnerable in many battlefield scenarios. It is clear that the U.S. armed forces have planned and will continue to plan helicopter operations in combat. In these open terrain scenarios, integrated threat systems must be neutralized or suppressed while helicopter operations are ongoing. The missions are planned in great detail and require fire support, escort, electronic warfare measures and close coordination with the ground force and external agencies. Thereby, vulnerability concerns can be assuaged.

The same approach must be taken to address vulnerability fears in an urban assault support mission. The urban assault support mission must be planned to the same level of detail (if not more) as its open terrain counterpart. All the assets and capabilities necessary to accomplish an assault support mission in open terrain must be available for the urban environment. Although significant limitations may apply, from restrictive rules of engagement to concerns about collateral damage, planning for the worst is essential in urban mission planning if vulnerability of assault support assets and their "precious cargo" is to be mitigated.

It is not just hardware and environmental limitations that present obstacles to victory in urban terrain. A traditional mindset about the linear battlefield may be just as debilitating. Although the Marine Corps has begun the change in thinking, the United States armed forces in particular are accustomed to training and equipping to fight a war

against a linear foe. A foe that comes to the battlefield arrayed in a somewhat predictable way is countered by doctrinal "templating." Urban warfare paints a much different picture as an interesting analogy is described in Major Ray Finch's article on Chechen leader, Shamil Basayev.

> "The core belief is that militaries fight other militaries – Marines fight other forces. Using a football game as an analogy, uniformed players only compete against an opposing team. Until the beginning of the 20th century, the game of war was pretty well confined to the battlefield. Even with the advent of modern weaponry, the belief has persisted that to win the game, one team must defeat the other…As we move into the 21st century, the game's structure is changing. With a weakening of the nation-state, Carl von Clausewitz's dictum that war is an extension of [state] politics may no longer be valid. As the state has deteriorated, the opposing team's military has broken up, and some of the players have moved up into the stands to wreak havoc there. While the U.S. military must still prepare to defend against a traditional 'state-sponsored' military, it is increasingly called upon to help [with] fights in the stands. Some will say that is a police function and that the military is not configured to handle such missions. However, the Marine Corps will find itself fighting on the playing field and in the stands, probably simultaneously." [17]

Assault Support Challenges

It should be no surprise then that challenges exist and must be confronted when contemplating assault support operations in the urban landscape. In every mission, no matter the environment, unique considerations must be analyzed and information requirements met to minimize risk to the force while maximizing the chance for success. The current political climate will not tolerate casualties. As witnessed in Operation Allied Force, the White House was unwilling to commit U.S. Army AH-64 Apache attack helicopters to the conflict against Slobodan Milosevic's Serbians in Kosovo, due inpart to

[17] MAJ Raymond C. Finch III, USA, "A Face of Future Battle: Chechen Fighter Shamil Basayev." *Military Review,* (May – June 1997): 39.

concerns over risk.[18] Future conflict in the urban environment will likely be no different is this regard. Therefore, it is prudent to identify and examine some of the challenges that must overcome; not only to win the urban conflict, but also to minimize casualties when considering assault support missions to an urban objective area.

The Threat

Every mission contemplated must take into account the threat that is anticipated enroute to and within the objective area. This is particularly important and difficult in urban warfare. The enemy will be unwilling to reveal their disposition and the urban landscape provides ready-made cover and concealment from friendly intelligence gathering efforts. The ability to presage the intent of the enemy will be exceedingly difficult. The urban environment provides the defender an asymmetrical advantage in that he may be able to hold off a much larger and more capable force with relatively meager assets. Also, their ability to engage and interfere with friendly assault support and other operations is enabled by their knowledge of, familiarity with and use of the city structures and layout. Conservative estimates of the enemy's capabilities must be assessed and assumptions of "worse case scenarios" should be heeded. Above all, the ingenuity of the enemy must not be underestimated. Weapons employment may be as unconventional as their tactics and on the surface appear formidable.

> The primary danger to helicopters and ground vehicles during insertion and extraction are shoulder-fired surface-to-air missiles (SAMs), rocket propelled grenades (RPGs), and hand-held anti-armor weapons. Infrared-seeking shoulder-fired SAMs are susceptible to countermeasures. It might be possible to reduce U.S. vulnerability to short-range SAMs during the insertion and extraction of forces through a combination of better decoys and new tactics. RPGs and many other hand-held anti-armor weapons, on the other hand, are unguided, so jam-

[18] Dana Priest, "Risks and Restraint: Why the Apaches Never Flew in Kosovo," *Washington Post*, 29 December 1999, Sec. A1.

> ming and decoys are not a viable solution. There are some ways of reducing this threat, however, through doctrine.[19]

Limited Assets

The urban battlefield consumes forces. In comparison to open warfare, the cost in manpower for successful urban warfighting is high. A study conducted by the U.S. Army's Human Engineering Laboratory found that a minimum of 4:1 force ratios of attacker to defender were necessary to keep the duration of the conflict to two weeks vice four weeks with a 2:1 ratio.[20] This implies that the combat support necessary to keep these ratios high could be exorbitant. The assault support assets necessary to provide the lift for the constant influx of fresh troops could be difficult to prioritize given other essential missions.

> The requirement to conduct simultaneous operations on both the extended and constrained battlefields with limited assets places a premium on survivability, deception and economy of force measures. Accordingly, assault lift will normally be reserved for penetration and lift of maneuver elements.[21]

The authors imply that there will be a shortfall of assault support assets in the urban battle and that a priority of lift should go to the maneuvering assault forces. Unfortunately, resupply, TRAP, and CASEVAC support in urban operations will also require a responsive logistical support system that will rely heavily on assault support assets to accomplish their tasks. Even though many see the key to OMFTS and STOM being the reduction of the logistics tail, the decision to take on the urban fight will demand an increase in all classes of supply.

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[19] Daryl G. Press, "Urban Warfare: Options, Problems, and the Future," *Marine Corps Gazette*, April 1999, 16.
[20] MAJ Charles A. Preysler, USA, *MOUT Art: Operational Planning Considerations for MOUT,* Monograph, Army Command and General Staff College (Ft Leavenworth, KS: May 1995), 39.
[21] MCWL Urban Warrior CEF, 27.

Similarly, the "golden hour" will likely remain a driving factor for getting wounded Marines to more capable facilities out of harm's way. Therefore, the significant CASEVAC requirement will be levied against the assault support force.

This places a burden on the planners of casualty evacuation and combat resupply missions into urban areas. Huge resupply requirements from ammunition to drinking water will consume sorties in an OMFTS force slugging it out on urban terrain. Response times and payload capacity mean that assault support aviation will be called upon to provide the lion's share of this support. Decision making by the ACE commander and force commander must be timely in order to properly allocate assets between combat assault and support missions. Since the Marine Corps is familiar with task organizing for combat, it may possible to tailor a force for urban combat operations that is more rotary wing aviation heavy to support such missions.

Constrained Harsh Terrain and Weather

The urban environment presents an unforgiving landscape for assault support aircrew. The recirculating rotor downwash while working close to the ground and limited landing areas will prove difficult tactically. The doubtless presence of trash piles and instability of the dwellings within such cities will themselves be obstacles to helicopter and tiltrotor operations. Hovering over unpaved streets will generate large dust signatures that will obscure visibility and announce U.S. presence. Hovering profiles will also render aircraft vulnerable to small arms and RPG fire as well as SAMs.

> Debris, panicked non-combatants, collapsed structures and interdiction by fire from concealed positions can prevent effective movement on the floor of the urban canyon. Accordingly, within the dense urban environment, the primary

> means of mobility are foot and, where tactical conditions permit, heliborne movement.[22]

Also, the enemy may choose to use the closeness of the urban battle to his advantage. A by-product of "hugging tactics" used by the urban enemy when faced with a superior force inserted by aviation is that supporting the friendly force by air becomes increasingly difficult. Once the initial insert is complete, the enemy now knows where and how many friendly troops were inserted. Should the situation deteriorate, assault support missions to reinforce or extract engaged and attrited friendly forces may run into "hot LZs" and withering ground fire when trying to relieve, reinforce, or extract forces in very close proximity to the enemy.[23]

Relying on aviation for support, whether in urban terrain or not, must be tempered by the reality of and potential for bad weather. Back up procedures and systems must be in place to fulfill mission needs when aviation cannot make it to the urban objective area due to poor weather conditions. Even more treacherous than open terrain, the urban obstacles from power lines to radio towers present formidable counters to helicopter operations when low ceilings are prevalent. Much of the fire support necessary for effective assault support and escort missions will also be negated by bad weather. Historically, weather has played a key role in the effectiveness of aviation's support toward urban operations.

> Weather may adversely affect all aviation operations. In the Battle for Hue City, US Marines were unable to employ their aviation capability because of low ceil-

[22] MCWL Urban Warrior CEF, 30.
[23] Marine Aviation Weapons and Tactics Squadron One (MAWTS-1) Manual*, Aviation Combat Element Military Operations on Urban Terrain (ACE MOUT) Manual,* 7th ed. (Yuma, AZ: United States Marine Corps, August 1998), 1-8.

> ings. In fact, only a single pair of A-4s was able to employ ordnance in support of the Marines fighting in Hue City during the entire battle.[24]

During the 1994-1996 Chechen conflict, Russian aviation encountered miserable weather conditions. According to the Commander of Russian Army Aviation, Colonel General Pavlov, 95% of the days in February 1995 were deemed "non-flying" days - having prevailing visibility below the mandated 1.5 kilometers. [25] These conditions partially accounted for the reduced effectiveness of the Russian combined arms effort and the eventual failure to reach Russian objectives in the city of Grozny.

Navigation

For all forces, whether on the surface or in the air, navigation within cities is daunting. Poor maps and densely packed landmarks and checkpoints contribute to an overwhelming task. For assault support aircrew, the difficulty is multiplied by the speed at which the platforms traverse the cluttered urban landscape.

It is imperative that the forces going into the urban battle be well rehearsed and intimately familiar with where they are going and how they plan to get there. It will not suffice to identify a large metropolitan area as the objective. The scale of urban combat operations even at the operational level must focus in on specifically what room, on which floor, within which structure, within the metro area is the objective and know how to get in and out of it.[26] "The ability to precisely navigate into a landing zone in all

[24] Multiservice Tactics Techniques and Procedures Manual (MTTPM) X-X.X.X, Final Coordination Draft, *Aviation Urban Operations* (Langley, VA: Air Sea Land Application Center, August 1999), I-4.
[25] Marine Corps Intelligence Activity, *Russia's War in Chechnya Urban Warfare Lessons Learned 1994-96,* Draft Study, MCIA-1586-001-97, March 1997, 20.
[26] Glenn, 16.

weather and all light conditions - especially for medevacs and resupply - is crucial to maintaining a high tempo of operations."[27]

This looms large for the ACE. Recognizing that getting the Marines to the city will not be the difficult part. Where within the city will they need to go? Extreme navigational precision is required and as the aircraft race over the sprawling man made structures, cues become exceedingly difficult to pick out. It is no coincidence that navigation with a 1:50,000-scale map is nearly impossible in urban terrain. Even if the detail was available at that scale, the rate at which an aircraft transits over the urban scene makes navigation at that scale meaningless. The cues and check points necessary to accomplish successful urban navigation (and ultimately mission accomplishment) require multiple crosschecks and limiting features that tend to be in very close proximity when compared to open terrain navigation. Additionally, the temptation when flying over the confusing urban scene is to slow down in order to capture more of the detail. Survivability however, requires higher airspeeds be maintained to complicate tracking solutions for anti-aircraft and surface-to-air missile gunners.

Command, Control, and Communications

Commander's intent has recently been a rallying cry for clearing up the uncertainty in military combat operations. The joint, force, or ACE commander simply cannot be everywhere at once. When the fog of war causes doubt, remembering the commander's intent and executing in accordance with those guidelines ensures success. Never has commander's intent been more important, nor more necessary, than during urban combat operations. The on scene leader, at the small unit level, ground or air, must

[27] MCWL Urban Warrior CEF, 29.

be able to decide quickly, at the point of attack, in order to influence the action immediately. Command and intent on the urban battlefield must be seamless and understood at the lowest level.

Centralized control (unity of command) and decentralized execution for ground forces is crucial for success. The small element leaders, once immersed into the urban labyrinth, will have to be capable of split second decision making.[28] This runs contrary to today's CNN view of the world where every military decision is second-guessed by those who have little experience in the arena. Trust in the junior officer or NCO relies heavily on clear, concise commander's intent and mission type orders. The same is true on the aviation side of the equation. It will be foolhardy to fly huge flights of assault support aircraft into the core of an embattled city. Identifying landing areas for large flights within the city will prove difficult and unwise. Division and section leaders will have to make similar decisions of scale that a "strategic corporal" might have to make in a ground combat situation.[29]

Possibly the biggest challenge in urban assault support operations is airspace coordination, control, and communications. Even in open terrain, the altitudes at which most rotary wing aircraft operate during medium level threat missions, present acquisition difficulties for most friendly radar and line-of-sight communication systems. These problems will be exponentially increased in urban terrain. This is an area where technological advances can make a difference. Unmanned aerial vehicles, manned platforms, non-line-of-sight communications equipment, and tactical satellite technology have the

[28] Glenn, 19.
[29] In Marine Corps rotary wing aviation, a division of helicopters is a flight of three or four aircraft, while a section is a flight of two. Smaller elements will be more effective in urban assault support missions in that they are more maneuverable, will have a reduced visual signature, and will be able to land in smaller areas.

potential to alleviate some of the problems. The key will continue to be building back up plans, ensuring system redundancy, and leaving procedural control mechanisms in place to provide support in a "no comm" environment. An excerpt from the draft Multiservice Tactics Techniques and Procedures Manual for Aviation Urban Operations reveals how the task of talking can be a daunting one.

> Radio communications are severely limited in an urban environment. Aerial or rooftop retransmission systems may overcome some of the problems. The Israeli Defense Force (IDF) and others have employed remotely piloted vehicles (RPV) as retransmission platforms with success. The use of commercial telephone systems or landlines may be appropriate, but are susceptible to damage, sabotage, and monitoring. Visual signaling, while difficult, has proven effective when other means of communication are unavailable. Centralized command and control (C2) is difficult in the urban environment. Clear orders to subordinate commands are essential. Controlling airspace and air to ground coordination is a critical component of C2. Planning must address redundant and alternate means of communications.[30]

[30] MTTPM, I-3, 4.

Chapter 2

Lessons from History

The worst policy is to attack cities. Attack cities only when there is no alternative.[31]

— Sun Tzu

Now that some of the challenges facing assault support aviation in urban conflict have been identified, perhaps the past holds some lessons that can shed light on the subject. Many of the previously mentioned concerns come into keen focus when viewed through an historical lens. The next two sections will examine experiences of the United States and Russia in recent urban conflicts where helicopters were used to support a ground force. After a brief description of the operations, selected challenges to assault support in urban battles will be addressed from a historical perspective.

The 160th SOAR and "The Battle of the Black Sea"

Operation Restore Hope started as a humanitarian support mission. The United Nations' intervention had successfully thwarted a famine raging in the country of Somalia but clan warfare and factional fighting to gain the political upper hand continued. The UN was offering a power sharing agreement among the clans wrestling

[31] Sun Tzu, *The Art of War,* translation by Samuel B. Griffith (London: Oxford Press, 1963), 78.

for control of Mogadishu and all Somalia. However, Mohamed Farrah Aidid, leader of the Habr Gidr clan, felt that it was time for his clan to lead the country.[32] Within one year, with continued clashes between clans and mounting casualties, a majority of the 38,000 man UNITAF (Unified Task Force) departed Somalia leaving a multi-national UN force in charge and the assigned U.S. forces relegated to quick reaction force (QRF) duties.[33] Aidid's Somalia National Alliance (SNA) flexed its political and military muscles and the situation rapidly dissolved into a "low intensity conflict" between the UN forces and Aidid's clan.

Retired Admiral Jonathan Howe was asked to supervise the difficult transition in Mogadishu by then UN Secretary General Boutros-Ghali. Howe was convinced that the removal of Aidid would bring an eventual end to the bloodshed and anarchy, but that a special military force would be required to complete the mission.[34] In early June, twenty-four Pakistani troops from the multi-national force were ambushed and slaughtered by the SNA. The UN outlawed the SNA, put a bounty on Aidid, and a retaliatory mission that employed attack helicopters from UNOSOM was mounted on 12 July against the Abdi House, killing between 50 and 75 Somalis from the Habr Gidr clan.[35] Howe's pleas for a special operations force were finally answered in August and Task Force Ranger was formed and deployed to Somalia, arriving on 23 August.[36]

Task Force Ranger was 450 of America's elite special operations fighting forces.[37] The Delta Force, U.S. Army Rangers from 3rd Battalion, 75th Ranger Regiment,

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[32] Mark Bowden, *Black Hawk Down: A Story of Modern War,* (New York: Atlantic Monthly Press, 1999), 92.
[33] Ibid., 92.
[34] Ibid., 91.
[35] Ibid., 95.
[36] Ibid., 95.
[37] Ibid., 96.

