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MASTER OF MILITARY STUDIES

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**TITLE:**

THUNDER RUN I AND II: A CASE STUDY OF MECHANIZED OPERATIONS IN URBAN TERRAIN

SUBMITTED IN PARTIAL FULFILLMENT  
OF THE REQUIREMENTS FOR THE DEGREE OF  
MASTER OF MILITARY STUDIES

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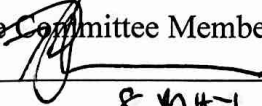
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## Executive Summary

**Title:** Thunder Run I and II: A Case Study of Mechanized Operations in Urban Terrain

**Author:** Major Jonathan L. Peterson, USMC, AY2016-2017

**Thesis:** The sustainment of a military force projects power and extends maneuver by maintaining and resupplying critical supplies at pivotal moments to generate combat power.

**Discussion:** The purpose of this paper sought to analyze the future of the Marine Corps surrounding two war fighting functions – logistics and force protection – in extending maneuver operations in a future distributed operating environment. By examining the actions of 2nd Brigade during Thunder Run I and II in Baghdad in 2003, this paper aimed to identify a future logistics concept to sustain combat power in tomorrow’s conflict. In fighting a distributed fight, the lethality of extending maneuver operations is incumbent upon the ability to sustain that force as far forward as possible by means of road networks, waterways, or airways. The pairing of humans and machines in the twenty-first century is centered around creating a new offset strategy – what has been termed the “third offset.” Manned and unmanned teaming (MUM-T) is just another method in applying the human cognitive dimension with technology in warfare.

The Marine Corps and the Army see the employment of MUM-T systems critical to each Services’s future operating concept. The Marine Corps Operating Concept calls for incorporating unmanned systems throughout all six war fighting functions, “because mastering the man-machine interface offers a revolution in military operations,” in overcoming challenges in all environments, terrain, and urban areas. Additionally, the Marine Corps Operating Concept seeks to capitalize on manned and unmanned systems, “to enhance survivability, increase lethality and reduce manpower requirements” on the Marine Air-Ground Task Forces. The Army Operating Concept seeks to accelerate new technologies within the Department of Defense to maintain an overmatch on adversaries, while, “extend[ing] the operational reach and...capability and agility of units.” The Army suggests enhancing formations with manned-unmanned teaming will allow units to cover more terrain, increase combat power, and reduce risk to personnel executing dangerous tasks. Further, in expeditionary environments, the Army views unmanned ground systems (UGS) conducting autonomous re-supply operations critical to future operations.

**Conclusion:** In looking to the future, new transportation capabilities and technologies need to be tested, procured, and employed to support distributed operations at both the tactical and operational level of logistics. Unmanned ground and air platforms will provide new ways to plan and execute distribution systems and sustain operations in tomorrow’s fight. Ground resupply convoys could be designed with a mix of manned and unmanned vehicles to offset enemy dangers, operate 24-hours a day, and limit risks to humans in order to deliver supplies. Supply distribution networks would be revolutionized from the traditional hub and spoke method limited by the fatigue of a driver and hours a human can operate in any given day. The logistics UGS will require a weapon system that is tele-operated or autonomous and outfitted with a stabilized crew-served weapon. Additionally, the turret system will put the gunner inside the vehicle and out of harm’s way. The lethality of a stabilized gun system able to operate day or night provides the type of precision fires to make convoy operations “hard targets” in all environments.

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## **Acknowledgements**

I kept the best for last. As I finish this project up, it is closing in on 0200 with my wife taking care of our children, not unlike any other late night when I'm trying to finish up some project or work task. She is a super star while juggling the responsibilities of a wife and mom, while having her own fulltime career! During this research project, we had our second child, and she has been nothing but amazing, supportive, and more understanding than I ever could. Thank you for all that you do for our family and your patience with this Marine! Your hard work is so appreciated. And to my kids, I'm looking forward to spending more time with each of you. You both provided me numerous unscheduled breaks from this research paper when I needed one. All my love to you three!

## **Introduction**

The term “thunder run” dates back to the Vietnam War era. In the 1960s, artillery fire bases within Vietnam were sequentially named Thunder Run I, Thunder Run II, and so forth. To disrupt the supply lines between fire bases, the Viet Cong sent guerilla teams out at night to set up ambushes and deny friendly actions along the ground lines of communication (GLOC). In order to keep the GLOCs secure, tanks and armored vehicles patrolled the roads in the evening. The armored columns traveled at high speeds up and down the road networks and conducted reconnaissance by fire missions. These mechanized missions through enemy lines would live on to be called a thunder run.<sup>1</sup> During the Iraq War, two thunder runs played a crucial role in quickly bringing down Baghdad.

Before the 2003 Iraq War, the last experience the United States (US) Army had with fighting in an urban environment was in Mogadishu, Somalia. The political aftermath from carrying out a helicopter inserted raid force with thin-skinned Humvees in support provided a historical precedent the Army did not want to repeat in 2003. As the US Army rapidly marched towards Baghdad in a three-week period, 2nd Brigade’s thunder run missions into the heart of Baghdad forced a quick capitulation of a city of 5 million people. The impressive feat of seizing Baghdad in only five days cannot be overlooked as a study for future battles to be fought in metropolitan cities. Lieutenant General David McKiernan’s, Command General Coalition Forces Land Component Command (CFLCC), initial plan for seizing Baghdad consisted of a flexible plan to cordon the city, and create forward operating bases from which to attack from and “seize critical targets, destroy Iraqi forces, and eventually clear the city, if required.”<sup>2</sup> However, the plan to seize Baghdad drastically changed as 3rd Infantry Division (Mechanized) set in motion a bold plan to enter the capital’s outer defenses on 5 April 2003.



Some views for the fight inside Baghdad were worried the urban battle might turn out like the *Battle of Grozny* in 1994.<sup>3</sup> In this battle, the Russian Maikop Brigade suffered around 80 percent casualties with 20 of 26 tanks destroyed and 102 of 120 armored vehicles destroyed.<sup>4</sup> How did the US Army prevent another Mogadishu or avoid the Russian outcome in Grozny? What capabilities are required in future conflicts to maintain a superior advantage over adversaries? What requirements are needed to sustain combat power during decisive actions and critical moments on the battlefield? Moreover, what lessons from the *Battle of Baghdad* during Thunder Run I and II offer areas to study as the character of war evolves?

The case study of the Iraq War thunder runs will be examined through the shaping actions and battles fought during Thunder Run I and Thunder Run II. Studying the thunder run missions provide a significant historical review for the speed, initiative, and decisive actions executed to defeat the moral, mental, and physical will of Iraqi forces so quickly. As the 3rd Infantry Division performed multiple thrusts offsetting the Iraqi forces surrounding the capital, along with the shaping and decisive actions of the US Air Force and Marine Corps, 2nd Brigade struck at the heart of Iraq. Second Brigade created disorder and confusion by applying a variety of rapidly advancing mechanized and infantry forces. Several observations stand out from the thunder runs missions that allowed 2nd Brigade to get into the enemy's observation-orientation-decision-action OODA loop. From analyzing these observations, new capabilities emerge that may provide the future force the critical structure in logistics for projecting and maintaining combat power. The sustainment of a military force projects power and extends maneuver by maintaining and resupplying critical supplies at pivotal moments to generate combat power.

At the completion of the thunder run case study, an analysis of the war fighting functions of logistics and force protection provide an understanding for how sustaining a maneuver force

extends combat power. Following the case study review, the author will provide some analysis applicable to the future of the Marine Corps surrounding two war fighting functions – logistics and force protection – as defined in MCWP 5-1. Next, an operational decision game (ODG) was developed to test a future logistics concept using manned-unmanned teaming (MUM-T) in a future conflict. The decision game results further cultivated ideas to refine the logistics MUM-T concept to meet the demands of tomorrow’s battlefield.

### **Manned and Unmanned Teaming**

The pairing of humans and machines in the twenty-first century is centered around creating a new offset strategy – what has been termed the “third offset.” Richard Lim highlights two reasons on what MUM-T will provide the third offset, “First, MUM-T helps establish technical superiority by exploiting the revolutionary potential of unmanned systems. Second, MUM-T can help prolong that superiority by exploiting the human dimension of warfare, which, when teamed with unmanned systems, is harder for potential adversaries to duplicate.”<sup>5</sup>

Looking back, the United States sought two “offset” strategies during the Cold War period to gain a military-technical advantage over our adversaries. The first offset strategy, focused on the Soviet Union, transpired during President Eisenhower’s “New Look” defense policy. The New Look incorporated nuclear weapons, ballistic missiles, and aircraft capable for strategic bombing.<sup>6</sup> In 1973, the Arab surprise attack on Yom Kippur announced a new age of lethality with precision systems able to efficiently attack ground and air platforms. General William Depuy observed the shift in technology on the battlefield and stated in 1974, “What can be seen, can be hit. What can be hit can be killed.” The second offset started to occur in the 1970s with the investment in systems like stealth, battle networks, precision-guided munitions,

missile systems, and space-based navigation to offset the Soviet Union's conventional force quantitative advantage.<sup>7</sup>

Then in 2014, former Secretary of Defense Chuck Hagel, announced initiatives for developing a third offset strategy. In part, technology proliferation and a rise in military-technical parity among our adversaries required a new offset strategy to maintain an American military dominance. As Hagel launched a "department-wide effort to identify and invest in innovative ways to sustain and advance America's military dominance for the 21st century,"<sup>8</sup> the third offset incorporates areas of MUM-T, autonomy, cyber, artificial intelligence, and electronic weapons.

The idea and development of MUM-T concepts have existed for generations. During the Electrical Exhibition of 1898, Nikola Tesla showcased a radio-controlled boat at Madison Square Garden.<sup>9</sup> Tesla was ahead of his time, people thought he was using magic as he moved his boat through a pool. A writer from New York Times suggested Tesla use the boat as a wireless torpedo.<sup>10</sup> In 1944, not well-known experimentation took place on a tele-operated radio-controlled LVT-2 (Landing Vehicle Tracked).<sup>11</sup> A 1945 video demonstration shows a LVT-2 drone laden with explosives test a concept for clearing beachhead obstacles for amphibious operations.<sup>12</sup> These two examples moved the idea forward on what the "possible" is in removing humans from hazardous tasks on today's modern battlefield.

During the wars in Afghanistan and Iraq, an explosion of air and ground robotic systems came online. On the ground, insurgents were using improvised explosive devices (IED) to offset their military weakness to kill a superior force. In the first year of the Iraq War, there was over 5,600 roadside bomb attacks, the number increased to over 2,500 a month by 2006.<sup>13</sup> A requirement for Explosive Ordnance Disposal (EOD) teams dramatically increased to handle the

spike in enemy IED tactics. Bomb disposal is extremely dangerous, not to mention handling all the different triggering methods the enemy use such as: pressure initiated, command-detonated, radio-controlled, wireless, or victim operated.

Improvised explosive devices became the number one killer in Iraq and led to the Department of Defense spending over “\$6.1 billion to counter IEDs in Iraq.”<sup>14</sup> Systems like the PackBot and Talon were quickly fielded to EOD teams to use as a stand-off tool in identifying, handling or detonating IEDs. The PackBot and Talon created a cheap means to protect EOD teams and deal with the deadly employment of IEDs. Peter Singer highlights the rapid increase in fielding ground robots in Iraq, “When U.S. forces went into Iraq in 2003, they had zero robotic units on the ground. By the end of 2004, the number was up to 150. By the end of 2005 it was 2,400, and it more than doubled the next year. By the end of 2008, it was projected to reach as high as 12,000.”<sup>15</sup> Humans and ground robots saw a coming of age following the wars in Iraq and Afghanistan.

The pairing of humans and machines in the twenty-first century is a reality in shaping the third offset. Through research and experimentation, military institutions and governments have sought new ways to dominate one’s adversary over hundreds of years. The Army defines MUM-T as the employment “[of] manned and unmanned air and ground vehicles, robotics, and sensors to achieve enhanced situational understanding, greater lethality, and improved survivability...to produce synergy and overmatch with asymmetric advantages.”<sup>16</sup> Manned and unmanned teaming is just another method in applying the human cognitive dimension with technology in warfare. By examining the actions of 2nd Brigade during the thunder runs into Baghdad, this paper aims to identify future logistics capabilities required to support and extend maneuver forces’ combat power in tomorrow’s conflict.

## Thunder Run I

### *Introduction*

Gaining control of Baghdad served as the key to ending the Iraq War and bring about the defeat of Saddam Hussein. However, prior to the war starting, the intelligence on what the fight would look like in the capital was uncertain. Before the ground portion of the war started, it was estimated less than 9-12 company equivalents of the Republican Guard would make it to Baghdad and report to the Special Republican Guard (SRG).<sup>17</sup> In the capital, the SRG estimated around 15,000 soldiers, was tasked to defend key sites and repress public discontent in Baghdad.<sup>18</sup> Additionally, Saddam's conventional forces were augmented with paramilitary and militia forces like – the *Saddam Fedayeen* and Ba'ath Party militia.<sup>19</sup>

Saddam's different forces led to the assumption of effective city-defense strategy making for a difficult task to clear. Iraqi forces would leverage the complex urban environment as an advantage to attrite Coalition forces. Colonel Steven Rotkoff, the deputy C2 for CFLCC, stated "Captured documents revealed a detailed plan to divide Baghdad into sectors and defend it in a manner reminiscent of the First Battle of Grozny. The international airport and the palace complex area in the heart of the city would be the most heavily defended sites in Baghdad. All intelligence reporting supported these assessments, indicating that the defense would crystallize around these two critical facilities."<sup>20</sup>

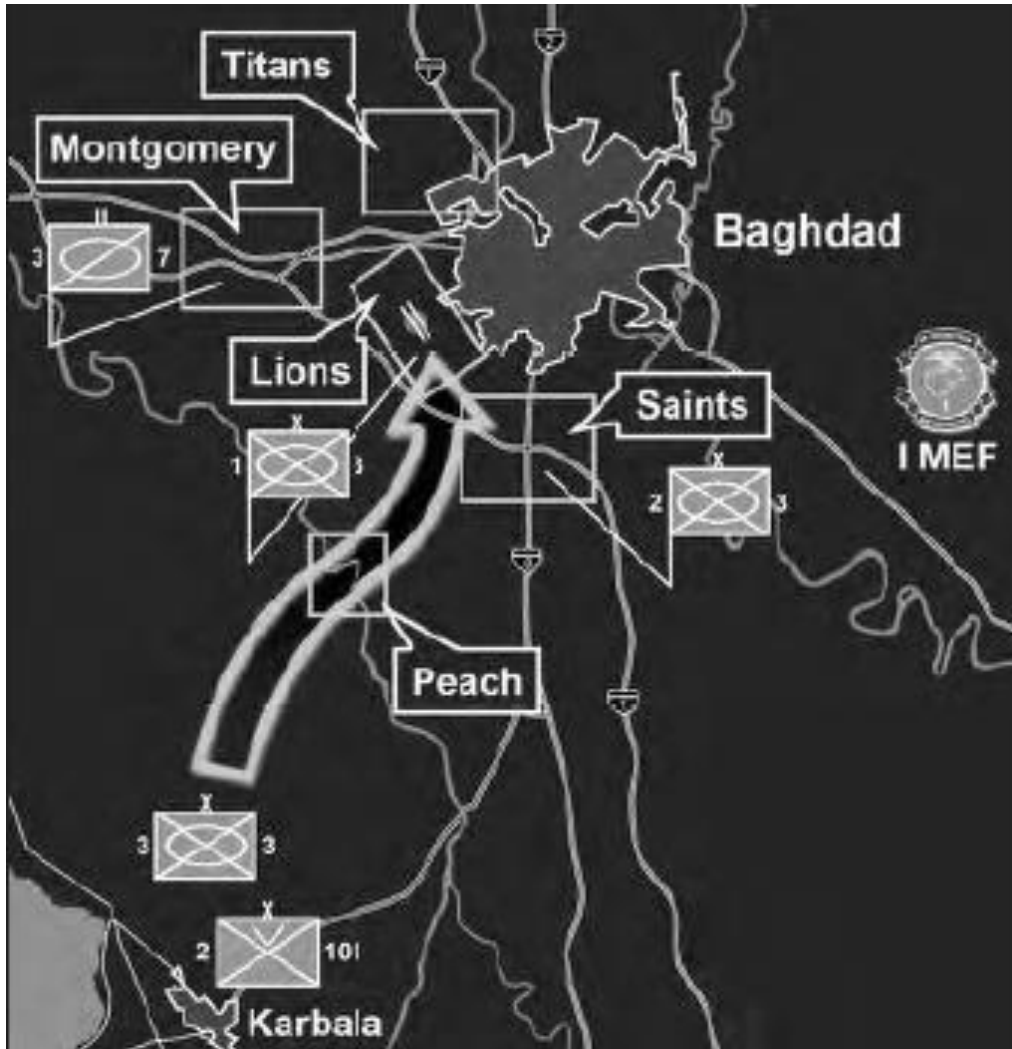
However, before conducting a thunder run into the capital city, an estimate of the city's defenses and intelligence on enemy forces needed to happen. Rotkoff noted "Prewar intelligence estimates noted the presence of paramilitary forces in large numbers but were vague on how these forces might operate."<sup>21</sup> Expectations of the fight to come were of a "hornet's nest." However, while *Rogues*'s mission engaged in an intense fight, the first thunder run would

suggest Iraqi forces would not be able to mount an effective defense of the city.<sup>22</sup> Analyzing Thunder Run I serves the function to understand the decision to go into Baghdad with 2nd Brigade (*Spartans*) after 1st Brigade seized the Baghdad International Airport. Moreover, it is a study of a way to conduct an attack into a complex urban environment.

### *Orders into Baghdad*

On the evening of 4 April, 3rd Infantry Division (Mechanized) moved into its assigned objectives for surrounding Baghdad. The Marine Corps's 1st Marine Division was located southeast of Baghdad and marched towards the capital city. The 1st Marine Division's objectives were assigned the east side of Baghdad. The units of 3rd Infantry Division were arrayed with 1st Brigade located at the Baghdad Airport (Objective LIONS), 2nd Brigade assembled around the intersection of Highways 1 and 8 (Objective SAINTS), and 3rd Brigade was closing in on the north side of Baghdad (Objective TITANS).<sup>23</sup> (See Figure 1.)

According to V Corps planning, Objectives TITANS, LIONS, AND SAINTS were the locations to which 3rd Infantry Division (ID) would halt. The 3rd ID objectives surrounding Baghdad and the Marine objectives to the east would set the cordon around the capital. From the cordon, the Army and Marine Corps would conduct raid type missions within the capital with mechanized forces and Army airborne units until the regime collapsed. Lieutenant General William Wallace's, the commanding general for V Corps, reasoning for stopping at these objectives and not driving straight into Baghdad was out of concern for heavy casualties in a block-by-block clearing method.



*Figure 2: 3rd ID's Brigade Objectives Surrounding Baghdad (Source On Point)*

Both Major General Blount (3rd ID Commanding General) and Perkins did not think highly of V Corps's plan for taking down Baghdad. (See Figure 2.) It was slow, bloody, and would halt any initiative gained up to this point. The cordon and raids would give Iraqi forces time to set into a defense to prolong an urban fight in a city of 5 million. Also, the thought of continuously fighting for the same terrain in the city and then giving it up would demoralize the men of 3rd ID. Additionally, a long and bloody offensive within the capital could potentially play into an international intervention and diplomatic solution favorable to Saddam. Up to this point in the Iraq War, 3rd ID had successfully crushed all enemy actions with minimal casualties.

Blount was certain that his heavy mechanized forces could handle anything the Iraqi forces had within the capital. Iraqi forces were off balance and extremely vulnerable to the pressure mounting on the regime. Blount notified V Corps he was going to mount a mechanized force into Baghdad to shorten his lines of communication between brigades. Blount did not receive an answer back from V Corps, so he went forward with his plan. As Perkins called in midafternoon to report 2nd Brigade's missions for the following day, Blount passed his new tasking for the mission into Baghdad.



*Figure 2: 2nd Brigade Task Organization (Source Thunder Run)*

#### *Thunder Run I Objective*

Blount's objective for the thunder run into the city was for 2nd Brigade to conduct a heavy mechanized raid north on Highway 8 through the capital center. Once at the city center, the armored column would swing west on Airport Street to link up with 1st Brigade located at the



Baghdad Airport. The route was an estimated eighteen-mile one-way course that would take the armored column through the wealthiest districts of the city. Additionally, the raid would feel out the enemy defenses and composition. Perkins was onboard with the mission. He believed the mission was the right thing to do to seek a quicker victory with seizing Baghdad and winning the informational war.

### *Intelligence on Downtown Baghdad*

The intelligence known on the composition and disposition of enemy forces inside Baghdad was poor. The V Corps only had one unmanned aerial system (UAS) in direct support of the entire corps. Second Brigade would get the priority for the system in executing the thunder runs, but up to this point, the ISR platform gave no intelligence value to the mission to be conducted on 5 April. Outside of some satellite imagery held at the headquarters level of battalions and higher, there were not many good maps to use at the lower tactical level with the troops. The 1:100,000 level maps of Baghdad did not give the resolution needed to see highway exit numbers, road markers, and neighborhood district names. However, the introduction of Blue Force Tracking allowed for individuals and unit commanders to track locations with precision and an ability to send and receive messages.<sup>24</sup>

### *Mission*

Originally, Perkins was planning to launch two battalions against enemy forces in the area. With his battalions consolidated at Objective SAINTS, the brigade would rearm and refuel in order to finish off the remaining elements of the Medina Division south of Objective SAINTS. With 2nd Brigade's mission changing, Perkins had Lieutenant Colonel Schwartz report to the brigade tactical operations center (TOC) to discuss the mission and objectives of the upcoming thunder run. By the time Schwartz, the commanding officer for Task Force (TF) 1-64 (*The*

*Desert Rogues* or *Rogue*) Armored Regiment (AR), finished his discussion with Perkins and the brigade staff, he immediately returned to his battalion to give his battalion order. Following the orders brief, the company commanders of TF *Rogue* only had about five hours to prepare for the thunder run. The armored column would not travel with any wheeled vehicles during the mission. So, the TF *Rogue* company commanders had to reconfigure vehicles, personnel, and combat loads prior to stepping off the next morning. Additionally, new fire support plans and coordination efforts with enabling forces would need to be adjusted. The changes brought new time consuming activities. Task Force *Rogue* would not be getting much sleep that night. (See Figure 3.)

