REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*
05/10/2017	Master's Thesis	AUG 2016 - MAY 2017

4. TITLE AND SUBTITLE
Drone Squad: Drone Warfare Support at the Squad Level

5a. CONTRACT NUMBER
N/A

5b. GRANT NUMBER
N/A

5c. PROGRAM ELEMENT NUMBER
N/A

6. AUTHOR(S)
Iiams, Zachary E., Major, USA

5d. PROJECT NUMBER
N/A

5e. TASK NUMBER
N/A

5f. WORK UNIT NUMBER
N/A

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
USMC Command and Staff College
Marine Corps University
2076 South Street
Quantico, VA 22134-5068

8. PERFORMING ORGANIZATION REPORT NUMBER
N/A

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)
N/A

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public Release, distribution unlimited.

13. SUPPLEMENTARY NOTES

14. ABSTRACT
The Drone Squad (DS) is a set of integrated drones that can be used individually or, to reduce computing data, be used in a minimum four squad formation. One drone, of the DS, would be issued to each squad, vehicle, or section (squad will be used as the common term for each). Each drone of the DS would have the ability to conduct observation and then have the capacity to carry different capabilities. The capabilities would be surveying, fires targeting, CBRNE detection, facial recognition, and direct action. When operating as a group the DS would be connected to each other via a network.

15. SUBJECT TERMS
Second Battle of Fallujah, Operation Phantom Fury, Operation Al-Fajr, Movement, Maneuver, Fires, Protection, Intelligence MUM-T, Automated, Drone Squad, Swarm

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			USMC Command and Staff College
					19b. TELEPHONE NUMBER *(Include area code)*
Unclass	Unclass	Unclass	UU	90	(703) 784-3330 (Admin Office)

Command and Staff College
Marine Corps University
2076 South Street
Marine Corps Combat Development Command
Quantico, Virginia 22134-5068

MASTER OF MILITARY STUDIES

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

AUTHOR:

Zachary E. Iiams

MAJ, USA

AY 16-17

Mentor and Oral Defense Committee Member: Benjamin Jensen PhD
Approved: _____
Date: 8 MAY 17

Oral Defense Committee Member: Paul Goldfein PhD
Approved: _____
Date: 8 MAY 2017

United States Marine Corps
Command and Staff College
Marine Corps University
2076 South Street
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DISCLAIMER

Executive Summary

Title: Drone Squad: Drone Warfare Support at the Squad Level

Author: MAJ Zachary E. Iiams, USA, AY2016-2017

Thesis: The US military can capitalize on current commercial off the shelf drone technology to provide a multi-functional system that increases situational awareness, security, protection, and reduce the enemy's freedom of maneuver allowing US forces to close with and destroy the enemy.

Discussion: The purpose of this paper is to provide an analysis and evaluation of a Manned-Unmanned Teaming (MUM-T) concept that will support the American warfighter at different operating levels. The Second Battle of Fallujah, Operation Phantom Fury, was selected to identify ways to improve operations and determine what could be required of a MUM-T concept to address anything identified. The case study also served to identify factors that lead to the success of Operation Phantom Fury; such as, removing anonymity and saturating an area with military forces. Once the case study was complete, an initial MUM-T concept was developed to address any issues identified. The initial concept was to have one drone at the at the squad level to provide local intelligence, surveillance, and reconnaissance and then provide an additional capability based on a mission swappable pod. If a mission required a force saturation the drones can be linked to form a Drone Squad. The Drone Squad is a drone swarm that can perform a range of military operations. After the initial concept is introduced an operational decision game was conducted to gauge the feasibility of the initial concept and to determine any concept shortfalls. Based on mentor feedback, an additional concept was added to the operational decision game. The second concept provided friendly forces the capability to pull intelligence from a variety of open sources and governmental sources, known as Social Media Scraping. This would allow friendly forces to act on events before they occurred or as the events were developing. At the conclusion of the operational decision game, the data collected was reviewed and the results were that the drone squad would require an additional person (or a person assigned) in the squad to operate the drone, additional intelligence analyst personnel to review the information from the Social Media Scraping. Also, based feedback, the Drone Squad and Social Media Scraping were combined with two additional concepts: the optionally manned and armed logistics vehicle and the active denial system. The four concepts were combined to develop the Technology for Urban Terrain concept. The Technology for Urban Terrain works well in permissive, uncertain, and hostile environments. The Technology for Urban Terrain could provide leaders and commands options across the range of military operation. Although the name contains Urban the concepts are applicable to multiple terrain types.

Conclusion: The Drone Squad will be best utilized at the squad level and in any operational environment: hostile, uncertain, or permissive. The Drone Squad provides friendly forces a range of options in dealing with situations while conducting operations and degrade the enemy's freedom of maneuver. Although the Drone Squad is intended to support the squad level, its usefulness is not limited to that echelon. The Drone Squad can enable higher level missions that span across the three levels of warfare: tactical, operational, and strategic.

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Acknowledgements

First; I would like to thank my wife. Without her I would not have been able to complete anything. She ensured I was distracted as little as possible while working on this project. Also; putting up with me and remaining interested as I droned on about drones.

My parents who both raised me to continue my education in the subjects that I found interesting and taking the time and effort to keep current on technology while I grew up, so I could keep up in a constantly changing environment.

Next I would like to thank two members of the angry wizard guild: Dr. Ben Jensen and Dr. Paul Gelpi. Their motivation for education kept me going when writing became arduous. Their vast knowledge kept me researching to ensure I was as thorough as possible.

Lastly; Games Workshop “For the Great Good!”

Manned and Unmanned Teaming

Manned-Unmanned Teaming (MUM-T) can be defined as living people controlling or working alongside a machine. MUM-T has been researched and developed since as early as 1940s, with the BQ-8, a remote-controlled B-17.[1] MUM-T could provide a technological advantage by providing faster intelligence development and increasing force ratio while keeping force personnel size low. MUM-T is not just limited to drones, it can be working alongside narrow artificial intelligence that can assist in analyzing large amount of data. The US Army and US Marine Corps are both pursuing MUM-T concepts that can provide an advantage during combat.

Developing new systems are only one part of a new MUM-T concept, there must also be a capability gap that the MUM-T system can fill. One such gap identified that MUM-T can address is providing enough of a presence to cover assist in covering a large area and essential denying an enemy force anonymity and providing observation around dead space in an urban environment. The following paper reviews a historical battle that provide context for a MUM-T concept. Then a initial concept is developed to address that capability gaps identified during the historical battle review. An operational decision game is used to test if the concept provides a useful capability to a friendly force operating in a deteriorating environment. The last part is using input from the operational decision game to develop a larger concept known as Technology for Urban Terrain.

Historical Case Review of Operation Phantom Fury

Operation Phantom Fury, also known as the second battle of Fallujah or Operation Al Fajr, was combined operation between the United States military and Iraqi Forces (IF). This operation tested how Coalition forces could operate in a dense urban terrain against a prepared defense. This historical study will examine how the coalition forces used the intelligence, fires, movement and maneuver, and protection warfighting functions to prepare for the operation and how the insurgent force prepared their defense.

Background

The history of resistance in Fallujah, Iraq did not begin with the 2003 Coalition invasion, but can be traced back to anti-colonial sentiment in 1917.[2,3] The people of Fallujah fought against the British Soldiers who occupied Iraq during World War 1.[4] To make anti-foreign sentiment worse, a British aircraft, practicing aerial policing, destroyed a market in Fallujah by mistake.[5]

After the Coalition invasion of Iraq in 2003, friendly forces needed to occupy key terrain across the country. Fallujah had an important role for Iraq because of the road that runs through it to Baghdad, Iraq and from there, to surrounding countries.[6] These roads were major lines of communications for Coalition forces as they sought to restore stability to Iraq. Units from the 82nd Airborne were the first to occupy Fallujah.[7] On 28 April 2003, 82nd Airborne Soldiers established a patrol base in a school and were soon confronted by a protest that resulted in the death of several protesters.[8] Although the 82nd Airborne units continued to have security issues in Fallujah, it was not until 1st Marine Expeditionary Force (MEF) took authority of Fallujah that events would turn against the coalition.

On 31 March 2004, the insurgents in Fallujah conducted an ambush that would prompt a response to the growing insurgent force in the city.[9] Four contractors, from the private security company Blackwater, were providing security for a small logistical convoy when they got lost in Fallujah.[10] The Blackwater contractors did not inform the land space owner , 1st MEF, and did not have correct maps and quickly got lost.[11] During the escort, traffic stopped the Blackwater contractor's convoy and while they were stopped the insurgents ambushed them.[12] The insurgents killed the Blackwater contractors and subsequently set their vehicles on fire.[13] The ensuing mutilation and displaying of the contractors' corpses by Iraqis led to the battle for Fallujah. The insurgents took the corpses of the Blackwater contractors from the destroyed vehicles, drug them through the streets and then hung them from one of the bridges around Fallujah.[14]

In response to the failing situation in Fallujah, higher headquarters instructed the staff of 1st MEF to begin planning for an assault on Fallujah and subsequently began Operation Vigilant Resolve.[15] Operation Vigilant Resolve objectives were to eliminate Fallujah as an insurgent safe haven, eliminate enemy weapons caches, establish law and order, and capture or kill the perpetrators of the Blackwater ambush.[16] On 5 April 2004, 1st MEF began the assault on Fallujah. During the assault, 1st MEF destroyed insurgent positions located in a mosque leading to political pressure to stop the operation on 7 April 2004.[17] Public political pressure due to the destruction that happened during Operation Vigilant Resolve and other operations halted Operation Vigilant Resolve. 1st MEF also lacked sufficient forces to assault the city of 2,000 insurgents and a population of 300,000 and no reinforcements had been able to reach Fallujah or been assigned.[18]

At the end of Operation Vigilant Resolve, the Fallujah Brigade took jurisdiction of Fallujah.[19] The Fallujah Brigade was an IF unit manned from pre-invasion Iraqi Army officers and soldiers from Fallujah. Shortly after the Fallujah Brigade assumed jurisdiction, the unit began to fall apart and the officers and soldiers either abandoned their posts or joined the insurgent force.[20] The collapse of the Fallujah Brigade provided the insurgents newly trained personnel with weapons. The forces that joined the insurgent force and the weapons they brought bolstered the insurgent morale and also the belief that they had repulsed the foreign invaders solidified Fallujah as beacon of resistance.[21]

Coalition Preparation for Operation Phantom Fury

The Fallujah Brigade dissolution and the worsening situation in Fallujah required a final action from the coalition in Iraq. Higher headquarters ordered 1st MEF to begin planning for an assault to seize Fallujah in September 2004.[22] They identified three key tasks to complete the assault: destroy the insurgents in Fallujah and eliminate sanctuary, IF control Fallujah, and prepare for follow-on operations.[23] 1st MEF developed a plan that was broken into five phases: phase one preparation and shaping, phase two enhanced shaping, phase three assault, search, and attack, phase four transition, and phase five transfer of control.[24] For the purpose of this historical case study only phases one, two, and three will be examined.

Phase One

1st MEF would use phase one, preparation and shaping, to realign forces, conduct lethal and non-lethal target operations against insurgents, their equipment, and the citizens of Fallujah, and conduct IO.[25] 1st MEF did not simply move forces on the battlefield, the commander requested armor forces and additional IF for the operation. Due to lessons from Operation Vigilant Resolve and fighting in Najaf, 1st MEF requested armored forces that could penetrate

insurgent defenses, secure the area, and respond quickly to assistance needed. 1st MEF also requested additional IF in order to show the Iraqi government's resolve to secure peace and to provide additional forces to seize and secure Fallujah.

In preparation for Phantom Fury, 1st MEF conducted lethal and non-lethal target operations against the insurgents, their equipment, and the citizens of Fallujah. Prior to the beginning of the operation 1st MEF conducted a series of raids, cordon and searches, vehicle checkpoints, and indirect fire and close air support (CAS) missions.[26] These missions would be essential to destroying the insurgent's ability to fight, resupply, and conduct command control. 1st MEF also conducted a series of feints around Fallujah in order to deceive the insurgent forces of their intentions.[27] 1st MEF's feints and raids prevented the insurgents from being able to focus their defensive efforts against 1st MEF's main efforts and also disrupted the insurgent's ability coordinate operations as they had intended (Figure 1).[28]

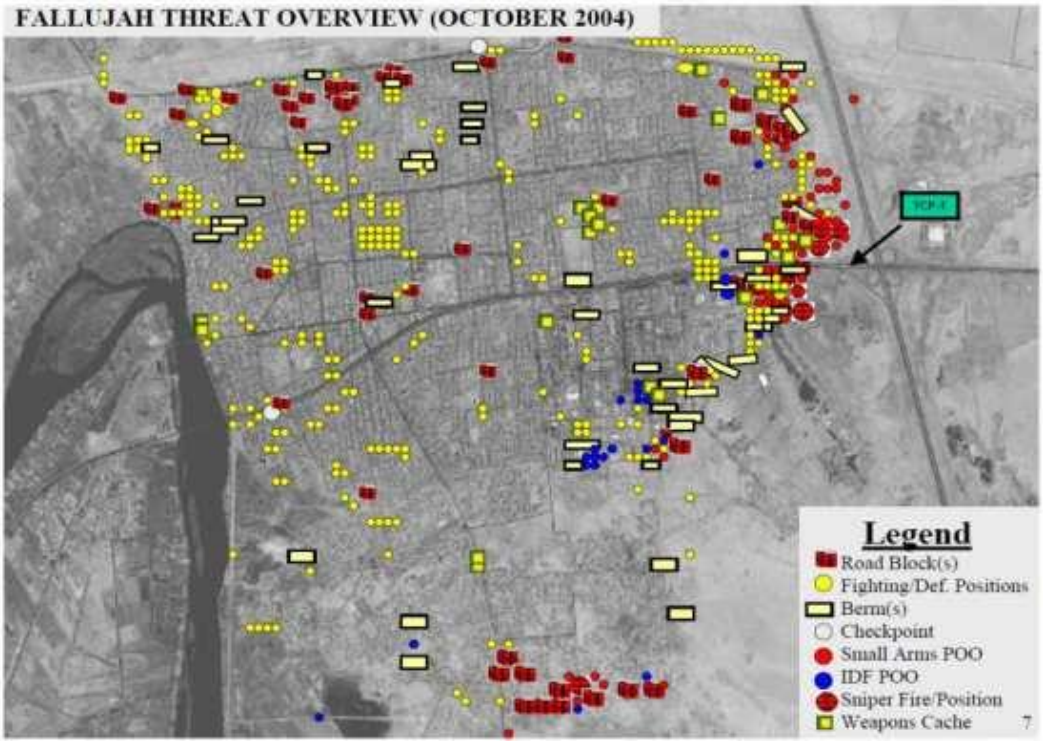

Figure 1: Fallujah Threat Overview (October 2004)[29]

1st MEF's non-lethal targeting used against the citizens of Fallujah was to warn them of an impending assault, not to support the insurgents, and encourage them to leave before the assault happened. 1st MEF IO efforts were apparent as most of the citizens had left Fallujah, leaving few non-combatants in the city.[30]

1st MEF incorporated media quickly into Operation Phantom Fury based on the lesson from Vigilant Resolve. 1st MEF would ensure news outlets were readily available to provide information to the people from the coalition's perspective.[31] Footage was not being taken from only one area, Iraqi advisors were also fitted with video recording equipment to show that the coalition was truly securing the city and show the atrocities in Fallujah perpetrated by the insurgents.[32] By providing multi-view footage, 1st MEF was able to conduct their IO campaign and provide the main message or counter-message what the insurgents were broadcasting.