U.S. Navy SEALS, U.S. Air Force Parajumpers and the 160th Special Operations Aviation Regiment (SOAR) all had members making up the conglomerate of TF Ranger. After countless rehearsals, and six actual missions, day and night, the force was dispatched on 3 October 1993 to snatch two of Aidid's lieutenants from a target building adjacent to the Olympic Hotel in "downtown" Mogadishu. Nineteen aircraft, including surveillance and C2 aircraft, twelve vehicles, and approximately 160 men made up the force that particular day.[38]

"The Battle of Black Sea" pitted a loosely organized militia and thug gunman with small arms and antiquated anti-tank missiles against a highly trained, techno- logically superior, dedicated helicopterborne force, culminating in an intense fifteen-hour battle within the confines of the city of Mogadishu. It claimed eighteen U.S. servicemen's lives, wounded seventy-three while killing an estimated five hundred Somalis and wounding over one thousand.[39] This led to the end of the United Nation's mission in Somalia. Heroic deeds were performed by many during the battle; but the chaotic urban battlefield proved to equalize the forces that met that day. During the battle, two Black Hawk helicopters were shot down and one was severely damaged but was able to return to crash land at the airport. A fourth Black Hawk, the first to be hit by RPG fire, had also been severely damaged on 25 September, prior to the 3 October mission.[40]

The 160th SOAR is not an ordinary aviation unit. The skills and training of the pilots and crewmen that serve with the 160th are remarkable. They are extremely qualified Special Forces operators. The Delta Force and the 160th aircrews train together constantly and know intuitively what each other's requirements are and what to expect.

[38] Bowden, 5.
[39] Ibid., 310.

The aircraft that they fly and the equipment that they use are the finest the nation has to offer. The Sikorsky MH60 in the Kilo and Lima variants is very different from its conventional U.S. Army aviation cousin the UH60. The MH60 is a state-of-the-art, highly specialized and eminently capable platform. The weapons systems and aircraft survivability equipment is superior to almost all front line helicopter units from any service. Moving map displays, NVG compatible cockpits, and continuously upgraded avionics packages ensure that the 160th pilots have a technological advantage on today's battlefields.

The survivability and crash worthiness measures built into the MH60 are noteworthy and very effective considering the hail of small arms fire they received on the 3 October mission. Even with all these factors on their side, for the pilots and crew of the 160th and Task Force Ranger, the mission was very costly. It is truly testimony to their will to fight, professionalism, and determined spirit that the mission was not a complete disaster.

How then, did a synchronized, lightning quick snatch turn into a Somali strategic victory? Viewed from the challenges of the threat, limited assets, and the harsh urban environment, trends begin to emerge that are worth examination.

The threat, when looked at on the surface, did not appear too formidable. Could not a well-trained, well-armed, highly motivated special operations force defeat a rag tag, third world militia? Certainly, the enemy force was not capable of out fighting the U.S. force on its own terms. The Somalis had to find a way to level the playing field. Even though the Somalis were fierce fighters, to step out into the open in traditional infantry formations would have invited immediate destruction by Task Force Ranger. Bowden

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[40] Ibid., 111.

discusses in *Black Hawk Down* that the Somalis had discovered the American's critical vulnerability.

> To Aidid's fighters, the Rangers' weakness was apparent. They were not willing to die…To kill Rangers, you had to make them stand and fight. The answer was to bring down a helicopter. Part of the American's false superiority, their unwillingness to die, meant that they would do anything to protect each other, things that were courageous but also sometimes foolhardy. Aidid and his lieutenants knew that if they could bring down a chopper, the Rangers would move to protect its crew. They would establish a perimeter and wait for help. They would probably not be overrun, but they could be made to bleed and die.[41]

To meet the desired end of downing an American helicopter, the Somalis focused the majority of their RPG arsenal on the task. Since the Soviet style anti-tank weapon was designed to explode on impact it meant that the gunners had to hit a moving helicopter – a decidedly difficult proposition. The Somalis however, had some help. Islamic fundamentalist soldiers from Sudan, who had fought against Russian helicopters in Afghanistan, showed the Somalis how to replace the impact detonator with a timed fuse.[42] This allowed the charge to explode in the vicinity of the aircraft, simplifying the gunner's solution and eliminating the requirement for a direct hit. The fundamentalist advisors also taught Aidid's militia to aim at the tailrotor; the most vulnerable area and the least dangerous to the gunner since he could wait until the aircraft flew overhead before revealing his firing position and engaging the aircraft.[43]

Additionally, Aidid's men had adapted their tactics to meet the American threat. An RPG gunner was easy to spot if perched on a rooftop, especially if he chose to fire from that position. The helicopters would engage anyone on a rooftop that was armed, usually before the gunner could fire his weapon. Somali gunners found innovative ways

[41] Bowden, 110.
[42] Ibid., 110.
[43] Ibid., 110.

to make themselves more survivable and their weapons more effective. By digging holes adjacent to open areas and in the dirt streets to absorb the weapon's back blast and disguising their firing positions, shooters could remain concealed until a helicopter flew over.[44]

Were there limited assets available to the operation? Task Force Ranger was organized to execute very specific missions of short duration. Arguably, the size of the force, its assault support lift assets, and its organic firepower was sufficient for those limited engagements. The force could not however, become decisively engaged within the urban area of Mogadishu and expect to succeed. Going into Aidid's Black Sea neighborhood near the Bakara Market in the daylight was risky, and the task force commander warned that although the mission would succeed, it might be more than the American people would stomach.[45] Thus, with the political situation being what it was, overwhelming force was not an option.

Conscious decisions made by civilian and military leadership to limit the force size may have had an effect on the operation's endstate. There continues to be controversy over whether an Abrams M1A1 tank unit, a Bradley fighting vehicle unit, or AC-130 gunships, if deployed, would have made a difference in the outcome.[46] Additionally, one very well trained and superbly outfitted CSAR helicopter was manned and committed during the mission, but when the second Black Hawk was shot down twenty minutes after the first, they could not respond in time to save the crew and personnel on board. Obviously, given the nature of the mission, the planners and operators did not foresee two helicopters being shot down.

[44] Ibid., 110.
[45] Bowden, 21.

From the special operations perspective, the heavier the force, the more unwieldy and cumbersome it becomes. Of course, assault support and rotary wing CAS assets were immediately stretched to the limit once the mission began to dissolve into a prolonged firefight. The task force simply did not envision fighting in the city for fifteen hours. Tragically, the U.S. had limited its capability to respond to an unforeseen situation by assuming that fighting a determined enemy in the city would not be necessary despite the known nature of urban combat operations.

The urban environment itself had much to do with the unforeseen delays and chaotic developments that led to the deterioration of the original mission. The constrained and harsh urban terrain became a "force multiplier" for the Somalis. The technological advantage wielded by the helicopterborne force was to a great extent neutralized on the streets of Mogadishu by the urban chaos and the Somalis familiarity with it. The difficulty involved in flying assault support missions into an urban area is described well in a USSOCOM after action report by an U.S. Army Major attached to Task Force Ranger.

> Helo 1 went to their LZ, determined that they couldn't land and roped their assaulters. Helo Number 2 on short final saw that their original LZ was to [sic] tight for them so they landed on the far side of the street intersection. These two helos created such a brown out condition plus the fact that Helo 1 landed in the street intersection, the Number 3 Helo decided to do a tight go around to let the dust settle. The fourth Helo was the tail helo and on short final the brown out was so severe that we lost sight of all the other helos.[47]

The concentrated urban populace, particularly one that is hostile to the arriving force, can provide an extremely harsh environment in which to operate. As the 160th SOAR helicopters continued to operate in the Black Sea area in support of the ground force over an extended period, the small arms and RPG fire grew in volume and the accuracy im-

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[46] Ibid., 338.

proved. A helicopter pilot attached to the task force recounted the withering fire and their reaction to it.

> During the day and night of October 3-4, I watched hundreds of rocket propelled grenades (RPGs) and thousands of rounds of small arms tracers rip the sky around my team and the other helicopters on the vicinity. One particular engagement stood out in my mind as an exceptional illustration of teamwork. We were chalk two in a flight of two helos providing Close Air Support to the pinned down ground element. Chalk 1 was inbound to the target when a RPG was launched at him from approximately 700 meters to my front. The aircraft at approximately 1000' AGL saw the gunner, and conducted a target handoff by sparkling him with a laser. Chalk 2 immediately turned to this target and attempted a minigun engagement, whereby his gun failed. Thinking quickly, he fired a rocket and destroyed the target. This entire episode happened on a matter of 3-5 seconds.[48]

Finally, the difficulties involved with command and control of operations in an urban area are underscored in Mogadishu. Simple and executable command and control procedures must be planned and put into use in urban operations due in part to the reduced decision times available to the aviation and ground forces. The very advantages that an airborne C2 system provides to the commander and the troops engaged in the fight were handicapped. A complication in communications procedures which did not allow the P3 Orion surveillance platform to talk directly to the convoy trying to find its way through the streets to the site of the first crash caused an unavoidable delay in communications traffic.[49] The result was that too much information was reaching the convoy too late. This caused wrong turns that further confused the lost convoy.

Once the operation is studied in earnest, it is more difficult to state categorically that the Battle of the Black Sea was an American military failure. It is abundantly clear

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[47] "Task Force Ranger Operations in Somalia 3-4 October 1993," U.S. Special Operations Command and U.S. Army Special Operations Command History Office, unpublished, 1 June 1994, 45.
[48] USSOCOM, Task Force Ranger, 10.
[49] Bowden, 112.

that on the ground in Mogadishu, the "low intensity conflict" became very intense and deadly.

However, in the air, although aircraft were shot down, the support of the ground force by aviation assets was successful. From CSAR and CASEVAC to insertion and fire support, the helicopters played a key role in ensuring that the remaining forces were protected until an extract could be affected. Some would point to the downed aircraft and say that the helicopters were too vulnerable to ground fire in the urban situation. Given the fierce nature of the urban fight, the amount of time spent over the objective area, and the huge numbers of RPGs fired at aviation platforms, it is remarkable that only four RPGs found their mark. Also incredibly, no aircraft were downed by small arms alone.

Still, the American losses sent Washington reeling and the public was caught off guard. The American people thought that the armed forces were feeding Somalis, not trying kidnap a warlord. When televisions in the U.S. showed dead Americans being dragged through the streets of Mogadishu and Mike Durant in hostile hands, the mission was doomed. Washington had not prepared the American people for such an outcome.

Russian Assault Support in Chechnya

Helicopters are not suited for urban combat. [50]

- Colonel General Vitaliy Pavlov
Commander of Russian Army Aviation

The United States is not the only country to experience the difficulties involved in operating helicopters in an urban setting. The Russian-Chechen conflict that raged from December 1994 to August 1996, pitted a former superpower with sophisticated weapon systems against a rebel force with small arms, anti-tank missiles, and a limited number of non-integrated air defense weapons. The Chechen rebels by most accounts thwarted decisive air power employment, especially rotary wing, throughout the war with conventional and unconventional tactics. Helicopter losses and damage were relatively high. The Russian pilots were also victims of a collapsing economy that robbed them of needed training and flight time in the period before the conflict. These factors contributed to an environment where adjustment and experimentation with different tactics was necessary for achieving a measure of success.

The Battle for Grozny, the most urbanized area that the Russians faced during the intervention, may hold some particularly poignant issues for the use of attack helicopters and assault support platforms. Loosely categorized under two of the assault support challenges of constrained, harsh urban terrain and command, control, and communications, the examination of the historical lessons of the Russian experience with

[50] MCIA, *Chechnya,* 19.

helicopters in Grozny reveals stark differences between that conflict and Somalia. Interestingly, despite the two events being on either end of the conflict spectrum, some similarities stand out.

Acting on events following the coup attempt in the former Soviet Union in August of 1991, the Russian Republic of Chechnya declared its independence from Russia. Initially invited and elected as to president of Chechnya, Dzhokhar Dudayev, a former Soviet Air Force General took control of the fledgling republic.[51] The Russian Fifth Congress, after Russians in the local regime deemed Dudayev's election as illegal, declared the elections unconstitutional.[52] Dudayev responded by dissolving the Chechen parliament in the spring of 1993, and crushed opposition protest with his presidential guard in June, killing nearly 50 people.[53] Opposition to the Dudayev regime began as a low-level insurgency in the country and its leaders asked Russia to help it restore the constitution. By December 1994, Russian troops had entered the republic and by the end of the month had the city of Grozny surrounded on three sides. After a stubborn Chechen rebel force refused to surrender, the battle for Grozny began on New Year's Eve 1994.[54]

It is immediately apparent that Russians were executing a very different plan in Chechnya compared to the American effort in Somalia. The scale of the operation alone was tremendously greater for the Russian problem. In many ways the assault support challenges met by the Russian forces in Chechnya were aggravated by the sheer size of the urban battlefield in Grozny. Generally considered a "modern" city prior to the

[51] Timothy L. Thomas, "The Russian Armed Forces Confront Chechnya: The Battle for Grozny, 1-26 January 1995 (Part I)," *Low Intensity Conflict & Law Enforcement* 5, no. 3 (Winter 1996): 409.
[52] Thomas (Part I), 409.
[53] Ibid., 409.
[54] Ibid., 409.

invasion, Grozny dwarfed the third world town of Mogadishu. Reasonably then, the problems and challenges of urban combat in Grozny would be greater than those found in Mogadishu.

Other curious differences exist between the two. The population and its reaction to an invading force were interesting. In Mogadishu, once Task Force Ranger landed, the militia and a large part of the local populace flocked to the scene, either to fight or to watch the events unfold. In Grozny, maybe due to the highly lethal nature of the Russian tactics, the local populace hid or fled. The rebel Chechen force used small hunter-killer teams and hit-and-run tactics against the Russians. The Battle for Grozny was a very deadly environment for Russian forces, Chechen rebels, and Chechen civilians alike.

> Overall, Russian sources estimate that the Russian Army lost about 18% (400 vehicles) of its total armored vehicle force of 2,221 over the course of the campaign. Russian casualties were also high – perhaps constituting as much as 12.5% of the total entering force in Chechnya through March 1995 – six months before the second battle for Grozny where the Russian casualties were 'appalling.' Civilian loses were also high. Then-Russian National Security Advisor, Alexander Lebed, estimated that 80,000 civilians were killed in the fighting in Chechnya and another 240,000 were wounded through September 1996.[55]

On the aviation side, an immense effort was mounted to support the ground forces. Even at a time when the Russian military was no longer receiving the funding it once enjoyed, the numbers are impressive. Fixed wing sorties, mostly fighter-bomber or ground attack missions amounted to over 5300.[56] For the rotary wing side, a task organized army aviation support element was formed by combining two squadrons of Mi24 HIND attack helicopters, two squadrons of Mi8 HIP assault helicopters and reinforcing

[55] MCIA, *Chechnya*, 3.
[56] MAWTS-1, 5-17.

them with Mi26 HALO heavy lift helicopters.[57] They accounted for 6287 rotary wing sorties flown for a variety of missions from assault support, to water resupply, to MEDEVAC.[58] Losses due to AAA, MANPADS, RPGs, small arms fire, and CFIT (controlled flight into terrain) were felt on both the fixed and rotary wing side. For the fixed wing aircraft, four Su25s and one Su24 were downed and at least one more Su25 was damaged by a ZSU 23-4, *Shilka.*[59] Rotary wing aircraft faired worse with seven Mi24s, five Mi8s, and 30 other aircraft of many types damaged.[60] Much like Task Force Ranger, the losses at first appear shocking. However, for the Russians, the loss rates work out to be .094% for fixed wing and .19% for rotary wing. Yet, since the Russians were fighting a "rebel force," the Russian leadership deemed those losses as excessive and rotary wing support was discontinued for a time due to their perceived vulnerability.

To further render the urban terrain hostile to the invading Russians, the Chechens, mush like the Somalis, improvised tactical air defenses to protect themselves from air attack. By truck mounting 23mm AAA pieces and 12.7mm heavy machine guns on four wheel drive utility vehicles much like the Somalis did in the Battle of the Black Sea, the Chechens were able to maintain a mobile air defense capability. Traditional AAA systems like the ZSU 23-4, *Shilka* proved just as lethal in the city.[61] The heavy machine guns were especially useful against close air attack from helicopters.[62]

In an effort to provide support to the ground forces Russian Army Aviation found that there were contradictions in assault support doctrine designed to attack the urban bat-

[57] National Ground Intelligence Center, *The Russian Armed Forces in the Chechen Conflict: Analysis, Results and Conclusions,* Analytical Review, NGIC-HT-0278-96, April 1996, 90.
[58] Ibid., 5-17.
[59] Ibid., 5-17.
[60] NGIC, 5-17.
[61] MCIA, *Chechnya*, 16.
[62] Ibid., 16.

tlefield. While Russian doctrine stated that top down building clearing was preferred, by helicopters lifting troops to rooftops, Russian doctrine also stated that helicopters were too vulnerable to snipers, AAA, and ambushes in an urban setting.[63] Thus, in order to meet the threat posed by the Chechen forces and to mitigate the gaps and contradictions in Russian assault support doctrine, Russian helicopter pilots modified and developed new tactics.

Unlike in Somalia, in general, helicopters did not routinely participate in direct support of troops in combat within the city. This led to a fragmented effort to bring combined arms to bear on the Chechen rebels. Instead, the assault support assets were primarily used for transporting personnel, delivering replacements, transporting ammunition, and pulling out the wounded, sick and displaced citizenry.[64] Heavy lift helicopters like the Mi26 HALO were used for transportation of troops, water, and supplies between Russian held strongholds and airports supporting the operation.

To avoid the threat envelopes of the Chechen AAA weapons systems, Russian helicopter pilots devised ways to engage targets at maximum ranges. Modifications were made to equipment to adapt to the urban environment of Grozny. Helicopter gunships were modified to use 240mm rockets to increase stand off range.[65] The traditional 57mm and 80mm rockets lacked sufficient range to keep the helicopters out of weapons engagement parameters of Chechen air defense threat.[66] In many instances, missiles (guided and unguided) were used instead of bombs within the city. Unguided aerial rockets were used against area targets while the guided AT-6 *"Shturm"* missiles were

[63] Ibid., 19.
[64] NGIC, 90.
[65] MCIA, *Chechnya,* 19.
[66] Ibid., 19.

used against ammo dumps and armored targets.[67] Also, the AT-6 *"Shturm"*, anti-tank PGMs (precision guided munitions) were very useful against urban targets when the weather permitted.[68] Additionally, unconventional roles for helicopters were explored as the Russians used assault support assets as "sniper control" platforms.[69] Ground fire taken from buildings was vigorously returned, at times injuring and killing civilians and children in addition to the enemy snipers.