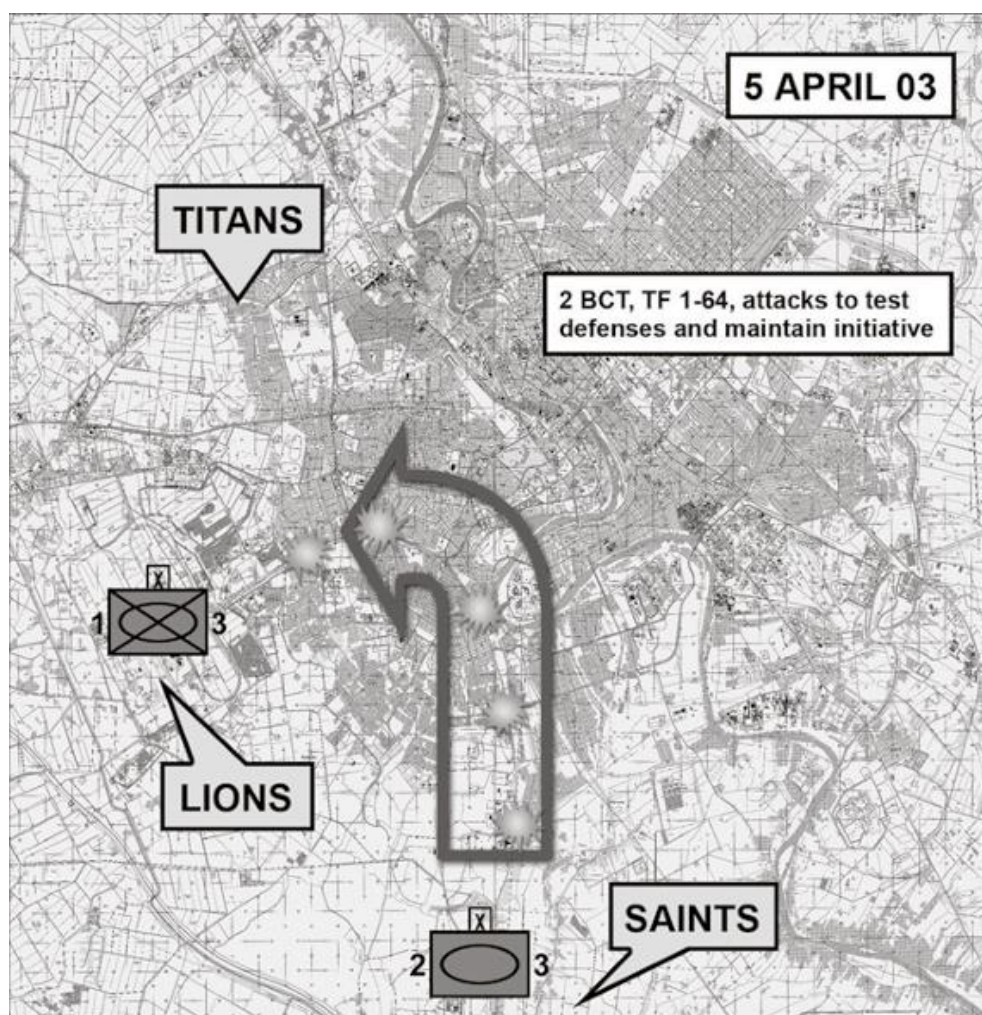


Figure 3: Thunder Run I Map (Source Takedown)

Prior to TF *Rogue* stepping off, the brigade's S-2 shop did not have any information on the composition and disposition of enemy forces inside the city. Schwartz was able to get his hands on some black-and-white satellite imagery of Baghdad, but the date stamp on the photos was unknown.<sup>25</sup> They could have been several days to several weeks old. The imagery provided to the commander was of little use. Additionally, Schwartz's scouts, who would usually conduct a reconnaissance of the enemy prior to a mission would be unable to. The situation was too dangerous. Also, there was no information from any Special Force units in the area. A request to have an ISR asset conduct a fly-over of the area was never executed. Task Force *Rogue* would be going in blind and on their own. The battalion would be conducting a reconnaissance by fire mission.<sup>26</sup>

The best information on the condition of the thunder run route came from American pilot reports flying over the area.<sup>27</sup> The highway was clear and undamaged. Iraqi forces had not placed any obstacles on the highways leading into the city and more importantly had not blown or damaged any bridges or overpasses. The composition of Schwartz's task force during the attack was made up of twenty-nine Abrams tanks, fourteen Bradleys, and several other M113 armored vehicle variants.<sup>28</sup> Task Force *Rogue*'s tracked vehicles would have no problems traversing the asphalt paved four lane highway. Additionally, Air Force A-10s secured the Task Force's flanks through close air support and 1-9 Field Artillery provided indirect fires for TF 1-64.<sup>29</sup>

For Perkins, the thunder run into Baghdad was not the only mission his brigade had to deal with on 5 April. He also had Lieutenant Colonel Twitty's TF 3-15 (*China*) Infantry Battalion (IN) assigned to eliminate the 14th Brigade of the Medina Division located around the Euphrates, and Lieutenant Colonel DeCamp's TF 4-64 (*Tuskers*) AR would attack south of

Objective SAINTS to finish off the remaining enemy forces of the 2nd and 10th brigades of the Medina Division.<sup>30</sup> Task Force *Rogue* Battalion's raid into Baghdad would be the main effort, however.

In the early morning of 5 April, thirty rockets from a multiple launch rocket system (MLRS) and artillery barrage opened up the first actions for Thunder Run I.<sup>31</sup> Soon after, Schwartz gave the call over the radio for his reconfigured battalion to move out. Perkins would accompany the battalion on the mission inside his M113 command vehicle. Schwartz would integrate with the lead assault company and Perkins in the middle of the armored column. *Wildbunch* (A Company) commanded by Captain Hilmes, was the lead company for the TF 1-64 AR. Several minutes after receiving the word to take off, Hilmes radioed over the battalion net that he was in enemy contact. Hilmes's company took enemy contact from small arms fire and rocket propelled grenades (RPG); they were also dealing with an enemy dug into trench lines and firing buildings and rooftops.<sup>32</sup> Task Force *Rogue* would remain in enemy contact for the duration of the raid.

The night prior, Schwartz gave specific orders to his men to maintain a fifteen kilometer per hour pace with a vehicle interval of fifty-meters. The drivers were told to maintain this strict spacing and speed in order to prevent the enemy from being able to fire into the tank's vulnerable rear exhaust grills. All the vehicle gunners and commanders were responsible for destroying enemy targets in their view and then pass targets off from the lead vehicles to the rear vehicles. It would be a column of fire penetrating the enemy defenses in a 360-degree battle.<sup>33</sup>

### *The Enemy*

Inside Baghdad, the men fighting for Saddam were made up of Special Republican Guard, Fedayeen, Baath Party militia, Arab foreign fighters, and Jihadists looking for a shot to kill

Americans.<sup>34</sup> On 5 April, Schwartz's battalion came in contact with hundreds to thousands of these fighters. Some wore military uniforms, others wore civilian attire with military chest rigs and bandoliers of ammunition. After the battle, intel verified Fedayeen Saddam militiamen wore black pajamas. Mercenaries from Syria had pockets full of Iraqi dinars. The forces were armed with small-arms, RPGs, suicide vehicles, anti-aircraft artillery, mortars, a few Boyevaya Mashina Pekhoty (BMP), and a T-72 tank.<sup>35</sup>

The enemy lacked air support for CAS and ISR or the ability to move troops around the battlefield on helicopters. The Iraqi Air Force was either grounded or destroyed. Troop movements were conducted through the use of cars, trucks, buses, and a handful of armored personnel carriers. Similarly, the same civilian vehicles used to transport personnel were laden with explosives and used as suicide vehicles. The fighting spirit of Iraqi forces varied significantly among the different formations around the capital. The coalition air campaign and speed with which coalition ground forces were moving demoralized the Iraqi forces. Additionally, the Iraqi military's dysfunctional command and control system and mistrust between Saddam Hussein and his military forces added to the disorganized capital defense.

### *In the Fight*

Captain David Hibner commanded 2nd Brigade's engineer company (*Dawg*). Hibner went with the engineer platoon assigned to TF *Rogue* for this mission and was following in trace of *Wildbunch* in several M113s. In the prior battles fought in An Najaf and As Samawah, the engineers had come up with a system to fight in urban terrain to support the armored elements. One engineer manned the APCs .50 caliber machine gun while the other four or five engineers crammed inside their M113s fired M4 carbines or another machine gun.<sup>36</sup> Tanks were only able to fire in one or two directions with limitations on the elevation of the tank's main gun. The

engineers were capable of firing on five or six targets at the same time with no elevation limitations. This technique, however, also would be a vulnerability with exposing Soldiers to direct enemy fire with limited to no armor protection. The engineers did not bring a mine clearing line charge (MICLIC) for this mission. Bringing the line-charge was debated, but it was ultimately left behind out of concern the enemy might get lucky and blow it up. If the Iraqis built any obstacles or minefields in TF *Rogue*'s path, the battalion would have to reduce them by air, artillery, or with brute force with tanks.<sup>37</sup>

As TF *Rogue* continued to engage enemy forces, there was no discernable formation or defensive positions. The enemy was firing randomly from buildings, tree lines, vehicles, overpasses, and dug-in fighting positions several meters away from the highway. Trench lines were dug in around tree lines to mask their position or along city block walls to help conceal their location.<sup>38</sup> However, TF *Rogue* never encountered a defensive layer with positions built in depth along their path. The Iraqi force never built an area defense in the capital. There was plenty of willing Iraqi and foreign fighters bold enough to attack an armored force, but nothing like a US doctrinal template for building a proper area defense.

The defensive positions built along Highway 8 were not concentrated on denying a force access to the center of the city. There were no areas or positions where the Iraqi forces were mutually supporting each other to repel an assault. Engagement areas (EA) consisted of small arms, RPGs, machine guns, suicide vehicles, and a few air defense artillery (ADA) pieces and BMPs. However, there was no discernable means to how the enemy forces were being employed. A good example of the defensive disorganization came from the initial engagement. The lead tanks of *Rogue* spotted uniformed enemy soldiers in the early morning making tea and were utterly surprised when the tanks engaged and destroyed their position. Additionally, the

EAs did not have engineering obstacles with registered indirect assets to focus fires into supplemented with a counterattack. As for an Iraqi reserve force, there were plenty of waves of enemy attacks but nothing major to counterattack American armor. When counterattacks occurred, they were not well coordinated. The Iraqi force did not prepare positions where infantry, armor, and artillery massed to stop or turn an assault with engineering obstacles.

### *Charlie One-Two is Hit*

After the battalion traveled about four miles, a tank commanded by Staff Sergeant Diaz was hit by a RPG. Initially, Diaz did not think anything was wrong. His tank had weathered other RPG rounds from previous battles. However, this time after the tank traveled about 500 meters, it came to a dead halt with smoke pouring out of the engine compartment. A lucky RPG hit pierced the vulnerable rear grill of Diaz's tank. Diaz and the rest of the tank crew quickly exited the vehicle and pulled the handle on the exterior emergency fire suppression system. The Halon did not put the fire out. As Diaz was trying to save his tank, other tanks surrounded him to create a protective perimeter. For nearly thirty minutes Soldiers tried to put the fire out and hook the tank up for tow, but the fire would not go out.<sup>39</sup>

While the recovery operation was underway, Blount was monitoring the situation from his assault command post located at the airport. He was listening in on the radio nets and watching the Blue Force Tracking (BFT) screen and unmanned aerial vehicle (UAV) feed. He was getting concerned with a gap forming in the column. The recovery was taking too long and Soldiers were exposed in the intense firefight going on. Blount contacted Perkins to get a report on the situation. Perkins assured the commander that he would leave the tank if *Rogue* could not recover it in a timely fashion. Blount moved up to Grimsley's position, the commander for 1st Brigade, to ensure his brigade was ready to support 2nd Brigade if required.<sup>40</sup>

Finally, Perkins drove up to the recovery site and told the men to leave it and ordered Schwartz to abandon the stricken tank and continue on with the mission. Enemy forces started to concentrate their fires on the tank recovery site. Major Donovan, the battalion operations officer, explained the situation with the recovery operation, “The psychology of losing an armored vehicle is large. The guys on my tank were monitoring the radio and everyone was getting hammered just like we had in Jajaf. They were just hurtling buses, technical trucks, you name it, at us. Vehicles came flying up and dropping guys off one hundred meters from our vehicles. It was insane to watch these guys jump out and just get mowed down.”<sup>41</sup> Hilmes mentioned that some good came out from the lull in the battle during the recovery operation:

It was not all bad. By that time we had expended an enormous amount of ammunition, and the stop was a wonderful opportunity for gunners and loaders to re-link a lot of coax and get ready for the real push through the heart of Baghdad on Highway 8. People were emptying spent brass boxes and I even had several tank commanders who traded out .50-caliber for 5.56. It was a great chance to cross level class five [ammo]. If we had not done that I don't know if all of our tanks and Bradleys would have had anything to fire when we really needed them as we pushed into BIAP [Baghdad International Airport].<sup>42</sup>

Soldiers in the open were in harm's way as heavy fires and RPGs were directed towards the easy targets. Task Force *Rogue* was quickly losing the initiative. With the order to abandon the tank, Diaz and his crew removed all the sensitive items and documents and their personal gear from the tank. Diaz and his gunner moved to the platoon commander's tank, commanded by First Lieutenant Gruneisen. The driver and loader went with the platoon first sergeant in his M113. In all the confusion and following training procedures, Gruneisen's gunner threw two thermite grenades into the tank. Additionally, another tank shot a HEAT round at the downed tank so that it would not fall into enemy hands. Perkins was annoyed with this. He planned on recovering the tank on a later thunder run mission.<sup>43</sup> Schwartz pointed out after the battle, “There was tremendous reluctance to leave a tank behind. Andy [Hilmes] was holding his own,



Rock was holding his own, Dog was doing well, and Cobra was fighting the fire. There was no reason to charge out of there in haste and risk adding chaos to the mix. We tried for as long as possible to save the tank and I purposely tuned out the brigade commander's calls to move immediately; however, a point came where we had to go."<sup>44</sup>

During the recovery operation and firefight, civilian traffic continued to use the south bound lanes and Highway 8 off ramp near the downed tank. Hilmes's Soldiers were firing warning shots at the civilian vehicles to keep them away, nonetheless, one driver was still persistent. Hilmes moved a Bradley vehicle to block the ramp. Two civilians' vehicles drove into the stationary Bradley and a uniformed officer was noticed in one of the cars. Several dismounts from the Bradley rushed out to grab the Iraqi officer. It turned out to be a colonel in the Iraqi Republican Guard.<sup>45</sup> Later, after being interrogated, the prisoner said he was a logistics officer heading to work. He had no idea that the Americans were in or near Baghdad. He believed that the American forces were stopped south of the Euphrates as broadcast on the government controlled radio station. It was astonishing that senior Iraqi officers were believing the misinformation broadcast from the Iraqi regime.<sup>46</sup>

### *Oscar Mike*

With TF *Rogue* back on the move, the battalion headed towards "spaghetti junction" a complex intersection similar to downtown Los Angeles. The cover of black smoke and continuous engagement made it difficult to read the highway signs. One tank platoon missed the turn to the airport and had to backtrack by crossing over a median guardrail to get back on course. The battle was still raging with heavy fires and RPGs flying into vehicles and skipping off the road. Iraqi soldiers were being delivered to the fight by bus and truck. Some stripped of

their uniforms and ran rather than face sure death. Others stayed and fought and were cut down by the column of fires of TF *Rogue* vehicles.

Grunseisen's tank had gone from being in the lead element of the column to last in line. Picking up the extra gear and personnel from the tank that was destroyed slowed down his movement. The gear was loaded onto the front of the tank and blocked the driver's view. As the tanks offset their main guns to opposite sides of the road to engage enemy, the tube clipped a cement pillar. Instantly, the jarring effect spun the turret around uncontrolled over a dozen times and threw gear all over the road. The gears on the turret were stripped and the main tube bent. The tank halted and the crew tried to pick up what they could. The tank was out of commission, and the turret had to be locked down so that it would stay in one place.<sup>47</sup>

With all the mayhem Grunseisen was dealing with, he had fallen behind and missed the turn to the airport. He was headed into downtown Baghdad. His company commander called him and tried to get him to turn around and get back on course. He was headed towards a traffic circle full of enemy and the only the weapon he had of use was the loader's M240. He did not have a good option to turn around immediately, so he sped through the intersection. One pickup truck full of enemy soldiers slammed into the tank. When this happened, Grunseisen's tank drove over the pickup truck and killed the driver. The tank headed out to get back with the main column.<sup>48</sup>

In a different area of the fight, one RPG round hit a Bradley around the driver's hatch causing it to blow off. The driver, Private First Class Sunday, was shocked and thought the vehicle was on fire. He jumped from his driver's position and broke his leg on impact with the pavement. Staff Sergeant Empson in a trailing Bradley drove up to the downed track and went to retrieve Sunday. After some delay, Empson and got Sunday in the back compartment. After

switching out drivers and hooking the damaged track up for tow under fire, they headed to the airport only a few kilometers away. Several other casualties were starting to mount up as two Soldiers were hit while a M113 ramp was down. A platoon executive officer was hit in the head with a round and survived. The bullet was found lodged in his Kevlar helmet at the airport. The medevacs would have to wait until the injured reached the airport. It was too risky to land a helicopter anywhere near the battle.<sup>49</sup>

### *First KIA*

Around two-thirds of the way to the airport, one well-known Soldier in the battalion was killed. Staff Sergeant Booker had been using his M4 to repel enemy fighters away from getting close to his tank. His .50 caliber machine gun had jammed and he exchanged this ammunition for small arms during the tank recovery. As he was high and exposed in the turret while firing his rifle, Booker was hit. It looked like shrapnel from a RPG caused the damage. He was quickly given medical attention and the medical track was brought up to where Booker was located. The battalion physician's assistant, Captain Dyches, was unable to save Booker due to the massive damage sustained to his face and body. Booker's death was the battalion's first KIA in all the fighting they had taken part in and was a blow to the men.<sup>50</sup>

### *Barricade and Link Up*

Near the airport, a barricade of jersey barriers was placed along the road to trap the column. Schwartz was still with the lead vehicles and was developing a plan to deal with the situation. His engineers had limited assets for obstacle reduction and this area was not a good location for them to be exposed with an intense fight surrounding them. First Lieutenant Ball solved the problem for Schwartz. Ball was the lead tank for the battalion with an attached mine plow. He throttled up to full speed and rammed the barrier. As his tank hit the jersey barrier, the

Abram became airborne and then the seventy-ton tank came crashing down. By the time the rest of the first tank platoon crossed the barrier it was reduced to rubble. Task Force *Rogue* had a clear path to the airport. The last tense moment for Ball on this day was momentarily mistaking 1st Brigade's tanks located near the Baghdad Airport as T-72s. The misidentification was quickly remedied and TF *Rogue* entered friendly lines.<sup>51</sup>

Grimsley's brigade at the airport was waiting to receive Schwartz's men. Medical care and helicopters were staged to handle the incoming casualties. There were two seriously wounded and one KIA with a handful of others requiring some level of medical attention.<sup>52</sup> Every vehicle had some scar from the battle. One tank was destroyed and several other armored vehicles were severely crippled. Task Force *Rogue* had fired hundreds of thousands of rounds of ammunition of varying types. Vehicles were covered in empty brass casings. Numerous soldiers' personal gear stored on the outside of vehicles either was missing or burned up from absorbing the impacts of gunfire and RPGs. *Rogue* Soldiers observed the external baggage of duffle bags and backpacks deflected the RPGs and potentially saved a few vehicles and personnel from serious damage. Schwartz estimated his task force had destroyed one tank, one BMP, thirty enemy vehicles, several ADAs, and nearly 2,000 enemy.<sup>53</sup>

As TF *Rogue* assembled in a protected area, Blount met up with Perkins to congratulate him on the success of the mission. Both men discussed options for upcoming missions and Blount ordered an attack into the city with the entire 2nd Brigade to conduct another thunder run. Perkins agreed. As Perkins began planning with his staff, he wanted two things. First, he wanted the ability to stay the night. Second, he wanted to broadcast over live news the successes in downtown Baghdad. He desired to counter the misinformation being broadcast by Baghdad Bob on Iraqi forces defeating the Americans surrounding Baghdad. Perkins did not necessarily

share the staying overnight option with Blount but wanted to present this option at the right time. He did not want Blount to get focused on the brigade staying the night and disapprove the mission before it even started.<sup>54</sup>

### *Conclusion*

*Rogue's* successful movement to contact penetrated the city's outer defense to collect valuable information on Iraqi tactics, and the composition and disposition of enemy forces. Surprisingly, *Rogue* suffered only one KIA with a few other serious injuries during the intense fight, along with one destroyed M1A1 tank. Thunder Run I proved the city was vulnerable with a poorly organized city-defensive strategy. Additionally, *Rogue* demonstrated that a heavy mechanized force could produce devastating effects on Saddam's forces, "to demonstrate American resolve and facilitate the fall of the Iraqi regime"<sup>55</sup> in Baghdad.

## **Thunder Run II**

### *Introduction*

Building off the success and intelligence gained from Thunder Run I, Blount ordered another attack into the center of Baghdad. From the senior commander's view point, "Baghdad looked difficult, but it did not look like Grozny."<sup>56</sup> *Rogue's* actions during the thunder run on 5 April showed the city's defense strategy susceptible to the violent action and speed of a mechanized force. Iraqi forces did not properly prepare strong points within the city. Baghdad was ripe for another attack. This time, Thunder Run II would include Perkins's entire brigade.

While a battle of two opposing forces raged, another war of information did as well, and Perkins recognized it and wanted to win this battle too. The Iraqi Information Minister, Mohammed Saeed al-Sahhaf or "Baghdad Bob" quickly followed up after Thunder Run I with his own misinformation and lies to bolster forces to defend Baghdad. Baghdad Bob stated,

“They fled. The American louts fled. Indeed, concerning the fighting waged by the heroes of the Arab Socialist Ba’ath Party yesterday, one amazing thing really is the cowardice of the American soldiers. We had not anticipated this.”<sup>57</sup> From the mind of Perkins and other senior commanders:

Baghdad Bob’s lies had an effect on the Iraqis’ defensive effort—their morale and fighting zeal. More than just pandering to the Iraqi civilian population, the Iraqi military leadership actually believed that the Americans were dying in droves far south of Baghdad. Even the captured Iraqi colonel, arguably someone who should have known the true military situation, expressed shock at finding Abrams tanks and Bradley Fighting Vehicles in his capital. Not understanding how far and how fast the coalition had moved only emboldened the defenders in the city. Allowing these lies to stand would only worsen the eventual fight for Baghdad.<sup>58</sup>

The Iraqi response to the first thunder run was not a sophisticated or integrated urban defense.<sup>59</sup> *Rogue*’s attack during Thunder Run I “had clearly taken the Iraqis by surprise, confirming that the coalition firmly held the initiative.”<sup>60</sup> Perkins would further push the initiative to win the information battle and the collapse of Saddam Hussein's regime.