Phase Two

Once phase one completed, 1st MEF moved to phase two, enhanced shaping. 1st MEF's tasks for phase two were isolate Fallujah, secure the peninsula, secure the hospital, block the bridges, move of forces into assault position.[33] 1st MEF's operations would best prepare the battlefield for the follow-on assault and ending phases.

1st MEF would need to isolate Fallujah from support from any outside influence and also isolate insurgent fighters from their command and control nodes and each other. 1st MEF conducted electronic warfare (EW) attacks against the insurgents.[34] Their EW efforts would disrupt the insurgent's ability to communicate and coordinate efforts. In order to isolate Fallujah from outside influence, 2nd Brigade Combat Team (BCT), 1st Cavalry Division (CD) established blocking positions along Fallujah's southern and eastern city limits (figure 2).[35] 2nd BCT, 1st CD isolation of Fallujah prevented insurgents from fleeing the city or prevented more

from entering the battle once it began. To further isolate the insurgents in Fallujah, 1st MEF would secure the peninsula to the west, block the two bridges and seize the hospital near the bridge.[36] 3rd USMC Light Armor Reconnaissance Battalion (LAR) would be tasked to secure the peninsula and block the two bridges.[37] 3rd LAR seizure of the peninsula and block bridges would further the efforts to isolate Fallujah and support IF 36 Commando Battalion (CDO) seizure of the hospital. 36th CDO seizure of the hospital denied the insurgents a command and control node and also provided the coalition forces means to execute their IO campaign by showing that the insurgents were using safe places, such as hospitals, as positions to attack from (figure 2).[38,39]

1st MEF's final task for phase two was to move forces into assault positions.[40] 1st MEF had two Regimental Combat Teams (RCT) that would move into position for the assault, RCT-1 and RCT-7.[41] RCT-1 would serve as the main effort for the operation and would deploy to the northwest in preparation for the assault.[42,43] RCT-7 would be the supporting effort and would deploy to the northeast in preparation for the assault.[44,45] With all attack forces in position, the hospital seized, and the city isolated, 1st MEF was prepared to assault.

Insurgent Fallujah Preparation

The insurgent force in Fallujah did not sit idly be after Operation Vigilant Resolve and prepared to again repulse the invaders. The insurgents force was made up of multiple groups with multiple goals, the forces were former regime elements, extremists, tribal fighters, and criminals.[46] The insurgent forces reasons for fighting ranged from personal gain, exporting jihad, establishing and Islamic State, and gain political influence.[47]

The insurgents prepared for an inevitable assault on Fallujah by preparing their defenses. The insurgents established fighting positions, developed breaks in walls to evade coalition

forces, fortified houses, emplaced obstacles in entryways, and placed improvised explosive devices(IEDs).[48] The insurgents prepared for a long fight with resupply points placed throughout the city, which were focused in protected sites to prevent United States forces from exploiting the site.[49] By the end of October, the insurgents had prepared a sizable defense to hold Fallujah and maintain their power.

Operation Phantom Fury Execution

On 8 November 2004, RCT-7, 1st MEF began their assault on Fallujah.[50] RCT-7 breached Fallujah in the northeast in order to search and attack insurgent force in their sector.[51] RCT-7 main forces were composed of 1st Battalion/8th Marines (1/8), 1st Battalion/3rd Marines (1/3), 2nd Battalion/2nd BCT, 1st CD (2/2) and two IF Battalions.[52] Along with the main forces, RCT-7 had one mechanized infantry company, Alpha company/2nd Battalion/63rd Armor Regiment (A/2/63) a tank company with Bradley fighting vehicles (BFV) attached, one combat engineer company, 1 artillery battery, one amphibious assault company, one engineer armored combat earthmover (ACE) company, and one special operations team.[53]

RCT-7 would breach Fallujah in three separate areas.[54] 2/2, 1/3, and 1/8 were each partitioned sector of RCT-7 area of operation, 2/2 was assigned the eastern sector, 1/3 the central sector, and 1/8 the western sector.[55] RCT-7 forces would breach their sectors with their available resources.

2/2 would conduct their breach in three phases: secure the near side, breach, and secure the far side. A/2/63 secured the near side by moving into attack by fire positions and then destroying enemy positions with tank and BFV fire.[56] Once A/2/63 secured the breach site; the engineer platoon, assigned to 2/2, fired their mine clearing weapon system and subsequently

detonated multiple IEDs and created a clear path to enter Fallujah.[57] Once the path was cleared, A/2/63 moved through the path and secured the far side of the breach.[58]

The deliberate movement of forces through the city provides a direction for the mission to be conducted. The breach will allow forces and logistical elements to move into the city and reinforce the maneuver forces as counter-insurgency operations are being conducted. As the maneuver forces are conducting movement they will be supported by indirect or direct fires and other enablers. The indirect and direct fires provide to maneuver forces on the ground the ability to destroy a hardened target with limited risk to ground forces. The additional enablers can range from sniper teams that can provide direct fire against critical targets or explosive ordinance disposal teams that can degrade and destroy the IED threat.

1/3 would attempt to conduct a breach in their sector, but would face serious issues. 1/3 attempted to breach the city with dismounted assets.[59] During the breaching operations; 1/3 attempted to destroy the rail road tracks with explosives, but were unable to destroy them, this misfortune was further compounded when their bulldozer became disabled in the breach and 1/3 was unable to get the secondary equipment to the breach site.[60] Insurgents took the opportunity created by the delay in the breach to maneuver on 1/3 and begin firing on the Marines. The insurgents attack would wound four personnel and strike 3 armored vehicles.[61] After the failure of the breach; 1/3 requested the use of 2/2 breach site and would use it to move armored equipment into their sector.[62] 1/3's inability to create a breach in the obstacles would slow other efforts to enter the city and provide insurgents denser target at other breaching areas on the periphery of the city.

Upon breaching Fallujah; RCT-7 unit's 2/2, 1/3, and 1/8 began to clear the city by driving through the streets and then clearing all of the houses in their sector. 2/2 would use multiple

methods to clear their area, one method was to use the indirect fire capabilities that the artillery battalion provided.[63] During the operations, the fire support officer (FSO) of 2/2 was given information on an insurgent force maneuvering through their sector and requested a fire mission.[64] The FSO acted on old information and due to this the enemy was not observed and required one of 2/2 tanks to move forward and observe the target site.[65] The FSO quickly acted on intelligence and was able to destroy the enemy. 2/2 also used their indirect fire assets, but due to the high buildings in Fallujah forward observers (FO) would occupy the tops of buildings to provide enemy observation, but also expose them to enemy fire.[66] 2/2 was clearing a residential area when an observer team was maneuvering to establish an observation post (OP) and begin to target insurgent forces.[67] While occupying the OP; 2/2 FOs came under insurgent attack which resulted in the death of two Soldiers.[68]

During clearing operations, 2/2's movement was constantly outpaced 1/3 and 1/8 operations.[69] As 2/2 cleared south, the insurgents would maneuver out of their sector and into 1/8's or 1/3's sector only to re-enter 2/2's to attack them in areas they had already cleared or 2/2 would be required to halt movement to allow 1/3 or 1/8 to catch-up.[70],[71] Before 2/2 moved south into Fallujah's industrial zone they would need to move back north into their sector to clear insurgents that had maneuvered back into 2/2's sector.[72] 2/2 was able destroy the insurgents, but at the cost of injuring three Soldiers.[73] During the operation, 2/2 reached highway 10 and was instructed to wait for further instructions.[74] While 2/2 was waiting, the insurgents began to fire them from the south side of the highway.[75] 2/2 was able to mount a defense and call in indirect fire and neutralize the insurgents.[76] At the end of clearing operations; 2/2 would transfer control of their sector to 1/8.[77] The delayed movement and limited unmanned aerial vehicles to provide

reconnaissance to units on the ground created an opportunity for insurgents to maneuver against the US forces.

1/3 clearing operations were similar to 2/2's operations, clearing the streets and then clearing the houses in their sector. Due to personnel strength issues most of the building were cleared by fire teams of Marines, typically four personnel.[78] During clearing operations, 3rd Platoon, Alpha Company, 1/3 was clearing a portion of the regiment's sector when 1st squad began to clear one of the building.[79] The fire team first breached the exterior gate without issue and moved through the courtyard and breached the main door.[80] As the squad moved through the entryway and moved to the first door and was engaged by insurgents in the room.[81] The insurgent fired on and killed the marine that was coming into the room and also wounded a second marine.[82] The remainder of the squad moved up and recovered the wounded Marine.[83] A second squad moved up to assist in clearing the building and recovered the Marine that was killed in action (KIA).[84] While recovering the wounded and KIA Marine,; the platoon requested a ground medical evacuation (MEDEVAC).[85] During the MEDEVAC, insurgents from inside the building maneuvered to the top of the building and once the vehicles drove off they opened fire on the Marines in the open.[86] The squad moved back to the building to finish clearing it and continued to clear the houses in their sector.[87]

Not all of RCT-7 sector was houses and personal property, some of the areas were government building that needed to be cleared to set the Iraqi government up for success. 1/8 would have the task to clear the government complex in RCT-7's sector and then continue to clear south of highway 10.[88,89] While seizing the government complex, 3rd Squad, 2nd Platoon, Alpha Company, 1/8 moved to clear the rooftops and came under sniper fire.[90] As soon as the squad took fire they took cover behind a short wall and tried to identify where the sniper was

firing from, when one squad member saw the position he relayed the position to their M203 grenade launcher gunner and he destroyed the sniper's position.[91] Immediately the squad came under fire from another sniper, the squad leader decided to move his squad off the roof top, he ordered his squad to suppress the suspected sniper position while he fired an AT-4 rocket launcher at the position.[92] After the squad leader fire the AT-4, the squad threw multiple smoke grenades that concealed their movement off the rooftop.[93] The rooftops provide the insurgents or coalition forces the ability to provide observation on movement and to call for indirect fires on enemy positions. This is why controlling, not all but, the rooftops that provide observation and the ability to provide fires is critical while fighting in dense urban terrain.

On 8 November 2004, RCT-1, 1st MEF began their assault on Fallujah. RCT-1 would breached Fallujah in the northwest in order to search and attack insurgent force in their sector.[94] RCT-1 main forces were composed of 3rd Battalion/5th Marines (3/5), 3rd Battalion/1st Marines (3/1), 2nd Battalion/7th Cavalry, 1st CD (2/7) and two IF Battalions.[95] Along with the main forces, RCT-1 had one mechanized infantry company, Charlie company/2nd Battalion/63rd Armor Regiment (A/2/63) a tank company with Bradley fighting vehicles (BFV) attached, one combat engineer company, 1 artillery battery, one engineer armored combat earthmover (ACE) company.[96]

RCT-1's operation began their breach in the northwest and were delayed due the complexity of destroying railroads, but after six hours of effort the engineers breached the obstacles and created two lanes of movement through the insurgent’s minefield.[97] Once the breach was completed the clearing operations are similar to RCT-7's operations. One event of difference is when a platoon from Lima company began to clear, two Marines clearing a building engaged a large number insurgents resulting in one Marine becoming injured and the second

Marine was able to inform his platoon of the number of insurgents.[98] The platoon sent in more Marines to recover the wounded Marine, but insurgents from the roof fire through the roof and kill one more, the platoon continued to recover the personnel and once the Marines are cleared from the building, Lima Company destroyed the building.[99]

1st MEF continued to clear Fallujah of all remaining insurgents. By the end of December 2004 1st MEF began to allow the population back into the city. 1st MEF's battle into Fallujah was hard fought, but crucial to prevent the insurgent force from having a base of operations.

As Operation Phantom Fury ended the lack of early warning for ground forces became an issue faced by the coalition forces conducting the operation. To clear a building the US forces would need to breach the outside area without any reconnaissance aside from someone maybe looking over the wall. As the tempo of the operation slowed in some areas the insurgents were able to move unobserved against coalition forces, because no one was able to see the insurgent's movements. The fight for observation was critical for coalition and insurgent forces. The force that controlled the rooftop had the reconnaissance capability, but also exposed the force to adversarial fires. Operation Phantom Fury was very successful, but much and more can still be learned from it.

Initial Drone Squad Concept

The *Marine Corps Operating Concept* and *Army Operating Concepts* describe how both branches will evolve into new forces and capitalize new concepts and technology. Both operating concepts provide key areas that help focus the two branches during the evolution. The Drone Squad Concept supports both operating concepts in key areas:

Marine Corps Operating Concept (MOC)

6.2.7 Exploiting Automation

6.3.1 Role of Signature in Offense and Defense

6.3.2 Networking for Rapid/Precise Fires

6.3.4 Enhanced Concept of Intelligence

6.4.2 Broader Concept of Combined Arms/Information Warfare

6.4.3 Urban Operations/Complex Terrain

6.4.4 Infantry and Mobility

6.4.6 Expeditionary Logistics

6.5 Exploit the Competence of the Individual Marine

Army Operating Concept (AOC):

3.3.c Develop Situational Understanding through Action

3.3.e Sustain High Tempo Operations

3.3.f Establish and Maintain Security

3.3.g Consolidate Gains

3.3.h Respond to and Mitigate Crises in the Homeland.[100,101]

The Drone Squad (DS) is a set of integrated drones that can be used individually or, to reduce computing data, be used in a minimum four squad formation. One drone, of the DS, would be issued to each squad, vehicle, or section (squad will be used as the common term for each). Each drone of the DS would have the ability to conduct observation and then have the capacity to carry different capabilities. The capabilities would be surveying, fires targeting, CBRNE detection, facial recognition, and direct action. When operating as a group the DS would be connected to each other via a network. This would allow the DS to operate on different frequency bands and continue operations in frequency jammed areas. Operating

individually in a frequency contested area, the drone would be set to either return to point of departure or in a covert operation fly to predetermined position in order not compromise the position of Marines or Soldiers.

The DS concept is based partly on a cyber security threat known as an advanced persistent threat (APT).[102] The goal of an APT is to gain access to a network, remain concealed, and provide information on the target. The DS can be employed covertly or overtly, overt operations would show a persistent presence even when actual personnel are located elsewhere or add the amount of personnel to provide observation on blind area and covertly to maneuver on a target and prepare intelligence for action. Covertly the DS could support a scout OP by being flown out farther to provide visibility on dead space and provide different angles of viewing.