Weather had a much greater effect on the urban use of aviation in the Chechen conflict than it did in Somalia. It is here where the U.S. should take some important lessons. Many of the platforms and weapons systems that America will rely on to prosecute the urban battle will be restricted by bad weather. Poor onboard navigation and radar systems limited the use of Russian helicopters at night and in bad weather. Mi24s were forced into mostly day fair-weather missions, which contributed to their vulnerability to small arms and AAA.[70] Even in weather with good visibility, low ceilings limited the tactics available to flight crews. In particular, weapons that were very useful in the urban arena were affected by bad weather. Laser guided PGMs from aircraft and artillery were not employed due in part to the poor weather.[71] This forced lower altitude profiles, which did not permit laser-guided munitions. In turn, the use of iron bombs in place of the guided munitions greatly increased the potential of fratricide and civilian deaths.[72]

Many of the assault support and aviation related command, control and communications issues that the Russians faced in Grozny, may have been challenging even outside

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[67] NGIC, 90.
[68] MCIA, *Chechnya*, 19.
[69] MAWTS-1, 5-17.
[70] MCIA, *Chechnya,* 20.
[71] Ibid., 20. Also, dusty conditions, myriad reflective surfaces, and battlefield smoke and haze greatly diminish laser-guided munitions' utility.
[72] NGIC, 88.

of the urban battlefield given the state of the Russian military at the time. There is ample evidence that the urban environment may have exacerbated problems that already existed, causing more harm than they might in another environment.

The original intent of the attack on Grozny was to execute a combined arms assault with special operations, artillery, and aviation in direct support of the ground troops. This initial plan was the result of an earlier failed attempt to subdue the city. Timothy Thomas found that the Russians had not listened to their own after action reports.

> Major Valeriy Ivanov, speaking to the State Duma deputies about the failed 26 November attack, noted that he was told "special forces would be at work in Grozny and helicopters would provide fire support from the air. Infantry would be attached to the tanks." None of this support appeared.[73]

This meant that helicopters, even though in general support, would conduct close attack and assault support missions segregated from ground forces engaged within the city to avoid fratricide or being shot down.

Communications of all types, always a challenge in urban terrain, were problematic for the Russians and were at least partially overcome by the Chechens. Buildings and terrain routinely disrupted urban battlefield tactical communications. The Russian tactical solution was to use high ground-based and aircraft-based relay stations.[74] The Chechens, lacking sophisticated communications equipment, established an ad hoc communications network via Motorola radio and cell phone for mobile air defense assets to overcome a lack of radar or a formal integrated air defense system.[75] Also, there were

[73] Thomas, 414.
[74] MCIA, *Chechnya,* 17.
[75] MAWTS-1, 5-16.

accounts of intrusion on Russian nets by Chechens to call close air support in on Russian positions.[76]

Remotely piloted vehicles (RPVs), a crucial part of urban C3, did meet with some success. The *Shmel*, a multi-sensor capable RPV, could operate up to two hours out to a range of 60 kilometers; it was used to increase survivability of reconnaissance teams.[77] The *Sterkh* RPV was fitted with one of two small modular payloads: (1) a stabilized, day-light television camera and real-time transmission capability and (2) an electronic warfare jamming package.[78] Even visual communications proved difficult for the Russians. In an attempt to coordinate and identify Russian armored units as friendly to attack helicopters, the Russians painted the hatches of their vehicles white. This backfired when no Russian Army Aviation showed up and the Chechen forces acquired and more easily engaged the Russian units highlighted against a gray sky.[79]

Other problems hampered the Russian aviation effort that could be described as command failures or the result of slumping resources. Even though 59% of the Army Aviation mission commanders were veterans of the war in Afghanistan, and all were trained up to "first class level," poor pilot flight time (40-50 hours per year, vice the 100-150 hour recommended minimum) was a chronic complaint.[80] Poor maintenance and technical support also was reported in helicopter aviation and all of the Russian forces. Unclear guidance from the Russian leadership on ROE (rules of engagement) led to situations that endangered Russian forces and eventually led to frustration and a break down

[76] NGIC, 88.
[77] MCIA, 20.
[78] Ibid., 20.
[79] Thomas. 414.
[80] NGIC, 91.

of ROE discipline. Helicopter crews, early in the conflict, had to call back to ask permission to engage fully deployed Chechen combat equipment.[81] Finally, Russian Army Aviation was reluctant to employ newly developed systems in the Chechen conflict. Blamed on insufficient funds and the lack of a unified command and control system, the BOMAN vehicle, a self-contained C3 and target designation platform, and the only two Ka50 "Havoc" attack helicopters in the Russian inventory at the time, were not available for use in Chechnya.[82]

From an aviation perspective, Lester Grau for *Strategic Forum* summed up the use of Russian air power in the Russian-Chechen conflict.

> The Russians used a lot of fixed-wing aircraft, but they were of limited tactical value in Grozny. They were used to provide support while artillery was moved into range. Because air strikes could not be precisely targeted, attack fighter-bombers concentrated on large "free-fire" zones. Fixed-wing aircraft proved of more value in attacking targets outside the city. Helicopter gunships were of much more value. They were used against snipers and weapons in the upper floors. The helicopters flew in behind captured high-rise buildings and would "pop-up" to engage these targets, but had to fly to and from the engagement area using the shelter of captured buildings[83]

The fact that the Russians returned to the breakaway Republic of Chechnya in 1999 to again attempt to subdue the rebel elements there says a great deal about the success of the 1994-1996 effort. Even though the Russian approach to the urban problem this time around was somewhat different, the city of Grozny still presented a difficult impediment to Russian objectives. Whether or not assault support helicopter operations had been refined to more effectively support the ground forces is difficult to determine at this time.

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[81] NGIC, 28.
[82] NGIC, 90.
[83] Lester W. Grau, "Russian Urban Tactics: Lessons from the Battle for Grozny," *Strategic Forum* 38, (July 1995): 5.

Armed with the foundation of these two historically significant urban confrontations, are there ways avoid relearning these lessons and still overcome the challenges facing assault support in the complex and lethal urban battlespace? In another approach to the problem, are there solutions from a technology, training, or tactics perspective that, combined with what is known about these past experiences, could help achieve success in an urban environment using assault support?

Chapter 3

Technology - Can it Win the Urban Battle?

How might technology provide an answer to the challenges facing assault support in the urban battle? To help the ground forces involved in the urban battle, a great expeniture of resources and effort have gone into developing a non-lethal weapons capability. The use of non-lethal weapons could reduce casualties on both sides especially if rules of engagement are restrictive. Directed energy, sonic weapons, and ground-based remotely controlled vehicles all have some promise for the ground force engaged with an urban foe intermingled with non-combatants. Unfortunately, few of these options are available or even viable for assault support crews. Indirectly of course, the assault support force can benefit from some of the technological gains made by the ground forces. More useful for an urban assault mission, would be a technological break through that would allow for effective assault support with fewer force protection concerns in support of the ground force commander. From the standpoint of the challenges to assault support in urban operations however, some areas are more likely to benefit from technology than others. Command, control and communications and navigation are areas where direct relationships can be drawn between technological improvements and mission success.

For assault support platforms, getting Marines to the objective area ready to fight is the primary goal. For the urban environment, any technological advancement that fa-

cilitates achieving that goal becomes very valuable. Global Positioning System (GPS) enhancements are essential for accurate crosscheck navigation and landing zone location. Until the latter half of the 1990s, an integrated GPS receiver was not available in the Marine Corps' primary combat assault support aircraft.[84] Additionally, current fixed wing and rotary wing aircraft lack GPS systems that are capable of providing overlaid visual cues enabling identification of urban specific details. Communications relay and retransmission capabilities from air breathing and non-air-breathing systems must be explored to overcome line-of-sight (LOS) limitations within the urban canyon. Also, the development of non-line-of-sight (NLOS) communications and digital data connectivity is recognized as essential to ensure effective command and control with engaged units.[85]

In the training arena, the lack of urbanized training areas and ranges calls upon technology to provide high-fidelity flight simulators to hone aircrews' urban flying skills. Also, the development of highly capable mission planning and rehearsal systems to give pilots an intimate familiarity with urban planning and mission characteristics.

Traditional ambient light amplification devices are too sensitive to the abrupt light level changes prevalent in the urban environment. Streetlights, burning rubble, searchlights, and flashes from ordnance and small arms greatly degrade the acuity and resolution of night vision devices (NVDs). Since NVDs seek to amplify a preset portion of the visible spectrum, bright light sources within that spectrum make NVD use a challenge in urban terrain. In urban scenes, some of the weaknesses of image intensifiers are mitigated by the employment of thermal or infrared sensors.

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[84] The CH46E, although fitted with various "strap on" navigation systems throughout the years, did not have a true integral GPS navigation system until the Communication and Navigation Control System (CNCS) began fielding in 1996.

[85] Glenn, 29.

Current forward looking infrared (FLIR) technology seeks to enhance the differences in thermal emissivity between objects within the visual scene. However, the relative homogeneity of the thermal scene within an urban center poses its own difficulties to infrared sensors. Night vision devices must evolve to the point where the advantages of both technologies complement each other and reduce the resident disadvantages. Sensor fusion of traditional light intensification and infrared technology can provide a bridge to full spectrum night and day vision without obscuration. This advance could prove invaluable in an urban environment where visible light and thermal sources are abundant and instantaneous identification of friends and foes in close proximity is paramount.

If technology can assist in providing an increased capability to carry out a well-planned mission to an urban objective area, it should be welcomed. However, much like other realms of conflict, rarely will a magical remedy be forthcoming from a gadget, or system of gadgets. An example of how technological evolution of weapons systems may actually run counter to urban warfare effectiveness is in the case of weapon overspecialization. Overspecialization in particular weapon systems can be problematic in an urban setting. The venerable bazooka and recoilless rifle in past conflicts proved very effective in alternate roles on the urban battlefield. Unfortunately, highly evolved, laser guided anti-tank weapons on today's attack helicopters (e.g., HELLFIRE) have less utility in an urban environment.[86] The question is clear, how can technology be used to an advantage without being used as a crutch?

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[86] CAPT Jon M. Hackett, USMC, Aviation Requirements Officer, Marine Corps Combat Development Command (MCCDC), interview by author, 10 October 1999. The verticality of the urban target area is very difficult for a top-attack weapon system. Weather also becomes a factor if low ceilings are present. Efforts are under way to address these shortfalls with replacement rocket and missile systems (i.e., The Advanced Precision Kill Weapon System (APKWS) and Modernized HELLFIRE) more adaptable to the urban fight. Capt Hackett was also involved in Operation Silver Wake, the noncombatant evacuation operation (NEO) from Albania with HMM-365 and the 22nd MEU(SOC) during LF6F 2-97.

> We must not make the mistake of attempting to substitute technology as the prime instrument of success instead of the Warrior. Next, we must guard against over reliance on technology. The threat will use this over reliance against us to great advantage. Furthermore, we must train and equip our Warriors with the capability to revert to manual means when technology fails them in combat. Murphy will always be with us. The truth of the matter is that when GPS fails, if one cannot read a map or conduct terrain association to navigate, the ongoing operation will suffer. Finally, while systems such as UAVs, cruise missiles and other PE (precision engagement) technology will most likely be available in future MOUT, the conflict will be decided by the individual Warrior in the MOUT environment.[87]

Technology may not be the panacea its supporters would like it to be, as Russell Glenn observes, "Approaches to addressing capability shortfalls include technological enhancements in addition to doctrinal and training adaptations, but technologies offer both frustrations and promise."[88] Examination of the technologies on the cusp of reaching the Marine Corps may provide some insight into what is in the realm of the possible verses that which is fairy dust.

MV22B

The United States Marine Corps has embarked upon a journey to acquire and employ one of the most revolutionary aircraft to see military service since the introduction of the helicopter into military service over forty years ago. The MV22 Osprey tiltrotor is an advanced technology, vertical/short takeoff and land (V/STOL), multi-purpose aircraft. It combines the speed and range efficiency of a turboprop airplane with a wide range of missions required of a helicopter.[89] The long awaited replacement for the venerable CH46E Sea Knight holds great promise for the MAGTF commander.

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[87] MAJ Stephen J. Mills, USA, *Military Operations in Urban Terrain (MOUT): A Future Perspective for a Joint Environment,* Advanced Research Project (Newport, RI: Naval War College, February 1997), 48.
[88] Glenn, x.
[89] Bell-Boeing Joint Program Office, *V-22 Product Information* (Arlington, VA: Unpublished, 1996), 1.

Exciting as this new aircraft and its capabilities are one must not lose focus on the environment in which the aircraft will be employed to get a true picture of its strengths and weaknesses. In many environments the MV22 will be extremely useful and will provide a quantum leap in assault support lift capability while increasing the likelihood that the Marines will arrive to their objective safely. However, some of the impressive characteristics of the MV22 must be put into perspective when facing the urban battlefield. Of course, no single aircraft could answer all the challenges that face assault support in the urban littorals and also be 100% invulnerable to exposure to a hostile force. The resultant aircraft would not be able to lift off the flight deck. It is important however, to identify and assess the limitations as well as the strengths of this new assault support platform.

When the MV22 was still a concept, proponents recognized that the aircraft would bring unique capability to the Marine Corps and that tiltrotor technology would revolutionize the function of assault support. Since this new aircraft would be able to do things that current helicopters were unable to do, a few assumptions were made that may not have been prudent. Whenever concerns over the threat, and how to defeat the threat arose, proponents said that this radically different airplane would be able to avoid threat envelopes and "fly around the threat." This over generalization has hampered MV22 defensive armament and aircraft survivability programs. Major Robert Clinton, in his paper on the promise of the MV22 for the future of assault support, briefly covers the trade off that is evident as well as the reality of threat avoidance.

> The penalties for threat avoidance are increased time to reach the objective area with an equivalent loss in useful combat radius. The MV22 mitigates the penalties by giving the flight leader the range to fly around known threats or contaminated areas and the speed with which to rapidly disengage from unanticipated

> threats. . . . Even so, surprise attacks will occur and avoidance will not always be possible.[90]

It is important to note that even if the MV22 could do this unlikely feat, the characteristics of urban objective areas are such that the enemy will likely be in close proximity to the landing zone chosen for insertion or extraction of friendly forces and equipment. It will be impossible to regularly avoid the threat in the urban battle area. This points to the need for protection of the assets and the Marines on board those assets.

An area where the MV22 will be challenged while within the urban battlespace is susceptibility. Related to vulnerability, susceptibility is defined by now Col Tim Hanifen in his series of articles on the capabilities, characteristics, and employment of the MV22, as "all those factors and design considerations that enable an adversary to see, hear, track, and engage an aircraft."[91] The statements made by Col Hanifen concerning the MV22 within the context of susceptibility are correct assuming the MV22 is operating in an enroute profile (i.e., airplane mode). Enroute terrain and profiles flown may vary widely depending on the threat anticipated; and the MV22 will perform very well verses many threat systems while enroute to, or egressing from an urban objective area. For urban combat applications however, some of the advantages that Col Hanifen describes may not be applicable.

Speed is an asset that the MV22 can exploit during its flight to the objective area. Its vast improvements in maneuverability while in airplane mode, when compared to conventional helicopters, will afford the assault support pilot unprecedented versatility. However, once inside the initial point (IP), or the point at which the aircraft must begin

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[90] Major Robert D. Clinton, USMC, *A Critical Analysis of Assault Support in the 21st Century,* MMS Thesis (Quantico, VA: U.S. Marine Corps Command and Staff College, April 1996), 28.

its transition to helicopter mode for the terminal phase of the approach to the landing zone (LZ), physics will require a more predictable descending, decelerating flight path. The envelope in which the MV22 will operate will certainly expand at the hands of skilled Marine aviators. However, at some point, especially in the highly challenging urban landing zone, a helicopter-like glideslope must be intercepted to allow for transition to a no hover landing or hover profile for insertion of the Marines. One might argue that within the urban canyon an even more conservative profile would be necessary to ensure adequate obstacle clearance. Thus, the exposure time of a single or multi-ship flight of MV22s will necessarily increase, increasing its vulnerability by making it more susceptible to enemy action.

As envisioned, the urban battlefield's reduced engagement ranges due to close quarters and line-of-sight limitations, coupled with an infinitely more difficult intelligence gathering problem, could render the MV22 most susceptible when the enemy is most ready for its arrival in the objective area. The constrained urban battlespace and cluttered "cue field" will force MV22 pilots to reduce their approach speed as they transit over the urban landscape to give them more time to sort the useful cues out of the clutter.[92] As the speed decreases to allow cue identification, some of the tactical benefit of that speed is obviously lost. The lower and slower MV22 now presents a less formidable and lucrative target.

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[91] LtCol Timothy C. Hanifen, USMC, **"**MV-22 Osprey, Part I: Performance Parameters and Operational Implications," *Marine Corps Gazette*, March 1999: 60.

[92] Cue field is defined by the author as the available area from which an observer must acquire, identify and discern navigation cues.

Another advantage touted by MV22 advocates is the reduced acoustic signature of the aircraft.[93] The aircraft is quieter in cruise flight than a helicopter. Even though quieter than a traditional helicopter while in airplane mode, this does very little to make it less susceptible in an urban objective area. As the MV22 begins its transition to rotor-borne flight, the first step is to increase prop rotor RPM from the cruise setting of approximately 85% to 100%. This is necessary so that the rotors, once in helicopter mode, can generate enough lift to keep the MV22 flying once fully transitioned to helicopter flight. As the prop rotor RPM increases and the transition from wing-borne to rotor-borne flight progresses, the noise signature increases significantly. The resultant noise signature in this profile is comparable to a traditional assault support helicopters.