### *Mission Planning*

Building off the success of the first thunder run into Baghdad with one battalion, the entire 2nd Brigade joined the second thunder run. Both TF *Tuskers* AR and TF *China* joined the fight in the city with TF *Rogue*. The initial plans generated through the discussions of Wallace and Blount scoped out options for 2nd Brigade seizing and staying overnight, to just performing another hit-and-run raid. Wallace was concerned that if the brigade got trapped, he would not have the forces available to help out. He did not want another repeated Somalia incident. Fifth Corps passed to Blount to stay out of downtown. Blount’s staffed passed this information to Perkins, but Perkins never received it.<sup>61</sup> The final discussion to clear up Perkins desire to spend the night would happen once he reached the palace and Blount called him to figure out what was

going on. When talking with Blount, Perkins established four preconditions for his brigade to remain overnight:

1. Fighting into downtown Baghdad without 2nd Brigade becoming fixed
2. Seizing defensible and symbolic terrain at the downtown palace complex
3. Opening and maintaining a ground LOC using Highway 8 and the Qadisiyah Expressway between the Tigris River and Objective SAINTS
4. Resupplying sufficiently to remain overnight<sup>62</sup>

Perkins felt the Iraqi forces were on their heels and not well organized in the city. The intel gained from enemy actions on 5 April provided Perkins the insight on an ill-prepared city defense and the enemies inability to deal with or counter a mechanized force. The two tank battalions would lead the brigade downtown and continue to create such chaos to overwhelm the enemy. Perkins would hit at the heart of the political power in the capital by taking and holding key terrain. He would counter Muhammad al-Sahaf's (Baghdad Bob) propaganda of the Americans being defeated by Iraqi forces with emplacing American tanks in the center of downtown Baghdad.

Perkins met with his planners on 6 April to discuss key aspects for the upcoming mission. Items that needed to be addressed on this thunder run were how to logistically support the brigade to stay the night and the order of movement for the brigade. Each battalion was assigned different objectives in the capital and along the route. Discussions developed over to either bring the fuel and ammo with the armored force or to set up a replenishment site outside of the city. Perkins was inclined to bring the supplies with him. He did not want to degrade his defensive positions by sending forces out piecemeal to refuel.

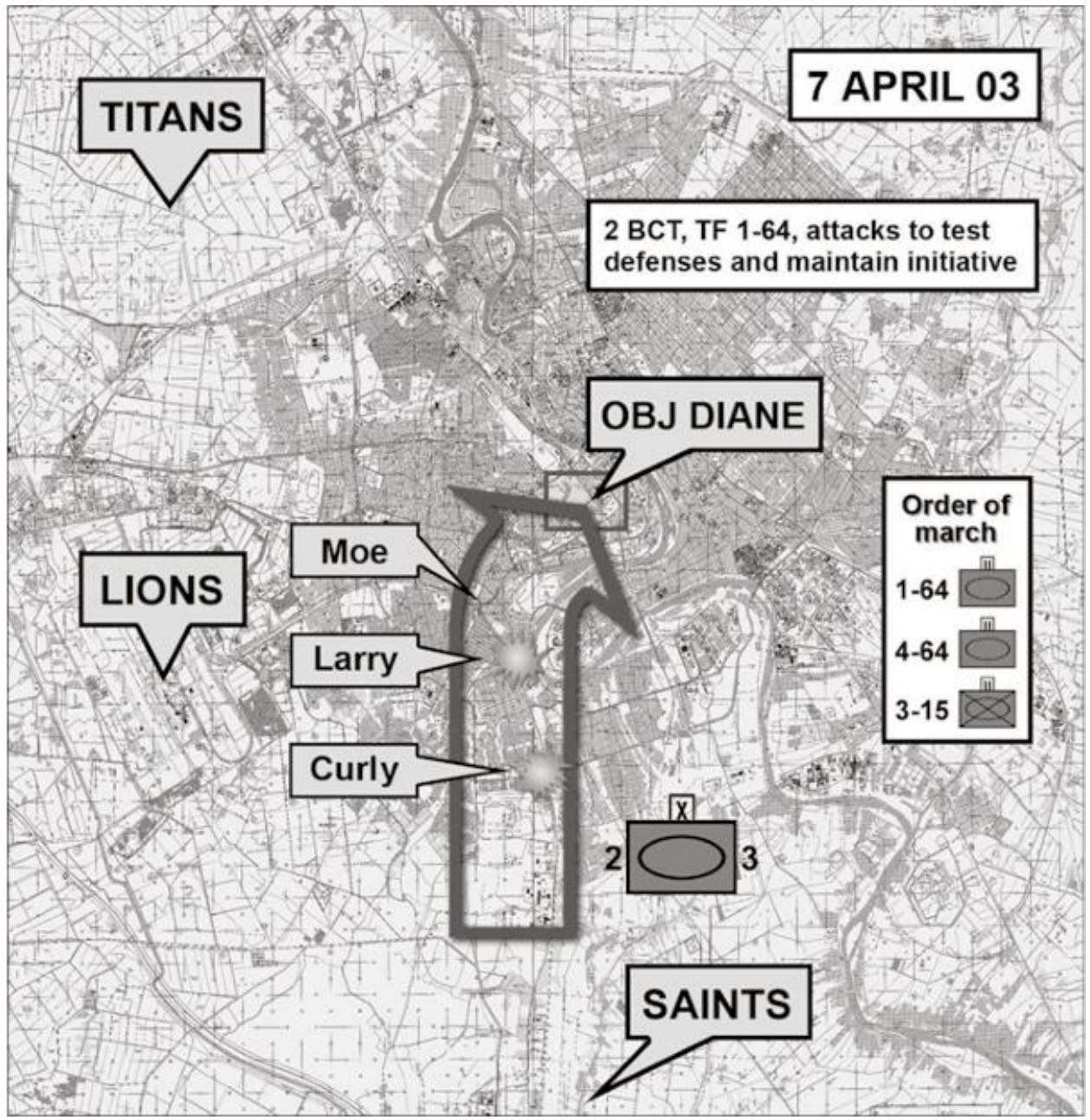


Figure 4: Thunder Run II Map (Source Takedown)

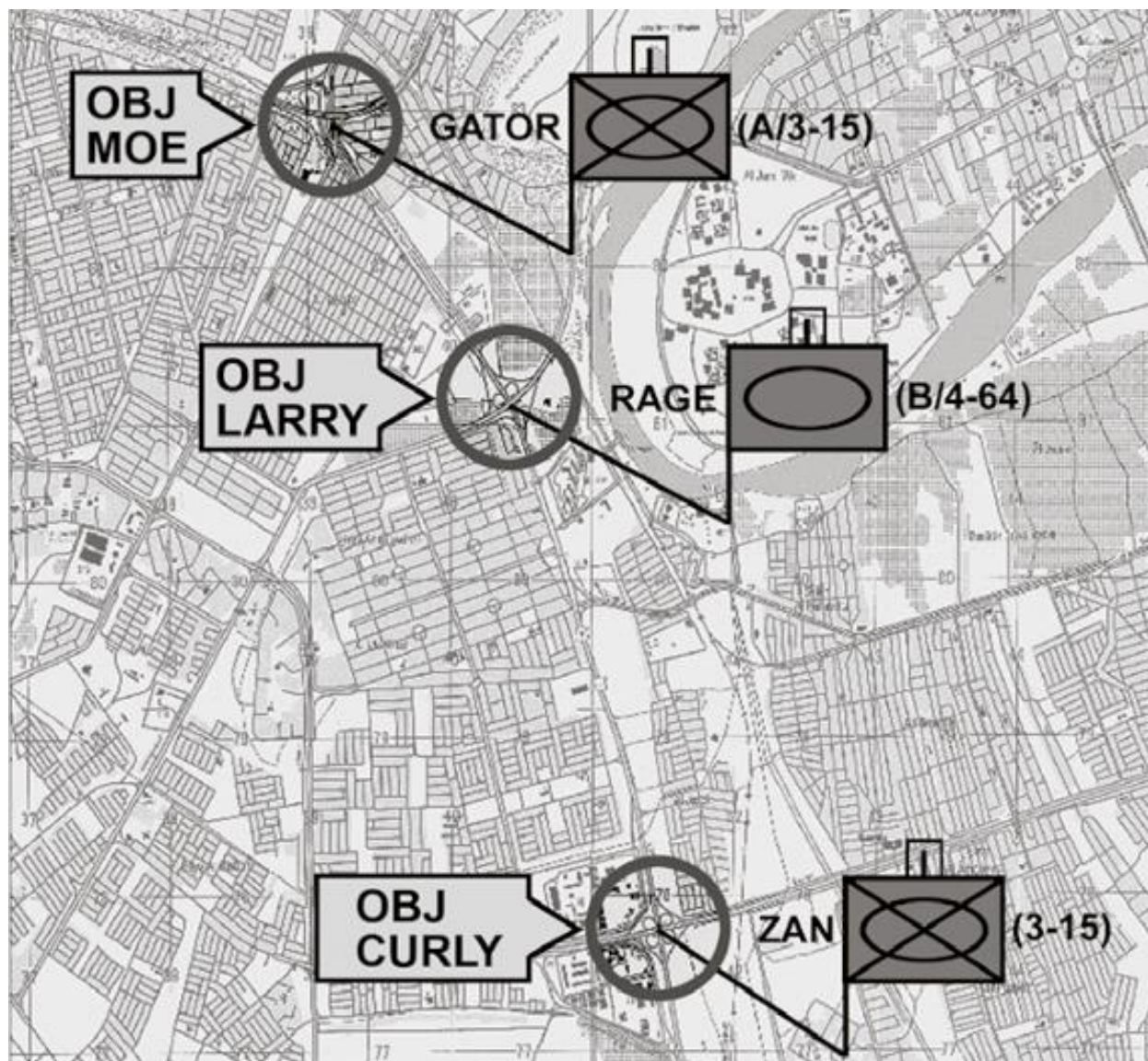
Initial recommendations on the organization of the movement into the capital had TF *China* lead so that Twitty's men could secure the highway overpasses. Once the overpasses would be secured the tank battalions would then pass through to the next object. Perkins did not like this plan as it was too slow. The tank battalions would be stuck in the rear waiting to get into the fight. Perkins shifted the plan. Schwartz's TF *Rogue* would lead the brigade as he was



familiar with the route, followed by DeCamp's TF *Tuskers*, and then Twitty's TF *China*. As the lead battalion would near each overpass, brigade artillery would fire airbursts over the location to destroy enemy forces located at these key points. The tank battalions would then continue moving through the intersections. Similar to the first thunder run, targets would be passed from lead vehicles to trail vehicles. (See Figure 4.)

#### *Battalion Assignments and Objectives*

As the lead tank battalion, Schwartz was assigned the mission of securing the monument area, a park, zoo, and the Al-Rasheed Hotel (Objective DIANE). The hotel was thought to be full of international news agencies. The land size is comparable to the National Mall in Washington, DC.<sup>63</sup> The terrain was open, which allowed for good observation. It was not as urbanized as other parts of the city with buildings and roadways. Securing these objections was significant for psychological reasons. DeCamp would follow directly behind the lead tank battalion and was assigned the Republican Palace, villas, and other government buildings located along the Tigris River (Objectives WOODY WEST and WOODY EAST). DeCamp's objectives would strike at the political center of the regime. The terrain in this location was more complex with street intersections, bridges, and buildings all over. Twitty would be the final battalion in the column heading north. He would seize the three overpass intersections leading into the city to secure the supply line into downtown. The intersections were named Objective CURLY, LARRY, and MOE. (See Figure 5.) The brigade TOC moved from a field to an abandoned warehouse one kilometer from Highway 8 with the logistics train.<sup>64</sup>



*Figure 5: Objective CURLY, LARRY, and MOE (Source Takedown)*

Perkins established several key decisions for the next day's fight, they included: the perimeters for staying overnight, repositioning forces as the things changed on the ground, employment of both artillery and air assets, and how and when to resupply his battalions.<sup>65</sup> The brigade logistics officer, Maj Mullen, knowing the resupply of the brigade was a crucial piece to Perkins plan, went out scouting for a location for the logistics train to assemble. As he was exploring Highway 8 about a mile north of the TOC, he ran into a minefield. There were hundreds of mines scattered in rows on the pavement surface with dirt covering each one. The

minefield was roughly 200 meters by 550 meters.<sup>66</sup> When Mullen and his accompanying security element left to report back to Perkins, Iraqi forces in technical vehicles attacked. After a short engagement and speeding away from the area, Mullen made it back to the brigade TOC.<sup>67</sup>

*Minefield: Direct Front*

The update of a minefield brought new concerns over the next day's operation. With the enemy's ability to place a minefield so close to the brigade, the staff was worried that other obstacles could have been emplaced along the highway. The staff looked at a few options on how to handle the situation and requested a UAV to conduct a recon overflight of the route. Unmanned aerial vehicles were hard to come on such a short notice, with the mission hours away, Vth Corps put one UAV up. Around 0400, division headquarters reported back that no other minefield was detected on Highway 8; however, four or five barriers comprised of burned-out vehicles and debris were on the highway.<sup>68</sup>

While the UAV flight was underway, combat engineers from *Dawg* were quickly working to create a breach lane along the known minefield. No matter what the reconnaissance flight found, the minefield had to be cleared. The engineers decided the best option to create a breach lane was to conduct a covert breach. Luckily, the engineers got a practice round of this type mission a week earlier when *Dawg* conducted a covert breach in the city of Najaf. As the engineers got to work, a security element of Bradleys from Captain Burris's infantry company was in over watch. Using thermal sights, the Bradleys spotted a few enemy covering the minefield. Among the enemy were two technical vehicles, an anti-aircraft gun, and a recoilless rifle. Once the engineers completed their mission, these enemy positions were quickly destroyed.<sup>69</sup>

It was around 0300 when the engineers got started and the brigade was leaving the line of departure at 0500.<sup>70</sup> The mines were Italian-made about ten inches in diameter and five inches in height. Initially, the technique for removing each mine was by lassoing them with engineer tape and then dragging them to the side of the road. There was a concern for booby-traps. The procedure was time consuming and time was running out. With no antihandling devices found on the first several runs, the engineers went to a more expedient method. The mines were swept with two fingers to feel for antihandling devices and then moved.<sup>71</sup> After nearly two hours, the engineers pulled away from the site after clearing 444 mines and marking the breach lane with panels and signs.<sup>72</sup> The mission was a success and no one was injured. The minefield was cleared at 0500.<sup>73</sup> Minutes later the Bradleys opened up and destroyed the technicals, anti-aircraft gun, and recoilless rifle.

#### *Thunder Run II Execution*

As Schwartz's battalion moved north, several Iraqi positions were getting hammered with indirect fire. Using lessons learned from the first thunder run, there would be no stopping. Downed vehicles would be passed onto trail units to deal with. Schwartz's lead tank, after passing through the minefield, became disabled from two RPGs. The tank stayed in place as the rest of the brigade went around it. The initial fighting was intense as TF 1-64 AR headed north, but in future interviews the Soldiers said it was nothing like the first thunder run. The enemy was still fighting from buildings, bunkers, and trenches like the day before. Iraqi forces had not changed their tactics.<sup>74</sup>

Within thirty minutes, the lead elements of TF *Rogue* had reached Objective MOE before heading east into downtown. The objectives for TF *Rogue* and TF *Tuskers* were only a few miles away. Enemy resistance with the tanks had decreased as each battalion quickly pushed

east and soon drove under the crossed sabers or headed to the palaces. At the palaces, the enemy was attacking with small arms and a recoilless rifle, but was quickly destroyed. Enemy actions picked up in intensity once TF *Rogue* and TF *Tuskers* fanned out to cover their assignments. The city started to come alive with small and stubborn counterattacks. Perkins was fighting both a physical war and informational war. As Perkins made it to one of the palaces, orders were passed down from to staff in Kuwait to Vth Corps directed Perkins to destroy a statue of Saddam. Perkins immediately put out a call to his battalion commanders. Schwartz's battalion found a good statue of Saddam on a horse in his own parade field. One tanker fired a multi-purpose anti-tank (MPAT) round center mass and the scene made quick media as Fox News cameras were broadcasting live.<sup>75</sup>

#### *Direct Hit on 2nd Brigade TOC*

It was just after 1000 when the brigade executive officer, Lieutenant Colonel Wesley, contacted Perkins on an Iridium satellite phone to congratulate him and to discuss the way forward. Wesley was located back at the brigade TOC and was in charge of coordinating fires and when to push the sustainment forward. At this point both tank battalions were located in downtown Baghdad and Twitty's infantry battalion was spread across four locations: Objective MOE, LARRY, and CURLY; and two Bradley platoons providing security on the brigade TOC. The time was getting close for Perkins to make some key decisions as his fuel guzzling tanks were nearing a half tank. As Wesley was walking away from the brigade tentage to talk with Perkins, an April missile struck. The missile knocked Wesley to the deck as it hit the center of the TOC. A fireball consumed the area and Soldiers quickly reacted quickly in all the confusion. Tents were burning to include the surrounding vehicles that made up the operations center.<sup>76</sup>

Wesley let Perkins know the TOC was hit and ended the conversation to go deal with the situation and get the TOC back into the fight. As Wesley focused on calming the chaos and getting the TOC back in the fight by salvaging strewn about equipment, Captain Glaser, the headquarters company commander, focused on dealing with the mass casualty event and putting out the fires. His company first sergeant dealt re-establishing the site security and potential follow-on attack. Additionally, a M88 tank retriever from the 4-64 TOC aided with knocking down walls of the compound to create an opening for blocked in vehicles to escape the inferno.<sup>77</sup> In total the missile strike killed five, wounded 17, and destroyed 22 vehicles.<sup>78</sup> However, Wesley managed to put together a secondary TOC in about 45 minutes to get back in control of the raging fight going on to his north.<sup>79</sup>

#### *Securing the LOC*

While Wesley was dealing with sorting out the mess at the brigade TOC, the fight was heating up along the LOC for Perkins to get his much-needed sustainment package downtown. Twitty's battalion (*China*) held the key locations of MOE, LARRY, and CURLY. Captain Wright with Alpha Company (*Gator*) was located at Objective MOE with his full company. Captain Hubbard (*Rage*) seized Objective LARRY minus two platoons detached to secure the brigade TOC. Without a full company, Twitty had to assemble a makeshift company to seize Objective CURLY. Captain Hornbuckle (*Zan*), an officer working in battalion's operations section, was put in charge of seizing the final objective CURLY. The ad hoc company was made up of a Bradley platoon and the mortars and engineer platoon. This was the first time that these men would fight together and only had six hours to prepare before stepping off. Twitty had his battle-hardened command sergeant major accompany Hornbuckle, as he went with Hubbard in the center of the battalion.<sup>80</sup>

Twitty was concerned with giving up two Bradley platoons for brigade's security and his troop strength available for the mission. He called Perkins up to voice his concern and discuss the situation of securing all three positions along the LOC. Perkins reassured him that he would get the reinforcements, if required.<sup>81</sup> As TF *China* seized each of the overpass objectives, enemy forces regenerated at all three intersections after both tank battalions killed everything in their swath. Actions at each location happened concurrently but will be broken out separately to describe the fight TF *China* endured to keep the critical LOC open.

### *Objective MOE*

At Objective MOE, Wright positioned his tank platoon north, one Bradley platoon faced east and the other west. Wright's forces had the difficult task of securing spaghetti junction. The attached engineer platoon used the armored combat earthmover (ACE) bulldozer to create obstacles. The ACE pushed over telephone poles and trees, piled up cars, and created berms to slow or canalize the enemy at all three of TF *China*'s objectives.<sup>82</sup> The Wildbunch's mission was to destroy all enemy forces trying to re-seize the intersection.<sup>83</sup>

Wright's Soldiers immediately came under contact with the enemy as the company was setting into their assigned sectors. A company sized force of Fedayeen attacked from the southwest. In the east, another company of Fedayeen and foreign fighters attacked. Finally, two companies of Special Republic Guards attacked from the north. Civilian buses were used to transport these forces directly in front of the tank positions which became easy targets to destroy.<sup>84</sup>

The fight around Objective MOE was a 360-degree fight. Enemy positions were interlaced into trench lines among the palm trees and vegetation. Additionally, intense fire came from fortified bunkers, public buildings, and even a local mosque that was used to rearm and

refit. Iraqi forces were swarming the *Wildbunch* from every direction. Wright went on the offensive to destroy Iraqi forces trying to mount a counter attack. He sent a mounted force north, led by Second Lieutenant Van Kirk, outside of his assigned area into the city to destroy enemy forces massing. Once Van Kirk finished off clearing enemy forces north, the company consolidated into defensive positions around the intersection. Engineers continued to build obstacles for the company to deny the enemy freedom of movement into their positions. The obstacles helped to block a late afternoon suicide vehicle attack that detonated 200 feet from the outer perimeter. After nearly eight hours of continuous combat, it was estimated that the company destroyed more than sixty vehicles and killed hundreds of enemy combatants.<sup>85</sup>

The *Wildbunch* would continue to fight well into the night and next day. As Iraqi forces continued their suicidal attacks, what they lacked in tactics was made up for in bravery. Wright noted that his company fired nearly twice the combat load his men carried. He felt that at one point if the Iraqis continued to press the fight his Soldiers would have to resort to hand-to-hand combat within an hour. Additionally, he had to call in more than twenty artillery danger close missions and another six danger close mortar missions to stop the enemy. The fighting was close and intimate.<sup>86</sup>

#### *Objective LARRY*

Hubbard's men, along with Twitty, were fighting a similar intense fight at Objective LARRY. His company was located in the center of the battalion's three objectives with nineteen armored vehicles. Hubbard positioned one tank platoon to the northeast and the other tank platoon to the southeast sectors. His Bradleys and infantry were given the entire west sector for their responsibility. The fighting began the moment Hubbard's men started to take up their assigned sectors. The first couple intense hours came with the Iraqis launching wave after wave



of suicidal vehicles from the south. The vehicles were taxis, buses, civilian cars and trucks, dump trucks, and one recreational vehicle. Iraqis would approach at high speeds, firing out of windows or the bed of the pickup trucks. Once each suicidal vehicle was destroyed, they would blow up in a tremendous explosion from the explosive material packed into the vehicles.<sup>87</sup>

First Lieutenant Brzozowski leading the infantry platoon only had three of his four Bradleys for this mission on the western sector. The enemy he was fighting was made up of two to three-man RPG teams with technical vehicles. Civilian vehicles were used to resupply the enemy during the battles. The enemy he faced was estimated to be a company reinforced in strength, around 200 personnel. Every one of his Bradleys was hit by numerous RPG rounds and small arms fire. In the afternoon, one of his Bradleys unmasked to destroy a ZSU-23 that was firing at dismounted Soldiers. The Bradley was struck by two RPG rounds with one penetrating the armor but the round did not detonate. However, the men dismounted from the Bradley and his platoon was down to two fighting Bradleys. The remaining two Bradleys consolidated on the high ground. He was reinforced with a tank to bring his combat strength back up to acceptable levels but he felt his position was in jeopardy of being overrun. To stop the enemy's initiative, he decided to assault the enemy position. Moving down a side street on the west side of the highway, he found three large trucks carrying RPGs, small arms ammunition, and rifles. With no combat engineers with him, expedient charges using claymores were rigged and destroyed all the vehicles and loaded supplies. The platoon returned back to their original positions following the raid.<sup>88</sup>

The western sector was still hot with enemy actions. The Bradleys were scarred from the multiple RPG hit with all the gear on the outside now either destroyed or burnt up. Brzozowski decided to launch a second raid on the morning of 8 April to deal with the menacing enemy

located around a mosque minaret. With one tank in over watch, the two Bradleys assaulted the mosque courtyard and were greeted by a handful of Iraqis. However, the platoon discovered a massive weapons cache estimated to have around 30,000 small arms, 3,000 RPGs, 2,000 grenades and some artillery and mortar shells. In dealing with the cache, a platoon-sized element counterattacked. In the end, Brzozowski's men were able to destroy the ammunition cache. In the course of the next four days, his platoon was fired on by only one RPG round.<sup>89</sup>

Hubbard would go on to credit the use of artillery as breaking the enemy's will. The tank platoons would deal with the same type of suicidal enemy firing from building, trenches, and bunkers. Every vehicle in Hubbard's company was shoot up multiple times by RPGs or small arms.