The utility of the DS can be applied to the historical review of Operation Phantom Fury. The DS would be able to provide reconnaissance, deception, fires support, and protection. Operation Phantom Fury was the result of a growing insurgent force in the city of Fallujah and three events that led to the operation, 82nd Airborne personnel firing on a demonstration, the murder and mutilation of the Blackwater contractors, and Operation Vigilant Resolve.

The first prelude was the firing of the 82nd Airborne personnel on the Iraqi demonstration.[103] As the platoon prepared to use an Iraqi school for a patrol base a crowd gathered to protest their use of the school and the American presence.[104] At one point the 82nd personnel believed they came under fire from the crowd and so they returned fire, killed Fallujah residents in the crowd.[105] If the leaders on the ground had the capability to gain better situational awareness, they could have been able to identify where the gunfire originated from and then provided that evidence to the local elders for their own adjudication or identified there were no weapons in the crowd and not fired upon the crowd or even with the DS observed the crowd

moving on their position and broken contact to a different position. The DS could have given the leader more options besides firing upon a crowd or breaking contact when they first observed the crown. The leader could have posted a forward OP to provide warning, but this could have led to the death or capture of US forces, but if part of the DS, the individual drone, was placed in a OP, the only loss would have been a small flying drone that is similar to the ones sold around the world. This example is in support of MOC 6.3.1, 6.3.4, 6.4.3, and AOC 3.3.c, 3.3.e, 3.3.f, and 3.3.g.[106,107]

The second prelude was the murder and mutilation of four Blackwater Contractors. The contractors were escorting a logistical convoy through the city when they were attacked and killed during an insurgent ambush.[108] Their bodies were pulled from their vehicles drug through the streets and hung from a bridge.[109] The contractors did not inform the military ground space owner (GSO) of their movements, so no one was aware of their location.[110] This tragedy may not have been prevented, but efforts must be made to prevent this from happening again. The sheer number of drones in the DS can supplement company, battalion, and brigade level unmanned aerial vehicles (UAV). By saturating the environment with the DS this would have identified the convoy moving through the city and would have allowed the GSO to communicate to the contractors. Once communication established, the DS could have provided information to the GSO on a better route out of the city and this information relayed to the contractors. If the GSO was unable to communicate with the contractors before they were ambushed, the facial recognition capability could have recorded the faces of the personnel in the protest and during subsequent patrols into the city the DS could have assisted in the intelligence identification of the perpetrators of the mutilation. The availability of UAV is always in limited supply during

operations and always in high demand, but is prioritized to critical missions. The DS concept would be in support of MOC 6.3.1, 6.3.4, 6.4.3, and AOC 3.3.f, 3.3.g, and 3.3.h.[111,112]

The third prelude to Operation Phantom Fury was Operation Vigilant Resolve. Although the actions of US forces were not the reason for the operation's failure, but the loss of the IO.[113] The insurgents were able to send their message without the coalition forces side of the story. When coalition forces destroyed a mosque that insurgents were using to engage coalition forces only the portion of the mosque's destruction was televised throughout the world.[114] The DS has the ability to broadcast footage, and coupled with the amount of the drones in the DS, would provide evidence to news correspondents on the US forces point of view. The DS capacity to be reconfigured per mission can allow unclassified footage that correspondents can watch and use in their reports. The DS concept is in support of MOC 6.3.4 and AOC 3.3.c and 3.3.g.[115,116]

Operation Phantom Fury was an example in a conventional force moving to destroy an enemy in a fortified position in dense urban terrain (DUT). The DS concept has the capability to enhance intelligence, fires, movement and maneuver, and protection.

At the beginning of Operation Phantom Fury, 1/3 would need to breach the obstacles and then begin to clear south into their sector.[117] 1/3 experienced complications during the breach which caused a delay in their operation. The insurgents capitalized on this delay and maneuvered on their position. RCT-7 was the support effort for Operation Phantom Fury and did not have priority and also during their breach the two Raven UAVs crashed.[118] The DS concept is adaptable to the situation and by saturating the environment with observation drones, 1/3 could have been proactive to the insurgent’s movement and with the precise fires provided by the DS destroyed them to prevent disruption of the breach. The DS also works can work on a different frequency band this would allow the DS to operate during electronic warfare attacks.

The DS concept would be in support of MOC 6.3.2, 6.3.4, 6.4.2, 6.4.3, 6.4.4 and AOC 3.3.c, 3.3.f, 3.3.g.[119,120]

During clearing operations, 2/2 would need to provide accurate fires on to insurgent positions and to accomplish this 2/2 would have Soldiers occupy positions on top of roof tops, exposing them to insurgent fire and would require them to clear a building in a small team if needed.[121] The DS would be able to occupy positions without exposing personnel to enemy observation. The DS is also smaller and provides a small target in order to prevent or lower risk to Marines and Soldiers. The DS concept is in support of MOC 6.3.1, 6.3.2, 6.3.4, 6.4.3 and AOC 3.3.c, 3.3.f, and 3.3.g.[122,123]

While clearing buildings; 1/3 followed a similar pattern, breach the outer wall, breach the house, and then move room to room until it is clear.[124] 3rd Platoon, Alpha Company, 1/3 could have used a drone from the DS before breaching the outer wall, then moved to the main entryway. Before breaching the drone can move in to the building from a higher level and conduct reconnaissance of the inner building and identify insurgent positions. During the reconnaissance, the drone can be equipped with a direct-action capability to either detonate or fire upon the insurgents in the building. The drone can also be used to deceive the insurgents on the avenue of entry from either the upper levels or lower levels.

While clearing the government complex 1/8[125] Marines came under fire from snipers and were not able to quickly identify their positions. To identify the sniper positions, the leader could employ a drone from the DS to identify the sniper's position and then provide location for indirect fire, engage the sniper with the drone, or use it to distract the sniper while the squad broke contact. The DS is in support of MOC 6.3.1, 6.3.2, 6.3.4, 6.4.3, 6.4.4 and AOC 3.3.c, 3.3.e, 3.3.f, and 3.3.g.[126,127]

Access to current technology make the DS an easy option for units to adapt faster than a larger single system. The DS could be filled with such small quad-copter drones as the DJI Phantom 4.[128] The DJI Phantom 4 (DJIP4) has many capabilities already built-in that are useful for the Marine and Soldier, it can be set to follow a person and vary the altitude while following the person providing a wide-angle view.[129] The DJIP4 can recon a location set by the operator ahead while providing live feed to the operator.[130] The DJIP4 also can maneuver itself without harming itself due the built-in obstacle avoidance programming, this could prevent accidental damage while flying in dense urban terrain.[131] If an adversary has moved out observation, but observed by the DJIP4, the can be set to track a specific target. Due to the ease of flying small quad-copter drones, such as the DJIP4, a unit level training plan could be established and more personnel could be trained on the system versus a longer course where personnel have to leave the unit and miss vital training.

The technical support needed to operate the DS could be as minimal as possible due to the commonness of the systems. The DS being utilized as an individual system would still require an operator to send commands to the system before any mission and then to alter the command as needed. The narrow artificial intelligence (AI) in the systems currently can allow the operator to set a fly and track command to the system. The DS would need a continually improving narrow AI to provide more capability, that could range from friend or foe identification, threat analysis based on an ability to reach back to a repository of databases to identify people and equipment based on technical databases and social media reconnaissance.

If the DS is used as a squad element the drones could be set to individual tasks which could reduce processing time by distributing search criteria across multiple drones. The DS would still require an operator to set the mission and adjust accordingly. As operating as a

complete DS, the search area covered would be increased because the drones could relay movement information to each other, while each individual drone performs its mission.

Although the DS primary role is to support the squad to company level access to intelligence databases could prove useful to all echelons. The DS could be set to operate as a much larger search DS. This could be as simple as utilizing drone swarm programming to set an entire Regiment's or Brigade's DS assets to cover an entire city while in search of a high value target or missing personnel. By setting the DS in this swarm pattern, can serve multiple purposes, provide a large search area, supported by set search parameters to reports only specific data set by the operator/operators. A larger DS swarm could be set to deceive an adversary on where we are focusing our efforts, while higher echelon ISR assets are providing coverage on the actual target area. The DS swarm could provide a large visible presence to deceive, deter, or deny an adversary advance warning based on the US military reliance on technology.

The DS concept is based on utilizing current technology that is available now and then improved upon and also the simple means to maintain them. The DS is not intended to be a complicated system, but be able to use the Marines and Soldiers who fly drones as a hobby and reduce training time of exploit the knowledge of Marines and Soldiers. The commonness of the drones reduce time to acquire repair parts, instead of requesting a part and then waiting a week for the part to be shipped and delivered the leader can purchase the repair parts or 3d print the part. The DS would continue to provide ease of use and a capability to the squad level and enhance their situational awareness.

Operational Decision Game

The purpose of the operational decision game (ODG) was to determine if the DS concept was able to provide a useful capability to military forces in the event of a likely scenario. The

ODG is an informal way to validate if the DS concept can assist a force during the execution of their mission. Coalition forces were able to successfully accomplish Operation Phantom Fury, because the Coalition forces were able to convince the local population to temporarily leave the city and then saturate the city with military forces. The Coalition force's actions removed the critical requirement of anonymity, by removing as much of the local populace as possible and exploited the critical vulnerabilities of the force ration by saturating the city with a large number of forces. Unfortunately; US forces will not always be able to convince a population to leave their city and must continue to fight the insurgency.

By knowing the major factors that attributed to Coalition forces success and the attributes of the city an ODG was designed to apply the attributes of the city, dense area and populace, and remove the factors that attributed to the Coalition forces success. The reason the factors were removed was because it is not reasonable to assume a local populace will always leave a city. Based on an emerging threat in a city military force would not be able to mass a large force on an objective until the threat was large enough.

Operational Decision Game Development

The ODG was designed to place a friendly force into a DUT during a deteriorating security situation. A US Army Infantry Battalion, with only currently assets, would be assigned to Kiev, Ukraine to assist the Ukrainian government in destroying or reintegrating insurgent, transition security back to Ukrainian security forces. There were no restrictions in the ODG in regards to requesting additional assets, that was for the participant to determine. Kiev was selected because it is a DUT environment with a large population and that future operations could occur within this type of environment. This location favors the enemy by providing

anonymity and leaving the population in place. The goal is to determine if the concept is able to assist the force in mission accomplishment.

During the development of the ODG an additional concept was added to provide the US force a way to pull intelligence information from the various types of social media. The additional concept would allow the unit to pull social media data on targeted personnel, such as location or recent activities, or track events being published on social media, news outlets, or governmental assets. This concept provides the US forces an ability to garner intelligence at the Battalion level to maneuver against the insurgent forces. This concept was added to the ODG because during DUT operations the local populace might use social media to broadcast events that could assist in fixing the security situation or an adversary could use it as a communications platform to broadcast their message to a large population.

The ODG had two variations. The first ODG variation included the DS concept and the social media intelligence concept. This provided the player a new option in completing the mission. The second ODG variation did not include either concept and the US Infantry Battalion was only equipped with the equipment current assigned to the unit. The second game variation was to identify, if any, gaps the force structure has in a DUT environment. The two game variations intent was to have an experimental variable and a control variable.

Operational Decision Game Purpose

The ODG was distributed to a fifteen-person group. The group demographic was two professors and thirteen military member students. The personnel have varying levels of experience of conducting ODGs. There were two school professor participants and thirteen students. Seven ODGs were retuned completed with varying levels of input. The levels of input ranged from solving only the solution set to providing feedback on feasibility of the two

concepts. The experimental concept ODG was the only game returned for analysis. All data is based on the new concept ODG and no data is based on the control and this is why this will remain an informal way to develop the two concepts and will require more research.

The goal of the ODG was to provide feedback to the concept developers on how to address any discovered shortfalls. The ODG was also a means to answer the following research questions:

1. Did the experimental concept provide an advantage as compared the control?
2. What additional requirements do the concepts require?
3. How could the concept be refined to support on-site forces and commanders?

Operational Decision Game Results

The responses provided invaluable information to improve the concepts from the squad level and how to integrate the two concepts at multiple echelon levels. However; due to the lack of control responses additional research will required, but the responses were still invaluable.

The responses identified three areas of improvement: additional personnel, information synthesis, and overall concept capability. Three of the seven ODG identified personnel shortfalls that would need to be addressed to make the Drone Squad and Social Media Scraping concept as capable as possible. ODG player 2 identified that to sort through the data that is being compiled additional intelligence cells would be needed to review the data. ODG player 4 identified that the current squad design does not have the personnel to handle new equipment and an additional person should be assigned to the squad, known as the assistant to the squad leader.

The second area of improvement identified is the synthesis of the data that is being gathered. ODG players 1, 6, and 7 each identified the need to quickly synthesize the data. ODG player 7 suggested that analytical applications could be used to quickly sort through the data.

ODG player 6 emphasized the requirement to synthesize the data quickly, but also a fast way to send an intelligence update to forces in the target area. The data synthesis will be a major area of future research and could be a combination of human and narrow artificial intelligence data analysis.

The third area of improvement identified can be categorized as general capability observations. ODG player 2 expressed concern over the 30-minute flight time and how that can interfere with an ISR plan. This concern is shared and could be addressed by adding a charging station installed on a vehicle or spare batteries carried during a patrol. ODG player 2 also indicated that the Social Media Scraping and Drone Squad should be incorporated into a ISR collections plan. ODG player 3 noted that one of the mission specific pod for the Drone Squad should be a signal intelligence (SIGINT) pod. ODG play 4 recommended that in addition to a facial recognition pod, an object recognition pod should be available. An object recognition pod could provide the operator the ability to identify vehicle and weapon types. ODG player 7 identified that due to the amount of data being collected, there needs to be a way to store the data. This will become a serious issue and will require a large amount of storage space. A 1080p 30-minute video can take up to 22 Gigabytes of space.[132]

All of the above-mentioned improvements will be added to the original DS concept. As the DS concept continues to develop additional research time should be committed to test the improvement for identify if the intent of the change has been met. Some of the changes might require a change to force structure and assigned equipment.

Although the DS is a capable concept, the DS is meant to enable the operating force, but alone can affect only so much. If the DS is combined with additional concepts this can form a more holistic way to enable the operating force.

Future Concept - Technology for Urban Terrain

Created by: Majors Rachell Baca, Zachary Iiams, Jonathan Peterson, and Alexandra Plunkett

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.[133] 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."[134] 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 Marine Corps Operating Concept (MOC) emphasizes that "operations in urban areas are the most likely to occur and the most dangerous."[135] Further, the MOC emphasizes the Marine Corps must "Exploit man-machine interface and manned-unmanned teaming (MUM-T) to overcome challenges in urban terrain."[136] 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."[137] It also enables enhanced support to the targeting process by pdroviding 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.[138] 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.[139]

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.[140] 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)[141] 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.[142] 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.[143] 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 MSRs. 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 causalities 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.[144] 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.[145] This effect is the "repel effect" and causes humans to close their eyes, turn their heads or bodies, and move out of the beam.[146] 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.[147] 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."[148] 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 atmospherics. 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.