These factors will serve to partially nullify many of the advantages that technology brings to the MV22. As the aircraft begins to fly, appear, and sound more like a traditional helicopter in the urban environment, the more susceptible it becomes to the enemy. This increase in susceptibility occurs at the time when the MV22 and the Marines on board can ill afford it – in the chaotic, harsh urban surroundings. If, while in this flight regime, the future urban foe is armed with MANPADs, RPGs, and small arms, the enemy will have a potent anti-aircraft capability against the MV22 force.

How then does the assault support pilot of the most capable and versatile aircraft yet developed for those missions ensure survival of his aircraft, aircrew, and troops on board in such a potentially hostile environment? Survivability is a very important

[93] Bell-Boeing, 9.

element of urban assault support operations. How survivable will the MV22 be in the urban battle and what has been done, or what can be done to increase the likelihood of mission success an urban scenario?

One concern over the survivability of the aircraft relates to its current lack of a self-defense weapon or DWS (defensive weapon system). Although research, development, testing and evaluation for the DWS were funded in FY 2000, the aircraft will reach the fleet without a self-defense weapon since production funding is not slated until FY 2004.[94] With IOC (initial operational capability) in mid-2001 and its first operational deployment scheduled for 2003, it is unlikely that a DWS of any type will be fitted before the first operational MV22 squadron deploys.[95]

The need for self-defense weapons for future urban conflict must be addressed. Even if the DWS on the MV22 reaches the fleet for the second, or more likely, third deployment, discussions continue over the aiming and targeting capability of that weapon system. In this time of reduced military spending, every system is evaluated for efficiency and economy. It has been demonstrated that for effective fires in an urban battle, precision is required. "Kentucky windage" will not suffice. The crowded, close quarters conflict of the urban future will force extreme short-range engagements that will occur at "danger close" ranges from friendlies with noncombatants potentially in the crossfire. A highly capable, precision targeted weapon system must be available in the urban environment for successful employment. A helmet mounted, multifunction sight, boresighted to the FLIR system, that is crew station selectable, should be a threshold requirement for

[94] "MV-22 Undergoes Sea Trials," *Marine Corps Gazette*, March 1999, 6.
[95] Ibid., 6.

the MV22's DWS. Fielding of the aircraft without a fully integrated defensive weapons suite is foolhardy.

Part III of Col Hanifen's articles on the MV22 discusses some interesting points about the employment of the MV22 and acquisition of a DWS.

> A visibly mounted defensive weapon in the hands of trained Marines has favorable psychological impact particularly in the low intensity/third world arena. It tells potential and possibly reluctant adversaries they will not be able to shoot the MV-22/CH-53E supported force with impunity. Any engagement risks defensive retribution. One of the last perceptions Marines desire to promote is the minds of adversarial troops anywhere in the world, is that the new MV-22 is unarmed, no threat, and 'easy' prey to be fired upon at will with impunity. If unescorted and fired upon, Marines must have a capability to protect their fellow Marines and themselves.[96]

The DWS also has the added benefit of providing the Marines inserted by the MV22 force with a limited fire support asset. Certainly, critical planning and integration issues exist that must be addressed if fires from a weapon system on an assault support platform are to be effective and safe for those needing the fires. However, especially if the MV22 flight is going long range, without escort (e.g., Operation Eastern Exit, Liberia, January 1991), to the urban center, the DWS would provide some measure of protection for the aircraft and the inserted force.

Other aspects of survivability are worth discussing as well. Armed escort of the MV22 continually comes up as a challenge for mission success and the survivability of the aircraft and its embarked Marines. This tactical problem needs to be addressed for all environments, not just the urban battlefield. Truly, there are more options than initially appear viable for armed escort of the MV22. Although currently, there is no escort platform in the same performance category as the MV22, there are aircraft on either end of

[96] LtCol Timothy C. Hanifen, USMC, "MV-22 Osprey, Part III: Warfighting and Related Acquisition Challenges," *Marine Corps Gazette*, July 1999: 78.

the aircraft's capabilities that can conduct adequate armed escort duties. In the enroute phase of the mission, fixed wing aircraft, whether they be F/A18s, AV8s, or the future Joint Strike Fighter, combined escort can be conducted very effectively. In fact, the increased speeds of the MV22 will allow fixed wing escort platforms to maintain more survivable profiles themselves while keeping track of the MV22 flight.

As the MV22 flight approaches the objective area, a more familiar armed escort procedure comes into effect. At the initial point, or a transition point where the MV22 begins its transformation back into a helicopter, traditional attack helicopter escort by AH1Ws or future AH1Zs is not very different from today's tactics. There are many coordination and integration issues to be addressed as this new aircraft begins its tour of duty as an assault support work horse, but Marines will certainly find ways to bring effective combined arms action by assault support into the future. Later in this paper, one such technique for the escort of MV22s into an urban objective area will be explored.

Optimally, a combination of defensive weapons, countermeasures, built in survivability measures and armed escort would be the best combination to ensure survival and mission success on a high or low intensity battlefield to include an urban one. Major Clinton goes on to assert that armed escort and self-defense weapons compliment each other.

> Armed escort operations are not always totally effective. Any aircraft which has a mission to fly over hostile territory requires self-defense armament to supplement armed escort…in the age of dwindling funds and resources it only makes sense to design every aircraft to the best of its ability to defend itself on the modern battlefield.[97]

[97] Major Clinton, 29.

Another measure of survivability, and one very important to the urban fight is aircraft survivability equipment (ASE). This equipment is a suite of passive and active measures to decoy or defeat enemy weapons systems used against it. For the MV22, a low infrared signature paint scheme, AAR-47 Missile Warning Set, APR-39V2 Radar Warning Receiver, ALE-47 Countermeasures Dispensing System, and AVR-2A LASER Detection System are all fitted.[98] This suite is current technology, installed on aircraft in the military inventory today. Unfortunately, many feel that this suite is sufficient. There are provisions for upgrades to these systems, but one specific area is woefully short for the urban arena.

The ALE-47 Countermeasures Dispenser has provisions for 60 individual expendables. These expendables are loaded for each mission based on what threat is most likely to be encountered by the aircraft. Infrared decoys from specific portions of the IR spectrum and radar frequency-specific chaff bundles are the most common expendable loads. These expendables are loaded into the dispenser or "bucket" according to predetermined program designed to defeat specific weapons systems and to be dispensed automatically or on pilot demand. The problem is the total number of expendables available to the MV22 crew. Sixty total slots are available, thirty on each side of the aircraft, which is the same amount available today on assault support aircraft. This means that the total number of expendables available to the MV22 crew is no greater than the number currently available on 1950s technology aircraft. Many tacticians believe that at least twice as many expendables would be required for a typical mission profile to the urban center.[99] Discussions with the MV22 Program Office reveal that additional "buckets" to

[98] LtCol Hanifen, Part I, 62.
[99] MAWTS-1, 4-28.

increase the number of expendables would contribute to mission success on the urban battlefield, but are too expensive and the design is too far along to incorporate these changes before IOC of the aircraft.

Looking at the design of the aircraft, the MV22 was built to sustain significant battle damage and still safely return to base or make a safe landing clear of enemy forces. This may prove to be a very important attribute of the aircraft. In Somalia, the 160th SOAR's MH60 Black Hawks took a tremendous pounding from small arms and light machine gun fire yet were able to continue the mission in many cases. The inherent ballistic tolerance of composite materials makes the weight bearing structures of the MV22 very strong yet difficult to take out with ammunition up to 14.5 mm.[100] Triply redundant, digital, fly-by-wire flight controls provide for full authority if one or even two systems fail.[101] The fuel cells are filled with inert gas as the fuel is burned to reduce the likelihood of combustion should the cell integrity be compromised in a crash. Additionally, the cells are self-sealing in the event of fracture or crash.[102]

On the other side of the design equation, the MV22 is a large aircraft. Although its length is only 57 feet, 4 inches, its width at 84 feet 7 inches is very close to a CH46E's length. A significantly larger aircraft from rotor tip to rotor tip means that the landing zones required for the safe insertion or extraction Marines by MV22 will have to be significantly wider than the current conventional helicopter landing zone (HLZ). When considering width alone, the MV22 is even wider that the CH53E's rotor diameter of 79

[100] Bell-Boeing, 11.
[101] Ibid., 15.
[102] Ibid., 11.

feet. This means that the aircraft could find it difficult to fit into urban LZs used by its assault support ancestors.

Size contributes to susceptibility as well. The larger the aircraft, the easier it is to hit with small arms and shoulder launched weapons such as RPGs. Note that during the Battle of the Black Sea, the MH6 and AH6 "Little Birds," flown by the 160th SOAR as close air support and close in fires platforms, were not hit by RPG fire. The MH6s and AH6s are markedly smaller than the MH60 Black Hawks. This comparison is interesting in that the MV22 is much larger than the MH60. The main rotor diameter of the Black Hawk is 53 feet, 8 inches and its fuselage is just over 50 feet.[103] Given the dimensions of the aircraft and the experience in Somalia, one would have to conclude that the MV22 would be more susceptible than the MH60 in a similar urban environment.

The size of the aircraft is also important when considering another aspect of susceptibility. The greater the size of the aircraft, the greater its radar cross-section, given that the MV22 does not incorporate "stealth" technology. Radar cross-section is the signature that an aircraft has when its skin is "painted" or hit by radio waves directed by radar transmitter receivers. In general, the larger the aircraft, the more visible it is to enemy radar equipment.

The final aspect of size that may make the MV22 more susceptible than desired is the weight of the aircraft. At a hefty 52,600 pounds maximum vertical takeoff gross weight, the MV22 is over twice as heavy as a CH46E at maximum gross weight (24,300 pounds).[104] Weight has two impacts on aircraft operating in urban terrain. First, if the

[103] Michael J. H. Taylor and others, eds., *Jane's Encyclopedia of Aviation,* (New York: Portland House, 1989), 816.
[104] Bell-Boeing, 3-1.

situation in an urban operation is such that a rooftop landing is necessary, there will be fewer roofs that might be capable of supporting the weight of a MV22. It is arguable whether or not rooftops would be a viable landing area at all. The draft Multi-Service Urban Aviation Manual has a good discussion on the use of rooftop LZs.

> Some structures may accommodate helicopters landing on the rooftop. In cases where the load bearing capacity can be readily evaluated, (such as with existing rooftop helipads or with the availability of building design data), rooftops constitute viable HLZ. Some major cities have codes requiring rooftop helipads for buildings taller than a certain number of stories. These pads may have the maximum weight bearing capacity painted on the pad. The load bearing capacity of a rooftop cannot be accurately determined by simple observation. Roof clutter, such as antennas, lightning rods, and wires, may obstruct the landing area. Aircrews must also be aware of the unpredictable wind and venturi effects associated with flight in close proximity to very tall buildings, as well as out-of-ground-effect (OGE) operating requirements. These effects may require additional power during operations to and from high rise rooftops…HLZs, particularly those suitable for large multi-ship formations, are often limited in urban terrain. A careful balance must be made between the limited availability of suitable HLZs and exposure to observation, direct fire, or an ambush.[105]

Rooftops may be areas easily ambushed by the enemy. Regardless, the number of buildings that the enemy will have to booby trap or post snipers at will decrease given that there will be fewer buildings able to withstand the MV22 landing weight. If a hovering profile is chosen to preclude landing, the aircraft is more vulnerable to small arms and RPG fire since a hover profile by definition exposes the aircraft to observation and fields of fire from above and below the rooftop.

The second weight related issue is that the heavier the aircraft, the greater the downwash effects from its rotor system during hovering operations. At a maximum out-of-ground-effect hover gross weight of about 52,000 pounds, a MV22, in a hover will

[105] MTTPM, III-19.

generate a significantly stronger rotor downwash than the CH46E.[106] This factor was discovered early in the aircraft's developmental flight testing, but was underscored in a recent Vince Crawley article on the MV22's performance during operational testing.

> Testers also noted severe downwash in a simulated urban area. "Downwash…while hovering over the target building had a significant effect on the surrounding buildings and the streets below," the OT-IID report said. "While the shock effect of noise, confusion and flying debris may prove to be a tactically useful characteristic, their effect on friendly ground troops and mission aircraft have not been thoroughly evaluated."[107]

These factors must be considered when employing the MV22 in the urban environment. Assessing these limitations, and developing ways to minimize them while capitalizing on the aircraft's strengths, will only serve to bolster the Marine Corps' decision to procure the aircraft. The technology that makes the MV22 an inspiring assault support platform cannot erase some of the drawbacks that result from exploiting that technology to its fullest. If these limitations are ignored or denied, the urban terrain will be unforgiving on aircrews daring to venture there.

UH1Y and AH1Z

> *Rotary-wing aviation for urban combat does not need great range or speed, but demands a richer defensive suite, great agility, and increased stealthiness.*[108]
>
> - Ralph Peters

Ralph Peters' words hold an interesting dilemma for technology proponents. The MV22 is trying to capitalize upon those traits that may not be useful or prudent in the

[106] Bell-Boeing, 3-1.
[107] Vince Crawley, "Safety Questions Linger For V-22 Osprey," *Defense Week,* 17 May 1999, 1.
[108] Peters, 46.

urban littorals; while the "demands" he cites are still on the MV22 wish list. Luckily, the MV22 will have partners on the urban battlefield to help it accomplish its mission. Advanced technology has produced the further evolution of two of the Marines Corps' battle tested veterans. Bell Helicopter's H-1 program has spanned over three decades and with leading edge technology, seems poised to begin the new millennium with even greater capability. The AH1Z and UH1Y will be the newest in this line of attack and utility helicopters to serve the Corps. Their potential usefulness on the urban battlefield may be the impetus needed to ensure success of future assault support missions.

Initially chosen over other replacement aircraft for economic reasons as replacements for the AH1W and UH1N, the AH1Z and UH1Y will provide necessary links to both fire support and command and control for an MV22 and CH53E force to operate in the urban environment. A draft document from the Marine Corps Combat Development Command, Requirements Division lays out the role of the "Zulu" and "Yankee."

> The AH-1Z / UH-1Y will introduce a new level of capability and new functionalities currently unavailable to the MAGTF or Joint Commander. These capabilities will include an enhanced Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) capability for execution of over the horizon operations, versatile and selective firepower options to cover the spectrum of target suites found in a complex warfighting scenario, and the ability to control Marine, Joint, and Allied aircraft and fire support assets via secure digital communications. The AH-1Z and UH-1Y will fuse real time digital air and ground situational data to allow the aircrew to integrate fully into all phases and levels of air and ground operations. The Z/Y will be required to not only display this integrated picture, but to be capable of serving as a conduit to link and relay this picture to other ground or air stations to support digital network operations and over-the-horizon connectivity.[109]

A true combined arms approach to the urban problem is possible through the employment of these two aircraft in support of an urban assault support mission. The reli-

[109] Marine Corps Combat Development Command, "AH-1Z/UH-1Y Concept of Employment," draft paper by Requirements Division (Quantico, VA: United States Marine Corps, July 1999), 4.

ance on the AH1Z in the future as an escort for the MV22 has already been addressed. As an armed reconnaissance and rotary wing close air support (RWCAS) platform, the AH1Z will provide the protection and precision fire support needed to successfully accomplish support of the commander's intent during urban assault support.

> Further, the AH-1Z will provide unparalleled support in the Urban CAS role where its speed, size, survivability, and large weapons mix and payload will allow it to operate with devastating effectiveness. The AH-1Z will operate across the spectrum of conflict, providing presence, non-lethal, and low-yield point target capability in a MOOTW scenario, up to high volume, heavy prosecution of hardened point targets, troop concentrations, and materiel targets found in a Major Theater War (MTW) scenario.[110]

Additionally, as a true utility aircraft, the UH1Y will have a wide range of capability and many roles on the urban battlefield. In fact, based on its size, communications suite, sensor package and weapons systems, the UH1Y may prove to be an essential element for urban assault support missions. Many see the "Yankee" as a self-contained assault support platform for those missions which may require small teams up to squad size insertion or extraction due to its proposed robust organic capability in all mission areas.

> The UH-1Y will provide the MAGTF commander with vital C4I connectivity, as well as filling the utility mission gap left by the MV-22. The UH-1Y will also operate across the full range of conflict levels. The UH-1Y will be a major force multiplier in the Urban warfare arena, providing the MAGTF with three-dimensional access to the urban canyons and restricted landing zones characteristic of that environment. The UH-1Y will provide close fire-support with high-volume, low yield crew served weapons. The UH-1Y will prove critical to the MAGTF commander serving in the Command and Control role by overcoming data and voice communications line-of-sight problems allowing the commander to better visualize and control his forces.[111]

The duo is a natural team for the urban environment. Smaller than the MH60 Black Hawk yet with comparable capability, the "Zulu/Yankee" team may hold the right mix-

[110] MCCDC, Z/Y COE, 12.
[111] Ibid., 12.

ture of tools for the MAGTF commander's prosecution of the urban battle. The combination of weapons systems, command and control connectivity, sensor packages, communications capabilities, and combined arms concept will give great flexibility and responsive aviation support to the MAGTF commander. Especially for the urban battle, these aircraft possess immense potential for filling gaps in the current employment options that the commander foresees.

> The AH-1Z will be equally well suited to precision or area engagements of personnel, vehicles, materiel, and hardened positions. Because of its small size, flight characteristics, and close-in weapons systems, the AH-1Z will be the ideal and logical primary aerial fire support platform to support urban operations. In this light, the UH-1Y is also especially capable in the urban environment. The UH-1Y's high rate of fire and low collateral damage gun systems are tailor made for the demands of the urban battlefield. The UH-1Y will also directly support airborne sniper operations, psychological operations, and the delivery of non-lethal munitions.[112]

The AH1Z and UH1Y will be capable of integrating with a joint command and control system digital data communications to provide necessary connectivity between the MV22 assault force and the command and control structure. Able also to interface with unmanned aerial vehicles (UAVs), the "Zulu" will be capable of high volume relay and near-real time data uplinked to the overhead systems. The "Yankee" will have the capability to provide mobile remote control capability to the Marine Corps' next generation UAV the Vertical Takeoff Unmanned Aerial Vehicle (VTUAV).[113] Coupled with a new emerging concept called AMUST (Aerial Manned-Unmanned Systems Technology), the pair will be able to fully exploit technology in support of urban targeting needs.