#### *Objective CURLY*

The thrown together company commanded by Captain Hornbuckle dealt with the most intense fighting out of all three locations. After interrogating the enemy prisoners of war, the company discovered the force Hornbuckle's men fought were mainly from Syria. They came to specifically kill Americans. The bunkers and fighting positions hit hard on the first thunder run were reinforced. Hornbuckle instantly started taking enemy fire as he set his company into position. Intense fire was coming from all directions and buildings with RPGs, small arms, and suicide vehicles. The enemy was lobbing RPG rounds into his position from long distances along with unadjusted mortar and artillery fire.<sup>90</sup>

The mortar platoon took up position on Highway 8 with two tubes aiming north and two aiming south. The Bradley platoon was covering down on the western sector with the engineer platoon assigned the eastern sector. Some Army Special Force Soldiers joined Hornbuckle's company last minute and joined the fight with their civilian truck, which looked like a technical

vehicle. Friendly casualties quickly started to mount up. Two Special Forces men were dragged out of a nearby building after trying to clear it of enemy forces. Medics were taking up arms to repel the Syrian's assault. At one point, a Soldier on a stretcher engaged and killed two Iraqis while being carried on a stretcher back to the aid station.<sup>91</sup>

Twitty stayed in contact with Hornbuckle throughout periods of the fighting. Each time Hornbuckle said he was handling the situation, but Twitty could hear the excitement and concern in Hornbuckle's voice and contacted his CSM Gallagher to get his perspective. Gallagher let him know they needed reinforcements and needed them quickly. Twitty immediately called Perkins to ask for his remaining forces securing the brigade TOC. Perkins concurred with the request. Twitty then called Captain Johnson who was the officer in charge of the Bradleys to get to CURLY immediately. Johnson was monitoring the situation on the radio and within minutes had one Bradley platoon on the move north. Johnson's Bradleys helped with turning the tide of the position not being overrun. His 25mm Bushmaster cannons tore up the enemy trench lines at close range. Enemy parts and weapons flew into the air.<sup>92</sup>

Even with the additional fighting power of Johnson's company, indirect fires, and air support overhead, the enemy was still mounting significant resistance and damage to the men of TF *China*. Twitty's battalion was facing stiff resistance along Highway 8 and time was getting close for Perkins to make a decision for when to launch the resupply. The entire brigade was becoming amber and black on critical levels of ammunition and fuel. Each company across the brigade was cross leveling ammunition to fend off the attacks. Damage was also starting to mount up on multiple vehicles as weapon systems were being knocked out from enemy fire and shrapnel. Second Brigade was killing everything but the attacks were not letting up.<sup>93</sup>

### *The Resupply Mission*

Perkins was faced with a few key decisions and discussions for how to proceed. The time was after 1000 and the brigade had been fighting for around four hours. The tanks located downtown shut off their engines to conserve fuel to buy several hours for TF *China* to secure the LOC.<sup>94</sup> First, Perkins spoke with Twitty to see if the logistics convoys could make it through on the highway. Twitty then called Gallagher to get his perspective. Gallagher said the logistics convoy could make it through but with risk. The message was relayed to Perkins for approval and the 3-15 IN logistics train launched. Second, Perkins and Blount discussed options for reinforcing 2nd Brigade. Blount designated TF 2-7 IN as the reserve force which fell under 1st Brigade located at the airport. This reserve force would provide security for the Perkins brigade TOC and conduct a battle handoff at CURLY with Twitty's Soldiers.<sup>95</sup> Finally, Johnson's company would then escort the logistics convoy north to resupply each objective then head to the Kindi Highway to secure the rear area of the two tank battalions located in downtown.<sup>96</sup>

### *Resupplying TF China*

As Captain Bailey, TF *China*'s Logistics Officer, received the order to launch the logistics convoy, Captain Polsgrove assembled the troops for the convoy mission he would lead. The scout platoon from TF 3-15 IN would escort the transport vehicles north which had two .50-cals and one Mk-19 grenade launcher.<sup>97</sup> The transport vehicles would be going through the gauntlet with minimal offensive firepower and would be extremely exposed. The convoy was made up of twenty-one heavy expanded mobility tactical trucks (HEMTT) and Humvees with only two radios between all the vehicles.<sup>98</sup> Communications between the convoy was difficult with having to rely on hand and arm signals. The logistics convoy was a "soft target" laden with twenty thousand gallons of fuel and 110 tons of ammunition.<sup>99</sup> Their offensive firepower

centered around several mounted crew-served weapons (one Mk-19 grenade launcher, three .50-caliber machine guns, and one M-240 machine gun) and personal rifles.<sup>100</sup> Speed would be their friend as the vehicles drove 50 miles per hour to reach Objective CURLY.

Shortly after passing through the minefield, Sergeant Marshall in charge of the scouts was hit in the chest by a RPG. His body flew out of the turret. From the lessons learned from Thunder Run I and with orders not to stop, Polsgrove kept the convoy moving. Marshall's body would be recovered at a later time.<sup>101</sup> Everyone on the convoy was firing a weapon, even the drivers. One hand was on the wheel and the other engaging targets with a rifle out the window. Unfortunately, the convoy would be hit with another KIA. Right before reaching CURLY, Staff Sergeant Stever, after firing a .50 cal behind Marshall's gun truck was hit in the face and killed by RPG shrapnel that exploded near his M113.<sup>102</sup>

Once the convoy reached Objective CURLY, the situation was still chaotic. The enemy had not slowed much and the space for parking the massive resupply convoy was limited. The fire was so intense that the battalion Chaplain (a former infantry sergeant) in a "moment of decision" took up a rifle to help repel the assaults.<sup>103</sup> Trucks parked in the best available space using terrain to limit their exposure. Some of the Soldiers took up defensive positions to help the infantry, others started to offload ammo to resupply the infantry. The luck the convoy had with no cargo trucks being hit by enemy fire quickly ran out once they had stopped and consolidated on top of each other. A RPG round struck a truck loaded with ammunition which started a huge fire. The fire quickly spread to four other cargo trucks. Truck drivers tried to save as many vehicles by jumping in nearby trucks and getting them out of the fire radius. All said, only sixteen cargo trucks were saved from the fire.<sup>104</sup>

While the supply trucks were ablaze, Johnson was coordinating with the TF 2-7 IN operations officer, Major Coffey. Coffey arrived with an advanced party to work the battle handover between the units and get an assessment to best position his battalion. As both Johnson and Coffey were talking, heavy caliber rounds were coming in from the south and one of the Special Forces pickups was destroyed. Friendly fire was being exchanged as the lead elements of TF 2-7 IN approached from the south. Luckily, no casualties occurred from the blue on blue fire before the units ceased fire on each other.

The situation at CURLY was chaotic with trying to conduct a textbook turnover with two different units in the confines of the road intersection under enemy fire. Johnson ordered the remaining TF 3-15 IN Soldiers at CURLY to load up and prepare to move out to LARRY. There would be no clean relief in place with TF 2-7 IN. Polsgrove assembled the remaining sixteen trucks to get accountability and stage for the departure. With ammunition reaching critically low levels at Objective MOE, Twitty ordered Johnson to bypass LARRY and immediately head to Wright's position.<sup>105</sup> The march to Objective LARRY would include fifteen Bradleys from both the companies of Hornbuckle and Johnson.<sup>106</sup> Bradleys would be positioned throughout the convoy to protect the cargo trucks and lay down a wall of fire while approaching Objective LARRY. The Soldiers of TF 2-7 IN were now in charge of defending Objective CURLY and left to deal with the thirty EPWs captured previously by Johnson and Hornbuckle's men.

As Johnson's column of vehicles bypassed LARRY and headed for MOE, the plan was for the cargo trucks to peel off and stop to resupply Wright's Soldiers and vehicles. Johnson would then proceed to his blocking position along Kindi Highway. However, as the column slowed down and took the off-ramp to Kindi Highway, the cargo trucks did not peel off. In all the confusion, the cargo trucks continued to follow Johnson and the Bradleys into the city.

Wright's men would later send several vehicles to Johnson's new position to pick up needed ammunition and later that night escorted the remaining fuel and ammunition trucks back to MOE to resupply the entire company. Even with the five destroyed cargo trucks from the TF *Rogue's* logistics train, there was enough ammunition and fuel to resupply the entire battalion.<sup>107</sup>

#### *Resupplying TF Rogue and TF Tuskers*

Back at the palaces Schwartz and DeCamp discussed with Perkins the needed resupply for both TF 1-64 AR and TF 4-64 AR. Task Force *Rogue* and TF *Tuskers* shut down their tank engines for several hours and the time was around mid-day.<sup>108</sup> DeCamp wanted to move his logistics train located near the brigade TOC before it got too dark and required a resupply soon to allow the battalion to stay the night. The best option he saw with getting the logistics train to his position was by using speed. He only wanted to use wheeled vehicles. Due to TF 3-15's logistics train getting ambushed, he wanted his scout platoon armed with .50 cal's in armored Humvees to escort the cargo trucks. DeCamp's executive officer, Major Rideout, informed Captain Ballanco located near the brigade TOC to move out. Captain Puckett called up his support platoon officer in charge, First Lieutenant Luu, and told him to move out.

Luu's logistics train from TF *Rogue* went out first in front of TF *Tuskers's* resupply convoy. He was armed with seven mounted .50-cal's and two radios<sup>109</sup> and would be escorted by several Bradleys to the parade ground. Shortly after departing the tactical assembly area, the convoy came under heavy fire from buildings and rooftops.<sup>110</sup> The convoy was being engaged by RPGs, small arms, and machine gun fire. Tracers and rounds were skipping off the road as his convoy headed north on Highway 8 into the city. With only two radios, Luu had a difficult time controlling what his gunners engaged.

As Luu's convoy rolled through Objective CURLY, the enemy's dead were all over.<sup>111</sup> Carnage was scattered on the roads, fields, and intersections. The five supply trucks from TF 3-15 IN were still burning, but there was a break in the fighting.<sup>112</sup> Just north of Objective CURLY, the convoy came under heavy enemy fire again. Rounds from RPGs were flying between vehicles and skipping off the road as they were launched across the highway. As the convoy pressed onto Objective MOE, the enemy's fire started to decrease. The scars from the earlier firefight were similar to Objective CURLY with dead all over and brass cartridges spread over the highway.<sup>113</sup>

The navigator of the lead Bradley escorting Luu's trucks turned onto the wrong ramp trying to get to downtown. The intersection was very confusing at MOE, as the entire convoy came to a stop on the overpass. The right ramp was eventually found as the convoy had to back up and reset. Once back on the right road to downtown, the linkup point with TF *Rogue* at the parade grounds was only a few kilometers away.<sup>114</sup>

Prior to Luu's convoy taking off, Captain Ballanco, the logistics officer for TF 4-64 AR, linked up with his scout platoon to organize the movement to DeCamp's position. The armored Humvees were positioned in the front, middle, and rear of the resupply convoy. Additionally, Ballanco made sure the ammunition and fuel trucks were separated throughout the convoy. He wanted to mix the fuel trucks throughout the convoy so that if one exploded he would not lose all the fuel at once.<sup>115</sup>

Ballanco's convoy composition and offensive capability was similar to TF *China*'s resupply convoy. He had the battalion's scout platoon spread throughout the formation to protect the cargo trucks in pairs, and he only had a limited number of organic CSWs and a handful of radios to talk between vehicles. Once Ballanco's convoy took off, it quickly caught



up to the last vehicle of Luu's convoy. His vehicles were traveling around 50 miles per hour. The convoy's first enemy contact started after passing through Objective CURLY.<sup>116</sup>

The enemy fired with RPGs and small arms fire with a few rounds impacting the rear armored Humvee. At one point, one driver towards the front of the convoy engaged an Iraqi fighter by shooting his personal rifle through the windshield. The other vehicles got lucky as rounds missed the ammunition and fuel trucks. Nearing Objective LARRY, one of the convoy gunners engaged a tank by mistake causing no casualties. The last enemy engagement happened while passing north of LARRY where a Bradley was positioned and quickly silenced the enemy fighters. The convoy continued on past MOE and followed Luu's convoy through the messy spaghetti junction to their final destination. Ballanco's resupply convoy set up at the Republican Palace to rearm and refit TF *Tuskers* throughout the afternoon.<sup>117</sup>

*Conclusion: Thunder Run II Aftermath and Regime Collapse*

The arrival of all three resupply convoys in downtown Baghdad marked the turning point for Perkins to meet his criteria to stay the night. The rearming and refitting of the brigade set the conditions for all three battalions to withstand the counterattacks on the evening of 7 April and through the next two days. Sporadic heavy fighting continued for two days around the capital; the second thunder run was the tipping point for the rapid collapse of the Iraqi Regime and a strategic victory.<sup>118</sup> The *Battle for Baghdad* did not turn out like Mogadishu in 1993 or Grozny in 1994.

Second Brigade's actions on 7 April 2003 demonstrated to the Iraqis the American's will to defeat Saddam Hussein's forces and freedom of movement within the heart of Iraq. Arguably, Perkins's bold decision to stay in downtown Baghdad "made the single decision that...shortened the siege [of Baghdad] by weeks, if not months."<sup>119</sup> Additionally important, his senior

commanders, Blount, Wallace, and McKiernan trusted Perkins's tactical decision and "underwrote the risks that he took."<sup>120</sup> A V Corps after-action review speaks to the moral-mental-physical conflict the *Spartans* fought and won, "The decision to leave an armored brigade in the center of Baghdad overnight seemed unthinkable one day and obvious the next. We must never underestimate the psychological impact of an American armored force holding the ground it takes."<sup>121</sup>

In the following three days after 7 April, 3rd ID conducted operations to link up all three brigades. On the evening of 7 April, 3rd Brigade repelled a major Iraqi counterattack and then on 9 April attacked south of Objective TITANS to link up with 2nd Brigade. On 10 April, 3rd Brigade's last major offensive action took them down the western side of the Tigris River along Highway 1 to link up with the *Spartans*.<sup>122</sup> Also on this same day, 1st Brigade cleared all of Highway 8 in-between the airport and area seized by 2nd Brigade inside the city. By 9 April, 1st Marine Division was inside the city center and secured V Corps's eastern flank. On the same day, a M88 recovery vehicle attached to 3rd Battalion, 4th Marines (commanded by Lieutenant Colonel Bryan McCoy) brought down the infamous statue of Saddam Hussein in Firdos Square.<sup>123</sup>

Iraqi forces had the advantage of a complex urban environment to attrite the American forces but lacked the will and organization to defend as superior firepower, speed, and maneuver wore down the poorly defended city of Baghdad. Over the course of a few days, officers and soldiers of the Republican Guard and Special Republican Guard evaporated back in with the populace. Additionally, Iraqi political leaders and "the paramilitaries and international mercenaries melted into the city, waiting to assess how the Americans would proceed."<sup>124</sup> Third

ID would quickly shift from kinetic operations to stability operations after the fall of Baghdad; however, that story is for another case study.

From the case study of Thunder Run I and II, the last half of this paper focuses on analyzing two war fighting function – Logistics and Force Protection – and what is required for the US military to maintain a superior advantage in these two areas as the character of war evolves. Had Perkins not been able to resupply his brigade in downtown Baghdad, he would have most likely had to withdraw, and the collapse and time to seize the capital might have looked much different. In transitioning to analyze the future operating environment in relation to logistics and force protection, the author seeks to find a logistics concept for creating a new offset strategy in extending and sustaining maneuver forces in a distributed environment.

### **Logistics and Force Protection in Expeditionary Operations**

As stated in this paper's introduction, this section seeks to analyze the future of the Marine Corps surrounding two war fighting functions – logistics and force protection. The author views these two war fighting functions as critical to extending maneuver operations in future distributed operating environments. The challenges and issues 2nd Brigade faced during Thunder Run II speaks to the environment the *Marine Corps Operating Concept (MOC)* lays out. The lessons learned from Thunder Run II highlight key areas the Marine Corps should look at as it shapes the force for tomorrow's fight. In fighting a distributed fight, the lethality of extending maneuver operations is incumbent upon the ability to sustain that force as far forward as possible by means of road networks, waterways, or airways.

As Thunder Run II progressed, the two armored task forces of 1-64 AR and 4-64 AR decisively achieved securing each of their assigned objectives in downtown Baghdad. The fighting was intense but the Iraqi forces could not overcome the mismatch they faced with

defeating the mech-heavy force. The difficult part of the operation came in securing the LOC and protecting the logistics trains under fire during resupply operations in an urban and complex environment. Exposing bunched up ammunition and fuel trucks along urban roads and parked in open areas offered too easy of a “soft target.” The battalions of 2nd Brigade were task saturated within each objective area and unable to create a seam to launch the logistics trains into or spread too thin to initially escort the first resupply convoy. The Iraqi forces were not allowing any lulls in the intense urban fight.

Critically low states of ammunition and fuel created decision points for Perkins on maintaining maneuver elements in downtown Baghdad. With the M1A1 burning fifty-six gallons of fuel an hour sustained or ten gallons an hour while idling,<sup>125</sup> time was getting short with forces becoming amber and black on fuel and ammunition. The brigade had remained in the fight for over four hours, and the decision point for Perkins to send in the resupply vehicles quickly approached in order to meet his criteria to remain overnight in the capital. Logistics and force protection are two war fighting functions to take a deeper look at analyzing in this case study to better sustain a force for tomorrow’s distributed battlefield. A future logistics concept is presented in the “Future Concepts” section of this paper.

### *Distribution*

The Army OIF logistics issues, challenges, and areas executed well are documented in a 2005 RAND study named *Sustainment of Army Forces in Operation Iraqi Freedom*. In the study, theater distribution issues are highlighted with major problems pushing supplies other than fuel to forward units. Fuel was the one area the Army did not want to fail at during the march to Baghdad. It was a lesson learned from the Gulf War in 1991. Fuel distribution was war gamed in the planning process to ensure it would not create a culmination point with a fuel needy

mechanized force. Distribution for the other classes of supply were not as well planned out during war gaming activities. A large part of the problem was insufficient transportation assets and an extend LOC with security issues along the main supply route (MSR).

When assessing the inadequate number of cargo trucks available, there is not any data on the total number of vehicles required at every echelon of the Army units in Iraq. However, the RAND study was able to assess data collected from the 377th Theater Support Command (TSC). The 377th TSC required 930 medium trucks when operations started but only had 298 total trucks (including 147 flatbeds, trailers, and host nation trucks).<sup>126</sup> The 3rd Corps Support Command had similar issues at the start of operations. The command required 955 cargo trucks but only had 191 cargo trucks on hand at the start of operations. On 8 July 2003, the number of cargo truck for 3rd COSCOM reached 1,988.<sup>127</sup> An interesting fact to look at when comparing Operation DESERT STORM (ODS) and OIF is the cargo truck ratio requirements. In ODS the number of Army personnel to medium cargo truck was seventy-three, compared with around 194 for OIF.<sup>128</sup> Additionally, the distance for transporting supplies was much shorter during ODS. The furthest movement in ODS was 210 miles.<sup>129</sup> Movements to Baghdad from the port of Kuwait in OIF were over 400 miles. In not knowing where the next conflict might arise, or how it will be fought, the US military needs prepare for a complex distribution system with extended LOCs.