Conclusion

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.

Appendix A – Insurgency in Dense Urban Terrain with Future Concept

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Insurgency in Dense Urban Terrain

Operational Decision Game in Kiev, Ukraine

MAJ Rachel Baca

MAJ Zachary Iiams

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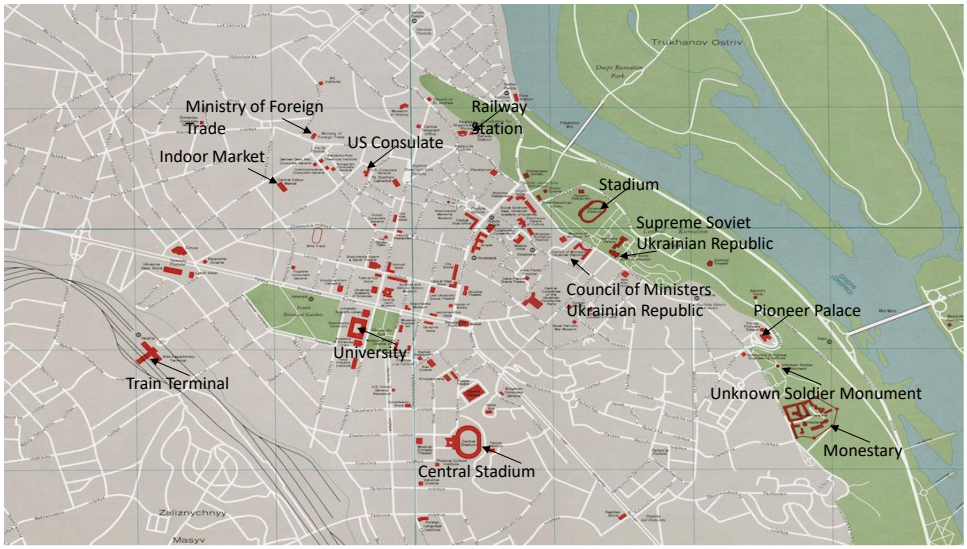
Map Segment of Kiev, Ukraine



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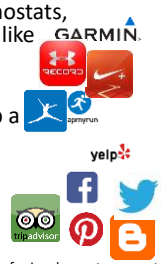
Information Environment

- Kiev is a modern city with 3G/4G/LTE networks, just about everyone owns, uses, and accesses the internet via a mobile device. Personal computers proliferate the country as well, with at least 1 personal computer in every household.
  - Social Media is primary means of communication for people under the age of 35.
  - Much like the US, most people have/wear personal fitness devices (PFDs) that monitor HR and pace count at a minimum.
- In addition to Internet, 8 out of 10 households utilize some sort of smart TV device such as appleTV or the Amazon Firestick.
- 7 out of 10 households also now have smart devices controlling their thermostats, lighting, locks, etc. Many have also made the switch to other smart devices like refrigerators.
- As with much of Europe, Ukraine has installed CCTV around the city to keep a watchful eye on its citizens in a hope to deter crime. Citizens have come accustomed to the cameras and no longer ay much attention to them.



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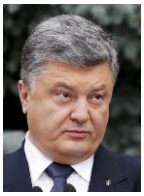
Road to War 2020

- The situation in Kiev has deteriorated quickly since the assassination of President Poroshanko which is largely speculated to have been in response to his continued push for political, economic, and judicial reforms; and the recent reinvigoration of attempting to join the EU.
- Since then, there has been an insurgency noticeably growing while the interim government works to replace Poroshanko.
- The US is currently transitioning to a new administration, but has been called upon by NATO to help suppress the unrest, squash insurgency, and aid Ukraine in the election process for the new government.
- While it cannot be proven, it is believed that Russia either conducted or supported the assassination of Poroshanko. Since the assassination, Russia has remained quiet in regards to the death, but has openly spoken of its opposition to the Ukraine joining the EU and its desire to eventually, one day, re-claim wh is rightfully theirs



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Current Situation

- Social Unrest among Locals who are worried that the government may return to a Pro-Russian state as well as though who are vocalizing the desire for a Pro-Russian government
- Protests among students both for and against joining the EU
- Assassination attempts on interim government leaders
- IED's and bombs found and detonated IVO government facilities and security forces in the area
- Recent sightings of non-governmental or media associated drones conducting surveillance of bridge crossings and areas that are highly populated throughout the day.

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Enemy and Equipment

- The insurgency blends easily into the Local population wearing street clothes and participating in daily activities.
- Have the ability to initiate and exacerbate protests and riots within the city in as little as 2 hours
- There are assessed to be around 40-50 insurgents being supplied and funded by the Russian government within Kiev proper.
- Equipment includes
  - Class 1 drones- linked to smart phones with video/photograph capability
  - AK 47's and RPG's
  - Homemade bombs/IEDs

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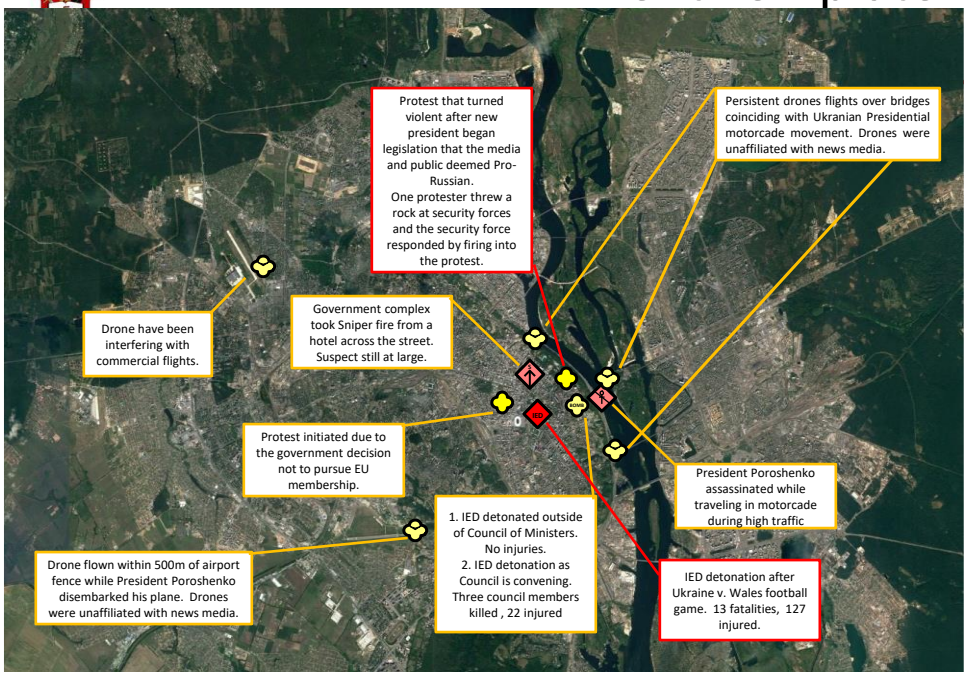
Event Template



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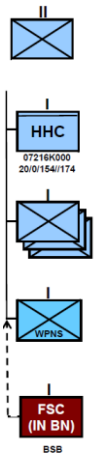
Friendly Composition

- 2/2 Infantry Battalion, 3rd Infantry Brigade Combat Team, 10th MTN DIV is fully mission capable.
  - 1 Headquarters and Headquarters Company,
  - 3 Rifle Companies
  - 1 Heavy Weapons Company
  - 1 Forward Support Company
- For full unit composition reference slide 14-20.
- 2/2 Infantry has been augmented with 108 HWWV for mounted operations



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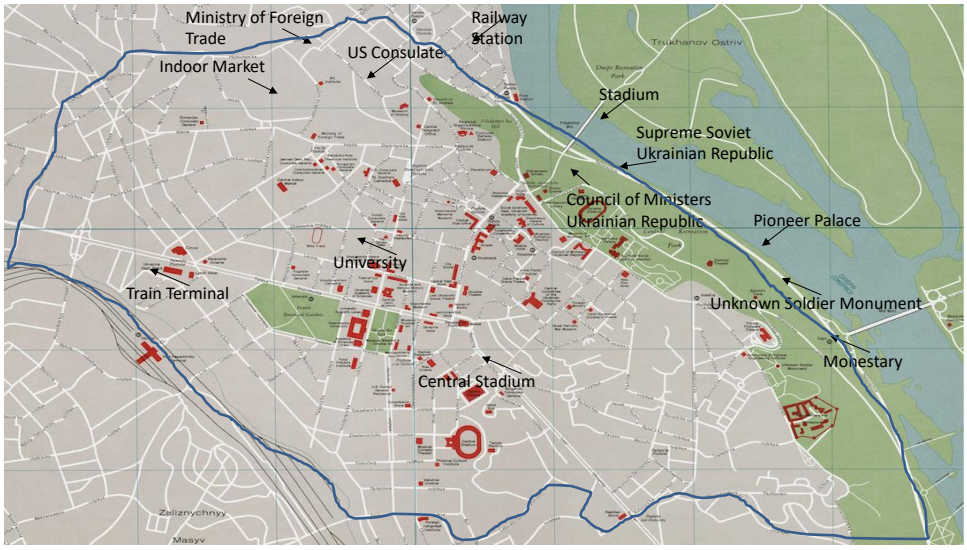
2/2 Infantry Area of Operations



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3rd Infantry Brigade Combat Team, 10th MTN DIV Commander's Guidance

- Insurgents in Kiev destroyed or reintegrated into the populace
- Set Conditions to transition security of Kiev to Ukranian security forces
- Prepare for Follow-on Operations

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Future Concept 1: Data Scraping

- Social Media Scraping Tool Kit
  - Scrapes ALL social media: Facebook, Twitter, Vimeo, Trip Advisor, Blogger, Yelp, MyFitnessPal, Garmin etc. searching for common themes and messages, flags key individuals/influencers and notifies analysts.
  - Analysts approve or disapprove the person of interest for further/follow on observation or collection
- Personal Fitness Device Tool Kit
  - Ability to view all information from PFD's within a Geo tagged area near real time.
    - Heart rate, activities completed, handle name, challenges joined/completed etc
- Smart Device Tool Kit
  - Ability to view all smart home devices within a geo tagged area real time and history up to
- CCTV Tool Kit
  - Access to CCTV across the country with AI that has the ability to predict locations of protests and riots prior to full blown execution

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Future Concept 2: Drone Squad

- Each squad or vehicle section Infantry has been issue one drone that is a part of the Drone Squad.
- Can be human controlled or autonomous
- Each drone has a one 1080P HD camera installed
- Each drone can be outfitted with one of the following pods:
  - Survey- Route Reconnaissance
  - Explosive charge
  - CBRNE Detection module
  - Target designator – Laser range finder and target GPS position
  - 9mm firearm pod – 15 rounds
  - Facial Recognition pod
  - Retransmission/Relay
  - Network Reconnaissance / Penetration
- Can operate up to 4 miles away from controller (Line of Site)
- Can fly up to 40 miles per hour
- Vehicle platforms have a recharging station
- 30 min flight time
- Battery can be changed during patrols
- 1 hour battery recharge time
- Individual Drone use
  - Drone can be set to a lead mode to fly a determined distance ahead of the squad to fly a predetermined route with the Infantry squad or maintain a distance a head of controller based on Friendly identification
  - The pod selected for the mission will determine patrol capability.
  - Based on the pod selected the pod can pull/push relevant data from information systems and databases to assist the squad.
  - The drone can be set to return to operator or fly to a predetermined points.
- Drone Squad Configuration
  - The drone squad pod load can be adjusted to suit the mission.
  - A drone is set a lead and is maneuvered by an operator or set on a pre-planned mission.
  - Drone squad is a living link system that allows for fault tolerance, if the lead drone loses contact, the drones will attempt to re-establish link and continue mission.
  - Drones can be outfitted with different communication pods to allow the drone squad to communicate on different frequency bands.

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

References on key terms are provided

SOLUTION SET

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Problem Framing

Problem Statement (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:

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COA Graphic and Narrative

COA GRAPHIC OR TYPED DESCRIPTION	MISSION:
	INTENT: (purpose, method, desired condition)
	CONCEPT: (incl. key tasks by phase)

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Theory of Victory

Synopsis of your Central Idea

Necessary Capabilities

Application & Integration of Military Functions

Spatial & Temporal Dimensions

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Anything Else?

- Please include any questions, comments, or additional details about employment of future concepts here:

Appendix B – Insurgency in Dense Urban Terrain without Future Concept

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Insurgency in Dense Urban Terrain

Operational Decision Game in Kiev, Ukraine

MAJ Rachel Baca

MAJ Zachary Iiams

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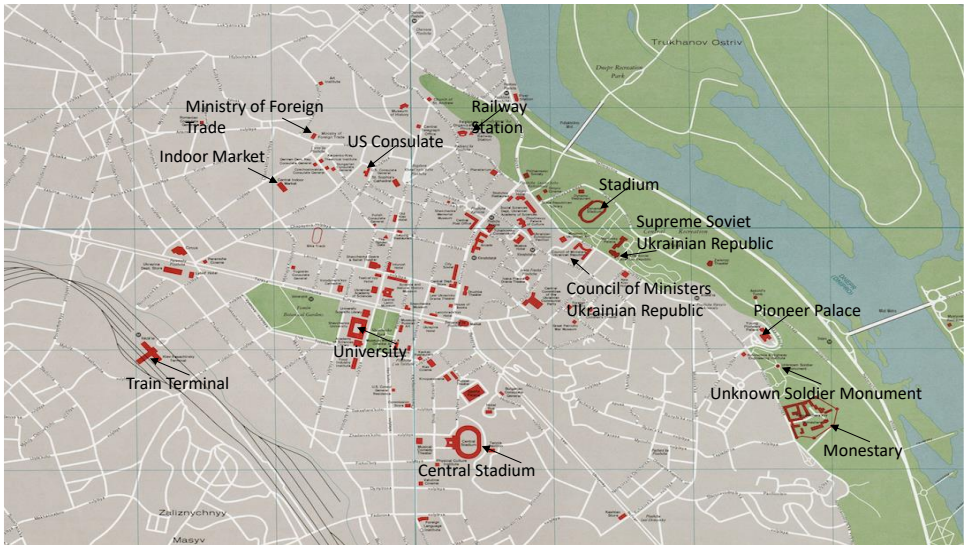

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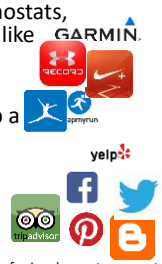

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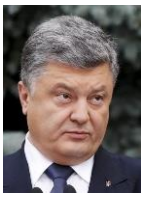