> With a UAV identifying and designating targets, the AH-1Z will conduct precision engagements of targets at the maximum range of its weapons systems increasing the survivability of the AH-1Z, and enhancing its lethality through surprise and accuracy. This symbiotic relationship will be even more valuable at

[112] MCCDC, Z/Y COE, 22.
[113] Ibid., 24.

> night or in mountainous or urban terrain. The UAV would perform the dangerous and time consuming tasks of target location and identification, looking down over obstacles and barriers. The AH-1Z's would then engage designated targets from safe attack positions taking advantage of standoff and terrain masking to avoid detection and engagement by threat forces and supporting arms.[114]

There is great technological promise waiting in the wings for Marine assault support when considering the urban challenge. Of course, it is one thing to say that a future platform will have a capability, and another thing to see that capability employed on the battlefield. Importantly however, it appears that the people making the requirement decisions for these future platforms at least have the urban environment in mind as they craft the need statements for the new equipment.

Unfortunately, as already stated, technology itself rarely answers all the questions and merely having the equipment out on the flight line does not guarantee success in the urban arena. The aircraft and systems are no better than the humans that employ them. In an urban conflict, the warrior, whether at the controls of an aircraft or behind the trigger, needs more than equipment to win. A more holistic approach to the urban assault support puzzle must be examined.

[114] MCCDC, Z/Y COE, 25.

Chapter 4

Training - The Old Fashioned Way to Victory

Given that many nations have purchased highly capable weapons systems, the difference between a true military capability or just having the gear has been training. The United States military has historically and correctly placed a significant emphasis on training its personnel for war. Many believe that during the Cold War, the difference between success and failure verses the Soviets would have been the U.S.'s ability to provide realistic training for the troops facing superior Soviet numbers. When considering the urban environment, training becomes particularly important yet very difficult to conduct. Adding aviation training to the mix complicates the issue even further. Training facilities, for example, are almost non existent for aviation units. The time-honored cliché of "train as you will fight" is never more poignant than for urban operations. Combined arms operations in open terrain are difficult enough without the complexities of the urban battlespace. Lip service to combined arms training in an urban fight will be disastrous. The draft Multi-Service Urban Aviation Manual calls for a tall order to be filled for effective aviation training in MOUT.

> Even a benign environment, such as disaster relief or civilian assistance requires focused training to minimize mission risks. Baseline training requirements must address navigating on urban terrain. It must also address locating and evaluating drop zones (DZ), landing zones/pickup zones (LZ/PZ), and safely negotiating manmade obstacles during a confined area takeoff, and landing…Frequent, realistic training is required to overcome the difficulties associated with aviation ur-

> ban operations. This environment requires achieving and maintaining a high degree of aircrew proficiency. The following areas should be included in unit training programs. Centralized control, decentralized execution; application of ROE; low level flight and navigation; night operations; and live fire training exercises focused on target ID, terminal control, and fratricide prevention.[115]

Maintaining Marine Corps aviation's tried and true approach to training will be crucial to the success of urban flight training. In all Marine Corps aviation training, an added emphasis in recent years has been ensuring "core competency." Limited resources dictate that aviation units focus on the skill sets that will support the unit's mission in combat. These are skills that the aviator must attain and master in order to be proficient in combat flying. These core competencies must be derived from the aviation unit's mission statement and essential tasks assigned to that unit in combat. This methodology is supported by the Marine Corps Aviation Training and Readiness Manual Volumes or "T&R manuals". These T&R manuals break out the specific sorties and training requirements that must be met in order for an individual pilot, an aircrew, and ultimately the unit to be "combat capable," "combat ready," and "combat qualified."

As of this writing, only one aircraft community in the Marine Corps has any urban flight training outlined in its T&R manual. The only way to drive Marine aviation units to train to the urban mission, and more importantly, ensure resources are set aside for that training is through the T&R manuals. Once the manuals reflect the requirement for pilots and units to train to the urban mission, the unit has the responsibility to train to meet that mission standard. The "stair-step" or "crawl-walk-run" approach applies. Introduction early in a young aviator's career to the urban environment is essential to ensuring success. Moving from simple navigation skills to live fire, combined training will build up an experience base first within individual units and throughout the Marine Corps

[115] MTTPM, I-10.

in a relatively short time. Unfortunately, that is just the beginning. Even if the aviation communities sign up for this needed training, they need a place to train.

Some rudimentary urban aviation training is going on today. Aviation Combat Elements (ACEs) are conducting Training in an Urban Environment Exercises (TRUEX) with their Marine Expeditionary Units (MEUs) during the work-up period leading up to their Special Operations Capable (SOC) qualification. These training evolutions are routinely conducted in a real city that has agreed to support and host Marine Corps training. There is considerable risk involved for the aviation element of the MAGTF and often flight profiles and aircraft mixes are adjusted to reduce risk and to minimize impact on the citizenry. This oftentimes results in unrealistic conditions for training of aviation on urban terrain however; all understand the fine balance that must be maintained in order to preserve the force and future training opportunities. Even though MEU(SOC) ACEs are exposed to TRUEX evolutions, the majority of rotary wing units and certainly most fixed wing units in the Marine Corps rarely have the opportunity to train on urban terrain. One answer for live aviation urban training is a "city" without the civilian populace.

Thus, one of the most daunting challenges facing urban aviation training is the availability of urban training facilities and ranges of suitable size for aviation operations. Live urban training sites are rare, difficult to coordinate, and hard to sell to local communities. One possible option in trying to provide realistic yet safe urban training areas is using, as interim urban training facilities, the growing number of military bases closed as a result of the Base Realignment and Closure (BRAC) initiative. The Marine Corps has had some success in securing temporary use of these closed military bases that have begun their transfer into civilian hands.

Formerly Williams Air Force Base, off-runway portions of Williams-Gateway Regional Airport east of Phoenix, Arizona, semi-annually serve as an urban aviation training area for Marines, soldiers, sailors, and airmen attending the Weapons and Tactics Instructor (WTI) Course at Marine Aviation Weapons and Tactics Squadron One (MAWTS-1) at MCAS Yuma, Arizona. MAWTS-1 works year round with local businessmen and authorities from local law enforcement to the Federal Aviation Administration to facilitate and secure the use of such facilities. These locations provide a more realistic yet mostly unobtrusive solution to a difficult problem. Although live fire is not permitted, the mechanics of urban navigation, objective area integration, fires planning, landing zone planning, and threat evaluation are available to assault support tactics planners and pilots for the evolutions conducted at the facilities. Uniquely located very close to a major urban center, the site provided an entry-level urban assault support aviation training opportunity. The drawbacks were many but the limited time available that MAWTS-1 had to use the area was most notable.

The Marine Corps' efforts to provide a more capable facility on a limited, but heretofore unprecedented scale to fixed and rotary wing attack aircraft have been underway at MAWTS-1 for since 1997. Named for the callsign of the action officer that made it possible, "Yodaville" is the Marine Aviation Urban Training Center (MAUTC); a live drop, inert ordnance, instrumented range that takes on the shape, feel, and look of an urban area complete with street lighting, vehicles, and "people" (steel stick figures). Yodaville, or the MAUTC resulted from a training needs statement (TNS) submitted to the Marine Corps Combat Development Command in April 1997 by MAWTS-1 to fulfill the Marine Corps' need to assess urban close air support capabilities with current CAS sys-

tems.[116] Although unsuitable for ground troop integration, since the "buildings" are constructed from ocean cargo shipping containers and cluster bomb unit containers, the 167 structures within the 45 acre site were built on an existing weapons range at the Moving Sands target set with the purpose of allowing the employment of inert, live ordnance. MAWTS-1 defined the requirement for the facility and secured funding with resource assistance from the Marine Corps Warfighting Lab (MCWL) in conjunction with the Urban Warrior Advanced Warfighting Experiment (AWE).

The facility provides several avenues to pursue urban CAS. First, the MAWTS-1 Urban CAS Assessment was the impetus for the building of Yodaville since no such facility existed in the Marine Corps or the other services. The assessment was designed to bring to light tactics, issues, equipment, and requirements needed to improve the Marine Corps' urban CAS capability as well as to refine existing TTPs for delivering ordnance in an urban battle. The second outcome from the development of the MAUTC was an effort to develop the integration of virtual interactive targets (VIT) into the training features available at Yodaville. VIT is government-owned software that provides engineering-level damage assessments of weapons effects on structures and surrounding materials.[117] Utilizing the existing Weapons Impact Scoring System (WISS) and Tactical Aircrew Combat Training System (TACTS) for bomb scoring and recording of CAS runs, the VIT system models the structures and vehicles at the site in addition to providing realistic effects of the ordnance delivered. This provides a virtual replay of the CAS missions and their effects as if it were a real town and live ordnance. Finally, Yodaville will be turned

[116] Major Floyd J. Usry, Jr., USMC and Major Matthew T. Sampson, USMC, "MAWTS-1 Urban CAS Initiatives," *Marine Corps Gazette,* May 1999: 35.
[117] Majors Usry and Sampson, 36.

over, once the assessment is completed, to the range facility at MCAS Yuma for use by operating forces DoD wide.

To build, maintain and outfit a service level or joint urban aviation training facility of the scale required for effective aviation operations may be prohibitively expensive. Yet, the need is critical for such a training facility. The U.S. Navy is the proponent for a joint mission needs statement (JMNS) under review by the Joint Urban Working Group that proposes a requirement for a new urban training complex.

> The establishment and development of a new tactical and operational training complex dedicated exclusively to providing expeditionary force training support to surface, subsurface, land and air clientele, as well as operational commanders… New Range Dedicated to Expeditionary Force Training. A new range exclusively for expeditionary force training may be developed with all range functions, logistical support and training infrastructure provided as part of the range program.[118]

Probably the most promising avenue for more realistic MOUT flight training is computer simulation. Recent technological advances in simulator design, modeling, and visual displays have yielded the potential for providing the urban assault support pilot, a challenging yet forgiving environment to practice urban flight techniques and procedures. Although not intended to completely replace the real thing, flight simulation is rapidly proving to be the best payoff for the investment in exposing pilots to the challenges of urban combat missions. The Marine Corps is looking at the day when all Marine Corps aviation simulators are networked, in order to allow pilots from different squadrons, across the Corps, to fly together in tactical scenarios to include urban missions. These linked computers will have advanced data bases able to portray mission fidelity, threat systems, and flying environments never before imagined by today's aviators. Even in a

[118] Brief given to Joint Urban Working Group for Joint Mission Needs Statement Review in support of Phase II of the Joint MOUT Study. Marine lead was LtCol Michael Manuche, 7 July 1999.

new urban live training facility it is unlikely to see the threats and situations necessary to thoroughly train an assault support aircrew. With simulation, this is all possible without the inherent dangers.

Training must continue to be stressed as an integral part of the urban equation. Despite dizzying technological advances, without the training to use such systems and the practice necessary to perfect tactics, techniques, and procedures, the highly capable equipment will be of little use. What begins to emerge is that a combination of factors will be necessary to win the urban battle.

Chapter 5

Tactics - New Problems, Old Solutions?

Whenever a "new challenge" is confronted, the tendency is to find new ways to overcome the new challenge. The assumption is that if there is a new problem, a new solution must be developed to attack the problem. The same is true for the urban environment. Although certainly, there are new concerns and difficult problems to address for solving the urban combat dilemma, there may be existing tactics, techniques and procedures that prove effective. If new TTPs are required, then it is essential that they be tested, refined, and evaluated thoroughly. Russell Glenn recognized these factors.

> What is evident from both a survey of written sources and the repeated assertions of those interviewed is that effective urban warfare requires special considerations yet manifests many of the same characteristics as successful warfare in other environments. Basic principles of tactics and leadership remain viable despite the fundamental differences in environment and greater risk of friendly casualties: synchronization of combined arms is essential; unity of command facilitates success; a unit must train as it will fight. Equally evident is the frequent lack of adherence to these and other principles by forces preparing for and conducting combat in urban areas in the past.[119]

An example of this idea is landing zone selection and evaluation. Generally, landing zones for an urban insertion or extraction are chosen much the same way that they are in open terrain. Criteria already exist that help planners make decisions about whether or not a landing zone is suitable. The respective tactics manuals of each assault support

[119] Glenn, 11.

aircraft type discuss items like: Size, shape, condition, and altitude; approach and departure routes; possible enemy positions; initial terminal guidance (ITG); landing formation; and the ground scheme of maneuver.[120] It is easy to visualize evaluating urban landing zones using these criteria. The specifics on the landing zones in an urban area may differ significantly from those in an open area but the fundamentals for planning are the same. It is important to keep in mind this tenet as this discussion on tactics continues.

Urban landing zones will still need to be secured much the same as in open terrain. Complete elimination of the threat in the area surrounding an urban landing zone is unrealistic. The difficulty becomes when and how to do the job of securing the LZ and maintaining its "cold" status. As with traditional landing zones, the ability to suppress enemy fire effectively will be necessary and more difficult in urban terrain, especially if collateral damage and noncombatant casualty concerns are prevalent. The transitory nature of urban combat from offense to defense and the reduced distances that an enemy may be held at bay will prove problematic. Thus, emerging non-lethal technologies may hold promise for airborne platforms as well as for ground forces when faced with a suppression requirement and accompanying restrictive rules of engagement (ROE). The requirement to suppress the enemy force in an urban setting without destroying the surrounding buildings or people may point to a need to temporarily stun or incapacitate those within the building so that a vertical assault can take place. Traditional fire support means, if ROE allows, will still need precision delivery capability with limited yet effective yields.

The previous paragraphs illustrate the role that tactics should play in assault support's taming of the urban environment. How then are links made to ensure mission suc-

[120] CH-46E TACMAN, 18-11.

cess and provide a foundation for solid execution? Solid tactics start with detailed planning. Planning is a key element of tactics development in that there must be well-understood, executable plan to accomplish the assigned mission. Without a solid plan, there can be no way of knowing what to expect and what to do when things go wrong. Flexibility is a by-product of effective planning, not a replacement for it.

The techniques used to analyze the mission based on METT-T will yield dividends in tactical execution. One of the indispensable elements of successful combined arms operations is fire support. Fire support planning will be key to successful assault support missions into urban terrain. A scalable fire support plan is necessary to provide protection for the assault support assets and the Marine force embarked aboard the assault support platforms. Being able to span the spectrum of conflict with effective fire support, lethal and non-lethal, will be a challenge, but one that is achievable with imagination and a true combined arms approach to the urban objective area. Finally, some foundation must be established for a basic outline or template for assault support operations in an urban area. From a baseline template, tailoring assets and tactics for the different threat levels that might be encountered is possible. The closer the tactics resemble existing operations the better, as long as they ensure mission success and are supportable by the assets at hand.

Urban Mission Planning

> The need for detailed planning is not new to combat but is vital to urban combat. A detailed plan helps in effective command and control, the integration of combined arms and in reducing friction caused by the nature of the urban environment.[121]

[121] MAJ Charles A. Preysler, USA, *MOUT Art: Operational Planning Considerations for MOUT,* Monograph, Army Command and General Staff College (Ft Leavenworth, KS: May 1995), 32.

As Major Preysler states, urban assault support mission planning has many similarities to assault support missions in other environments. However, what are some of the unique details in assault support mission planning that must be considered in an urban objective area? METT-T provides a baseline from which to begin an assessment.

Mission analysis is critical. Knowing what tasks are to be completed and how the assault support mission fits into the larger plan is key to understanding desired endstate of the assault. Even more important than in open terrain, a study of the commander's intent must reveal the 'why' of the mission and be clearly understood down to the lowest level. Since the nature of the urban battlefield is such that communications, command and control may be difficult, commander's intent allows for decentralized execution of the mission. Without it, the tempo needed for overwhelming the urban enemy will never be attained. Speed is life in urban combat. Major Preysler makes some key points about mission analysis but cautions that urban operations may still generate undesired results.

> In order to successfully attack to secure operational objectives, planners must have a detailed plan, accurate intelligence, reasonable restrictions/constraints, be able to develop overwhelming superiority, be capable of isolating the urban area on multiple levels, obtain surprise and possess doctrine that provides the commander with an understanding of the nature of urban combat. Even with proper planning there is still an inevitable cost when conducting urban operations.[122]

Knowing the enemy is the next step toward thorough planning and reducing the risk involved in urban flight operations. The intelligence process, key to any military operation, becomes even more crucial for successful urban aviation operations. Intelligence preparation of the battlefield (IPB) must be conducted in urban terrain much like it is in open terrain. Arguably, assault support operations may benefit even more from urban

[122] MAJ Preysler, 29.

IPB than in other environments. Ignorance of building height and obstacles to flight may be just as deadly as unknown enemy positions.

The enemy's likely response to a vertical assault force and his tactics against it are critical pieces of information to the air mission commander (AMC). It will affect in great measure the tactics chosen for the assault force. Altitudes and airspeeds of assault aircraft must be determined by respecting the threat environment. If small arms and RPGs are the threat and no known surface-to-air missile threat exists, 1500 feet and higher can be used to keep assault support aircraft out of effective range of those weapons. However, if MANPADS are present, a lower altitude (100-150 feet) profile that takes advantage of terrain masking and the night environment will be more effective in defeating that threat. These decisions must also be weighed after assessing the environment and the proficiency of the assault support crews since the low altitude, night time profile requires a significant training commitment.