Another issue with the low number of drivers and trucks available was that a major portion of Army logistics units are positioned within the Reserves. Mobilizing Reservists can take anywhere from three to four months to standup and deploy. The call for mobilizing the Reservists should have come before the 2002 Christmas Holiday period but the orders were delayed until after the new year. Also, Secretary of Defense Rumsfeld's disregard for the time

phased force deployment data (TPFDD) process compounded the issues of deploying and phasing forces. Instead of deploying units by capability, Rumsfeld chose to deploy units based on what he thought was important. In this process, units like truck companies were not seen as high priority and were not echeloned forward when they should have been.<sup>130</sup>

Two major changes in supporting the operational plan added extra friction to the already difficult task of supply distribution. First, the force was supposed to switch from bottled water after the fifth day of operations to bulk water. However, the decision was made that the troops would only use bottled water throughout the operation. Now it took double the amount of cargo trucks to move bottled water compared to food.<sup>131</sup> Finally, unanticipated unit moves required diverting cargo trucks for this task. Stiff enemy resistance along the LOC near As Samawah and An Najaf required reshuffling units from the 101st Airborne Division and the 82nd Airborne Division in order to allow the 3rd Brigade of 3rd ID to move on Baghdad.<sup>132</sup>

Road conditions and congestion, plus the 24-26 March *shamal* further affected the distribution capacity for Army theater logistical units. Initial photographic intelligence of the MSR showed what was thought to be a network of improved asphalt-paved two-lane roads. The photos proved wrong as the road way was paved in some areas and dirt roads in others. The two-lane road edges and shoulder were dilapidated and reduced the paved roads down to one lane. Driving in the shoulder consisted of vehicles driving in fine sand and slowing down. Enemy resistance in urban areas shifted supply routes west, which further added difficulties in extending MSRs and slowing traffic down by going off-road.<sup>133</sup>

Maintaining the planned 30 kilometers per hour proved impossible.<sup>134</sup> Some convoys consisted of serials having hundreds of vehicles and stretched for miles.<sup>135</sup> Vehicles getting stuck required recovery operations, over-exhausted drivers falling asleep caused accidents or just

blocked roads with trail vehicles not knowing what was going on ahead of them. In 3rd ID's after action report (AAR) points out the adverse effects of an ill planned movement control plan, "As 3ID(M) moved north, the terrain became very restrictive. As the desert quickly changed to elevated roads with restrictive terrain, units were forced to travel along a single route for hours. Well-planned and enforced movement tables must be trained. Without a solid movement plan, critical assets may not reach a crucial place on the battlefield at a desired time."<sup>136</sup>

Organic transportation within the division proved to be the lifeline to extend the supply distribution process and helped to ease mounting challenges. Motor transportation assets within the brigades and division had to download supplies from their trucks and move to establish logistics support areas to retrieve needed supplies. The support battalions did not have the capacity to deliver supplies directly to each brigade. While this process aided in refitting the forward units, it caused major strains to supporting ongoing combat operations and created additional risks to division resupply convoys.<sup>137</sup>

Working with the lift capacity available, the priority went to carrying fuel, ammunition, food, and water. Spare parts, construction materials, and class II supply items were shipped when space was available with the four priority classes of supply. However, due to the poor distribution method for marking and shipping non-priority items they rarely made their way to the requesting unit.<sup>138</sup> There was no means to track and ensure critical items made it to requesting units as parts or supplies could be intercepted by another unit in the chain. This break down for shipping critical repair parts often led to units cannibalizing equipment or taking parts off damaged or destroyed equipment. When there were no parts available, combat gear and equipment would not go into combat but sit idle in a brigade or battalion maintenance collection area. Both thunder runs suffered from vehicles not participating in combat operations for

varying maintenance reasons with no repair parts available. Operational level shortfalls for distributing critical repair parts created unnecessary tactical level problems. The problem did not stem from parts not being in country, but from a poor supply chain system in getting the correct parts to the requesting unit.

### *Looking to What the Future Offers*

In looking to the future, new transportation capabilities and technologies need to be tested, procured, and employed to support distributed operations at both the tactical and operational level of logistics. Unmanned ground and air platforms will provide new ways to plan and execute distribution systems and sustain operations in tomorrow's fight. Ground resupply convoys could be designed with a mix of manned and unmanned vehicles to offset enemy dangers, operate 24-hours a day, and limit risks to humans in order to deliver supplies. Supply distribution networks would be revolutionized from the traditional hub and spoke method limited by the fatigue of a driver and hours a human can operate in any given day.

Today, there exists unmanned ground vehicle (UGV) technology where a robotic system can operate cargo trucks in a fully autonomous or supervised mode. This technology is provided by either adding a kit to an existing manned vehicle or completely redesigning an unmanned vehicle from the ground up. Two benefits come from this type of approach to designing unmanned vehicles. First, the kit is a cost savings measure in using pre-existing vehicles and respective repair parts for that vehicle. manned system and turn it into an unmanned system. Secondly, the benefit of redesigning vehicles is the potential for reducing a its length. Take a cargo truck for instance, a redesigned truck without a cab could substantially reduce the overall vehicle length. With the limited space on a ship, a shorter vehicle can make room for more equipment or other supplies.



Similarly, Unmanned Aircraft System (UAS) like Lockheed Martin's K-MAX are required to create new ways to rapidly resupply and sustain distributed operations. It will be vital to create a means to use the air domain to bypass an enemy force, rugged terrain, water, and congested LOCs to deliver critical supplies. In the situation from OIF where it was difficult to ship critical maintenance parts to the correct requesting unit, in the future, logistics UAS platforms could fly directly from the supply source to the requested unit's position. Additionally, a UAS platform could be loaded to resupply several units based on available space and weight to multiple units in one movement. Supplies could be delivered to a stationary position or to a unit on the move as in the march to Baghdad.

#### *Increasing Force Protection within Logistics Convoys*

The question and problem to solve becomes how to find the right economy of force as defined in JP 3-0 to protect the LOCs and logistics units and not bleed off forces required for combat operations.<sup>139</sup> Both the Army and the Marine Corps had similar challenges protecting their LOCs and rear areas along their axis of advance to Baghdad. For future fights, the protection of the rear area and security along extended LOCs need to be addressed. As the MOC points out in section 6.2.6, the Marine Corps will need to "Develop the capabilities across all warfighting functions that enable the MAGTF to operate in a distributed posture in a complex non-permissive environment."<sup>140</sup>

Protecting the LOCs is vital to the sustainment of the force. This challenge gets even more pronounced as the exterior lines are extended further and further from logistics hubs. Distribution methods via ground or air are not difficult in concept but become difficult in execution as enemy forces work to sever LOCs and cut off maneuver forces from their support base. Logistics convoys by the nature of their offensive capability and composition become

“soft targets.” Additionally, attriting logistics convoys or applying pressure to supply lines have second and third order effects on the forward maneuver units. The importance in this planning comes from ensuring the right force protection for logistics units in order to extend and sustain a maneuvering force.

Logistics units are vulnerable in areas like complex terrain or urban areas and requires a new means of providing internal force protection. Forward units will require sustainment to remain in the fight and maneuver units cannot always be planned on to escort or secure every inch of a LOC. As 3rd ID’s AAR points out every unit needs to provide their own protection “All units must train to secure themselves. Even with pockets of resistance in urban areas, and not all main supply routes (MSR) completely secure, CS and CSS assets must be pushed forward. Units will not be able to rely on maneuver units to provide constant convoy security. All units must focus on securing themselves during convoy operations.”<sup>141</sup> When analyzing force protection for logistics convoys, one must first look at the equipment and offensive capabilities provided them at the organic level. The MOC lists three critical tasks in section “6.2.6 Train and Fight as Distributable Forces” that will require new force protection means to protect vulnerable logistics elements to support the anticipated future environment:

- Develop a blend of 21st century warfighting capabilities to enable the MAGTF at any scale to conduct maneuver warfare.
- Develop the capabilities across all warfighting functions that enable the MAGTF to operate in a distributed posture in a complex non-permissive environment.
- Explore the extent to which distributed MAGTF elements will require situational awareness, fires, logistics, communications, and maneuver assets to secure landing sites or maneuver to objectives deep inland.<sup>142</sup>

Thunder Run II serves as an example of how logistics trains become extremely vulnerable in an urban fight with complex terrain among a determined enemy force. Task Force *Rogue* Battalion’s logistics train lost five out of 21 cargo trucks due to enemy fire in one

engagement on 7 April 2003. At the tactical level, this high ratio of cargo trucks destroyed is a heavy toll to endure. Moreover, failing to resupply a main effort attack critically low on supplies and reaching towards a culminating point could decide strategic level outcomes. When looking at distances between positions for Thunder Run II, the length between Objective SAINTS and downtown Baghdad was just under 20 miles with five separate resupply points for 2nd Brigade. However, in the larger context of Operation IRAQI FREEDOM, the supply lines from Kuwait to Baghdad along the Army's axis of advance was over 400 miles. V Corps had to use as many forces advancing on Baghdad to protect and secure the rear area and LOC.<sup>143</sup> Elements of the 82nd Airborne and 101<sup>st</sup> Airborne were diverted to deal with securing the LOC. Areas around As Samawah, An Najaf, and Karbala had pockets of resistance as V Corps's main effort bypassed Iraqi strong points to use speed to advance on Baghdad. In extended LOCs, logistics units need to be ready to defend themselves and project offensive capability to not be seen as a "soft target."

When equipping logistics units for tomorrow's fight, four areas need to be looked at and require attention within force protection for retooling the force. First, mounted weapon systems consist of either a heavy or medium machine gun (i.e., .50-caliber machine gun, Mk-19 grenade launcher, or M-240G machine gun) attached to the pintle point of a turret system. Second, the gunner turret armor protection comes in a few different types: only a front shield, a front shield with back armor (with open slots to front left and right quadrants), and a fully encased turret with front shield and surrounding armor. Unfortunately, in all three variants, the gunner is exposed to enemy fire in urban terrain in the sides and rear, to each front left or right quadrant, and in every variant the gunner is exposed to overhead fire. When comparing the gunner protection of a logistics vehicle convoy to that of an armored vehicle there is no question which individual is

disadvantaged. Third, the weapon system is not firing from a stabilized weapons platform but rather from a rigid platform, unable to deliver accurate fires while a vehicle is moving. Finally, the number of internal radios and communications systems available to logistics convoys needs to continue to improve. Second Brigade's three logistics trains only had two radios per convoy. Since 2003, radio deficiencies in logistics units has been addressed to some degree but is still not on par with maneuver type forces.

There are only two options when firing a crew-served weapon (CSW) on a logistics gun truck, either from a hand-manipulated traverse and elevation (T&E) mechanism or free-gunning without the use of a T&E. Trying to fire a CSW and hit a point target while moving with an un-stabilized weapon system is nearly impossible. The vehicle's movement and vibrations greatly reduces the round's accuracy. The best way to suppress or destroy enemy targets using a T&E is to stop the vehicle, become a stationary base of fire, and suppress enemy targets. While this method is effective in improving round accuracy to hit any given target, it also provides the enemy a nice stationary target to fire at. This is not a great option when the vehicle mounting the CSW is an ammunition or fuel truck. Free-gunning is firing a CSW while mounted in a turret pintle but not attached to a T&E. This provides the freedom to quickly move a CSW in any direction but diminishes the accuracy of the round impacts. By not using a T&E, all mechanical stability is removed and employing the weapon system now relies on the muscular ability of the individual gunner.

Trying to fire accurate rounds from a logistics gun truck on the move and on target is almost impossible. When a vehicle is moving, the round accuracy exponentially deteriorates when firing at the sustained, rapid, or cyclic rates in an un-stabilized system. Suppressing and destroying enemy targets is left to a few lucky rounds impacting the designated target, while a

large portion of the ammunition fired is wasted. The trajectory of each round is random, subject to the vehicle steadiness, and compounded by the strength of the individual gunner. Previous factors defeat the weapon systems designed beaten zone, effectiveness, and safety when firing among friendlies. Free-gunning is highly discouraged or approved in any training environment or live-fire exercise. At greater distances the error factor for accurate rounds is only exacerbated with a potential of creating collateral damage.

More needs to be done with re-designing turrets and the associated armor for CSW gunners on gun trucks. Positioning gunners high and exposed to enemy fire is senseless, especially when compared to the protection afforded gunners inside armored vehicles. In the same vain as Bob Scales discusses in the book *Scales on War* for creating capabilities in the infantry to have overwhelming kill ratios comparable with aircraft,<sup>144</sup> similar actions need to be taken with the force protection of logistics convoy gun trucks. There is no reason for not moving a gunner inside a vehicle outfitted with a video game controller linked to a remotely stabilized and mechanical gun system. The remotely operated system could take advantage of today's spectrum of night vision technologies and optical zoom optics to provide first round effects on a target. Immediate rounds on a target, at the maximum effective weapon system range, would lay waste to enemy targets and exponentially improve the survivability of a logistics vehicle. Each round would have effects on the designated target. The one instance of a Soldier firing through his windshield to kill an Iraqi should not be the final answer in a self-defense scenario; and drivers of logistics vehicles should not have to fire a rifle with one hand, while the other hand is on the steering wheel.

Additionally, these new weapon systems could be employed across the joint force in new ways. Future gun trucks in any type unit could be employed to fulfill the task of a sentry on

guard duty in an expeditionary environment or used in a picket line fashion to observe and cover obstructed terrain. There is no question that this type of weapon system could have saved the lives of Booker, Marshall, and Stever on each of the two thunder runs. Moreover, this type of weapon system could protect or prevent other warriors from being wounded or killed in combat. How many other Marines and Soldiers could a system like this save or protect? The answer is many. The next section of this paper sets out the design of an operational decision game to test the author's future logistics concept. The scenario is set in a modern day urban fight.

### **Operational Decision Game (ODG)**

The case study of Thunder Run I and II served as a historical review to look back in time and analyze the *Battle for Baghdad* in order to develop a future military concept. In the battle, Iraqi force's initial strength played to the ability to fight in complex urban environment to attrite a superior force, and win the informational narrative to create an early political settlement. However, 2nd Brigade was an agile force that used speed, firepower, and maneuverability to generate combat power to paralyze and destroy Iraqi forces in the capital city. Second Brigade succeeded from its ability to sustain combat power overmatch against the enemy's defensive strategy and tactics. As 2nd Brigade crept towards a culminating point on ammunition and fuel, the brigade was able to push logistical elements forward to resupply maneuver forces in contact with the enemy, which became the deciding factor in 2nd Brigade remaining in downtown Baghdad versus withdrawing.

In transitioning from the case study analysis to a future concept, an operational decision game was created to aid in refining ideas and concepts for future battlefield logistical requirements. The ODG was set in a current day scenario, similar to the urban setting where Thunder Run I and II took place. The intention of the ODG was to test a future logistical

concept required to support a maneuver force engaged with enemy forces in an urban environment. Finally, the intent of the ODG was to extract new ideas, make refinements to initial concept assumptions, and see what other applications the concept might support outside of maneuver forces.

### *ODG Design*

The ODG was designed around a modern day urban fight in Iraq with the mission to defeat and clear out Da'esh forces located inside western Mosul. The scenario's situation develops around Iraqi Security Force (ISF) efforts to seize the western half of Mosul break down following a year of fighting. Da'esh continues to reinforce fighting positions in the western half of the city in anticipation of a final push by Coalition forces. Daesh leadership declares the "fate of the Caliphate rests in the battle for Mosul." The Coalition force, consisting of an American Marine Expeditionary Unit, an Army Heavy Combat Aviation BDE, an Armored Brigade Combat Team and other enablers (see Appendix A), must attack into western Mosul to destroy Da'esh forces in order to seize key terrain and deny Da'esh forces ability to rule Mosul. In addition to the existing equipment and technologies both the US Forces and Da'esh forces use, the ODG game includes the future logistical concept described in the "Urban Concepts" section of this paper.

In designing the ODG, the author believed the ODG players would use the future logistics concept in a similar fashion as the Thunder Run II resupply mission, by maneuvering a superior force at the enemy's gaps and then resupply forces at will to maintain the initiative, and prevent a culminating point in an urban fight. With incorporating the ability to tailor a logistics convoy with only essential supplies and convoy vehicle numbers, friendly forces are able to reduce the logistics footprint and the protection requirements for them. Additionally, with

logistics convoys having an increased weapons system lethality and force protection capability, the author expected to see ODG players use less maneuver forces for convoy protection missions. Finally, the author thought that the weapons systems incorporated into the logistics concept would give the ODG player an ability to employ convoy vehicles into a strong point, capable of defending resupply points, or integrating into the maneuver forces offensive or defensive plan. In testing the author's assumptions, the ODG incorporated small unit type ambushes along the Coalition force's MSR's and canalizing complex terrain located in the western side of Mosul.

### *ODG Responses*

The author developed the ODG, "The Siege of Mosul," (See Appendix A) during the month of January 2017, and disseminated it on 22 February 2017 to play within the Advanced Studies Program group. In mid-March, the author collected the final game, totaling seven completed games from seven different players. The depth of the game responses differed between each returned game. Some games were completed in its entirety with other games only partially filled out with a graphic course of action (COA) and narrative. (See Appendix B)

As for the player's background, this too varied among all the participants. The players were field grade officers with a specialty in the infantry, aviation, intelligence, acquisitions, and the author's instructor. Additionally, one player serves in the Air Force, three players serve in the United States Marine Corps, two players serve in Army, and the final player was the author's instructor. With varying backgrounds, deployment experiences, and knowledge in logistics, the author acknowledged this during the feedback process in refining his future logistics concept. The views, opinions, and ideas from each game player provided a balanced approach for



feedback from the different war fighting functions. Finally, the feedback provided valuable information for the author in refining the final logistics concept.

### **Future Concept: Technology for Urban Terrain**

Created by: Majors Rachell Baca (USA), Zachary Iiams (USA), Jonathan Peterson (USMC), and Alexandra Plunkett (USAF)

From the siege of Carthage in the Third Punic War to the current battle for Raqqa, wars have been fought in cities throughout history. Cities present militaries a multitude of challenges that are not present in open terrain, yet urbanization is expected to increase to the point that sixty percent of the world's population will live in cities by 2035.<sup>145</sup> As William Roseanau highlights in his article "Every Room is a New Battle: The Lessons of Modern Urban Warfare," open terrain, in contrast to urban terrain allows "maneuver and the virtually unrestricted use of firepower [...] where tall buildings, narrow streets, noncombatants, and other obstacles are few or non-existent."<sup>146</sup> The characteristics that make the urban environment challenging for US forces, provide the enemy excellent terrain where they can exercise an asymmetric advantage. As a result, the MOC emphasizes that "operations in urban areas are the most likely to occur and the most dangerous."<sup>147</sup> Further, the MOC emphasizes the Marine Corps must "Exploit man-machine interface and manned-unmanned teaming (MUM-T) to overcome challenges in urban terrain."<sup>148</sup> To this end, the Technology for Urban Terrain is a four system solution taking advantage of advances in the man-machine interface and MUM-T to close gaps across multiple warfighting functions and increase US military success in the urban environment.

The systems that comprise the Technology for Urban Terrain together contribute to the warfighting functions (WFF) of intelligence, fires, logistics, force protection, and maneuver. First, the big data, machine learning/artificial intelligence (AI) analysis tool, called Needle

Finder, contributes to the intelligence WFF by providing added support to the intelligence analyst already on the ground. This big data tool enhances any analyst's ability to better and more quickly "facilitate understanding the enemy, terrain, and civil considerations."<sup>149</sup> It also enables enhanced support to the targeting process by providing more in-depth, holistic analysis of situations, places, and people during the find and fix portion of the targeting process. Big data machine learning/AI assisted analysis will provide analysts the ability to sift through massive amounts of data ranging from full motion video, to social media, to smart home data quickly to help develop and provide better situational awareness as well as develop pattern of life within a given geographical location. Enhanced analysis capabilities will lead to more accurate, precise targeting, increasing both our kinetic and non-kinetic effectiveness while decreasing collateral damage and overburdening units and assets.

The second system is a drone system that contributes to maneuver, fires, force protection, logistics, and intelligence WFF. The Drone Squad (DS) is a scalable system composed of a single system at the squad level that can be integrated into a drone swarm option to provide support to multiple echelons of command. The DS can also be customized by mission because of the different payloads the DS can carry. Payloads can vary from a direct fire capability, target acquisition capability, intelligence support capability, and a chemical, biological, radiological, and nuclear detection capability. The DS provides a multitude of mission support functions to the squad level and higher echelons. In support of maneuver, the DS can gain an advantageous reconnaissance position that enables US and coalition forces to quickly maneuver on the enemy. The DS can engage the enemy via the support packages and force enemy movement, and support US and coalition forces control of an area by increasing the distance a force can control by reducing the limitation of blocked line of sight due to terrain. In support of the fires WFF the DS

can maneuver through or over terrain ahead of any US or coalition force to provide a position to request indirect fires that prevents US or coalition forces from exposing their position to enemy direct or indirect fire. The DS small signature will allow the DS to remain in place to observe the effects of indirect fire missions. In support of the force protection WFF the DS can enhance the defensive measures US or coalition forces are using in support of operations, and assist in the identification and location of friendly forces across the battlefield. The DS can also support logistical or combat operations by being able to move ahead of forces around dead space to identify obstacles or threats. Lastly, in support of the intelligence WFF the DS is a fast method for lower echelons of command to collect data in the operating environment and then provide threat assessments or targeting identification to US or coalition forces on the ground.

The third system is the optionally manned and armed logistics vehicle (OMALV) and primarily supports the logistics WFF. However, the system contributes directly to both maneuver and force protection in sustaining combat power. This system is an unmanned ground vehicle (UGV) platform that provides manned, autonomous, and tele-operated tactical-level motor transport operations. Moreover, OMALV offers the ability to scale the composition of convoys with up to five unmanned vehicles to every manned vehicle. This manned and unmanned scalability allows convoys the ability to task-organize to the threat environment. Additionally, the OMALV is armed with a stabilized weapon system capable of autonomous and tele-operated fire controls. A day and night optic provide for precision fires during all hours. Each OMALV is able to act as a wingman in a leader-follower manner to provide mutually supporting fires while convoys make their way along a route. Finally, the Drone Squad is able to integrate with the OMALV for ISR support and application of indirect and direct fire systems.

The fourth system is the Active Denial System (ADS), which is a non-lethal counter-personnel system that contributes to the fires and force protection warfighting functions. In terms of fires, the ADS produces non-lethal precision effects from a variable standoff range. The ADS affects human targets and the energy that the system emits causes the targets to move out of a specific area. This system reduces collateral damage that might otherwise occur from lethal fires in an urban environment. The ADS fires will mostly support close operations and can be used in fires in support of decisive operations, shaping operations, or sustaining operations depending on the commander's purpose. Likewise, the ADS will provide protection to US and coalition forces by enhancing survivability and effectiveness of friendly forces. Since the ADS repels people at a certain radius, it will minimize mobs in the vicinity of US forces and create a standoff distance that makes threats from enemy weapons less effective.

The Technology for Urban Terrain future concept incorporates four new systems that will benefit US and coalition forces in the urban environment. This concept will describe the following four systems: Needle Finder, Drone Squad, OMALV, and the ADS. For each system in the Technology for Urban Terrain future concept, this paper will provide a problem statement and a hypothesis for how the system proposes to solve the problem. Next, this paper will present a capability description, concept of employment, and measures of success for each future system that the concept proposes. Finally, this paper will provide system tradeoffs and recommend areas for future research.

### **Needle Finder- Big Data Machine Learning/Artificial Intelligence (AI) Analysis**

Problem Statement: The world has gone digital and the amount of big data that each person and organization produces daily continues to increase leaving an even bigger digital thumbprint. Billions of hours and terabytes of information is left unanalyzed and unexploited, with even

more millions being generated in near-real to real time. The United States military must figure out how to harness and analyze big data quickly, and increasingly, with less people.