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- There are assessed to be around 40-50 insurgents being supplied and funded by the Russian government within Kiev proper.
- Equipment includes
  - Class 1 drones- linked to smart phones with video/photograph capability
  - AK 47's and RPG's
  - Homemade bombs/IEDs

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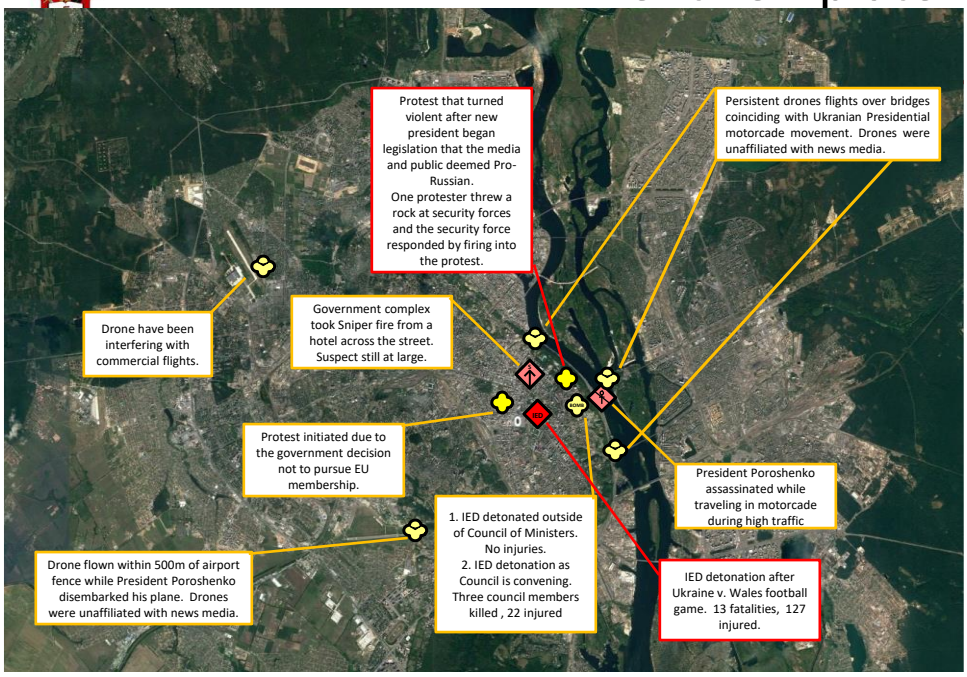
Event Template



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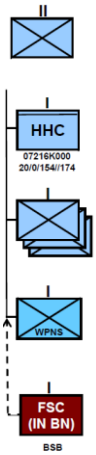
Friendly Composition

- 2/2 Infantry Battalion, 3rd Infantry Brigade Combat Team, 10th MTN DIV is fully mission capable.
  - 1 Headquarters and Headquarters Company,
  - 3 Rifle Companies
  - 1 Heavy Weapons Company
  - 1 Forward Support Company
- For full unit composition reference slide 14-20.
- 2/2 Infantry has been augmented with 108 HWWV for mounted operations



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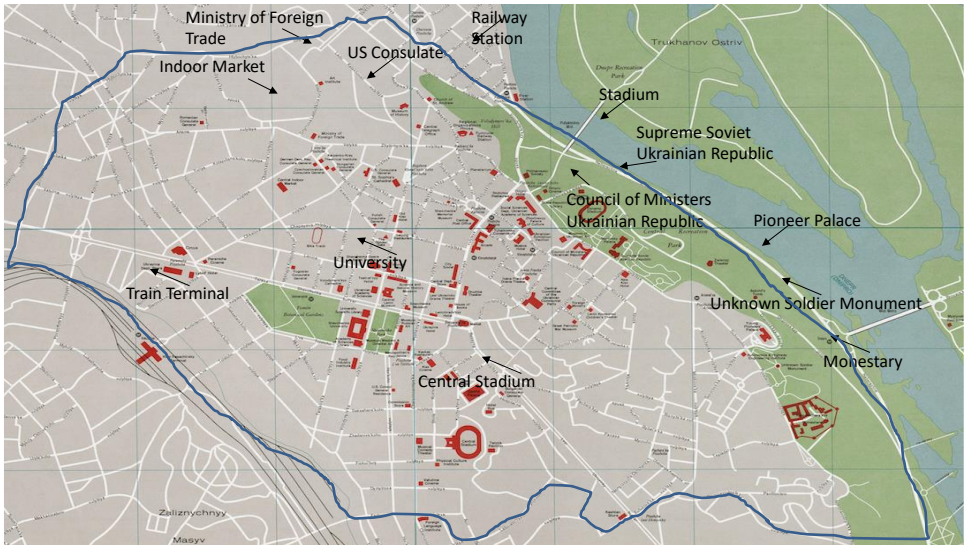
2/2 Infantry Area of Operations



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3rd Infantry Brigade Combat Team, 10th MTN DIV Commander's Guidance

- Insurgents in Kiev destroyed or reintegrated into the populace
- Set Conditions to transition security of Kiev to Ukranian security forces
- Prepare for Follow-on Operations

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

References on key terms are provided

SOLUTION SET

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Problem Framing

Problem Statement (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:

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COA Graphic and Narrative

COA GRAPHIC OR TYPED DESCRIPTION	MISSION:
	INTENT: (purpose, method, desired condition)
	CONCEPT: (incl. key tasks by phase)

UNCLASSIFIED

Theory of Victory

Synopsis of your Central Idea

Necessary Capabilities

Application & Integration of Military Functions

Spatial & Temporal Dimensions

UNCLASSIFIED

Anything Else?

- Please include any questions, comments, or additional details about employment of future concepts here:

Appendix C – Operational Decision Game Player Responses
Player 1

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Problem Framing

Problem Statement (incl. list of key facts and assumptions):

2/2 must isolate and capture/kill SS insurgents in a city of 7.5 million using a standard Battalion while not imposing complete martial law.

Tensions Between Current Conditions and Desired Conditions:

- Ability to control a population of 7.5 million
  - to find & monitor
- Popular support while searching for insurgents

Elements that Must Change to Achieve the Desired Conditions:

- 2/2 needs a force multiplier

Opportunities and Threats to Achieving the Desired Conditions:

- The more people, the more information that is available. However, manpower is required to find and sort it.

Limitations: can't augment the whole city.

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Theory of Victory

Synopsis of your Central Idea

- IW must be used as a force multiplier to augment low troop to population ratios. Ground troops will mostly be limited to figureheads while Isaf and IW ops attempt to expose the enemy.

Necessary Capabilities

- Robust Isaf/ANSF IW units.

Application & Integration of Military Functions

Throughout

Spatial & Temporal Dimensions

Due to the scope of the operation, time will be required. This will not happen in less than 6 months.

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COA Graphic and Narrative

COA GRAPHIC OR TYPED DESCRIPTION

Leading the personnel to effectively Isolate Kizer, 2/2 must focus on planning for a consistent presence in an attempt to draw the insurgents into a conflict. In the meantime all efforts must be made to exploit any and all electronic means to identify the insurgents in the city. That said, due to the porosity of the city, the likelyhood of capturing the insurgents is low. Therefore the reinforcement of popular support must take top priority. [redacted]

MISSION: 0/0 2/2 conduct stability operations IVO Kizer IOT prevent insurgent forces from infiltrating the local populace.

INTENT:
(purpose, method, desired condition)

I: Isolate the captive insurgent force.

M: Provide persistent presence [redacted] augmented with limited direct action ops.

C: Insurgent activity suppressed in Kizer.

CONCEPT:
(incl. key tasks by phase)

T: Provide visible deterrence.

T: Conduct IW ops

Player 2

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Future Concept 2: Drone Squad

- Each squad or vehicle section Infantry has been issue one drone that is a part of the Drone Squad.
- Can be human controlled or autonomous
- Each drone has a one 1080P HD camera installed
- Each drone can be outfitted with one of the following pods:
  - Survey- Route Reconnaissance ✓
  - Explosive charge
  - CBRNE Detection module ✓
  - Target designator – Laser range finder and target GPS position ✓
  - 9mm firearm pod – 15 rounds
  - Facial Recognition pod ✓
  - Retransmission/Relay ✓
  - Network Reconnaissance / Penetration ✓
- Can operate up to 4 miles away from controller (Line of Site) - ok through buildings?
- Can fly up to 40 miles per hour
- Vehicle platforms have a recharging station
- 30 min flight time — vehicles returning to platform every 30 mins could present a vulnerability? — what would you do if the mission required greater persistence?
- Battery can be changed during patrols
- 1 hour battery recharge time

- Individual Drone use
  - Drone can be set to a lead mode to fly a determined distance ahead of the squad to fly a predetermined route with the infantry squad or maintain a distance a head of controller based on Friendly identification
  - The pod selected for the mission will determine patrol capability.
  - Based on the pod selected the pod can pull/push relevant data from information systems and databases to assist the squad.
  - The drone can be set to return to operator or fly to a predetermined points.
- Drone Squad Configuration
  - The drone squad pod load can be adjusted to suit the mission.
  - A drone is set a lead and is maneuvered by an operator or set on a pre-planned mission.
  - Drone squad is a living link system that allows for fault tolerance, if the lead drone loses contact, the drones will attempt to re-establish link and continue mission.
  - Drones can be outfitted with different communication pods to allow the drone squad to communicate on different frequency bands.

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Problem Framing

Problem Statement (incl. list of key facts and assumptions):
Insurgent populations deeply embedded in Kiev is disrupting peace and government operations; 3rd Infantry BCT destroy/reintegrate insurgents set conditions to transition security of Kiev to Ukranian security forces.

Tensions Between Current Conditions and Desired Conditions:
- unable to identify insurgents from civilian population
- insurgents utilizing drones disrupting the peace
- aggitated populace resulting in protests

Elements that Must Change to Achieve the Desired Conditions:
- integrate insurgents
- detect/remove/prevent IED placement
- conduct counter UAS ops
- ensure protests are peaceful

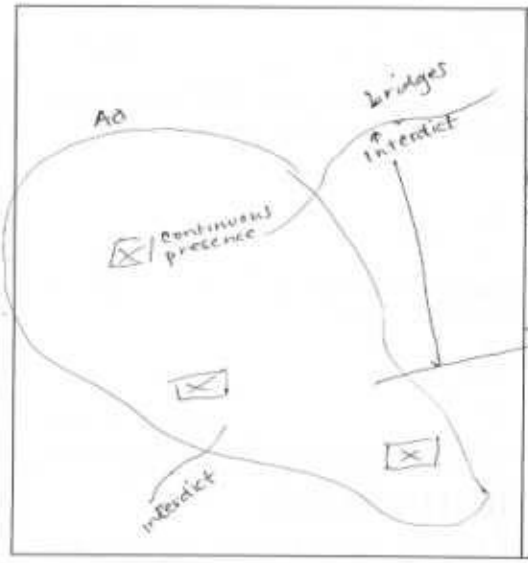
Opportunities and Threats to Achieving the Desired Conditions:
Opportunities - use of electronics, social media, cameras

threats - drones, ieds, insurgents embedded in local population, protests/riots

Limitations:
prevent escalation with the Russian government

JP 5-0, Figure III-6

COA Graphic and Narrative



MISSION:
Destroy insurgency population + neutralize EN drone + IED threats.

INTENT
(purpose, method, desired condition)
Purpose:
Reduce insurgent influence on population.
Eliminate insurgent ability to place IEDs/conduct drones
Method
Build intel picture
Continued presence
Peaceful protest + elections
End state:
Eliminate insurgency + peaceful elections

CONCEPT
(incl. key tasks by phase)
- conduct offense intel collection / PED op
- interdict main road by using checkpoints (rotating)
- support community building / governance in run up to elections. Ensure peaceful protests
- o/o execute HVT raids
- Continuous presence of forces throughout sector

Theory of Victory

I would use future concept 2 to collect and detect (ISR role)

Synopsis of your Central Idea

- Use future concepts 1 + 2 to tip + queue forces.
  - will provide intel on location + activity
  - drones can detect location of IEDs + maybe ID people who place them
- use intel acquired to provide targeting information to forces for capture/kill insurgents and detect/destroy IEDs + drones.

Necessary Capabilities

- intel focused operation -
  use of Sigint, open source, pattern of life, video } need 24/7 coverage
  will be critical
- need an intel cell to PED the data
- need targeting cell to translate useable intel into targets of interest.

Application & Integration of Military Functions

intel + protection - use of future concepts 1 + 2 will enable greater intel collection capability, esp in an urban environment
- allows US troops to have higher probability of success + understand EN's better

maneuver - social media scraping is a form of maneuver - exploiting gaps that we can use to our advantage

Spatial & Temporal Dimensions

- The AO is manageable but I am not sure how to assess the distance from the AO to the beddown location of US forces.
- Also, what % of CCTV coverage of Kiev is available - do we need additional overhead coverage?
- Where will intel be PED'd - will be time critical.
  emerging intel on insurgents will have to be acted on quickly

Player 3

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Future Concept 1: Data Scraping

- Social Media Scraping Tool Kit
  - Scrapes ALL social media: Facebook, Twitter, Vimeo, Trip Advisor, Blogger, Yelp, MyFitnessPal, Garmin etc. searching for common themes and messages, flags key individuals/influencers and notifies analysts.
  - Analysts approve or disapprove the person of interest for further/follow on observation or collection
- Personal Fitness Device Tool Kit
  - Ability to view all information from PFD's within a Geo tagged area near real time.
    - Heart rate, activities completed, handle name, challenges joined/completed etc
- Smart Device Tool Kit Look for devices controlling UAS or streaming pics/video from them. Then look for [illegible] [illegible] to [illegible] to [illegible] to perpetrator
  - Ability to view all smart home devices within a geo tagged area real time and history up to
- CCTV Tool Kit
  - Access to CCTV across the country with AI that has the ability to predict locations of protests and riots prior to full blown execution

Can CCTVs pick up flight paths of UAS's? Track to POO or destination? Real time may be difficult but analysis of video over days or a week may present a trend.
Deploy fake motorcades or fake flights of dignitaries to watch for trends. Publicize them to ensure people know who will be traveling —

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Future Concept 2: Drone Squad

Could the drones be equipped with a sigint capability to detect "enemy" UAS and by triangulation [illegible] and collide with them to bring them down or [illegible] them and track them.

- Each squad or vehicle section Infantry has been issue one drone that is a part of the Drone Squad.
- Can be human controlled or autonomous
- Each drone has a one 1080P HD camera installed
- Each drone can be outfitted with one of the following pods:
  - Survey- Route Reconnaissance
  - Explosive charge
  - CBRNE Detection module
  - Target designator – Laser range finder and target GPS position
  - 9mm firearm pod – 15 rounds
  - Facial Recognition pod
  - Retransmission/Relay
  - Network Reconnaissance / Penetration
- Can operate up to 4 miles away from controller (Line of Site)
- Can fly up to 40 miles per hour
- Vehicle platforms have a recharging station
- 30 min flight time
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- Individual Drone use
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  - The drone can be set to return to operator or fly to a predetermined points.
- Drone Squad Configuration
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  - Drone squad is a living link system that allows for fault tolerance, if the lead drone loses contact, the drones will attempt to re-establish link and continue mission.
  - Drones can be outfitted with different communication pods to allow the drone squad to communicate on different frequency bands.