The Marine Corps Intelligence Activity has compiled a product available on CD-ROM that contains publications essential for intelligence planning for operations the urban theater. The Baseline Reference Documents CD contains: EXFACTS/Country Primer, Generic Intelligence Requirements Handbook, MCIA Country Handbooks, Infantry Weapons Recognition Guide, Marine Corps Mid-Range Threat, and the Urban Generic Information Requirements Handbook.[123] Also a very useful reference for planning considerations, the draft Multi-Service Urban Aviation Operations Manual provides some insight into the difficult task of gathering intelligence on the urban enemy.

> Threat intelligence will be difficult to obtain, and more difficult to accurately update. Areas of control can change rapidly and may be confused much of the

[123] *Baseline Reference Documents*, produced by Marine Corps Intelligence Activity, vol. M30002A0091, MCIA-1229-001-99, (Quantico, VA: MCIA, 7 December 1998), compact disk.

> time. Planners must anticipate rapid changes in the threat and incomplete information. Every building and structure in an urban area is a potential enemy position. The presence of snipers, vulnerability to ambush, and the difficulty in distinguishing combatants from non-combatants places participants under additional psychological stress.[124]

Assault support mission planners would characterize the "troops and support available" portion of METT-T as assets available and necessary for conducting the assault support mission. Task organization of the ground force will certainly require adjustments to the aviation task organization as well. Unlike HLZ operations in other terrain, if it is necessary to land close to the objective in urban terrain, the ground forces must be landed ready to fight. The organization of the ground force and the assault flight to deliver them must be planned and ensured at the pick up zones (PZs), not at the objective area's helicopter landing zones (HLZs). The proximity of enemy forces to the objective area HLZ will require quick insertion and extraction techniques. Loitering in the air or on the ground in an urban area invites disaster.

Myriad assets, both organic to the MAGTF and from the joint arena, will be needed in an urban operation. The identification and allocation of these assets up front must be efficient to ensure that the commander has the assets necessary to enable timely decisions. The Multi-Service Urban Aviation Manual identifies some of these assets.

> Commanders must establish reconnaissance operations early, using all available assets. Unmanned aerial vehicles (UAVs) with data linked video are useful assets. Manned aircraft with multiple reconnaissance systems such as low-light television (LLTV), forward-looking infrared (FLIR), and NVDs can provide focussed concentration of specific areas. These visual systems coupled with electronic intelligence (ELINT) systems, voice interceptions, direction finding (DF) platforms networked with ground-based systems, CA, SOF, and ground forces provide a picture of the urban environment. HUMINT can provide information on threat intent and forces, as well as information about city infrastructure and status. Gathering detailed information during the planning phase of an aviation

[124] MTTPM, III-1.

> operation provides planners and aircrew with information about threat positions, movements, routes, and weapons.[125]

Terrain and weather are essential considerations during urban operations. The city core proves to be some of the most demanding terrain anywhere. With fewer geodesy products available for urban terrain than conventional terrain, appreciation and study of it is more challenging. City driving maps, tourist maps and sometimes city planners' blueprints are of varying scales and questionable accuracy. The unforgiving nature of the urban landscape to assault support aviation has two sides. First, the confusing and complex urban core provides a haven to the enemy bent on engaging friendly aircraft. The environment allows for numerous hiding areas and alternate positions for weapons systems.

> Urban operations may make aircraft more vulnerable. Urban terrain provides excellent cover and concealment for a variety of weapon systems… Light to medium AAA may be employed from ground sites, the tops of buildings, in or near attack prohibited structures, or mounted on civilian vehicles; thus providing aircrews with a more complicated threat picture…MANPADS, with their size, weight, speed of employment, and ease of concealment, make them excellent weapons for operating from within close proximity to, or on top of buildings and other structures.[126]

Second, the city environment is very difficult to operate in effectively given the relative unfamiliarity that aircrews have with urban flying. Anticipation and identification of obstacles, navigation cues, and the objective area contributes to cockpit task saturation that is difficult to replicate in other environments. All these factors make the enemy's job of defending the city easier.

> These multi-storied buildings offer many challenges to the aircrew. These large, significant terrain features may simplify navigation, but tall buildings and narrow roads severely limit the ability to fly between buildings. Large open areas for LZ, such as parks and parking lots, are often adjacent to these buildings. If ex-

[125] MTTPM, III-1.
[126] Ibid.,, III-1.

> tremely steep ingress/approach and egress/departure angles are required for LZ access, utility may be limited. Open rooftops offer easy access to insert ground teams and extract isolated personnel, but the very nature of these multi-storied buildings may require out of ground effect hover or aircraft operating near maximum power available limitations. Depending on weather conditions, aircraft limitations may exclude this type of maneuver. The threat level coupled with the ability to gain access to rooftops and their structural integrity will influence their use. Enemy access to upper levels and rooftops may allow them to fire down on aircraft and ground forces below.[127]

Obviously, weather has a great effect on flight operations in any terrain, but its effects are amplified in urban areas. The weather, from winds to thermal heating, has unique effects in urban terrain. Unlike wind direction in open areas, swirling and unpredictable currents in the city make for treacherous flight paths near buildings and open areas. Infrared designators and FLIR navigation and targeting sensors are degraded due to like surfaces conducting and reflecting heat in like ways. Temperatures tend to be higher in urban areas than in rural areas and the temperature ranges vary less due to poor emissivity in the concrete and asphalt structures when compared to natural surroundings.[128]

Finally, time is a friend and an enemy in urban conflict when considering assault support missions. The commander hopes to use time to his advantage by using vertically inserted forces to beat the enemy to a particular objective or to make the enemy's decision an equally unpleasant one. Time is an element that the commander seeks to use to exploit the enemy's decision cycle. However, it historically takes more time than planned for in order to subdue an urban enemy. The Russian experience in Chechnya is testimony to the chronic mistake of underestimating the length of time it takes to conduct an urban operation.

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[127] MTTPM, II-9.
[128] Ibid., III-2.

Due to the relative vulnerability of assault support platforms to visually sighted weapons systems, if small arms, AAA, RPGs, or MANPADS are anticipated in the urban objective area, the best time for an assault is at night. Night provides a way to defeat or complicate one component of the enemy's weapons system – the gunner. Visual acquisition of assault support aircraft at night is much more difficult than in the daytime. If Task Force Ranger's mission was conducted at night as some of the previous missions had been, the 160th SOAR may not have lost as many aircraft to the visually sighted RPG.

Of course, night operations bring difficulties to the friendly force employing the night. Training becomes a critical element for success if the mission is to be conducted at night. All phases of the operation become more complicated and dangerous at night. The smart mission planner and training officer will ensure that all tactical flight operations, day or night, be planned and executed as simply as possible and the common denominator being that they be successfully executed day or night.

> For example, night operations increase the likelihood that U.S. forces will achieve surprise and delay the reaction of enemy forces once they learn they are under attack. Furthermore, darkness interferes with the use of weapons that do not special night sights (such as RPGs and many anti-armor weapons). Darkness complicates all military operations; if the United States trains and equips its soldiers to operate effectively at night in urban raid missions, they can generate substantial advantages over our relatively unprepared enemies, and thereby reduce some of the risks inherent in insertion and extraction.[129]

For aviation operations in an urban environment, the assault support mission planner must understand that many of the factors that face the assault support force are similar to those faced in any other terrain. The attention given to the specifics and details will pay dividends when an urban setting is the area of operations. Attention given to those areas

[129] Press, 16.

where unique mission requirements may be needed or where risk can be averted will go even further to ensuring that the mission is accomplished.

Urban Fire Support and Suppression of Enemy Air Defenses (SEAD)

In a traditional sense, fire support has been the hallmark of Marine assault support. Recognizing the potential vulnerability of helicopters, mission planners for the aviation combat element assess the threat and build a fire support plan to defeat or neutralize that threat. The urban environment and the enemy that defends there present a formidable task to be overcome. Fears of non-combatant casualties, collateral damage, and fratricide tend to handcuff the fire support effort against an urban foe. Yet without adequate protection, the assault support assets needed to provide the MAGTF commander with mobility would be attrited before they can complete their mission.

In an environment where the local populace's response to military presence is unknown or assumed to be hostile, assault support platforms must be protected. In urban terrain, the threat can come from anywhere. A threat level of low, medium, or high may be very difficult to determine during planning, not to mention execution. Even if it is known that the local populace will support or tolerate U.S. forces, how long might that support last? The threat condition could change very rapidly. Task Force Ranger showed that the urban environment threat status is fluid and may change without appreciable signs. Thus, assault support pilots must plan for the worst. Fire support, escort operations and suppression of enemy air defenses (SEAD) must be vigorously planned, rehearsed and executed. Without a combined arms approach, sending a flight of any assault support aircraft into an unknown threat environment whether it be in urban terrain or not, is foolish.

With the nature of the urban environment comes a difficulty in locating and destroying or neutralizing air defense systems that may engage assault support assets. The full spectrum of options must be made available to the vertical assault force. From non-lethal neutralization methods to reactive suppression of enemy air defenses (RSEAD), the fires planner must have very clear guidance from the commander and ROE must be fully understood. Once it is established where the threat level is and how the forces will be allowed to respond or preempt enemy action, a suitable fires package can be assembled. If preemptive fires are not permitted responsiveness and precision become necessary elements of any reactive or suppressive fires plan.

In cases where the urban enemy is relying on cueing from a radar system or communication network of some type, RSEAD missions may be built to counter the threat's ability to provide cues to the tactical systems. Unfortunately, many times these systems rely on a good measure of autonomy to be effective, thus removing the need for external cueing. Solid route and objective area planning helps to identify those areas likely to contain autonomous systems and provides a means to avoid those areas. This of course points back to a robust intelligence effort that can quickly process and disseminate intelligence products to the lowest level.

> Aviation urban operations require extensive intelligence collection and a flexible and capable targeting capability. Weapons requirements for urban operations may be different from those for open terrain operations. Planners must consider military necessity, proportionality, collateral damage, non-combatant casualties, and precision engagement weapons. The ordnance requirements for a specific mission must focus on the target, employment techniques, minimum collateral damage, and the capability to safely employ in proximity to friendly ground forces.[130]

[130] MTTPM, IV-1.

It is difficult to imagine a 72-hour joint ATO cycle that could respond to the mind numbing targeting needs of a friendly force in an urban conflict. Preplanned packages, whether they are escort, RWCAS, or RSEAD must be orchestrated ahead of time to give maximum flexibility to the urban assault support air mission commander. This also necessitates a set pattern or template for providing fire support to the AMC. Trying to develop a flexible, responsive fire support capability without appearing predictable to the enemy is a great challenge. In Mogadishu, the Somalis divined patterns in the U.S. operations that were eventually exploited; varying times, altitudes, assets, routes, and responses must be thought out thoroughly.

The urban environment crowds friendly, enemy, and noncombatants into a constrained and lethal area. Thus, once the mode of fire support is decided, procedures for positive identification of friend or foe must be clear and concise from the aircrew down to the rifleman. Laser or IR pointers can make identifiable visual signals for the marking of targets or friendly positions. Also, adequate, distinguishable target marks are essential to responsive fire support. These procedures can be applied to other missions equally as well.

> The close proximity of friendly forces to targets makes positive location and marking of friendly units and targets critical. Procedures must be clearly understood and all participants must be issued the appropriate devices. All fire support assets should be familiar with the friendly marking system. The methods to do this are limited only by the creativity of the ground forces and aircrews…Aircrews require positive location of the target and friendly positions before expending ordnance. Methods employed must be adapted to the existing conditions. Positive air to ground communications are essential to coordinate and authenticate markings.[131]

[131] MTTPM, IV-6.

It should also be noted that extraction, resupply, TRAP, and CASEVAC missions require the same level of fire support planning as the initial assault. No mission into the urban center should be take for granted. Complacency in any terrain, but especially in urban missions could lead to disaster. Techniques mentioned earlier for target marking make expeditious zone identification possible and are critical for avoiding the enemy's threat envelopes during the ingress and egress. The worst possible scenario is for an aircraft to be forced into an orbit over the urban objective area while trying to visually acquire the LZ, exposing itself to the threat.

In some ways, an urban operation where the enemy presents a known threat level up front is easier to provide fire support for than a "low intensity" environment where the enemy's reaction to U.S. presence is uncertain. For a mid-level threat, an objective area escort of attack helicopters would be expected. Additionally, fixed wing proximity escort might be necessary. What if the political climate is such that overt signs of aggressive action would not be allowed? A platform that could provide a great benefit in rapid reaction to escalation in threat level could be very valuable.

Although it has its own vulnerability concerns, the AC130H & U are formidable answers to the fire support question in urban terrain. The AC130 series can provide very accurate and devastating fires to bear in an urban area. In Vietnam, Grenada, Panama, Desert Storm, Bosnia and Kosovo, the AC-130 (in all variants) was very effective against a variety of targets requiring great precision. A platform with lengthy time on station and the capability to precisely deliver 105mm, 40mm, and 20mm rounds with an extremely short "time-of-flight" would be invaluable in air defense and sniper suppression as well as immediate fire support missions. Crews of this platform are also familiar with engag-

ing targets within close proximity to friendlies and especially within the urban objective area, under the control of a ground FAC or FAC(A). The AC130 could provide significant suppressive fires if the threat level allows for its employment

Still, there are significant challenges to delivery of accurate fires in the urban arena. The realities of employing weapons of all types within the urban environment are substantial. Weapons selection is crucial. Precision delivery capability is obviously desired but is not be the only answer. Explosive yield becomes an important part of the equation for effective employment of ordnance in urban terrain. The delivery of fires within "danger close" parameters will be commonplace. Thus, selectable explosive yield and non-lethal weapons hold great promise in urban battles. If a friendly ground force can neutralize an enemy sniper without having to destroy an entire building, and those "fires" are reliable and responsive, mission success will be more expeditious.

Command and control has great bearing on the capability of providing responsive fires. If the fires platform must rely on approval of a higher headquarters for enemy engagement then costly delays will be inserted into the fires cycle. Capable and redundant C2 must ensure that platforms are there to deliver fires as necessary and that flexible fire support control measures – custom built to facilitate, not hamstring, the fires effort – are available. Methods to control fires and identify targets can be modified and adapted to the urban environment to ensure responsive fires in support of the assault support mission or ground scheme of maneuver.

> Common control methods include urban grid, bullseye targeting, objective area reference grid, and TRP. These techniques are based on the street and structure pattern present, without regard to the MGRS grid pattern. Aircrew must plan to

transition to the system in use by the ground element upon arrival in the objective area.[132]

Indirect fires are possible in support of urban missions if they have a precision delivery or non-lethal capability. Otherwise, the proximity of friendly units, noncombatants, and heavy collateral damage may prevent their employment. There are efforts under consideration for providing indirect, accurate, responsive fires for the urban environment but they have yet to reach fielding. The ground force may be able to employ organic mortars to some extent to aid in providing their own fires and for marking of urban targets. Direct fire capability is currently more useful in the close quarters urban fight. The M1A1 tank main gun, the LAV 25mm cannon and heavy machine guns provide a significant capability with some obvious drawbacks (e.g., tank employment within the city as in the Chechen conflict). Airborne non-lethal fires may provide an important capability in either scenario. The ability to incapacitate an enemy sniper or small enemy force resisting an insert could prove vital to mission success. Riot control agents or a sonic weapon may eventually be an organic weapon system on a RW CAS aircraft further increasing their value in the urban arena.

Fire support planning and execution must have a pivotal role in urban assault support to ensure mission accomplishment. Effective fire support whether it is lethal or non-lethal, must be responsive and tailored to the threat, and is essential to survival of assault support assets in urban terrain.

[132] MTTPM, IV-4.

Generic Urban Mission Profile

> Despite the difficulties, tactics, techniques and procedures – and the necessary technology to conduct air assault and resupply operations – must be developed.[133]

As the MCWL's document point out, whether or not the Marine Corps' experience in urban assault support is limited, baseline tactics must be explored. In an effort to provide a rough template to the urban mission planner for future urban tactics, remember that thorough mission planning and precise, disciplined execution should be hallmarks of all assault support operations, not just in urban settings. The assumptions made during this examination of an urban TTP template are many. First, there must be an operational objective and critical need to penetrate the city's core. Some of the traditional techniques of securing a LZ will still be necessary in MOUT scenarios. Once the objective is identified by the Vertical Unit Commander (VUC), the planning can commence for the Assault Flight Leader (AFL). Particularly in an urban penetration, assault support will only be effective if sufficient fire support is available and planned. Second, adequate self-defense capability in the form of a credible aircraft survivability equipment suite and a defensive weapon system must be resident with each platform venturing into the urban battlefield. Third, the MAGTF planners must have a level of confidence in the enemy situation within the urban objective area that allows for assault support operations to be mounted. This is not to say that a 100% solution is expected. Lastly, adequate fires must be available to directly influence the urban fight when, and if necessary. Not an exhaustive list by any means, but these basic tenets are necessary in any objective area planning effort and thus, crucial to the urban assault support mission.

[133] MCWL Urban Warrior CEF, 27.

With the above urban mission planning precepts, the aviation mission planner should look toward the urban objective area to start formulation of the plan. What is the MAGTF Commander's intent? What is the overall mission objective? What does the ground commander need to accomplish in order to meet with success? The key to any combined arms operation is face-to-face coordination and plan development between the Vertical Unit Commander (VUC) and the Assault Flight Leader (AFL). Once an understanding is established between the two players, a plan can be built to satisfy the requirements of both individuals with a keen eye focused on the threat. Urban objective area planning resembles objective area planning in any other environment with a couple of notable exceptions. The constrained, short range, close proximity of forces within the urban objective area requires flawless integration of aviation assets to avoid fratricide. Also, intelligence preparation of the battlefield (IPB) is a critical element, yet more difficult in urban situations to discern. The relative ease with which the urban enemy can and will use the urban terrain to his advantage will complicate the threat assessment.