Hypothesis: If the government uses an operational research approach to existing artificial intelligence (AI), analytical software, and programs then the capability required by the military will be available for employment in less time than it would take to procure new programs.

Capability Description:

Needle Finder is a program that sifts through available historical and current data, and has the AI to analyze the data within the means of a unit mission set. The Defense Advanced Research Projects Agency (DARPA) is currently researching six programs that focus on the development and use of AI for analysis and prediction as well as programs to provide analysis and recommendation for action against critical influencers through social media. The Department of Defense (DoD) will purchase access to large repositories of data such as Closed Circuit Television (CCTV) of urban areas, personal fitness devices, smart home devices, and all social media platforms. Needle Finder will use the data the DoD purchases and its repository of full motion video, imagery, and measures and signatures data to sift through for analysis when an analyst prompts it to assist in finding and fixing targets. Analysts will be able to run multiple queries based on mission sets simultaneously. The program will then sift through all of the data available, historic and real-near real time and provide predicative analysis to the analyst as recommendations to possible human and material targets, pattern of life tracks, locations for attacks, protests, or gatherings, etc. The analyst will either accept, decline, or flag to continue monitoring. Through the analysis and approval process the artificial intelligence learns patterns and links between physical and human networks and continues to provide recommendations.

### Concept of Employment:

The DoD will purchase access to large repositories of data such as personal fitness devices, smart home devices, social media platforms, and CCTV footage in the area where forces are deployed. Needle Finder will access all of these repositories as well as all full motion video and raw data in the DoD repository, and will process data using a cloud interface on any computer. This capability will be resident at the Army Brigade or equivalent and higher Intelligence Section (S/G2), specifically to the analysts who are responsible for fusion of information and intelligence.

Intelligence analysts will input the unit mission set and nest it with higher headquarters's mission to enable boundary analysis, which will enhance the find and fix portion of the targeting process and force protection. The analyst sets the mission geographical boundaries to narrow the initial data sift and analysis. Once the program identifies a person, place, or thing of interest it will then automatically widen its aperture to find links and connections both in and outside of boundary or prescribed data sets. Artificial Intelligence will then provide basic analysis of the targets identified, i.e. analysis of imagery highlighting change detection on the roof of a possible combatant. It will also then identify the individual who owns the building providing social network handles and an initial social media scrape of the individual's accounts. All of this information and analysis will be flagged for the intelligence analyst to confirm or deny the target for further analysis and monitoring or not.

### Measures of Success:

The most important measure of success for this concept is the amount of time it takes to cycle through the targeting process: find, fix, and finish. Upon entrance into a theater it may take months for a unit to fully develop and understand the operating environment, and only then

can targets be engaged. Success would enable this understanding of the operating environment and key players within it in a matter of weeks instead of months. Success depends on the US forces's ability to more rapidly and holistically understand the problem and commit fewer assets, but with greater fidelity of the situation, resulting in more effective results quicker.

#### Tradeoffs:

US forces must make tradeoffs in its development of big data analysis tool. First and foremost is the initial access to the data. DoD will have to purchase access to many data services that would provide information such as personal fitness devices and smart home devices etc. While DoD could utilize a small portion of its budget to purchase such data, the overall Defense budget is fluid from year-to-year and dedication to such a program may require shifting focus and funds. Second, the organization recording and archiving CCTV footage may only archive data for a limited amount of time. Additionally, as individuals and organizations move to recording and storing data on cloud networks, the DoD's reliance on networks will become essential. The DoD's preparation prior to entering a new theater will become and remain essential to gaining and maintaining the digital initiative. Understanding the network infrastructure and digital footprint of the countries the DoD is focused on as well as requesting and purchasing the proper data feeds will be crucial.

#### Areas for Future Research:

Once the Needle Finder is fielded and providing support to the intelligence analyst additional research and development could further develop support possibilities of the technology. First, further development of AI and machine learning could lead to future "less man-in-the-loop" target discretion and analysis, providing and executing recommendations for target engagement. Flagging targets as important non-kinetic (think Information Operations or

capture targets), kinetic targets (think kill/destroy), or engagement areas would enable faster planning cycles, greater fidelity and discretion of asset engagement, and limit collateral damage. Second, future research and development might focus on AI's ability to calculate more accurate second and third order effects outcomes based on method of target engagement. This would provide the man-in-the-loop greater fidelity of effects on the ground allowing for more accurate follow-on planning and actions. While this development would further AI, it will never fully replace the manned-unmanned team of machine, analyst, and operator.

### **Drone Squad**

Problem Statement: Dense urban terrain (DUT) provides the enemy multiple opportunities for forces to maneuver undetected and gain an advantageous firing position due to limited ISR assets.

Hypothesis: The Drone Squad provides, beginning at the squad level, an intelligence, surveillance, and reconnaissance (ISR) capability with mission swappable pods that enhances the forces ability to conduct missions.

Capability Description:

The DS is a small drone system at the squad level that provides local ISR to the squad and has swappable mission modules that leaders can choose to employ based on mission requirement. As mission requirements change the individual drone can be linked to other drones to form the DS. In the DS set up, the drones can be linked together to move and maneuver as a separate force with different mission pods as required to accomplish any assigned mission.

Concept of Employment:

A squad could use an individual drone for local ISR to provide time and distance of nearby enemy so leaders can determine threats and risk to force. The drone will allow the



operator to look ahead, see around dead spots, or lead into confined areas to determine risk. For example, an infantry squad leader could send a drone into a house first to identify if there are any hostile forces inside or a vehicle commander could use a drone ahead of his vehicle or convoy, around a blind spot, or into an intersection to determine if the route is visually clear of threats. Depending on the mission pod the drone is carrying, if the drone discovers a threat, the operator could engage the threat with the drone directly, call for indirect fire, maintain observation, or track the threat.

If the commander requires multiple drones to cover an area, he could employ them using the DS concept. A platoon leader would be able to employ four drones in a DS and Company Commander could employ as many as 12 drones in a Company level DS. A Battalion commander and higher would be able capitalize on the number of operational drones to design mission specific DS. Operating using the DS concept allows the commander a quick response to a critical situation, such as target development, support to troops in contact, or personnel recovery. If the commander requires target development he could task the DS to fly a reconnaissance mission to identify routes, to determine target location based on biometric scanning, or to fly a repetitive pattern to determine pattern of life. The commander could respond to a troops-in-contact situation by employing the DS to provide a faster ISR asset response, indirect fires capability, or to maneuver on the enemy force. Due to the DS scalable size, the DS could support personnel recovery efforts by providing a wide search area, using biometric scanning mission pods to identify personnel involved, tracking the missing personnel, or providing fire support until recovery. The DS concept provides leaders a low cost and responsive ISR asset for quickly evolving battlefields.

### Measures of Success:

The two measures of success for the DS are reduced collateral damage and increased situational awareness at the squad level. A squad would need to assess the reduction in collateral damage during actual combat situations due to the difficulty of fires clearance, operator training, and target identification. It would also be useful for evaluators to assess collateral damage at military training centers before the DS is used in combat. A squad can assess its increase in situational awareness during home station training and during training at a military training center. The unit's willingness to train with the DS from the individual level and higher is the most significant factor in whether the squad will see an increase in situational awareness.

### Tradeoffs:

The drone or the DS would still require an operator, reduced flight time, and payload size. The operator can set the drone or DS to operate semi-autonomously, but the DS will still require an operator to verify targets for engagement, load mission plans, pilot the drone if wanted, and provide maintenance. The operator still requires training to operate the drone, however, since the drones are based off of current market systems, units could leverage the knowledge base of personnel who already know how to pilot drones and create a unit training plan. Additionally, the DS utilizes commercial-off-the-shelf drones, whose flight time is limited to battery life. Current drone systems have approximately thirty to forty minutes of flight time. Therefore, the leader would need to take battery constraints into consideration for ISR planning, or ground units would need to carry additional batteries to keep the drone operational.<sup>150</sup> Finally, the drones have a limited payload capacity. Considering recent evidence, criminal organizations that use drones to deliver drugs into prisons have been limited to the weight of a hand gun, which is approximately three pounds.<sup>151</sup>

### Areas for Future Research:

Although current commercial drones can avoid obstacles and track targets, there are still areas to improve the DS capability. First, the mission pods are based on multiple commercial-off-the-shelf drone systems, such as facial recognition, land survey, and CBRNE detection drones.<sup>152</sup> Mission pods need to be designed to fit the size, weight, and power constraints of the drones. Second, to use the DS concept, each drone needs an easy-to-use swarm software program that would allow fast linking and processing power distribution to allow for data management. Third, the DS would require integration with or access to a database to pull information. This information could range from biometric, vehicle, or weapon identification information. Fourth, while current drone systems do have onboard maneuvering capability, the DS requires additional research and development on artificial intelligence to maneuver against a target so that the drone can utilize additional drones, cover, and concealment. Fifth, to be as functional as possible, the drone requires longer battery life and additional payload capacity, while retaining a small deployable design. Lastly, to assist in mechanized or motorized operations, the DS could benefit from a vehicle mounted launching and charging station.

### **Optionally Manned and Armed Logistics Vehicles (OMALV)**

Problem Statement: In both the open and urban environment, traditional ground transportation vehicles in the logistics community are not currently configured or equipped to meet the force protection demands and distributed environment described within the Marine Corps Operating Concept.

Hypothesis: The employment of optionally manned armed logistics vehicles will minimize friendly casualties by keeping personnel out of harm's way, increase convoy force protection,

extend sustainment requirements for distributed maneuver forces, and re-allocate manpower to other high demand force structure requirements.

Capability Description:

The optionally manned and armed logistics vehicle (OMALV) is an unmanned ground vehicle (UGV)<sup>153</sup> able to provide tactical-level ground transportation lift and internal convoy security. The OMALV is either operated as a traditional ground logistics vehicle with a human driver and internal crew or operated autonomously in a leader-follower fashion linked with a manned command vehicle. When an OMALV is not manned, the unmanned vehicle is able to navigate autonomously or by inputs from the associated command vehicle. The ratio of manned versus unmanned vehicles in planning convoy operations is one to five.<sup>154</sup> The OMALV weapon system is tele-operated or autonomous and outfitted with a stabilized crew-served weapon ranging from a M249, M240G, Mk-19, or a .50-cal machine gun.<sup>155</sup> Additionally, the turret system would put the gunner inside the vehicle and out of harm's way by configuring the stabilized weapon system with day and night optics and engagement controller. The manned command vehicle is able to monitor up to five unmanned vehicles and network their associated weapon systems into the convoy's force protection and fires plan. Unmanned OMALVs act as wingmen during convoy operations and provide mutually supporting fires along the convoy's route either by autonomous or tele-operated operation.

Concept of Employment:

The OMALV is an armed logistics vehicle primarily employed to conduct resupply convoys and long-haul movements of supplies, bulk liquids, and military containers via motorized transportation. The OMALV system offers the capability to operate convoys at an increased rate in any given twenty-four-hour cycle with a reduced footprint of personnel.

Employing OMALVs is scalable from motor transportation platoon sized missions to a Transportation Support Battalion during Marine Expeditionary Force sized missions. The lethality of a stabilized gun system able to operate day or night provides the type of precision fires that make convoy operations “hard targets” in all environments. When engaging enemy threats, the weapon system is able to provide accurate rounds on target at the maximum effective range of the respective weapon system. Additionally, the Drone Squad could integrate with the OMALV to provide an ISR platform for convoy operations. Drone Squads would provide convoy commanders route reconnaissance information, guardian angel over-watch during road marches, and the ability to call for indirect fire or air support when the DS detects enemy threats.

Other areas the OMALV system has potential supporting are offensive and defensive operations. During offensive operations, unmanned OMALVs could provide the firepower required to conduct a reconnaissance mission or act as a vanguard when able to minimize human risk factors. The OMALVs ability to network internal fires and stream video from the vehicle’s day and night optics provide valuable intel from the ground level. Unmanned OMALVs offer new means to reduce friendly casualties such as executing bounding over-watch in complex urban terrain for manned units following in trace, executing route clearance missions along main supply routes (MSR), and all the way up to conducting movement-to-contact operations in locating and relaying enemy locations. For defensive operations, OMALVs could be employed in a defensive picket-line to over watch difficult terrain with reduced line of sight using an economy of force or set into security post duties much like a sentry in a guard post within a Forward Operating Base.

### Measures of Success:

There are four areas for measuring the success of this system: increase the lethality of convoys operations in a twenty-four-hour period, increase throughput of convoy operations in a twenty-four-hour period, decrease manpower requirements for conducting convoys, and reduce the requirement for maneuver forces to protect logistics units. Providing precision fires to convoys turns previously perceived “soft targets” into “hard targets” to attack. The increased lethality of convoy’s force protection and internal security should reduce the demand for maneuver elements embedding in resupply convoy missions or patrolling MSR. Reducing the need to man every vehicle provides the ability to generate more convoys per day and allows force structure to move to other high demand manpower fields. Success in these four areas may reduce friendly casualties by not exposing unnecessary personnel into harm’s way.

### Tradeoffs:

Several tradeoffs exist with reducing manned requirements in convoy operations. First, motor transportation (MT) personnel do more than just drive vehicles from location to location. Often, MT personnel maintain and prepare every vehicle for convoys, then load and offload supplies to their customer. There may be a tradeoff to continue to do similar activities with fewer MT personnel which may impact the current MT organization. Secondly, the cognitive load of an individual will greatly vary when monitoring unmanned OMALVs in a garrison versus combat environment. Studies will need to research the correct balance of manned versus unmanned vehicles in convoy operations. Third, enemy threats will look for ways to deny the use of unmanned technologies by means of jamming, spoofing, or creating complex environments difficult for machines to comprehend. As OMALVs are presented with new situations and environments, the OMALV will be required to have an ability to upload shared

information along the system enterprise. Fourth, as new technologies for the OMALV emerge, the new force structure will be required to maintain and operate the new system. It may be necessary to reduce MT operators at the cost of creating new requirements for more mechanics, armory and optics personnel, communicators, or other military occupational specialties. Finally, the tolerance for losing gear is not well received within military ranks, even if it is due to a combat loss. How will this approach to gear accountability change as units become less risk averse with employing unmanned vehicles in high risk situations?

Areas for Future Research:

Proven technologies for driving unmanned vehicles in extreme environments exists but the pairing of employing UGVs and autonomous weapon systems does not exist. First, in decreasing the man-in-the-loop and human cognitive load, research and development will need to address the combination of both autonomous UGVs and weapons systems. Operators of this system in a combat environment will quickly reach a tipping point of being over saturated with situational information and internal convoy task management. Research should focus on reducing tele-operated functions to the maximum extent possible to decrease the manpower requirement for conducting convoy operations. Second, vehicles breaking down or getting stuck is a common occurrence. Research will need to address unmanned recovery vehicles to remove the requirement of recovery operations currently being a manned mission. Finally, research should investigate new efficiencies in loading and unloading vehicles to address the manpower gap created by fewer MT personnel. The task to load and unload a convoy is time consuming and research will need to focus on more efficient container and storage systems and the best way to reduce friction in the delivery of supplies.

## **Active Denial System (ADS)**

Problem Statement: In the urban environment, the rules of engagement (ROE) either limit traditional fires or allow them, but traditional fires cause significant collateral damage; accomplishing the mission while minimizing friendly casualties and collateral damage requires new fires technology.

Hypothesis: The non-lethal active denial system (ADS) provides a counter-personnel capability that will reduce damage to the environment, decrease civilian and friendly casualties, and allow forces to clear areas faster to enable freedom of maneuver.

### Capability Description:

The ADS is a non-lethal weapon that provides a counter-personnel capability by using directed millimeter wave energy. The millimeter wave energy thermally stimulates nerves on the surface of the skin instinctively causing a person to move.<sup>156</sup> In the development of the system, researchers tested the system on over 13,000 volunteers and found that within seconds, reflexes caused the volunteers to move out of the beam to avoid the sensation on their skin.<sup>157</sup> This effect is the "repel effect" and causes humans to close their eyes, turn their heads or bodies, and move out of the beam.<sup>158</sup> The system has multiple built in safeguards including short shot duration, a scope for the operator to see the entire beam path, and hardware and software to adjust the beam path to adapt for environmental conditions.<sup>159</sup> Together rigorous testing, demonstrations, studies, independent reviews, and legal reviews proved the ADS technology effective in a relevant environment.

The DoD could integrate the ADS into multiple weapon systems depending on the intent for use. Currently, the maximum range of the ADS is 1,000 meters; however, shorter standoff ranges are possible. Due to the variation in standoff ranges, the ADS could be integrated into



fixed-winged platforms, helicopters, larger UAVs, ground vehicles, and maritime vessels. The power that the system requires varies with the standoff range and depends on the generation of ADS technology. A solid-state ADS technology, currently in development, will allow for a smaller form-factor with a lighter power supply that will be man-transportable and could be useful for dismounted infantry.

#### Concept of Employment:

The ADS is a counter-personnel weapon to use as a tool in the escalation of force. Specifically, the ADS should be a standard part of operations for crowd control, convoy and patrol protection, and checkpoint security. The ADS fills the gap between "shout and shoot" by providing a non-lethal weapon that gives a standoff range, but that the target cannot ignore or overlook. To incorporate the ADS into the rules of escalation of force, the military member would give the threat a verbal warning, then a visual warning using a device like a flag or light, and then employ the ADS prior to the use of lethal force. In this situation, the weapon would likely be mounted on a ground vehicle, including the OMALV, or be man-transportable by the individual. The DoD may also decide to integrate the ADS on fixed and rotary wing platforms that are providing fire support for ground forces, or use the ADS as an alternative to lethal force in close coordination with ground forces. Crew on-board a ground vehicle or aircraft could fire the system, or an operator in the rear could fire it using a low latency camera. Either way, the operator in the ground vehicle, aircraft, or rear will receive the same image through the boresight of the weapon.

Incorporating this non-lethal weapon into the inventory provides the Joint Force Commander (JFC) additional options and provide benefits for US forces in the urban environment. According to Joint Publication 3-06, *Joint Urban Operations*, "When civilians and

hostile forces are intermingled, non-lethal weapons will provide the JFC a broader range of capabilities intended to significantly reduce undesired injuries to civilians and damage to infrastructure." In addition to providing positive effects for the population of urban environments, there are benefits of using the ADS to US forces. For example, an ADS can provide friendly forces an alternative to clear angry mobs to a distance that reduces the threat of weapons against friendly forces and provides room for maneuver. There may also be a psychological benefit for US forces. Journalist David Brooks as quoted in *ARMY Magazine*, describes a scenario where insurgents use women and children in attacks against US forces causing US forces to engage, "soldiers and Marines feel a totalistic black stain on themselves because of an innocent child's face, killed in a firefight. The self-condemnation can be crippling."<sup>160</sup> In this same situation, the ADS would allow US forces to use non-lethal force.

#### Measures of Success:

The three most important measures of success for this system are reducing civilian casualties, friendly casualties, and collateral damage. An optimal decrease in these parameters is difficult to forecast since it is largely dependent on the character of the war. For example, if US forces are largely conducting air support, one might observe different results from an ADS than if ground and air forces were both heavily involved in an urban conflict. That said, a possible place to start measuring whether the ADS is successful is to look for a greater than twenty percent reduction of civilian casualties and collateral damage, and a greater than ten percent reduction in friendly casualties. Success in these measures may also increase support and trust of the local and US populace.

### Tradeoffs:

There are several potential tradeoffs inherent with the ADS technology. First, the weapon could be affected by weather and atmospheric conditions. An ADS integrated into an aircraft or ground vehicle may not be useful in inclement weather, including sand and dust storms. Similarly, the maritime boundary layer could reduce the intensity of the beam. In these cases, the user may not have the weapon available to him or the weapon may require additional power to achieve the same intensity on the target. Additionally, integrating the ADS into systems with limited size, weight, and power (SWAP) tolerances may cause operators to choose using the ADS technology instead of another sensor. For example, the MQ-9 currently does not have the SWAP to integrate an ADS, but it might be possible to integrate if the operator chose to temporarily remove and replace another sensor for missions when the ADS would be more useful. To prepare for these situations, it would be useful for the ADS to employ open system architecture and interface so it can be "plug-and-play" into existing combat systems. Finally, as with all non-lethal weapons, the ADS may not be useful in accomplishing the specific goals of the operator and the situation may escalate to a lethal engagement.

### Areas for Future Research:

While multiple technology demonstrations proved ADS technology works, additional research could increase its capability even further, particularly as the ADS integrates into other systems and platforms. First, the research and development community must continue to invest in batteries that provide sufficient power in the smallest form factor possible. Second, while initial deployment of this weapon will have a man-in-the-loop, future research should be dedicated to more autonomous employment to take the load off of task saturated operators. Third, because of vibration and atmosphere that the directed energy beam will encounter when

on an aircraft or ground vehicle in motion, research should improve beam stabilization. This will ensure the beam has sufficient intensity when it hits the target and reduce jitter of the beam on the target. Finally, a spiral development program could incorporate a counter-fire capability to protect ground vehicles and aircraft against rocket-propelled grenades and guided munitions.

#### *Technology for Urban Terrain: Final Remarks*

The four systems that comprise the Technology for Urban Terrain close current gaps across five warfighting functions in urban environments. These systems will contribute to the successes of US forces by allowing them to rely on machines to reduce cognitive load, protect friendly forces, prevent civilian casualties, and minimize collateral damage. Each system can be utilized individually or work together to achieve synergistic effects. The Needle Finder uses big data analytics to combine open source and classified data to provide better situational awareness from all available methods in an area of operations. The Drone Squad contributes to the WFF of maneuver, fires, force protection, logistics, and intelligence, and is a scalable and modular solution that adapts to the unique needs of a squad-level unit. The OMALV is a manned, autonomous, and tele-operated tactical-level motor transport system enhancing logistics, protection, fires, and maneuver in both urban and open terrain. Finally, the ADS is a non-lethal fires solution that provides protection to friendly forces by creating a standoff range between threats and the ADS system. Together, these four systems seek to reduce the asymmetric advantage the enemy has operating in the dangerous and complex urban environment.

#### **Conclusion**

The purpose of this paper sought to analyze the future of the Marine Corps surrounding two war fighting functions – logistics and force protection – in extending maneuver operations in a future distributed operating environment. By examining the actions of 2nd Brigade during

Thunder Run I and II in Baghdad in 2003, this paper aimed to identify a future logistics concept to sustain combat power in tomorrow's conflict. In fighting a distributed fight, the lethality of extending maneuver operations is incumbent upon the ability to sustain that force as far forward as possible by means of land, sea, and air. As the sustainment of a military force projects power and extends maneuver by maintaining and resupplying crucial supplies at critical moments in time to generate combat power.