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Theory of Victory

Synopsis of your Central Idea	Necessary Capabilities
Reference notes on "Future concept" slides	Large pool of data analysts I assess that even though software may ID trends, analysts will be needed to verify targets and establish priorities for needed intel and/or Cyber/maneuver targets
Application & Integration of Military Functions	**Spatial & Temporal Dimensions**
Intelligence Fires & Maneuver	

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Problem Framing

Problem Statement (incl. list of key facts and assumptions):

Enemy is hiding in population and using close ISR UAVs to surveil and threaten HVIs.

Tensions Between Current Conditions and Desired Conditions:

Enemy is operating with anonimity —> Draw them out / ID them
Enemy is not armed / equipped / motivated —> Decrease their usable supplies / frustrate their efforts
Enemy is gaining popular support —> Force them to show their malicious intent / turn popular support against them

Elements that Must Change to Achieve the Desired Conditions:

- Enemy must be located real time or rearward and forced to show themselves
- Enemy supplies must be reduced to untenable amounts. Take out their drones and force them onto CCTV or to use arms for violence

Opportunities and Threats to Achieving the Desired Conditions:

- Enemy has a unique and high volume of Elec signatures
- Enemy currently has freedom of movement. Limit their freedom to move / surveil / communicate.

Limitations:

- Enemy is operating in open/public domain. Jamming their frequencies affect public and limit Friendly ability to monitor them.
- Time sensitive b/c if they feel threatened they move to drastic measures against friendly HVIs

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Anything Else?

- Please include any questions, comments, or additional details about employment of future concepts here:

A counter social media push will have to be executed covertly at first and then very rapidly. Once enemy has any indication that they're being monitored / targeted they will rapidly change the comm methods or encrypt or begin using code words.

Enemy has shown the ability to use UAVs to target HVIs. As soon as they feel pressured, what was surveillance will rapidly transition to offensive action. It may be best, at that turning point to force them to target civilians and bystanders to build public support against them.

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Player 4

Solution Set

ODG: INSURGENCY IN DENSE URBAN TERRAIN

Andy Macak

1

Problem Framing

Problem <u>Statement</u> (incl. list of key facts and assumptions): 2/2 must support the sovereign Ukrainian government as part of a Ukrainian IDAD plan supported by a whole of US government approach to defeat a growing insurgency in Kiev that is covertly supported by Russian SOF UW and is split on accession to the EU.
Tensions Between Current Conditions and Desired Conditions: Current: insurgency in Kiev Desired: insurgency destroyed or effectively re-integrated into the populace.
Elements that Must Change to Achieve the Desired Conditions: Russian support/safe haven to insurgency.
Opportunities and Threats to Achieving the Desired Conditions: Opportunities: Shit ton of mobile devices, computers, TVs, CCTVs to exploit with SOCMINT/Cyber collections; Ukrainian military/police more knowledgeable of local terrain, culture, customs, sense of normalcy than US forces. Threats: Deteriorating political climate following assassination, emerging insurgency, govt legitimacy, US presidential transition (period of vulnerability), Russian clandestine activities and political interests, Pro/Anti-Russian polarities, pro/anti-EU polarities, IEDs targeting govt/pol/mil leaders, suspected COTS drone employment by insurgency for ISR, insurgency can hide amongst population. RUS SOF UW able to mobilize violent civilian protests./
Limitations: Insurgents in Kiev must be destroyed or reintegrated into the populace. Must set conditions to transition security of Kiev to Ukrainians security forces. Must prepare for follow-on operations.

2

Theory of Victory

Synopsis of your Central Idea

1. Employ cyber/SOCMINT capabilities to better develop insurgent activity in zone. Where are their safe havens/houses? How are they resupplied? What are their objectives?
2. Employ cyber/SOCMINT to expose clandestine RUS involvement in Ukrainian affairs.
3. Partner

Necessary Capabilities

1. This problem requires a whole of US government approach with receptivity from Ukrainian leadership to effectively address political grievances from disenfranchised elements of the population through dialogue and equal political access.
2. US forces partner with Ukrainian security forces to work by, with, and through local institutions to enable a local solution to a local problem.
3. Must isolate (or at least limit) RUS influence to Ukrainian insurgency.

Application & Integration of Military Functions

1. Intel drives operations. Operations can support intel IOT drive operations: saturating Kiev through partnered operations will attract attention from population IOT trigger insurgents to communicate. Use of digital devices can reveal their identities, locations, and areas of interest. Conduct of maneuver can trigger reaction from the insurgent to support collections efforts that may otherwise remain dormant/quiet.

Spatial & Temporal Dimensions

1. The longer the insurgency is able to continue, the more entrenched it can become, recruit sympathizers, and mobilize for larger operations.
2. Due to density of urban environment over size of AO, US forces can at best augment security efforts in zone through partner operations, enabling capabilities (intel/info sharing, fires, international commitment)
3. Cyber/SOCMINT detection requires time to develop.

1

COA Graphic and Narrative

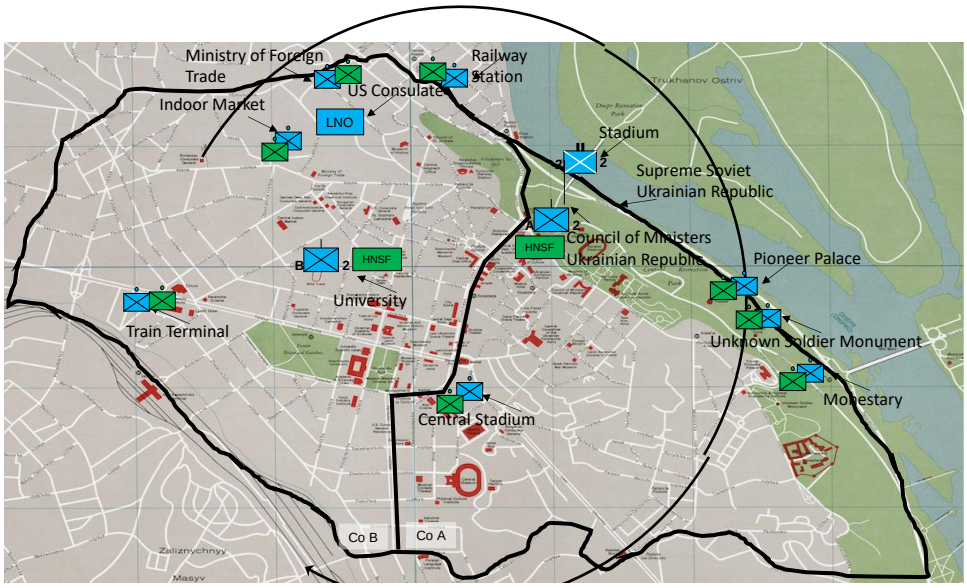
Next slide

MISSION
2/2 conducts FID in support of Ukrainian IDAD plan IOT defeat insurgency.

INTENT
Purpose: To defeat the insurgency.
Method: This must be a Ukrainian led effort with US forces supporting a local solution to a local problem. A solution also requires diplomatic, economic and informational instruments employed as part of a whole of US government strategy to support the Ukrainian IDAD plan to restore stability. 2/2 will support GoU efforts to defeat the insurgency by destroying insurgents in zone through partnered security operations working by/with/through GoU security forces and/or finding means to politically reconcile competing interests and reintegrate back into Ukrainian society. Minimizing civilian deaths/damages is imperative to maintain legitimate international support to the GoU. First do no harm. Treat every Ukrainian in such a way that they find Americans as no better friend, nor worse enemy.
End state: Insurgency defeated, 2/2 postured for follow-on operations.

CONCEPT & TASKS
HSS: Provide staff function support to maneuver companies IOT enable FID operations.
Co A: (ME) Partner with Ukrainian security forces to support Ukrainian internal defense IOT defeat insurgency in company sector.
Co B: (SE#1) Partner with Ukrainian security forces to support Ukrainian internal defense IOT defeat insurgency in company sector.
Co C: (SE#2) Reinforce GoU sensitive facilities IOT harden force protection from insurgent attacks.
Wpns Co: (SE#3): Employ snipers to conduct counter R&S on insurgent surveillance of GoU sensitive facilities. Task organize remainder of company into provisional rifle company. Partner with Ukraine security force QRF IOT augment operational flexibility to respond to time sensitive targets and counter insurgent maneuver.
FSC: Logistically sustain maneuver companies IOT support FID operations.

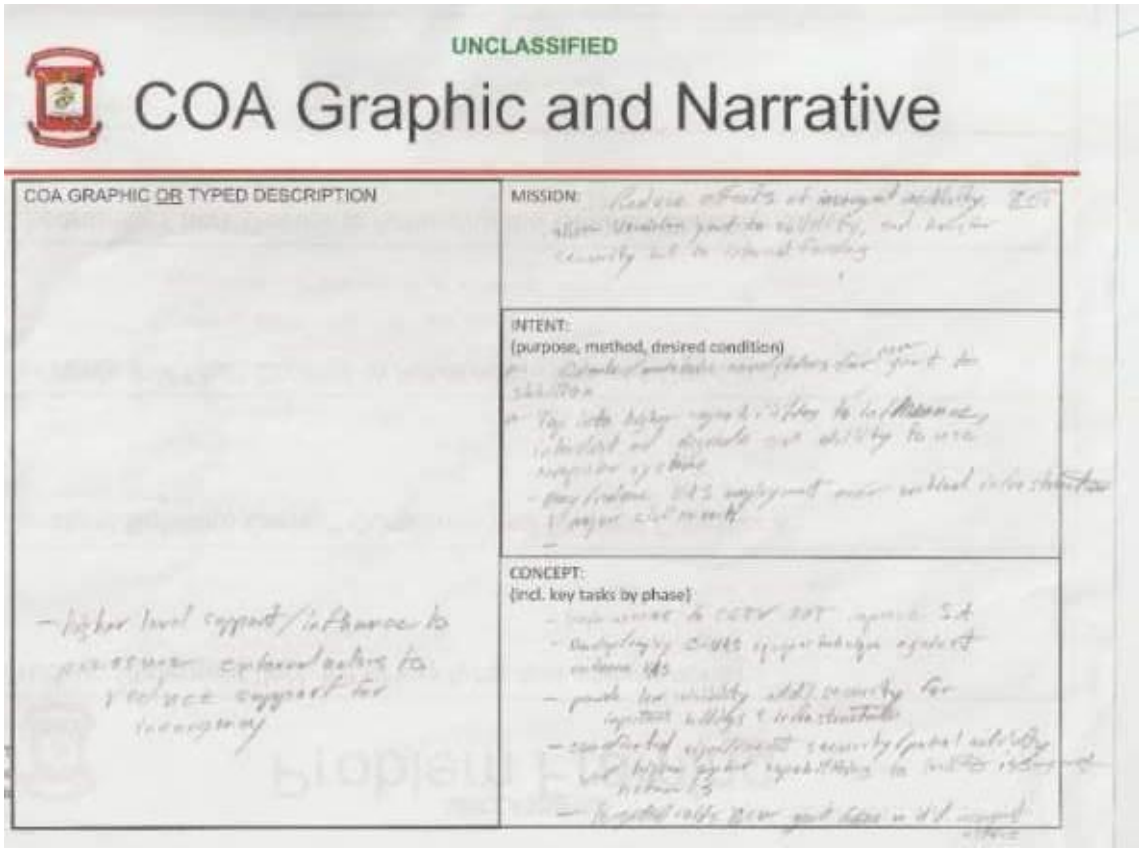
2/2 Infantry Area of Operations



Thoughts, Comments, Ruminations…

- **Data Scraping Concept:**
  - Where is the 'like button'?
  - Social media scraping and CCTV exploitation makes sense and technology exists today in open source (or *has* existed), commercial applications. I think it's a matter of how we integrate it into our formations to effectively employ it. For example, where is it housed in the command? What is the manning and equipment required? Training? DOTMLPF, etc. My thought is that higher echelons may retain ownership of the low density high performance computing assets, but smaller formations (i.e. Bde, Bn, Co) have a LNO/reach back function that ties into this capability.
  - One of the other challenges I think we face is security classification/access for the programs associated with these capabilities. Nothing is more frustrating than asking a USMC RADBN (SIGINT) lieutenant what he can do for me only to be given broad innuendos. So part of the solution going forward merits attention on not only training/educating the technical operator, but the rest of the organization that needs to integrate the capability into their planning and overall scheme of maneuver. I can elaborate further if that doesn't make sense…
  - Wrt PFD and Smart device geo-tagging/tracking, I understand the value of that to be the ability to geo-correlate multiple data points on a given target to derive higher fidelity analysis?
- **Drone Squad Concept:**
  - Why only one drone per squad? They cost ~$1k base model. What about reframing it as an expendable platform? An AT-4 costs ~$1200, an 81mm mortar round $600, 155mm EXCAL round $85k, MLRS missile $250k to $1m…concur in best interest not to lose the platform, recovery/reuse is tactically/financially sound, but what additional capability can we gain by not constraining ourselves to one per squad?
  - One of the things I'm wrestling with is how to make incorporating a sUAS seamless for the squad. If I have one drone that flies with 30min flight endurance, and I'm on a six hour patrol or 36 hour OP, those batteries start to add up. How do I take the burden of managing the asset off the unit leader? Is it an "assistant to the squad leader" as we've jokingly come to the conclusion, or something else? I'm still pondering that one, but the assistant to the squad leader sounds like a reasonable solution – even with autonomy, responsibilities would still exist for launching, swapping batteries, trouble shooting, etc
  - Facial recognition: I think we're good with facial recognition with software based solution with no need to swap a particular pod on to the sUAS. Check this out: https://www.extremetech.com/extreme/146909-darpa-shows-off-1-8-gigapixel-surveillance-drone-can-spot-a-terrorist-from-20000-feet. Dude took shit ton of smart phone cameras and processors, through them on a large UAS at 20k and can do object recognition. I think the magic is in the software and a smart phone camera is good enough for the 1000' and below our sUAS will fly.
  - One of the ideas I had was not just facial recognition, but object recognition – recognition of weapons, rank insignia, or other target indicators. We may not have a particular face to look for, but open carry weapons in a zone that they shouldn't't be carried openly would be of interest, or detecting the rank insignia for the leader in an enemy formation, or deciphering one vehicle from another type of vehicle, etc
  - Great idea with the CBRNE detection module – I think we often forget about the CBRNE threat beyond the gas mask on our leg.
  - The network recon/penetration sounded more interesting and original – I'd be curious to see what sources/conceptual employment you've generated for that function.
  - I like the idea of target designation, but also have concerns with it. Risks would include stability of the platform to maintain the laser on target and a strong wind not inadvertently throwing the sUAS off as a JDAM is enroute. A risk that can be mitigated, but important to factor.
  - 9mm firearm pod – curious what the reasoning was for that particular caliber? What is the effect desired that drove 9mm versus .45 or 5.56, or otherwise.