Figures 5-1 through 5-4 depict examples of how the urban objective area might be dissected in order to provide vertical assault insertion of a ground force. Figures 5-1 and 5-2 show a low intensity threat scenario and Figures 5-3 and 5-4 show a scenario that expects a medium intensity threat level. Although the following paragraphs will go into some detail, there are several items common to the illustrations. The urban area has been broken down into sectors depicted by bright green and pink lines. These lines portray areas that the different assets have for maneuver space and engagement areas. The bright green lined boxes are airspace dedicated to assault support assets, in this case MV22s. The bright pink lined boxes are set aside for the detached escort and RW CAS platforms.

Notice that a number of the buildings within this fictitious city have been lettered and features of the buildings have been numbered. For the purposes of this paper and to prevent cluttering the picture, only selected buildings have been annotated with the urban grid system. In an actual urban objective area, all buildings and features of interest would be labeled with this alphanumeric system to aid both ground troops and pilots with target and feature identification. Easily identifiable terrain (in this case, key intersections) has been labeled as target reference points (TRPs). Supposed enemy positions have been labeled. Black arrows show intended flight paths of various aircraft and their assigned altitudes are shown in colored boxes. Two blue arrows moving through the city to "Objective A" show a simplified ground force scheme of maneuver. The objective is also colored blue and its designation is "Delta 3."

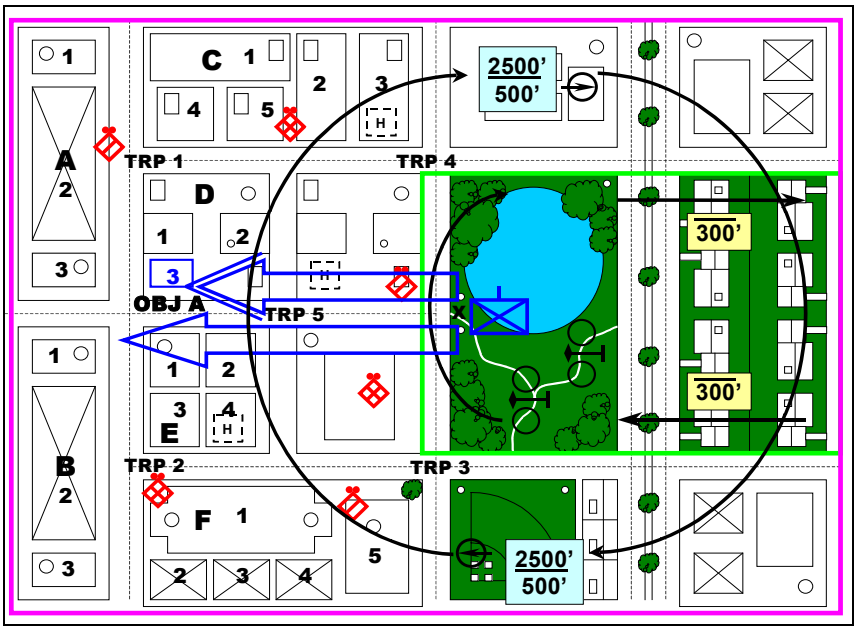

Figure 5-1. Low Intensity Threat Urban Assault Support TTP

For the purposes of this portion of the paper, “low intensity threat” will refer to small arms, vehicle mounted heavy machine guns, and rocket propelled grenades. The enemy force has no known MANPAD, self-propelled radar AAA or surface-to-air missile systems, nor are they integrated into a overall C2 system. As Illustration 5-2 shows, a three-dimensional piece of airspace is required to support the low intensity threat scenario. The assault support assets have the lowest chunk of airspace from the surface to 300 feet. This allows ingress to the objective area with minimum observation and denies the enemy tracking time with visually sighted weapons systems. Enroute, the assault support aircraft may fly a high to low profile to avoid the small arms threat and still be able to transition to a landing profile. The escort and RW CAS platforms have the 500’ to 2500’ block of airspace.

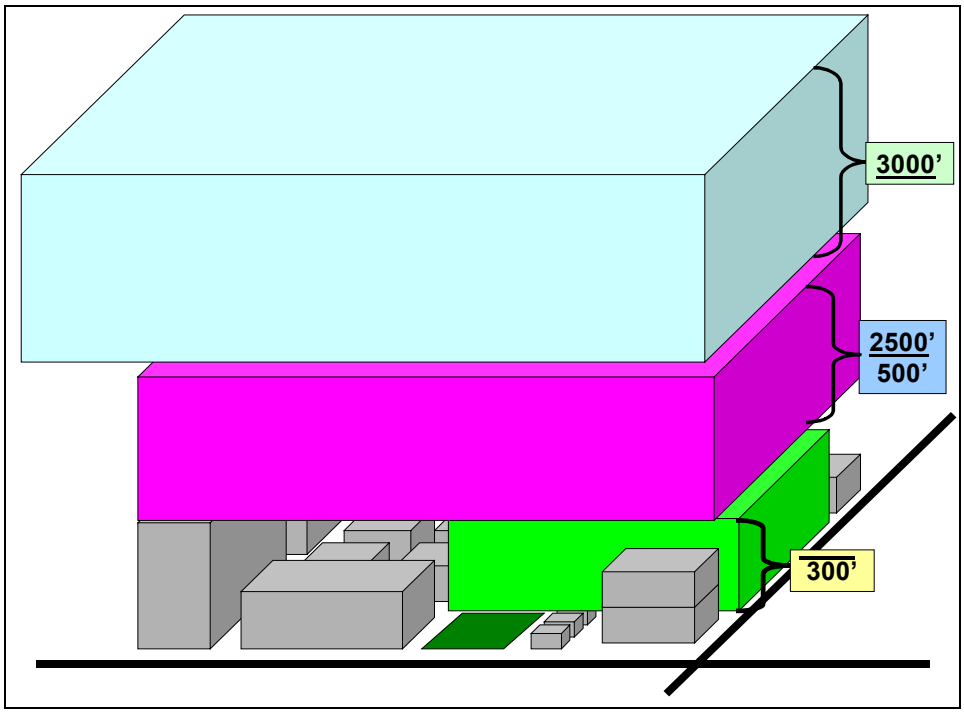

Figure 5-2. Three Dimensional Airspace for Low Intensity TTP

In a low intensity threat or MOOTW scenario, if a "show-of-force" is desired, the RW CAS assets should arrive in the objective area well ahead of the assault assets to provide "eyes on" the landing zone and also to perform the show-of-force role if desired. If a "no threat" mission turns into firefight (i.e., Task Force Ranger) the RW CAS is already on station to support the assault support aircraft or the ground force once it is inserted. The critical element is the coordination between airborne platforms and the ground component to ensure adequate fire support if necessary. To transition from a non-combatant environment to a combined arms fight will be difficult unless all the players are mentally prepared for the transition and it has been thoroughly planned as a contingency or branch of the non-combatant plan.

Fixed wing CAS with precision guided munitions capability could be stationed above the RW CAS block at 3000 feet and above to allow for full tactical employment of their systems yet give them an altitude sanctuary in which to operate. These altitudes also provide a show-of-force capability to the fixed wing assets. Also, should the AC130H/U be available, that block of airspace would work well for the employment of their weapons and a secondary mission of radio communications relay could be assigned. Keep in mind that extensive fires coordination will be necessary to allow the AC130 to engage ground targets with multiple aircraft in the area.

This profile takes into account the tactical effective range of the threat weapons systems and these altitude blocks are designed to minimize the small arms threat to mission assets. Communication and close coordination between the elements of the force is crucial. This points to an essential need for a highly capable C2 system. Line-of-sight

restrictions however, can be partially overcome in this profile by using altitude blocks overhead and assigning aircraft a secondary radio relay role. Also, aircraft may be fitted with a automatic retransmission capability to ensure connectivity with low altitude, urban profiles. A preferred method may include both voice and digital capable UAVs or a dedicated retransmission capability within a manned platform. As mentioned earlier in this paper, the centralized planning with decentralized execution of urban missions is key to ensuring that all involved can continue their tasks should command and control systems be rendered ineffective by urban terrain or enemy action.

The ingress of the assault support assets is covered by the overhead pattern flown by the escort aircraft. If the assault support platforms are MV22s they could be escorted in from their origin by fixed wing TACAIR assets and handed off to objective area escort once the transition to helicopter mode begins. Whether the rotary wing attack assets go out to the assault flight and provide attached escort or simply maintain a vigilant "eyes on" in the objective area as the assault aircraft approach is METT-T dependent. From an overhead position, in a low threat scenario, the RW CAS aircraft can maintain superb situational awareness of the urban battlespace and provide rapid and responsive fires if needed. Also, their line-of-sight restrictions for communications are lessened at the indicated altitudes. The 500' to 2500' block also gives the attack helicopters a full range of options for weapons employment from rockets and guns to PGMs.

Rotary wing attack assets must be provided ample airspace and time to conduct their close air support function. Key to their employment is the decision whether to give the attack helicopters time in the objective area to prosecute urban targets or preserve tactical surprise over the urban enemy by timing the arrival of assault and attack assets to be

near-simultaneous. Each option has its advantages and disadvantages. The urban mission planner must understand that the time required for acquiring, designating and engaging urban targets is much greater in comparison to the time traditionally allotted for these tasks in open terrain.

Once within the objective area, the AFL may be very close to the urban enemy and especially while on the deck or in a hover in the landing zone, will be vulnerable to enemy fires. Calling in fires from the EFL must be practiced and anticipated if they are to be effective. Once the ground forces are inserted, the FAC attached to the inserted unit will need some time to establish situational awareness in the urban chaos before taking control of fires in the objective area. During this pause, a FAC(A) will be needed either from a separate flight of helicopters or fixed wing aircraft or from the RW CAS aircraft already prosecuting the fight. The preferred method is to have a separate platform (i.e., UH1Y) and its escort assigned the FAC(A) role as a primary task to ensure adequate control of fires is maintained. After the insertion, the assault support aircraft expedites their egress from the area and are picked up by their fixed wing escorts and could proceed to bring in another wave or to return to base.

For a medium intensity threat scenario (Figures 5-3 and 5-4), the assumption is that the enemy force has radar guided AAA, MANPADS, and/or surface-to-air missile (SAM) systems. For this more formidable urban threat a thorough assessment as to the necessity of the mission must be completed. There is a much higher likelihood that the assault support forces or its fire support platforms may be engaged during the mission. Also, it must be understood that there will be a need for more assets in support of the operation. For the ingress of the package, there will be a need for electronic warfare aircraft

such as the EA6B Prowler for electronic attack of radar cued or radar guided threat systems. Whether employed to jam or provide cueing for an anti-radiation missile platform, the EA6B becomes an invaluable asset for this higher threat scenario. Also, the EA6B, or similar platform, would be valuable for electronic warfare support during the low threat missions as well to gather important electronic information on the enemy and to interrupt their communications.

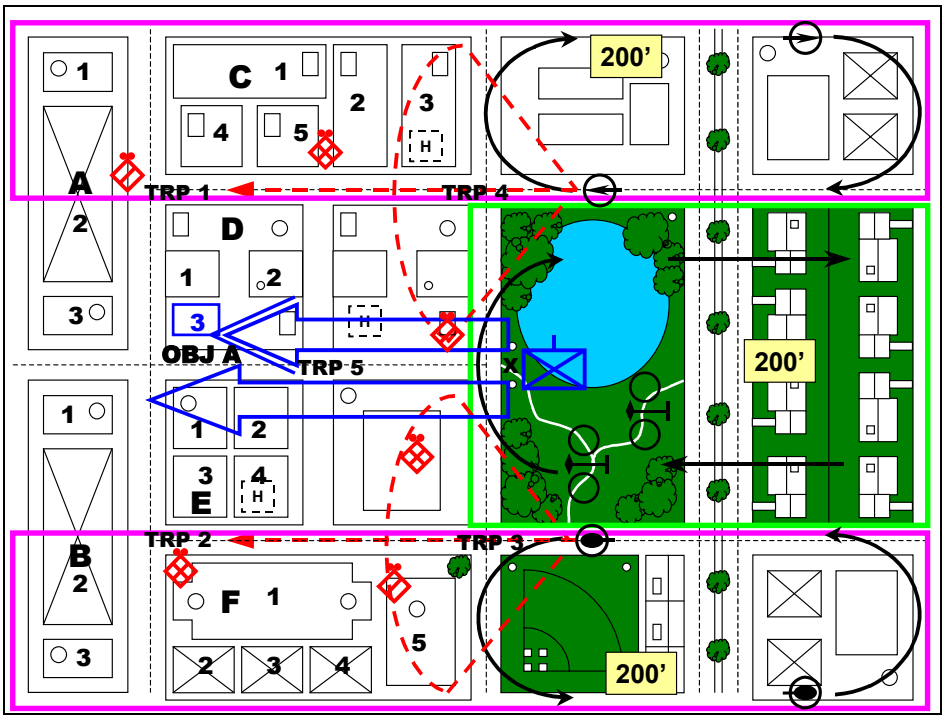

Figure 5-3. Medium Intensity Threat Urban Assault Support TTP

Notice the altitudes assigned to the assault support aircraft and the RWCAS aircraft. Rather than stack the flights overhead one another, the higher threat drives them to lower altitude blocks to avoid engagement. In order to integrate them into the same altitude regimes, the terrain must be divided geographically to provide for adequate deconfliction of flight paths. This must be done with care since the escort or RWCAS aircraft

must still be positioned so that they can provide adequate fire support for the assault aircraft during ingress and egress from the objective area. The bright pink and green lines divide the terrain into sectors that provide airspace for the separate flights of aircraft. Before the assault support assets enter the objective area and after they depart, the entire area would be available to the attack helicopters for target prosecution.

The fixed wing TACAIR CAS aircraft with precision munitions onboard would also need adequate altitudes for avoiding or defeating SAM attacks. For most missions 15,000' to 20,000' would be necessary for TACAIR aircraft to remain out of most low to medium altitude SAM threat envelopes. The AC130 fire support mission would likely not be tenable in this higher threat scenario due to the vulnerability of that platform at mission altitudes.

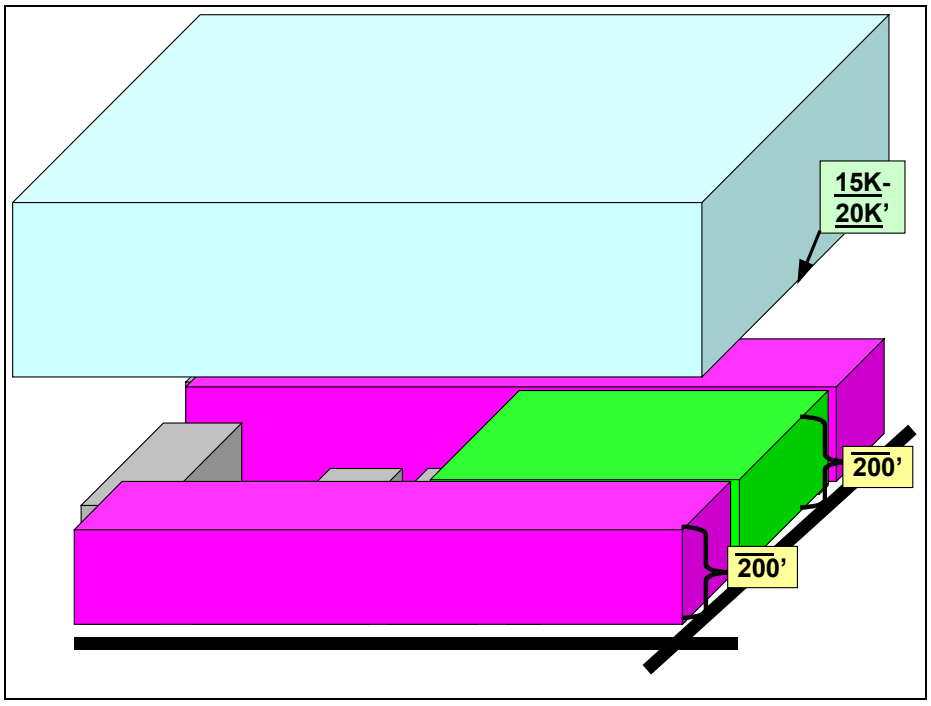

Figure 5-4. Three Dimensional Airspace for Medium Intensity TTP

In view of some of the unique limitations of the MV22 in the close, constrained urban area, it may be wise to employ the aircraft at the fringes or industrial outskirts of the city. Landing zones in those areas may be less fiercely defended and may be larger, able to accommodate the larger aircraft. In today's TRUEX evolutions CH53Es are employed in a similar fashion to avoid some of the peacetime training restrictions on noise and rotor wash. MV22s could provide essential force rotation options, resupply, and extended range CASEVAC capabilities, while UH1Ys could conduct assault support missions into the core of the city, escorted by AH1Zs. The intent is not to mutually exclude aircraft types from likely roles, rather to ensure flexibility, survivability, and mission success for the ground commander. Figure 5-5 depicts this option.

MV22s would bring resupply and fresh Marines to the outlying LZs. From there, a package of UH1Ys and AH1Zs could be ready to insert the smaller teams into tight landing zones deep within the city's core. The MV22s would also be available for the evacuation of casualties to the sea-base or amphibious shipping with its greater speed. This may be a key element of the CASEVAC plan since in hotly contested urban fights, the casualties may have to come out of the city core by ground first and then be further evacuated by air. Of course, threat permitting and urban terrain allowing, the MV22 would give great capability to the ground commander to go direct to important landing zones and objectives within his area of operations without the complication of subdividing his force. The intent is to show that another option is open to the MAGTF commander. The smaller, armed, multi-mission capable UH1Y would be suitable to these urban assault support missions.