The Marine Corps and the Army see the employment of MUM-T systems critical to each Services's future operating concept. The *Marine Corps Operating Concept* calls for incorporating unmanned systems throughout all six war fighting functions, "because mastering the man-machine interface offers a revolution in military operations,"<sup>161</sup> in overcoming challenges in all environments, terrain, and urban areas. Additionally, the *Marine Corps Operating Concept* seeks to capitalize on manned and unmanned systems, "to enhance survivability, increase lethality and reduce manpower requirements"<sup>162</sup> on the Marine Air-Ground Task Forces (MAGTF). The Army Operating Concept (AOC) seeks to accelerate new technologies within the Department of Defense (DoD) to maintain an overmatch on adversaries,<sup>163</sup> while, "extend[ing] the operational reach and...capability and agility of units."<sup>164</sup> The Army suggests enhancing formations with manned-unmanned teaming will allow units to cover more terrain, increase combat power, and reduce risk to personnel executing dangerous tasks.<sup>165</sup> Further, in expeditionary environments, the Army views unmanned ground systems (UGS) conducting autonomous re-supply operations critical to future operations.<sup>166</sup>

In looking to the future, new distribution capabilities and force protection technologies and systems need to be tested, procured, and employed to support distributed operations at all levels of logistics. The pairing of humans and unmanned ground vehicles and unmanned air

systems will provide new ways to plan and execute distribution systems in tomorrow's environment. Mixing manned and unmanned vehicles and aircraft will revolutionize supply distribution in the near-future. Finally, as battlefields become more complex with rear area operations closing in quickly on the frontlines, convoy operations will require new force protection technologies and lethal weapon systems for self-defense and offensive operations.

## Appendix A – The Siege of Mosul

# The Siege of Mosul

*Conduct raids against a hybrid force defending in a complex urban area IOT seize key terrain*

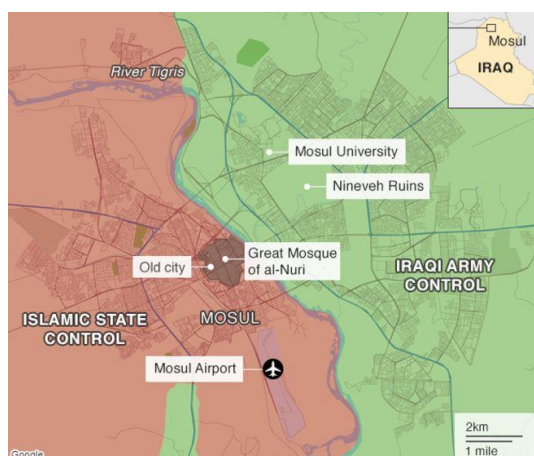
## Situation 2018: The Siege of Mosul

### Situation

- After a year of fighting, ISF efforts to seize the western half of Mosul break down
- Daesh continues to reinforce fighting positions in the western half of the city in anticipation of a final push by Coalition force
- Daesh leadership declares the “fate of the Caliphate rests in the battle for Mosul”

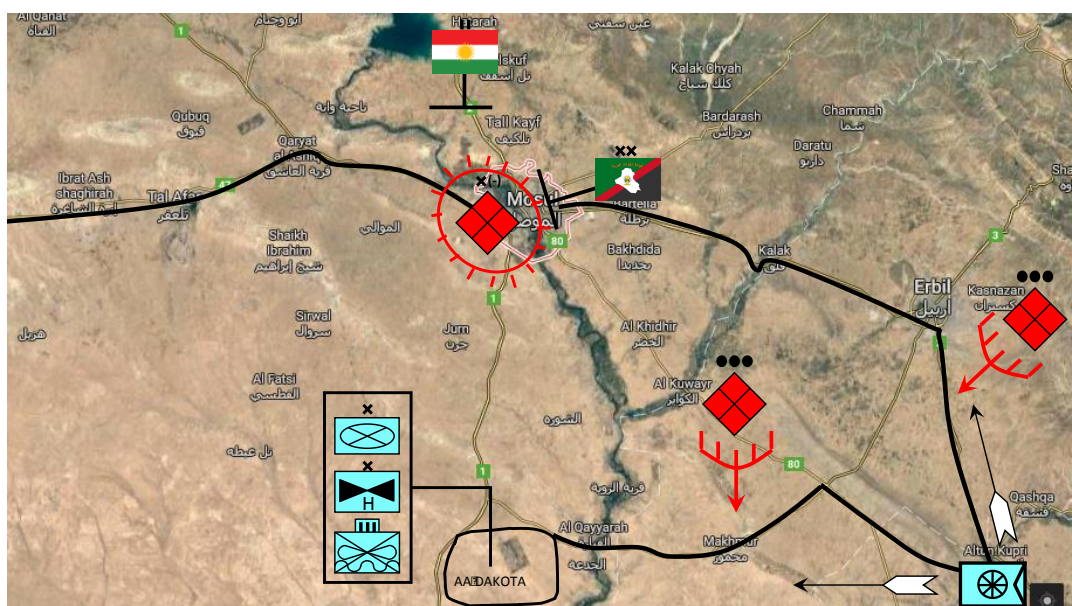
### CENTCOM Guidance

- Destroy Da’esh forces located in western Mosul IOT seize key terrain and deny Da’esh forces ability to rule Mosul
- Deny Da’esh forces ability to move forces along the Syria-Iraq road networks IOT halt their ability to reinforce or withdraw forces
- Secure friendly GLOCs IOT allow friendly forces freedom of movement
- Set conditions to enable humanitarian aid and stability operations IOT support Mosul civilian population



# Da'esh Fighters and Equipment

- BDE minus (~5,000) fighters
  - BDE is broken into five battalions (~1,000). Each battalion consists of three companies with one weapons company.
  - Each company (~200) is divided into six smaller teams with supporting light mortars, snipers, and class 1 UAS.
  - Each weapons company consists of AT-teams (RPGs), CSWs (PKM), heavy mortars, armored technical vehicles, and VBIEDs.
  - Majority of the fighters have been fighting since initial Battle of Mosul in October 2016.
- Able to quickly maneuver within the city by underground tunnels and trench line networks
  - Have had two years to build defensive positions and cache sites throughout the city
  - Able to quickly mass forces and resupply fighters in engagement areas
  - IEDs are planted along all road networks leading into the city
  - Suicide bomber attacks are carried out with by vehicles (VBIED), UAS, or vests
  - Snipers are employed throughout the city to slow dismounted operations
  - Allow armored convoys to push past friendly positions and then trap convoys with AT-team swarming tactics
- Equipment:
  - ~80 – armored technical vehicles
  - > 4,000 Small arms (AK-47)
  - > 80 mortars
  - ~18 sniper rifle teams
  - ~100 mortars
  - > 1,000 RPG-7
  - ~400 IEDs – more built as required (location of factory in SE of Warri unknown)
    - Includes IED, VBEID, HBIED, ABIED



**MLECOA is a mobile defense that uses strong points in urban terrain to canalize and attrite friendly forces. Goal is to protract conflict/retain Mosul.**

1. Daesh brigade (-) conducts company-sized strongpoint defenses in western Mosul, co-located with civilian population, critical infrastructure, and civilian sensitive sites IOT to retain the city indefinitely.
2. US forces are allowed to penetrate well inside the city IOT canalize friendly forces into defensive engagements areas. AT teams and snipers conduct harassing fires IOT fix and attrite friendly forces in complex urban ambush followed by rapid counterattacks. Exploit US casualties via social media.
3. Underground tunnel networks, alleyways, and defensive trench-line networks allow Daesh forces to mass forces quickly IOT attack canalized units.
4. AT teams are employed in swarming tactics to attack mechanized convoys in engagement areas IOT impede and harass convoy movements.
5. Daesh forces use HUMINT and UAS to collect on friendly actions moving towards Mosul.
6. US resupply convoys are attacked along the GLOC by small guerilla type units IOT destroy friendly supply lines and critical materiel.
7. Cached sites throughout Mosul allow quick resupply to Daesh forces.
8. Expect suicide bombers and IEDs (IED, VBEID, HBIED, ABIED) planted in roads, buildings, vehicles, and UAS.



## CJTF Composition (Friendly Forces)

- AEF
  - Air Intel Platforms: 1 x MQ-1 Squadron (Predator) – assume support personal in theater
  - 1 x MQ-9 Squadron (Reaper)
  - Air enablers: 3 x E3 (C2), 2 x JSTARs (ISR), 1 x Aircraft Maintenance Squadron, 1 x KC10 extender Squadron – assume enablers in theater
  - Fighters: 2 x Squadron ( 1x F-16C , 1 x F-15C)
- Maritime
  - 1 x ARG/MEU (standard loadout)
    - Additional forces
      - 1 x DET (4) F-35B (with MWSS for experimenting with Distributed Site Operations)
      - 1 x DET (2) KC-130 (with Harvest Hawk kits)
      - 1 x DET (4) MV-22
      - 1 x DET (4) CH-53
      - 1 x INF BN
      - 1 x Radio Company
- Ground
  - TSOC elements you can coordinate with
    - 1 x Army SOF Company (6 x ODA, JTAC capable)
    - 1 x Lebanese Police Group (6 x 20 PAX patrolmen detachments with shotguns, police cruisers and sidearms)
  - 1 x Heavy Combat Aviation BDE
  - 1 x Armored Brigade Combat Team
- Other
  - 2 x Cyber Support Teams (Presidential Finding in place for cyber actions against Daesh)
  - Role 3 Medical Facilities in Bagdad (with full MEDEVAC complement; ARG/MEU MEDEVAC also has facilities)

## Future Concept: Armed, Optionally Manned, Resupply?



- Significantly outperforms tele-operated systems in all weather conditions, day or night
- Achieves DPTempo up to 100 kph
- Tightly integrated kit enables optional autonomous operation
- Efficient and more protected means to perform critical missions in contested areas of operation
  - Route clearance can be performed over 500m standoff
  - Navigation can be sustained for over 10km in GPS-denied environments

- Systems integration via widely adopted open architecture standards
- User-friendly Operator Control Unit (OCU)
  - Displays only immediately necessary information
  - Facilitates swift input to maintain operational tempo
  - Requires only infrequent monitoring by operator
  - Allows single operator to control multiple UGVs
  - Easy to learn interface is immediately familiar to today's users
  - Simulation environment enables user training in less than three days

### M153 PROTECTOR

CROWS (Common Remotely Operated Weapon Station)



- M153 PROTECTOR is designed for small and medium caliber weapons, and can be installed on any type of platform.
- Detached line of sight (DLOS) enables the gunner to keep his sights on target, independent of ballistic solution for the weapon/ammunition use.
- Fully stabilized system provides unmatched observation and engagement capabilities.
- Thermal imager with dual field of view, autofocus and zoom.
- Color daylight camera allows wide field of view up to 5 degrees while observing, and more than 30 times optical magnified close-up view of the target area when identifying and engaging long distance target.
- The eye-safe laser range finder provides extremely accurate range measurements, providing the PROTECTOR first round on target capability.
- Incorporates high volume ammo and add-on armor for improved sensor and servo protection.

Under what conditions would you choose to employ his capability for resupply missions, route clearance, or offensive operations?

- UGVs for Armed and Optionally Manned Resupply convoys, defensive picket-lines, or security post duties
- Would you integrate it into fighting against Daesh forces, or area security?
- MUM-T: Would UAVs be useful in providing ISR and relaying fires control information for convoy operations?
- Ratio of manned/unmanned vehicles is 1:5.
- UGVs able to execute route clearance type missions.



## Optionally Manned and Armed Logistics Vehicles (OMALV)



Oshkosh TerraMax UGV



M153 Protector - CROWS II (Commonly Remotely Operated Weapon Station)

- **Military Problem:** In both the open and urban environment, traditional ground transportation vehicles are not configured or equipped to meet the force protection demands and distributed environment described within the Marine Corps Operating Concept (MOC).
- **Central Idea:** The employment of OMALVs will cover more terrain, increase force protection, reduce risk to personnel performing dangerous missions, extend sustainment requirements for distributed maneuver forces, and re-allocate manpower to other high demand force structure requirements.

### Overview

- The OMALV is an unmanned ground vehicle (UGV) able to provide lift for tactical- and operational-level ground transportation;
- Unmanned OMALVs operate autonomously in a leader-follower fashion linked with a manned command vehicle;
- Unmanned OMALVs navigate autonomously or by inputs from the associated command vehicle;
- Associated weapon system is autonomous or tele-operated, outfitted with a stabilized crew-served weapon ranging from a M249, M240G, Mk-19, or a M2 with day/night optics;
- The manned command vehicle is able to supervise up to five unmanned OMALVs and network their associated weapon systems into the convoy's force protection and fires plan;
- Turret system positions the gunner inside the vehicle with weapon system controller;
- Unmanned OMALVs act as wingmen to provide mutually supporting fires during convoy operations.

- **Implication:** The MOC calls for incorporating MUM-T as "the man-machine interface offers a revolution in military operations," and "enhance survivability, increase lethality and reduce manpower requirements" on the MAGTF in overcoming challenges in all environments, terrain, and urban areas. The OMALV can assist with sustaining a military force to project combat power and extend maneuver operations. The OMALV provides new ways to plan and execute distribution networks, while offering the capability to operate convoys at an increased rate in any given 24-hour cycle with a reduced footprint of personnel.

2 MAY 2017

Major John Peterson, USMC

# Solution Set

Fill in the problem framing, COA Graphic/narrative, and theory of victory slides

References on key terms are provided

# Problem Framing

Problem <u>Statement</u> (incl. list of key facts and assumptions):
Tensions Between Current Conditions and Desired Conditions:
Elements that Must Change to Achieve the Desired Conditions:
Opportunities and Threats to Achieving the Desired Conditions:
Limitations:

JP 5-0, Figure III-6

# COA Graphic and Narrative

	MISSION:
	INTENT (purpose, method, desired condition)
	CONCEPT (incl. key tasks by phase)

Use Deep, close, security & be sure combine offense-defense-stability (ULO)

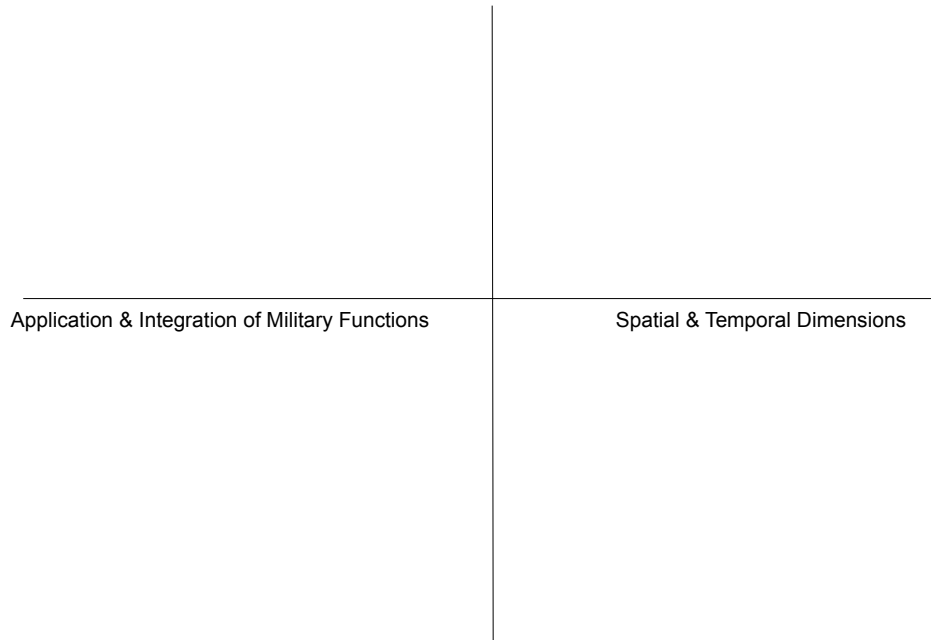
# Theory of Victory

Synopsis of your Central Idea

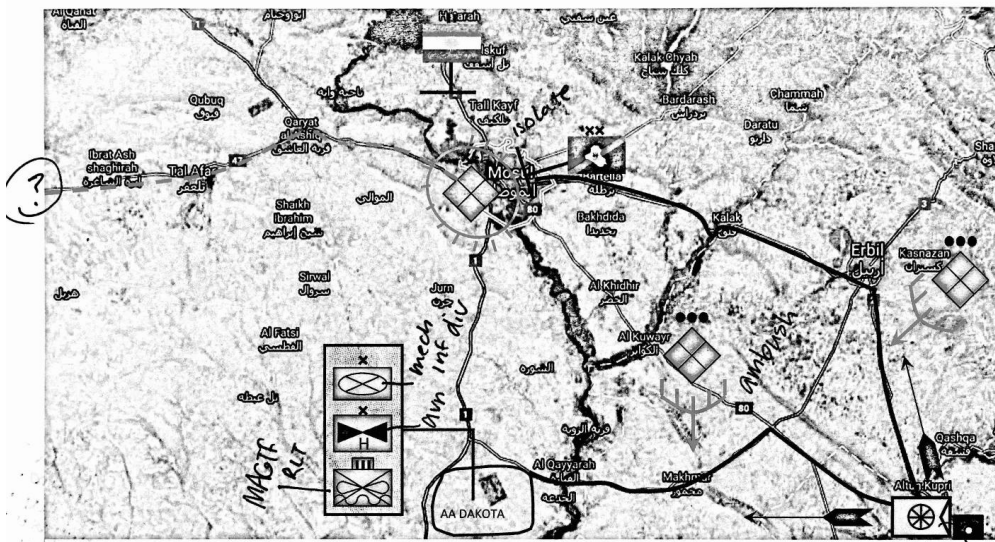
Necessary Capabilities

Application & Integration of Military Functions

Spatial & Temporal Dimensions



Appendix B – ODG Game Player Solution to Siege of Mosul Decision Games



MLECOA is a area defense that uses strong points in urban terrain to canalize and attrite friendly forces. Goal is to protract conflict/retain Mosul.

1. Daesh brigade (?) conducts company-sized strongpoint defenses in western Mosul, co-located with civilian population, critical infrastructure, and civilian sensitive sites IOT to retain the city indefinitely.
2. US forces are allowed to penetrate well inside the city IOT canalize friendly forces into defensive engagements areas. AT teams and snipers conduct harassing fires IOT fix and attrite friendly forces in complex urban ambush followed by rapid counterattacks. Exploit US casualties via social media.
3. Underground tunnel networks, alleyways, and defensive trench-line networks allow Daesh forces to mass forces quickly IOT attack canalized units.
4. AT teams are employed in swarming tactics to attack mechanized convoys in engagement areas IOT impede and harass convoy movements.
5. Daesh forces use HUMINT and UAS to collect on friendly actions moving towards Mosul.
6. US resupply convoys are attacked along the GLOC by small guerrilla type units IOT destroy friendly supply lines and critical materiel.
7. Cached sites throughout Mosul allow quick resupply to Daesh forces.
8. Expect suicide bombers and IEDs (IED, VBEID, HBIED, ABIED) planted in roads, buildings, vehicles, and UAS.

*anti tank*  
*resupply*

Respondent 1



## Daesh Fighters and Equipment

- Brigade minus (~5,000) fighters
- BDE is broken into five battalions (~1,000). Each battalion consists of three companies with one weapons company.
- Each company (~200) is divided into six smaller teams with supporting light mortars, snipers, and class 1 UAS.
- Each weapons company consists of ATGM-teams (RPGs), CSWs (PKM), heavy mortars, armored technical vehicles, and VBIEDs.
  - Majority of the fighters have been fighting since initial Battle of Mosul in October 20016.
- Able to quickly maneuver within the city by underground tunnels and trench line networks
  - Have had two years to build defensive positions and cache sites throughout the city
  - Able to quickly mass forces and resupply fighters in engagement areas
  - IEDs are planted along all road networks leading into the city → *need to clear to secure GLOCs*
  - Suicide bomber attacks are carried out with by vehicles (VBIED), UAS, or vests
  - Snipers are employed throughout the city to slow dismounted operations
- Allow armored convoys to push past friendly positions and then trap convoys with AT-team swarming tactics
- Equipment:
  - ~80 – armored technical vehicles
  - > 4,000 Small arms (AK-47)
  - > 80 mortars
  - ~18 sniper rifle teams
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  - > 1,000 RPG-7
  - ~400 IEDs – more built as required (location of factory in SE of Warrir Unknown)
    - Includes IED, VBEID, HBIED, ABIED

Respondent 1

# Solution Set

Fill in the problem framing, COA Graphic/narrative, and theory of victory slides

References on key terms are provided

## UGV questions:

- I would use terramax in 1:5 ratio for all resupply missions + route clearance
- I would use overhead ISR (manned or unmanned) + <sup>an</sup> overhead C2 (manned) to relay fire control info

Respondent 1

# Problem Framing

<p><u>Problem Statement</u> (incl. list of key facts and assumptions):</p> <ul style="list-style-type: none"> <li>- Need to secure GLOC to allow friendly resupply into Mosul.</li> </ul>	
<p><u>Tensions Between Current Conditions and Desired Conditions:</u></p> <ul style="list-style-type: none"> <li>- suicide bombers + IEDs, VBIEDs, ABIEDs, HBIEDs</li> <li>- unknown location of tunnels, trenches</li> <li>- fighters embedded amongst civilian population</li> <li>- ambushes along GLOC</li> </ul>	<p>- HUMINT + JAS collect intel</p>
<p><u>Elements that Must Change to Achieve the Desired Conditions:</u></p> <ul style="list-style-type: none"> <li>- secure GLOC <del>is</del> for ingress/egress of resupply trucks / forces + allow for movement to friendly forces in Mosul as required</li> </ul>	
<p><u>Opportunities and Threats to Achieving the Desired Conditions:</u></p> <p>opportunities- overhead ISR + C2, cyber, overhead fire support, armor brigade</p> <p>threats- IEDs, enemies amongst civilians, enemy's use of urban terrain</p>	
<p><u>Limitations:</u> <del>cannot</del> <sup>must</sup> enter city to resupply <sup>forces</sup> regardless of enemy to destroy Daesh in W. Mosul</p>	

JP 5-0, Figure III-6

Respondent 1

# Theory of Victory

## Synopsis of your Central Idea

- neutralize ~~enemy~~ infantry companies along supply routes using heavy combat aviation brigade & armored brigade combat team
- continue ~~patrol~~ to recon ~~at~~ GLOCs w/ ~~no~~ continuous MQ-1/9 coverage
- secure w/ infantry battalion

## Necessary Capabilities

- ISR heavy - FMV } MQ-1 / MQ-9
- SIGINT } SOF+
- HUMINT - Police Group
- overhead fires } ground PIC - JSTARS
- CH-46, MQ-9, F-35
- ground based fires - armored brigade, infantry battalion

## Application & Integration of Military Functions

- Fires - kinetic - from air to ground
- Cyber - disrupting social media
- lo - taking down social media accts + scraping social media for patterns of life
- Intel - heavy signals + FMV tracking - also heavy on humint
- Protection - for ~~resupply~~ log resupply troops and equipment
- use of armor, overhead fires, manned/unmanned resupply vehicles.