Player 5



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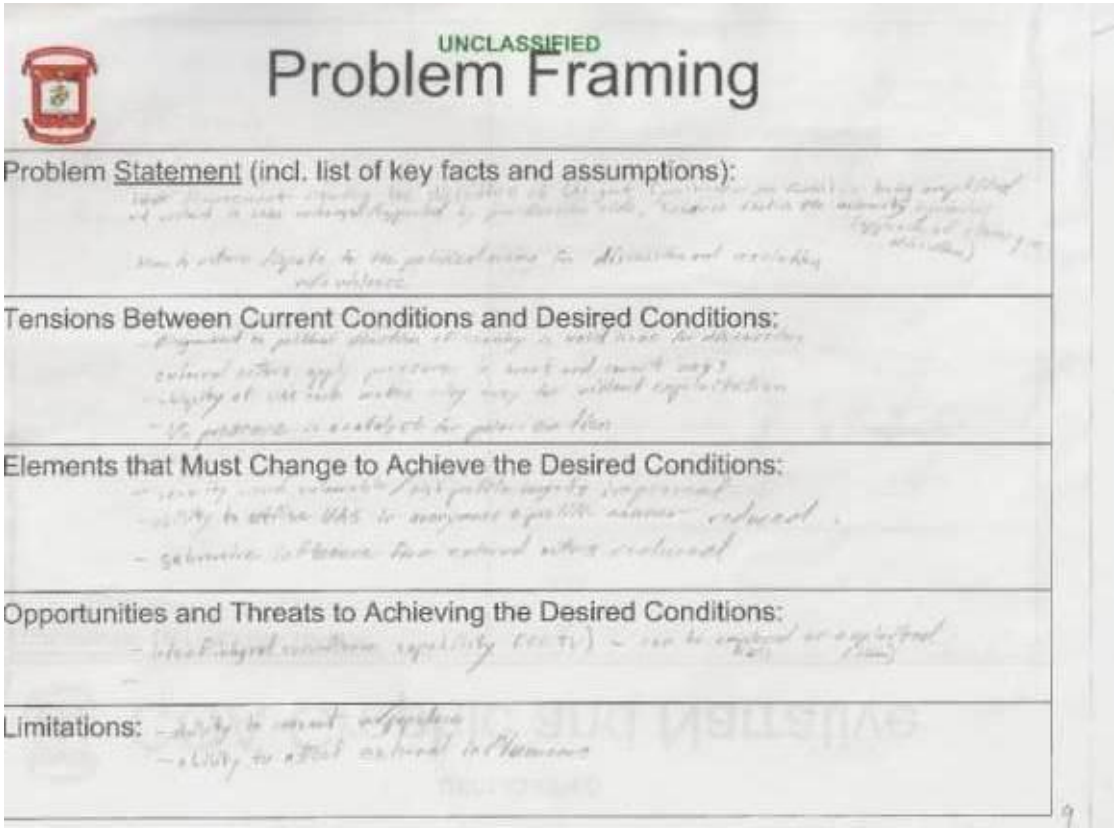
COA Graphic and Narrative

COA GRAPHIC OR TYPED DESCRIPTION	MISSION:
	INTENT: (purpose, method, desired condition)
	CONCEPT: (incl. key tasks by phase)



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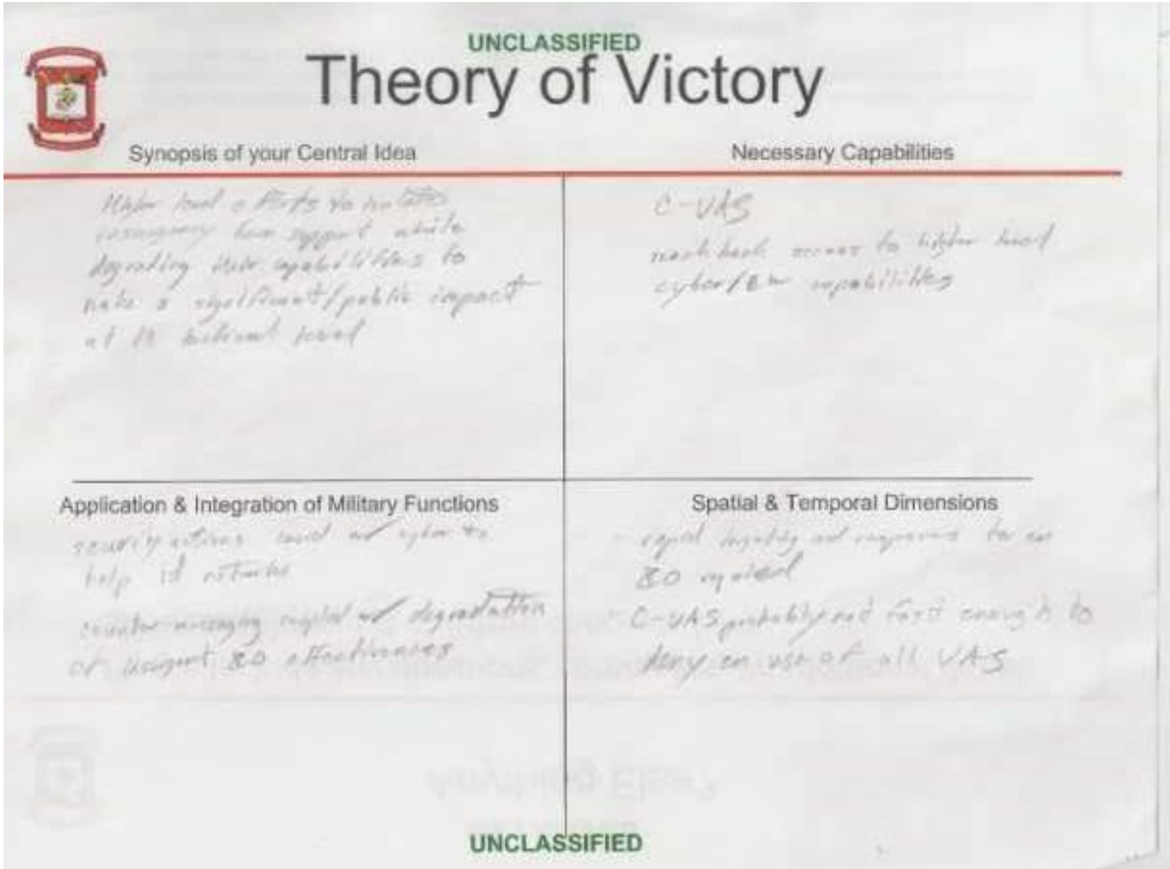
Problem Framing

Problem Statement (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: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Theory of Victory

Synopsis of your Central Idea

[illegible] significant/public impact [illegible]

Necessary Capabilities

C-VAS

[illegible]

Application & Integration of Military Functions

[illegible] degradation of [illegible] effectiveness

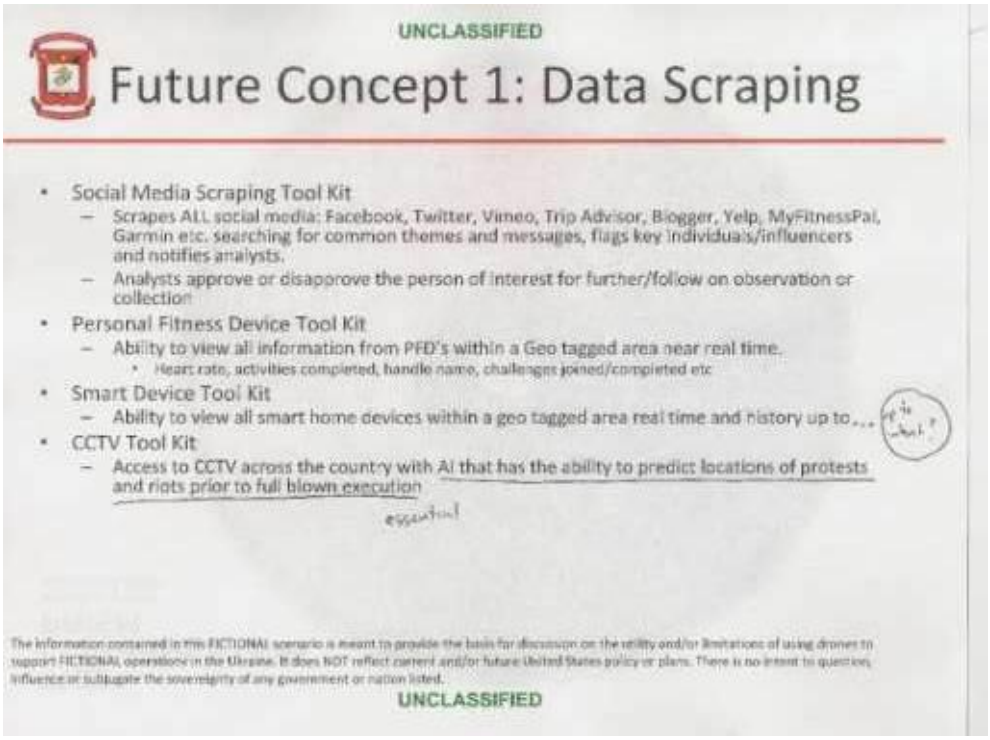
Spatial & Temporal Dimensions

[illegible]

C-VAS probably not fast enough to deny en use of all VAS

UNCLASSIFIED

Player 6



UNCLASSIFIED

Future Concept 1: Data Scraping

- Social Media Scraping Tool Kit
  - Scrapes ALL social media: Facebook, Twitter, Vimeo, Trip Advisor, Blogger, Yelp, MyFitnessPal, Garmin etc. searching for common themes and messages, flags key individuals/influencers and notifies analysts.
  - Analysts approve or disapprove the person of interest for further/follow on observation or collection
- Personal Fitness Device Tool Kit
  - Ability to view all information from PFD's within a Geo tagged area near real time.
    - Heart rate, activities completed, handle name, challenges joined/completed etc
- Smart Device Tool Kit
  - Ability to view all smart home devices within a geo tagged area real time and history up to...
- CCTV Tool Kit
  - Access to CCTV across the country with AI that has the ability to predict locations of protests and riots prior to full blown execution

essential

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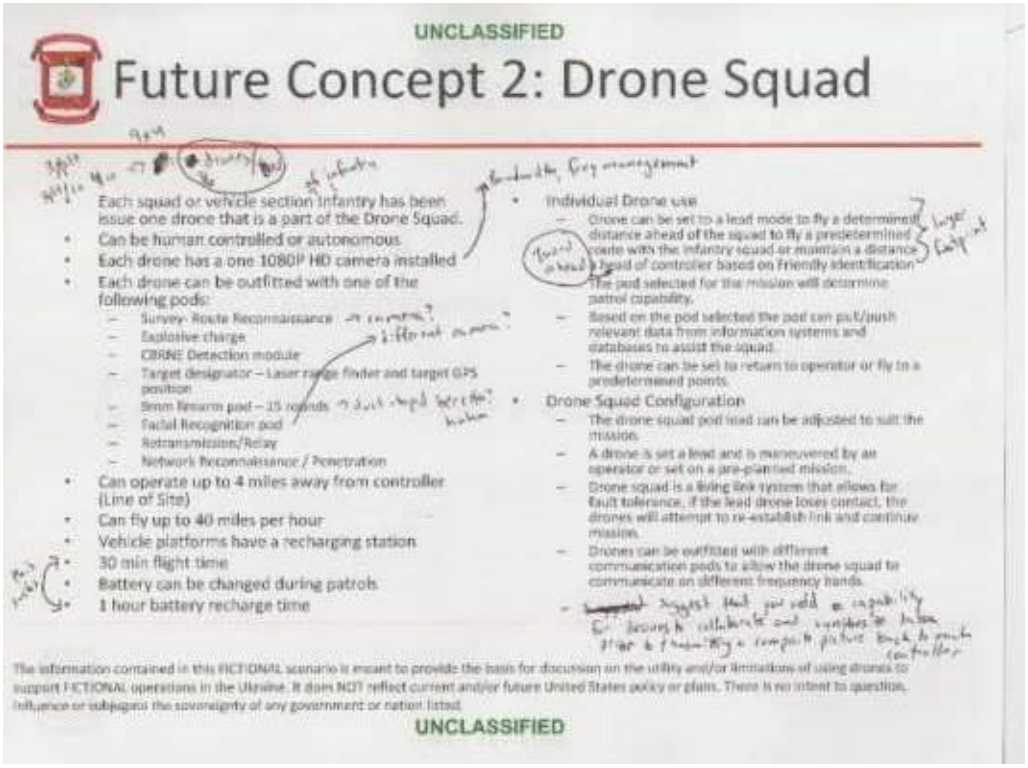

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Future Concept 2: Drone Squad

Each squad or vehicle section infantry has been issue one drone that is a part of the Drone Squad.

- Can be human controlled or autonomous
- Each drone has a one 1080P HD camera installed
- Each drone can be outfitted with one of the following pods:
  - Survey- Route Reconnaissance
  - Explosive charge
  - CBRNE Detection module
  - Target designator – Laser range finder and target GPS position
  - 9mm firearm pod – 15 rounds
  - Facial Recognition pod
  - Retransmission/Relay
  - Network Reconnaissance / Penetration
- Can operate up to 4 miles away from controller (Line of Site)
- Can fly up to 40 miles per hour
- Vehicle platforms have a recharging station
- 30 min flight time
- Battery can be changed during patrols
- 1 hour battery recharge time

- Individual Drone use
  - Drone can be set to a lead mode to fly a determined distance ahead of the squad to fly a predetermined route with the infantry squad or maintain a distance ahead of controller based on Friendly identification
  - The pod selected for the mission will determine patrol capability.
  - Based on the pod selected the pod can pull/push relevant data from information systems and databases to assist the squad.
  - The drone can be set to return to operator or fly to a predetermined points.
- Drone Squad Configuration
  - The drone squad pod load can be adjusted to suit the mission.
  - A drone is set a lead and is maneuvered by an operator or set on a pre-planned mission.
  - Drone squad is a living link system that allows for fault tolerance, if the lead drone loses contact, the drones will attempt to re-establish link and continue mission.
  - Drones can be outfitted with different communication pods to allow the drone squad to communicate on different frequency bands.