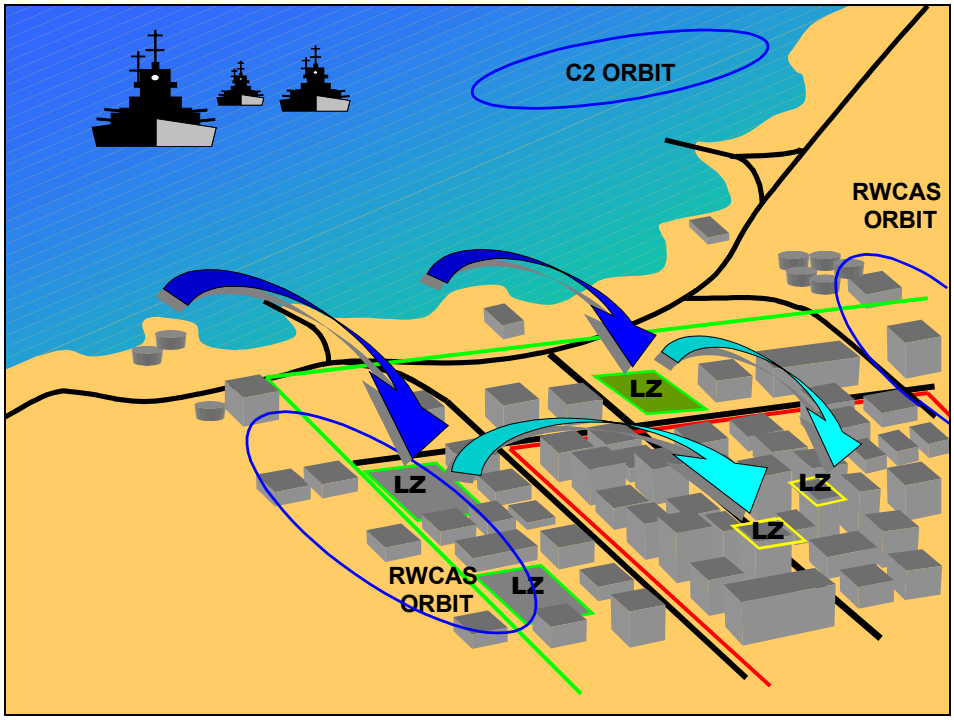

Figure 5-5. Composite Urban Assault Support TTP

The use of the MV22 at the edge of the city may be important for other missions. Isolation of the urban objective may be also be an appropriate mission for vertical assaults. If the threat risk is determined to be too great to operate within the city itself, assault support assets may be used to insert a decisive force to cut off the enemy's retreat or sever LOCs. The MV22, if limited by size or vulnerability to operations outside the city's core, may find the industrial or transportation areas more viable.

> Newer industrial or transportation areas are generally located on or near the edge of towns and cities. They typically consist of low, flat-roofed factory buildings, warehouses, and railway facilities. Industrial buildings are large, functionally designed, and normally have large parking lots or work yards suitable for LZ operations…Aircraft can operate more effectively due to the low building profiles, better LOS, and reliable communications.[134]

[134] MTTPM, II-10.

Complete isolation does not necessarily need to occur for success. Historically, attackers have won 80% of the urban engagements where partial isolation of the city was accomplished.[135]

Finally, these tactics are not rocket science. Assault support mission planners, WTIs, and their ground combat counterparts will have the onerous responsibility to plan and conduct these missions with or without "new" tactics. Innovative thinkers armed with a solid knowledge of the threat and their capabilities, will provide a rudimentary but firm foundation to start from when the urban assault support mission is assigned.

Project Metropolis

Background

The Marine Corps' interest in solving the urban puzzle continued post-Urban Warrior when the Marine Corps Warfighting Lab (MCWL) sponsored Project Metropolis in the fall of 1999. Looking for a way to build on the lessons learned during the Urban Warrior Advanced Warfighting Experiment, the Lab's focus shifted to developing an urban program of instruction (POI) for larger Marine units. The MCWL also wanted to capitalize on the on going MOUT (Military Operations on Urban Terrain) ACTD Advanced Concept Technology Demonstration) process that might capture new technological advances that had come about since the end of Urban Warrior.

Project Metropolis started at the platoon level and will eventually provide POI for the MEU (SOC) during the two years allotted for the project. The resultant POI for urban operations will then be presented to the Marine Corps Combat Development Process.

[135] MAWTS-1, 1-23.

Those working on the project hope that the techniques presented in the POI would help to reduce casualties in the urban environment to 20 percent or less from the historically dismal 30-40 percent. To develop the POI, the MCWL assembled subject matter experts from around the Corps and broke down into functional area working groups. Infantry, Fires, Mobility, Intelligence, Aviation, Logistics, and Implementation groups were formed to review a draft POI and develop additional techniques as required. Originally in separate groups of Close Air Support and Air Assault, the aviation related groups merged into an Aviation Working Group (AWG) to facilitate resident expertise and to ensure full integration of all aviation issues.[136]

Conference Action

Initially tasked with providing POI input and developing urban assault support TTPs, the AWG immediately recognized that there would not be enough time or resources available during the conference to accomplish both tasks. Two factors were perceived as preventing full development of both products. First, even though a great deal of effort and detail went into the ground combat unit POI, that same level of effort was lacking in regard to aviation related items. The MCWL simply did not have the resident knowledge base to fully explore all the aviation implications. That meant that the AWG had a much tougher task than the other working groups did. Second, there was reluctance within the AWG to propose close air support and assault support TTPs without having evidence that Marine aviation, in particular MAWTS-1, would support the proposals.

[136] The MCWL Project Metropolis POI Conference was conducted from 15-19 November 1999 in Coronado, California. The author attended the conference as the Aviation Working Group (AWG) recorder and as the Assault Support Subject Matter Expert (SME). Project Metropolis information is provided from the Aviation Working Group's Executive Summary, which was consolidated by the author.

It is arguable whether or not this was an accurate perception since the AWG did not attempt to contact MAWTS-1 or any other unit on the topic.

Another consideration for the AWG was the on-going MAWTS-1 Urban Close Air Support Assessment. That study, it was decided, would provide a wealth of information on potential TTP development for CAS in urban terrain. Therefore, it was determined that recommendations from the AWG, and Project Metropolis in general, be deferred until the results of the assessment were available and analyzed. A similar strategy was adopted for the assault support side of the equation. Urban assault support TTP development should benefit from a similar study. It was concluded that the MAWTS-1 methodology currently in use on the Urban CAS Assessment should be applied to assault support and the other six functions of Marine Aviation to attempt standardization of urban TTPs.

Recommendations of the AWG

The Aviation Working Group identified several recommendations to facilitate the development of a cogent urban aviation capability.

1. The draft MCWL document lacked a MAGTF perspective during a historical portion of the instruction centered on the battle for Hue City during the Vietnam conflict. The AWG recommended that the MCWL incorporate historically relevant examples that presented a MAGTF perspective including aviation.

2. The draft document also lacked training or exposure to urban aviation capabilities. The addition of a "Marine Aviation Capabilities and Limitations in the Urban Envi-

ronment" class that would provide an overview of the six functions of Marine Aviation and it's application in urban terrain was recommended.

3. The AWG recognized that although the desire of the Project Metropolis team was to develop a POI for all aviation communities, the means by which input is made into aviation training already exists. The Marine Corps Aviation Training and Readiness (T&R) Volumes for each aircraft type/model/series (T/M/S) address how to train aircrews and squadrons for combat for all assigned missions and in all regimes. Although currently lacking in urban treatment, making input to the system is firmly established and operating force-based. In other words, the AWG recommended that rather than build an entirely new system for aviation urban POI; simply make proposed changes to the existing T&R manuals for each T/M/S once the desired skills and tactics are developed.

4. Finally, the AWG recommended a long term, phased plan to bring MOUT facilities up to MAGTF-capable level while providing for some near term and interim measures to begin the significant task of training aviation and ground units together in an urban setting.
   - For the long term, the Marine Corps must commit to a MAGTF Urban Training Range. The facility must have the capability to accommodate all elements of the MAGTF, including aviation, up to the battalion level. Also, support should be given to the establishment of a Joint Urban Training Range.

- In the interim, existing urban training evolutions such as the MEU (SOC)'s TRUEX (Training in an Urban Environment Exercise), must be capitalized on to explore assault support suitability and vulnerability. Bases that have been closed do to the Bases Realignment and Consolidation (BRAC) initiative should be explored as temporary training areas for urban forces (e.g., George AFB, CA). Lastly, the Marine Corps' Urban Targeting Complex (Yodaville) outside Yuma, Arizona should be expanded and more fully instrumented to support selected units of the concurrent CAX evolution to begin training MAGTF elements in urban CAS, fires and assault support.
- Near term measures deal primarily with education. Marine Corps leadership must clearly state and charge the operating forces with attaining an initial urban combat competency. Each Marine unit must use initiative and imagination to seize and exploit the opportunities present for learning about urban warfare and its implications. The MCWL must contribute heavily to this education process.

Project Metropolis holds great promise for the ground combat element of the MAGTF. Urban tactics for the small unit, and soon the entire hierarchy of Marine ground units should provide for standardized, educated and skilled Marines in the uncertain future urban battle. The challenge is in providing the same level of education and training for the remainder of the MAGTF. More directly, significant resources and effort

will be necessary for Marine aviation to become fully capable to operate efficiently and effectively in urban combat.[137]

[137] Project Metropolis is a multi-phase event and will be going to several locations around the Marine Corps to teach and practice tactics for urban combat. There will certainly be further TTP developments that result from this effort. For more detail on the first Project Metropolis POI Conference, the author can provide copies of the AWG report.

Chapter 6

Conclusion - Don't Put Your Head in the Sand

> As innovations move the Marine Corps to new ways to fight from the sea, a proven concept will remain as part of the foundation of our operations. Assault support operations will remain a corner stone of ship-to-objective maneuver. The mobility, speed, and flexibility provided by assault support aircraft, combined with the remaining five functions of Marine aviation, provide the commander wide-ranging options in combat and noncombatant operations. Assault support began in the 1920's as a means of resupplying the Marine on the ground. Assault support has become a way for the commander to project power throughout the battlespace.[138]

Overcoming new challenges has been a hallmark of the United States Marine Corps for over two centuries. From amphibious operations to the introduction of the helicopter, the Marine Corps has taken the initiative and conquered the obstacles to progress. Although a change in paradigms is necessary and there are unanswered questions, the proclivity of the Marine Corps to take a chance on something new and have the institutional dexterity to adjust to a new mindset is noteworthy. The urban environment is no different in this regard.

As the developing countries' urban littorals grow and become more chaotic, the Marine Corps and all the U.S. armed services must adapt to the changing world environment. The national interests of the United States, its position as a world leader, and its military strategy are all adjusting to meet these new conditions. To deny that a

[138] MCWP 3-24, 6-1.

change is occurring is dangerously myopic. As the threat environment changes, so must the focus of the armed services to meet the threat. New weapons systems, doctrinal adjustments, and tactics developments must evolve to allow the U.S. to address the changing world.

The future of assault support as a function of Marines Corps Aviation is bright. As the MAGTF commander's "secret weapon," the ACE must have the ability to succeed in the urban environment in all threat levels. Certainly, the urban environment poses some challenges to the effective use of assault support. First, because the threat is unlikely to meet us toe-to-toe on an open linear battlefield, he will develop asymmetric approaches to defeat us by defending from his cities. Marine assault support can overcome this challenge by not underestimating his ability to thwart our plans and understanding the way the threat may attack our forces in his urban terrain. Challenges face the U.S. armed forces since there will never be unlimited resources to fight future urban battles. In a down sizing military complex Marines will have to use to the fullest extent the tools that are provided to win. Some new equipment is coming to help the aviators and ground forces deal better with the urban fight, but innovation and a keen understanding of the threat and the mission will go farther in the long run than a new piece of gear.

The challenge of a harsh and constrained urban environment is difficult to overcome. It is unlikely that U.S. forces will be allowed to "reduce" the urban homes of another nation to rubble to meet our military objectives. Again, an understanding of the environment and its characteristics as well as how to employ assets effectively in that environment will help to mitigate some of the difficulties found there. Navigation through

the urban morass without technological advances in GPS and other systems is still possible but a fundamental working knowledge of city design and practice in that medium are essential. Meanwhile, as those executing the urban operation feel these challenges, another challenge greets those trying to control it. Command and control in future urban operation will be facilitated by technology, but once again, backup manual systems and "no comm" plans based solidly in clear, concise commander's intent will preserve the success of the operation down at the fire team level. Similarly, a section of MV22s must be able to execute their mission with the necessary fire support seamlessly integrated, enabled by command and control, not hindered by its micro-management.

The urban enemy and his environment will consume those who refuse to learn from past mistakes. The Russian-Chechen conflict and the Battle of the Black Sea sheds light on the issues that future planners and operators in an urban conflict need to keep in mind in order to succeed. The urban battle space is not sanitary or simple; the assault support pilot must be able to vary flight paths while remaining oriented, bring precision munitions to bear, and still safely deliver the Marines to the landing zone. Underestimating the amount of time, effort, and resources that an urban operation will consume is setting the mission up for failure. The enemy will not respect symbolic military power and the urban foe will find the chink in our armor if we do not find ways to anticipate his actions and protect our critical vulnerabilities.

No single gadget, tactic or training evolution will ease the difficulties inherent in urban assault support operations. A combination of these elements must come together to assure victory in future urban chaos. There is no magic in technology. The more technology is relied upon to relieve the burden of urban operations the more friction there

will be when that technology fails. Paper maps, "no comm" plans, magnetic compasses, grease pencils, and commander's intent will still be staples of urban assault support missions. To discard fundamental skills for the sake of information superiority or technological advances is foolhardy in the face of a determined urban enemy. Therefore, the warrior, whether on land, at sea, or in the air, must be the focus of overcoming the urban challenges that face future U.S. forces. Training must provide a solid foundation for action. Rarely will an urban battle go as planned; but the pilot or ground force that has good urban warfare fundamentals, based on rigorous training, on their side will have the ability to adapt to changes without endangering themselves or the mission. Templated tactics that ignore the threat's strengths will fail. Solid tactics, employed by thinking operators and supported by a vigorously planned and executed fire support plan, whether lethal or non-lethal, will carry the day.

Finally, future concepts like OMFTS and STOM are reliant on Marine assault support and its well trained, dedicated Marines to give the MAGTF commander options not imagined without the full compliment of aviation assets. While assault support operations in hostile urban terrain may seem at first glance to be unwise or risky, if the full measure of past experience, new technology, rigorous training, and sound tactics are brought to bear, there is ample evidence to show that the end result will be success.

Glossary

AAA	Anti-Aircraft Artillery
AAAV	Advanced Amphibious Assault Vehicle
ACE	Aviation Combat Element
ACTD	Advanced Concept Technology Demonstration
AFL	Assault Flight Leader
AMC	Air Mission Commander
AMUST	Aerial Manned-Unmanned Systems Technology
ASE	Aircraft Survivability Equipment
AWE	Advanced Warfighting Experiment
AWG	Aviation Working Group
BRAC	Base Realignment and Closure
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance
CAS	Close Air Support
CASEVAC	Casualty Evacuation
CFIT	Controlled Flight into Terrain
CSAR	Combat Search and Rescue
DWS	Defensive Weapon System
EFL	Escort Flight Leader
FAC	Forward Air Controller
FAC(A)	Forward Air Controller (Airborne)
FIBUA	Fighting in Built-Up Areas
FLIR	Forward Looking Infrared
GPS	Global Positioning System
HLZ	Helicopter Landing Zone
IDF	Israeli Defense Force
IOC	Initial Operational Capability
IP	Initial Point
ITG	Initial Terminal Guidance
JMNS	Joint Mission Needs Statement
JSF	Joint Strike Fighter
JUWG	Joint Urban Working Group
LOC	Line of Communication
LOS	Line of Sight
MAGTF	Marine Air Ground Task Force
MANPADS	Man Portable Air Defense System
MAUTC	Marine Aviation Urban Training Center
MAWTS-1	Marine Aviation Weapons and Tactics Squadron One

MCCDC	Marine Corps Combat Development Command
MCIA	Marine Corps Intelligence Activity
MCWL	Marine Corps Warfighting Lab
MEDEVAC	Medical Evacuation
METT-T	Mission, Enemy, Terrain (& Weather), Troops (& Fire Support Available), Time
MOOTW	Military Operations Other Than War
MOUT	Military Operations on Urban Terrain
NLOS	Non-Line of Sight
NVD	Night Vision Devices
NVG	Night Vision Goggles
OMFTS	Operational Maneuver from the Sea
PGM	Precision Guided Munitions
POI	Program of Instruction
PZ	Pick-up Zone
QRF	Quick Reaction Force
ROE	Rules of Engagement
RPG	Rocket Propelled Grenade
RPV	Remotely Piloted Vehicle
RSEAD	Reactive Suppression of Enemy Air Defenses
RWCAS	Rotary Wing Close Air Support
SAM	Surface to Air Missile
SNA	Somalia National Alliance
SOAR	Special Operation Aviation Regiment
SOCEX	Special Operations Capable Exercise
STOM	Ship to Objective Maneuver
TACTS	Tactical Aircrew Combat Training System
T/M/S	Type/Model/Series
TRAP	Tactical Recovery of Aircraft and Personnel
TRP	Target Reference Point
TRUEX	Training in an Urban Environment Exercise
TTP	Tactics Techniques and Procedures
UAV	Unmanned Aerial Vehicle
UNITAF	Unified Task Force
USSOCOM	United States Special Operations Command
VIT	Virtual Interactive Targets
V/STOL	Vertical/Short Take-Off and Landing
VTUAV	Vertical Take-Off Unmanned Aerial Vehicle
VUC	Vertical Unit Commander
WISS	Weapons Impact Scoring System
WTI	Weapons and Tactics Instructor

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