## Spatial & Temporal Dimensions

how long are the GLOCs that need to be secured? (distance?)

where is USAF?

Respondent 1

# COA Graphic and Narrative

**MISSION:** Secure Gloc to enable resupply for forces inside Mosul ~~at all costs~~

**INTENT**  
(purpose, method, desired condition)

purpose - ~~to~~ provide routes for resupply into/out of mosul to AA Dakota

method - clear, neutralize, recon, secure

desired condition - freedom of action along Gloc

**CONCEPT**  
(incl. key tasks by phase)

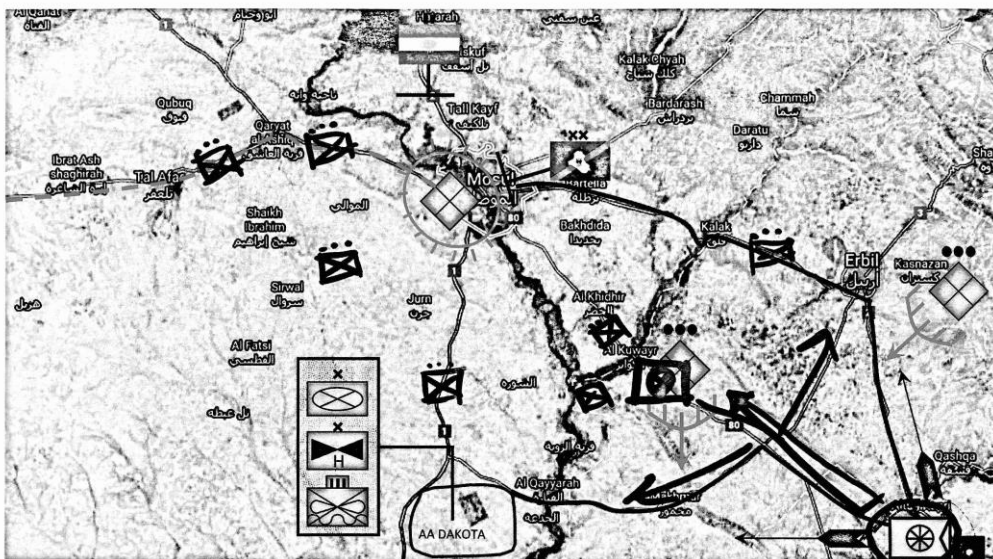
1. T clear routes of IEDs
2. T combat aviation + armored brigade neutralize enemy @ rally pt 1
3. T combat aviation + armored brigade neutralize enemy @ rally pt 2
4. T conduct FMV + Sigint collection w 2 caps off continuous coverage I/O pt 1 & 2
5. T secure Gloc w/ USMC Inf Battalion

↓ maintain freedom of action on Gloc

Use Deep, close, security & be sure combine offense-defense-stability (ULO)

neutralize 1132

Respondent 1



- MLECOA is a area defense that uses strong points in urban terrain to canalize and attrite friendly forces. Goal is to protract conflict in Mosul.**
1. Daesh brigade (-) conducts company-sized strongpoint defenses in western Mosul, co-located with civilian population, critical infrastructure, and civilian sensitive sites IOT to retain the city indefinitely.
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  7. Cached sites throughout Mosul allow quick resupply to Daesh forces.
  8. Expect suicide bombers and IEDs (IED, VBEID, HBIED, ABIED) planted in roads, buildings, vehicles, and UAS.

Respondent 2

## Problem Framing

<p><b>Problem Statement</b> (incl. list of key facts and assumptions):</p> <p><i>Supply route vulnerabilities threaten US force sustainability and EO fight</i></p>
<p><b>Tensions Between Current Conditions and Desired Conditions:</b></p> <p><i>Force mismatch (2x Bde<sup>(1)</sup> + aviation) vs (Bde<sup>(2)</sup> in prepared urban terrain)</i></p> <p><i>decentralized units vs regular (predictable) supply requirements</i></p> <p><i>higher supply req. for US forces vs enemy</i></p>
<p><b>Elements that Must Change to Achieve the Desired Conditions:</b></p> <p><i>Isolate en - as a whole + as smaller units</i></p> <p><i>Reduce risk (physical + information) to US logistics forces</i></p>
<p><b>Opportunities and Threats to Achieving the Desired Conditions:</b></p> <p><i>Limited public support &amp; militarization once US forces become significantly engaged</i></p> <p><i>securing flanks and rear areas as forces move deeper into the city</i></p>
<p><b>Limitations:</b></p> <p><i>Balancing supporting assets (air + fires) btw combat forces + logistics</i></p>

JP 5-0, Figure III-6

Respondent 2



# Theory of Victory

### Synopsis of your Central Idea

Systematic clearing of city by main cbt forces.

Logistics support leverages unmanned tech to reduce value of each individual vehicle + operates w/ defensive and offensive escorts. Acceptable % of supplies arrive w/ each convoy in timely fashion.  
Deter atks + destroy attackers =  
improvement of supply flow

### Application & Integration of Military Functions

JATel fires + maneuver closely coordinated in support of convoys

force protection improves w/ disruption + destruction of en. ambush capabilities

### Necessary Capabilities

Significant air/cbt power to dedicate to escort + hunting force

### Spatial & Temporal Dimensions

Deliberate operation → en not able to interdict a significant % of supplies

Respondent 2

# COA Graphic and Narrative

	<p><b>MISSION:</b> Neutralize en forces along GLOC JOT sustain fwd cbt forces (JTF is systematically clearing Wozul)</p>
	<p><b>INTENT</b> (purpose, method, desired condition)</p> <p>Utilize unmanned logistics capabilities to mass logistics convoy capacity and operate w/ escort force and hunter force</p> <p>mi - large convoy becomes a prime target for en - escort force provides protection + initial def. - allows convoy to continue moving after atk - hunting force prosecutes ambushers as convoy</p>
	<p><b>CONCEPT</b> (incl. key tasks by phase)</p> <p>Std gnd recon + security</p> <p>Convoys are largely unmanned - vehicles are left behind in Escort (air) deters atks Kill Zone JOT Hunting force atks en forces - maintain momentum</p> <p>Secured AA just inside/outside the city to re-org or re-direct convoy into smaller units moving to end units</p>

Use Deep, close, security & be sure combine offense-defense-stability (ULO)

Respondent 2

# Problem Framing

<p><b>Problem Statement</b> (incl. list of key facts and assumptions):</p> <p>~5,000 fighters w/ access to maneuver by underground tunnels &amp; built up defenses; ~18 sniper teams &amp; IEDs w/ factory still making more</p>
<p><b>Tensions Between Current Conditions and Desired Conditions:</b></p> <p>More fighters can be sent from Syria @ any time immediate ID cycle/social media plants to continue recruiting</p>
<p><b>Elements that Must Change to Achieve the Desired Conditions:</b></p> <p>Fighters cut off from Syria resupply isolate Daesh in Mosul from the rest of Daesh in the cyber domain</p>
<p><b>Opportunities and Threats to Achieving the Desired Conditions:</b></p> <p>Large JCTF to counter smaller Daesh force in Mosul, Cyber support teams with authorities, TerraMax to help provide security as they carry resupply</p>
<p><b>Limitations:</b></p> <p>Have to stay within Iraq boundaries cannot go into Syria</p>

JP 5-0, Figure III-6

Respondent

# COA Graphic and Narrative

<p>Deep</p> <p>cyber</p> <p>close</p> <p>security</p>	<p><b>MISSION:</b></p> <p>Destroy Daesh forces in western Mosul and deny their ability to reinforce from Syria. ID all FOM &amp; follow on stability ops</p>
	<p><b>INTENT</b> (purpose, method, desired condition)</p> <p>Destroy Daesh forces in Mosul Deny reinforcement Secure GLOCs</p>
	<p><b>CONCEPT</b> (incl. key tasks by phase)</p> <p>Cyber-disrupt ability to use social media to communicate and coordinate Secure &amp; Block LOCs from Syria Continue cyber attacks on Daesh in Mosul Attack Mosul w/ AEG, Harvest Hawks &amp; CAB Secure EXXCS w/ TerraMAX</p>

Use Deep, close, security & be sure combine offense-defense-stability (ULO)

Respondent

# Theory of Victory

## Synopsis of your Central Idea

Must isolate Daesh momentarily  
 10T block LOCs b/w Syria & Iraq  
 Then attack into Mosul while  
 continuing air attacks to interfere  
 w/ their ability to call for reinforcements  
 Utilize all of A&B & all capabilities  
 for attack & CRTB w/ Tenamar in  
 force to secure BLOCs after  
 friendly moves north

## Necessary Capabilities


IO, cyber, precision guided munitions  
 the ability to track & predict  
 movements from Syria to Iraq & vice  
 vs.  
 the ability to predict or intercept  
 coordination of Daesh fighters

## Application & Integration of Military Functions

Cyber & Intel find & fix enemy  
 S&T & maneuver - finish enemy  
 Logistics - Conduct force protection  
 & resupply of maneuver forces

## Spatial & Temporal Dimensions


500m round clearance standoff  
 for Tenamar  
 Cyber ops must stay within  
 oodloop of Daesh if not ahead  
 of to respond to or stay ahead  
 of media cycle

Respondent 


# Problem Framing

<p><b>Problem Statement</b> (incl. list of key facts and assumptions):          MILITARY PROBLEM ⇒ CLEAR WESTERN MOSUL OF DAESH FORCES.</p>
<p><b>Tensions Between Current Conditions and Desired Conditions:</b>          WESTERN MOSUL OCCUPIED BY DAESH W/ CONSTANT REINFORCEMENT &amp;          DESIRED CONDITIONS ARE TO LIBERATE MOSUL.</p>
<p><b>Elements that Must Change to Achieve the Desired Conditions:</b>          KILL/CAPTURE/ELEMENTATE PRESENCE OF DAESH FORCES IN MOSUL.</p>
<p><b>Opportunities and Threats to Achieving the Desired Conditions:</b>          USE FUTURE TECHNOLOGY COMBINED W/ JOINT DOCTRINE &amp; CONVENTIONAL          METHODS TO LIBERATE MOSUL.</p>
<p><b>Limitations:</b> DAESH IS EMBEDDED AC THROUGHT MOSUL W/ UNDERGROUND          TUNNELING &amp; NETWORKING CAPABILITY.</p>

JP 5-0, Figure III-6

Respondent 

## COA Graphic and Narrative

	<p>MISSION: Eliminate Daesh Forces IOT LIBERATE WEST MOSUL.</p>
	<p>INTENT (purpose, method, desired condition)</p> <p>WONT USE THESE FOR JUST RE-SUPPLY. WOULD USE THEM W/ OFFENSIVE CAPABILITY MOUNTED W/ FUTURE LASER TECHNOLOGY TO FUSIL OR M-KILL ENEMY EQUIPMENT AND/OR UAV'S, IED'S ETC. USE MUM-T CONCEPT TO MINIMIZE EXPOSURE OF IED'S ON FRIENDLY FORCES.</p>
	<p>CONCEPT (incl. key tasks by phase)</p> <p>WITH COMBINED USE OF LASERS, ACTIVE DENIAL SYSTEMS &amp; LETHAL FIRES, WITH A MAN IN THE LOOP RUNNING THE SHOW - YOU COULD ESSENTIALLY OPERATE IN AN URBAN ENVIRONMENT UNTIL VEHICLES ARE WEARHESTER ON AMMO, THEN EXIT &amp; RE-SUPPLY.</p>

Use Deep, close, security & be sure combine offense-defense-stability (ULC)

Respondent 24

## Problem Framing

<p><b>Problem Statement</b> (incl. list of key facts and assumptions):</p> <p>Role is to support Iraqi forces and maintain GLOCs to enable re-supply, comms, and access for advisors + fire support teams.</p> <p>need to maintain GLOCs</p>
<p><b>Tensions Between Current Conditions and Desired Conditions:</b></p> <ul style="list-style-type: none"> <li>- Daesh ability to swarm AT Teams + companies along GLOCs</li> <li>- IEDs, mines along GLOCs</li> </ul>
<p><b>Elements that Must Change to Achieve the Desired Conditions:</b></p> <ul style="list-style-type: none"> <li>- Clear and Hold Key Routes</li> <li>- Destroy Daesh Companies + AT Teams</li> </ul>
<p><b>Opportunities and Threats to Achieving the Desired Conditions:</b></p>
<p><b>Limitations:</b></p>

JP 5-0, Figure III-6

Respondent 25

# COA Graphic and Narrative

	<p><b>MISSION:</b> Secure GLOCs IOT enable sustainment of US/ISF and delivery of hum. aid</p>
	<p><b>INTENT</b> (purpose, method, desired condition) Enable sustainment of US/ISF and delivery of humanitarian aid. Convoys are the fixing element to allow for ground and air ambushes of ambush forces. Multiple defeats of ambush forces attest their capability and convince <del>ambush</del> forces that ambushing GLOCs is not a winning concept</p>
	<p><b>CONCEPT</b> (incl. key tasks by phase) Lead with unmanned vehicles, draw out Ambush/Swarm teams, mech companies/rifle companies poised to ambush swarm teams, supported by attack aviation.</p>

Use Deep, close, security & be sure combine offense-defense-stability (ULO)

Respondent 5

# Theory of Victory

<p><b>Synopsis of your Central Idea</b> Ambush the ambush forces, Unmanned vehicles allow for increased risk, isolate the forces in moral cut them off</p>	<p><b>Necessary Capabilities</b> Unmanned system, ability to quickly pass location information on fresh ambush forces</p>
<p><b>Application &amp; Integration of Military Functions</b> <del>ISF</del> - find in advance to position friendly ambush forces <del>ISF</del> Ambush forces being found is OK - may deter ambush of resupply convoys</p>	<p><b>Spatial &amp; Temporal Dimensions</b> Proximity of response forces, needs to be a dedicated task force</p>

Respondent 5

# Problem Framing

<b>Problem Statement (incl. list of key facts and assumptions):</b> <ul style="list-style-type: none"> <li>- Daesh is well organized</li> <li>- Fighters are motivated to die</li> <li>- Daesh has little sympathy for non-combatants</li> <li>- Daesh resupplies are well funded and organized.</li> <li>- Centcom force maintains attack on civilians</li> <li>- Media scrutiny is heavy</li> <li>- Water on flights is low / water in city is limited.</li> </ul>	
<b>Tensions Between Current Conditions and Desired Conditions:</b> <ul style="list-style-type: none"> <li>- Daesh is well entrenched and organized their moral is high enough to continue fighting</li> <li>- They are using civilians as shields to limit casualties of fighters</li> <li>- High number of fighters ratio to US does not favor an assault on Mosul. Even with UGVs they are entrenched and ready to fight.</li> </ul>	
<b>Elements that Must Change to Achieve the Desired Conditions:</b> <ul style="list-style-type: none"> <li>- Break moral of fighters inside mos</li> <li>- Centcom guidance needs to change ordering.                     <ol style="list-style-type: none"> <li>1. Become cities</li> <li>2. Deny enemy freedom of movement</li> <li>3. Set conditions for future of attack</li> </ol> </li> </ul>	
<b>Opportunities and Threats to Achieving the Desired Conditions:</b> <b>Opportunity</b> - US has greater cyber capability - US has UGV to move supplies and run deep routes, IED clearance. - Let ISF clear city. US should enable them for success but let them be the victors. <b>Threat</b> - Moral down is threatening to fail (serious) - need to make assets maintenance down - Daesh's water flow is limited, it allows foot traffic across river bed.	
<b>Limitations:</b> - US is limited to MEB/ABCT. Not sufficient manpower to defeat Daesh two years entrenched in urban environment.	

JP 5-0, Figure III-6

Respondent 5



# COA Graphic and Narrative

<p>Ideas on UGVs.</p> <p>I'm a bit uncomfortable sending out so many UGVs in a convoy that is going to still require manned vehicles but now put that manned vehicle in a highly outnumbered fight if it becomes dismantled.</p> <p>I think UGVs could be used more effectively by being able to conduct nearly continuous route/road clearance operations. Having 1 or 2 vehicle elements constantly at intervals with sensors would greatly increase understanding of road conditions. Occasionally send out convoys of larger vehicles as deception; enemy may now target totally unmanned convoy thus giving away their location and intentions to US forces. Plus increase of # of convoys same simply as decoys masks or actual movements, masks or size.</p> <p>Having smaller vehicles constantly at interval connected all of our locations could be mounted with repeater antennae or be used to collect constant covering EW searches.</p>	<b>MISSION:</b> With the defenses inside Mosul, I think the first tactic should be to cut them off totally. Provide the entire city with tons of food and water that is laden with sleep aids and depressants.
	<b>INTENT (purpose, method, desired condition)</b> Phase 1: P. Secure GLOC m. Distribute company sized elements from MEB/ABCT along with MSRs and assets. DC: constant movement of friendly forces along all major roads. Phase 2: P. Deny Daesh freedom of movement. M: Stop all traffic in part east of W Mosul. cut power, cut fiber optics. Daesh cell to remain isolated w/ mostly totally. DC: A static <del>and</del> Daesh unable to remain or communicate. Phase 3: Begin running Airdrops of water/food/medical supplies into W Mosul. Daesh will benefit but it should give way to civilians. Heavy operations, maybe there is a way to track supplies and see if they're being handed somewhere. Phase 4: wait weeks, literally wait them out. Make them realize fight and then push in on the city from every direction.
	<b>CONCEPT (incl. key tasks by phase)</b> P1
	Use Deep, close, security & be sure combine offense-defense-stability (ULO)

Respondent 5

# Problem Framing

<p><b>Problem Statement</b> (incl. list of key facts and assumptions):</p> <p>Enemy has desirable terrain in the city and I have long, vulnerable LOC</p>
<p><b>Tensions Between Current Conditions and Desired Conditions:</b></p> <p>Current:                  Desired: secure LOC, ability to isolate Daesh in Mosul                  Tension: Forces required to isolate and clear also need to secure LOCs</p>
<p><b>Elements that Must Change to Achieve the Desired Conditions:</b></p> <p>Secure LOCs</p>
<p><b>Opportunities and Threats to Achieving the Desired Conditions:</b></p> <p>opportunities: element + combat power                  Threats: small ambush teams</p>
<p><b>Limitations:</b></p>

JP 5-0, Figure III-6

Respondent 27

# COA Graphic and Narrative

**MISSION:** Isolate Mosul and secure LOC in order to enable follow on operations (clear)

**INTENT**  
(purpose, method, desired condition)

The purpose is to buy time and attrite Daesh while getting as many civilians out as possible. To do this, I must secure LOCs. The desired condition = 1) routes open 2) Mosul surrounded 3) Daesh isolated

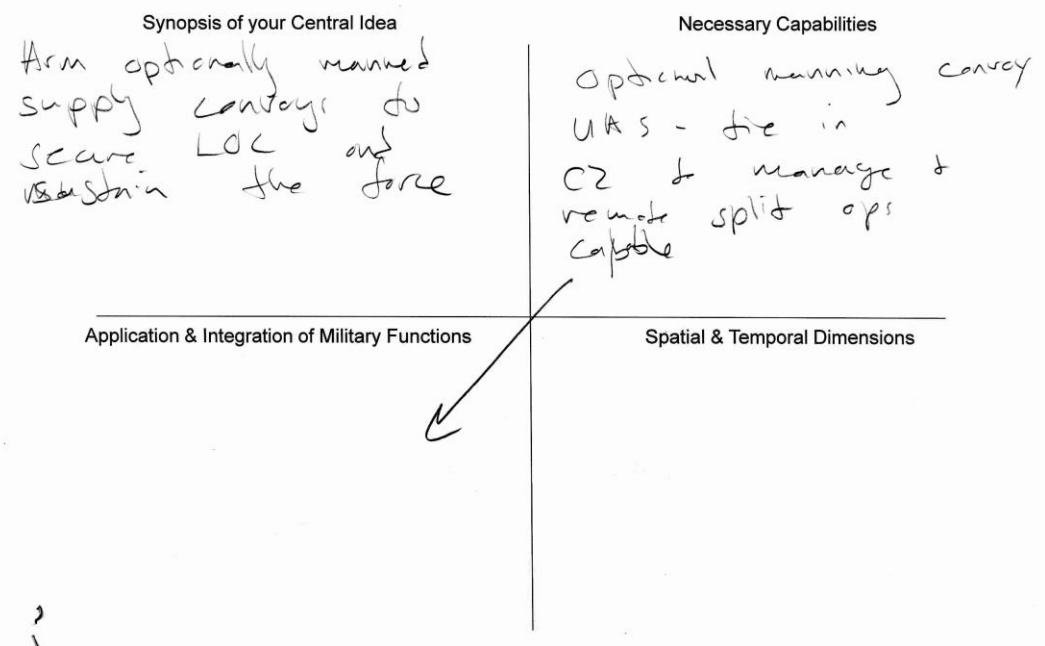
**CONCEPT**  
(incl. key tasks by phase)

1. Coalition forces block N/W entry
2. Coalition forces Gun Trucks Screen routes while supporting
3. HIMLA support by fire while ground units move to isolate and clear western Mosul

Use Deep, close, security & be sure combine offense-defense-stability (ULO)

Respondent 27

# Theory of Victory



Respondent 27



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- <sup>2</sup> Gregory Fontenot, E.J. Degen, and David Tohn, *OnPoint: United States Army in Operation Iraqi Freedom* (Fort Leavenworth: Combat Studies Institute Press, 2004), 331.
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- <sup>14</sup> *Ibid*, 20.
- <sup>15</sup> *Ibid*, 32.
- <sup>16</sup> Headquarters US Army, *The U.S. Army Robotic and Autonomous Systems Strategy*, TRADOC, (Washington, DC: Headquarters US Army, March, 2017), 24.
- <sup>17</sup> Fontenot, *OnPoint: United States Army in Operation Iraqi Freedom*, 335.
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- <sup>88</sup> *Ibid*, 251-253.
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- <sup>94</sup> *Ibid*, 256.
- <sup>95</sup> Zucchini, *Thunder Run: The Armored Strike to Capture Baghdad*, 217.
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- <sup>97</sup> *Ibid*, 205.
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