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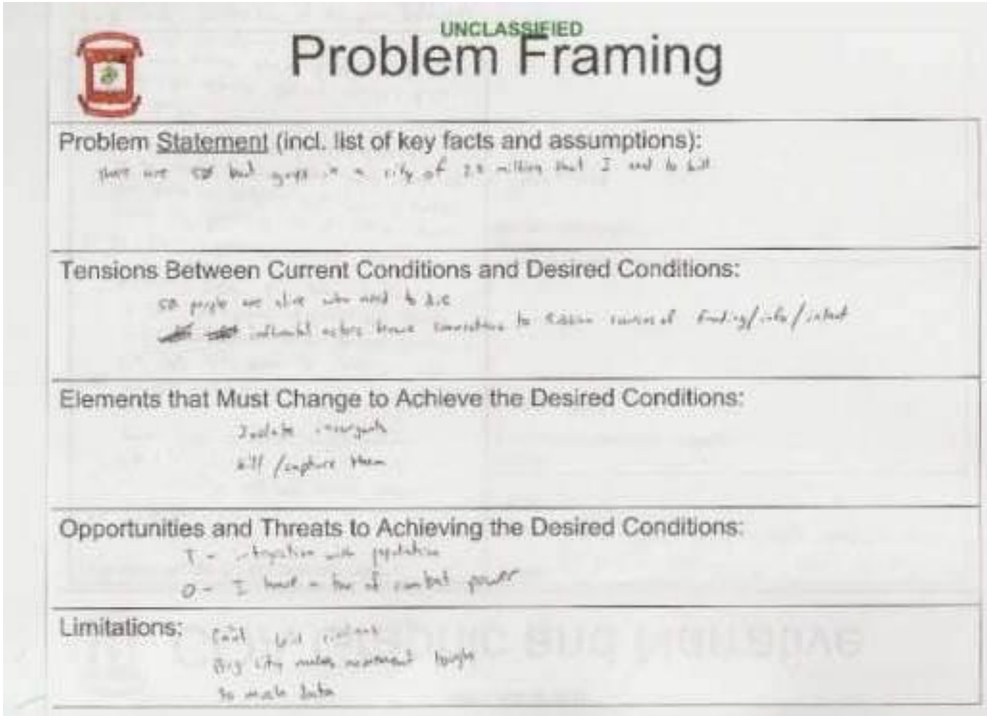

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Problem Framing

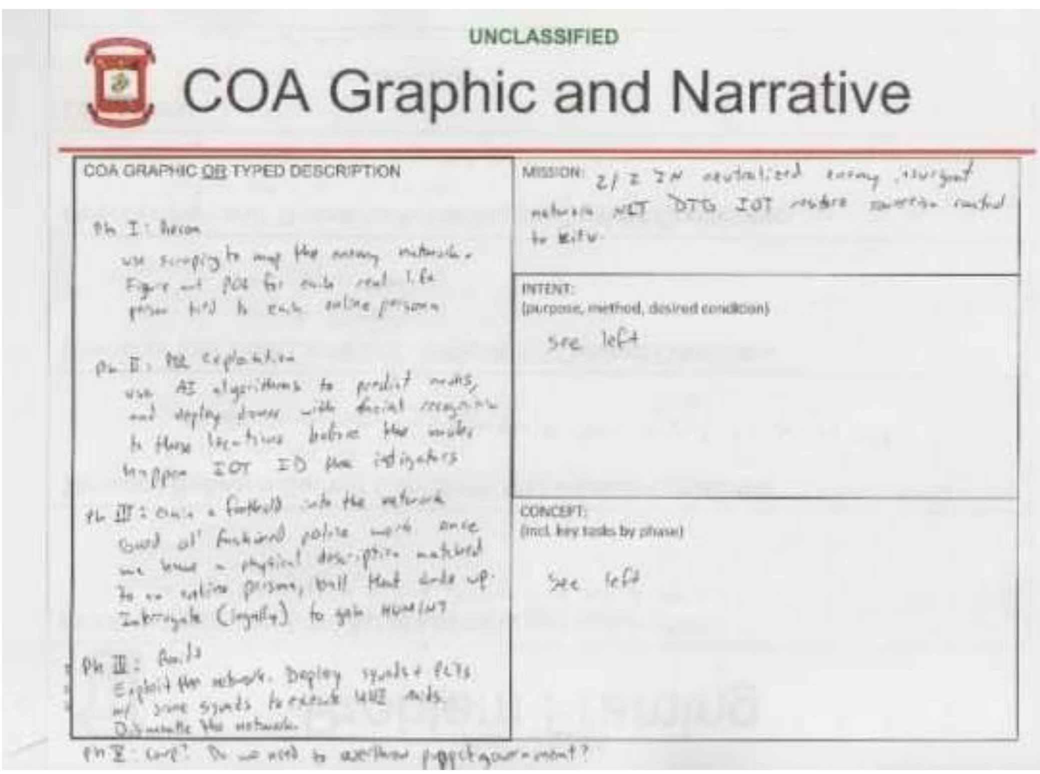
Problem Statement (incl. list of key facts and assumptions):
there are 50 bad guys in a city of 2.5 million that I need to kill

Tensions Between Current Conditions and Desired Conditions:
50 people are alive who need to die
influential actors have connections to sustain sources of funding/info/intel

Elements that Must Change to Achieve the Desired Conditions:
Isolate insurgents
kill/capture them

Opportunities and Threats to Achieving the Desired Conditions:
T - integration with population
O - I have a lot of combat power

Limitations:
Can't [illegible] civilians
Big city makes movement tough
to [illegible] data



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COA Graphic and Narrative

COA GRAPHIC OR TYPED DESCRIPTION

Ph I: Recon
use scraping to map the enemy networks.
Figure out POL for each real life
person tied to each online persona

Ph II: [illegible] exploitation
use AI algorithms to predict moves,
and deploy drones with facial recognition
to those locations before the moves
happen IOT ID the instigators

Ph III: Gain a foothold into the network
Good ol' fashioned police work once
we have a physical description matched
to an online persona, kill that dude up.
Interrogate (legally) to gain HUMINT

Ph IV: Raids
Exploit the network. Deploy squads + PLTs
w/ some squads to execute UAV raids.
Dismantle the network.

Ph V: Comp? Do we need to overthrow puppet government?

MISSION: 2/2 IN neutralized enemy insurgent network NLT DTG IOT restore government control to city.

INTENT:
(purpose, method, desired condition)
see left

CONCEPT:
(incl. key tasks by phase)
see left

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Anything Else?

- Please include any questions, comments, or additional details about employment of future concepts here:

My solution would have worked equally well with a police force as ~~would~~ it did with a military force. Some of my actions were particularly tactical ~~with~~ the exception of raids which SWAT can do.

Most useful capability for a city was AI capability to predict enemy or attacks. Least most useful is social media scraping

↳ do we need a human to combine these two sources of info, or can an AI combine which prediction w/ social media scraping to do the heavy analytical lifting for us?

↳ how does this info get to a squad? What is the gap between synthesis of social media + distribution of refined intelligence to deployed squad for exploitation? What is the method of distribution? Can we automate - way to tie drone into this loop?

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Theory of Victory

Synopsis of your Central Idea	Necessary Capabilities
Tie online personas to real life people IOT ID bad actors Transition to conventional policing in order to degrade the network.	social media scraping Mob prediction software → essential! Partnership with Ukrainian authorities
Application & Integration of Military Functions	**Spatial & Temporal Dimensions**
As described in Planning construct	Megacity is a challenge. One of the largest challenges for our BN is how to preposition forces across the city IOT facilitate rapid response to any location, without isolating tactical elements from one another.

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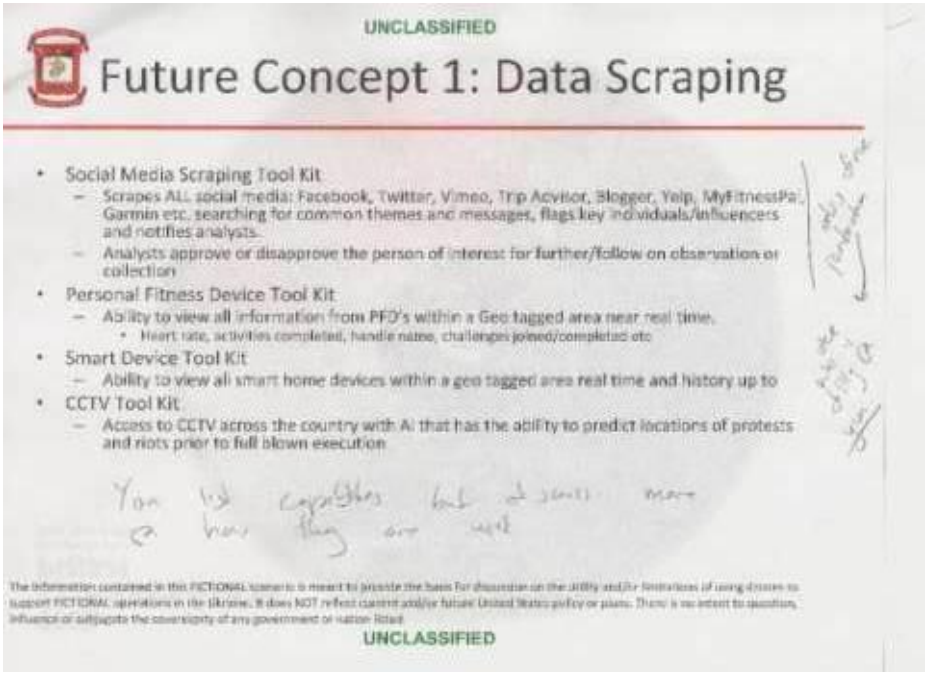
Player 7



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Future Concept 1: Data Scraping

- Social Media Scraping Tool Kit
  - Scrapes ALL social media: Facebook, Twitter, Vimeo, Trip Advisor, Blogger, Yelp, MyFitnessPal, Garmin etc. searching for common themes and messages, flags key individuals/influencers and notifies analysts.
  - Analysts approve or disapprove the person of interest for further/follow on observation or collection
- Personal Fitness Device Tool Kit
  - Ability to view all information from PFD's within a Geo tagged area near real time.
    - Heart rate, activities completed, handle name, challenges joined/completed etc
- Smart Device Tool Kit
  - Ability to view all smart home devices within a geo tagged area real time and history up to
- CCTV Tool Kit
  - Access to CCTV across the country with AI that has the ability to predict locations of protests and riots prior to full blown execution

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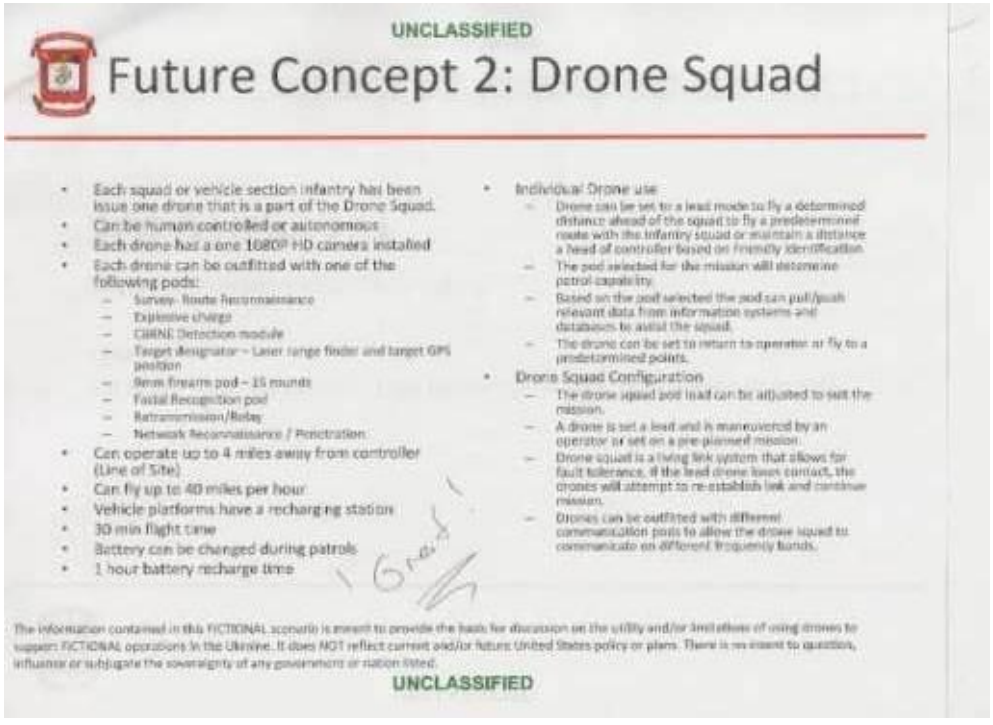

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Opportunities and Threats to Achieving the Desired Conditions:

Limitations:

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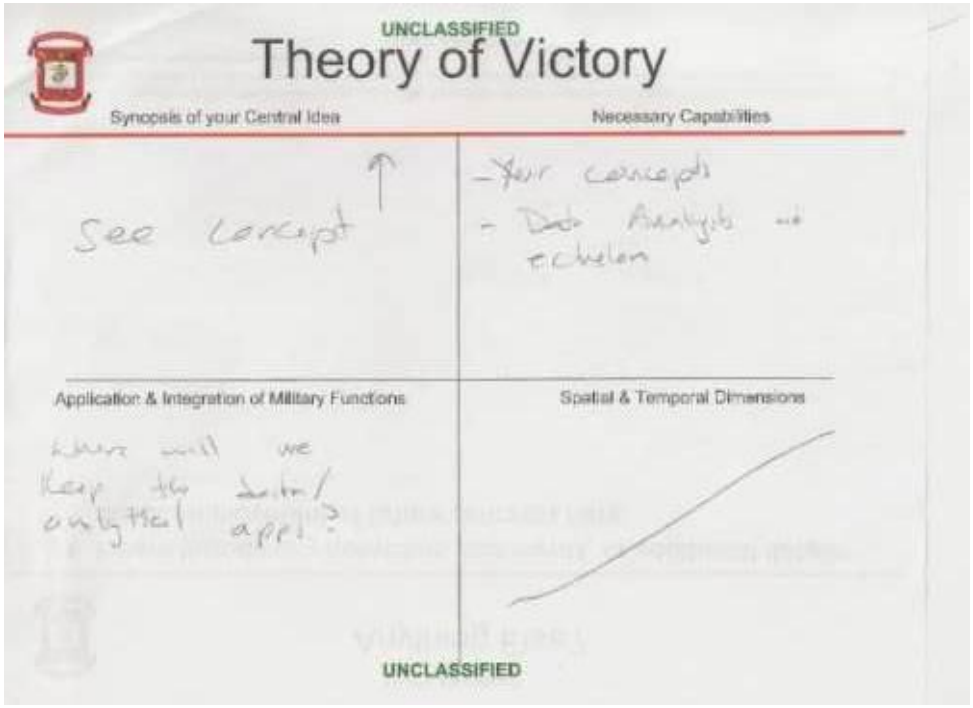
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Theory of Victory
Synopsis of your Central Idea
Necessary Capabilities
See concept
- Your concept
- Data Analysis at echelon
Application & Integration of Military Functions
How will we keep the data/ analytical app?
Spatial & Temporal Dimensions
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