

CARPATHIANS' EAGLES: SIMULATING AIRMOBILE OPERATIONS  
IN ROMANIAN MOUNTAINOUS TERRAIN

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MASTER OF MILITARY ART AND SCIENCE  
Wargame Design

by

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## ABSTRACT

CARPATHIANS' EAGLES: SIMULATING AIRMOBILE OPERATIONS IN ROMANIAN MOUNTAINOUS TERRAIN by Major Ovidiu Popescu, 105 pages.

This thesis and wargame addresses the question “Can the use of air capabilities in Romanian mountainous terrain be effectively represented in a competitive wargame to train the Romanian mountain brigade officers and battle staff on airmobile mountain operations?” The Romanian Land Forces lacks an understanding for the planning and conduct of helicopter-supported operations within its borders because of the absence of military publications and manuals regarding airmobile operations. The desired outcome of this wargame is to provide the brigade officers and battle staff a better understanding of the military environment. Through the use of this wargame, the brigade planners will understand how to use the air capabilities in mountain operations, what the limitations are, and what factors should be taken into consideration while planning airmobile operations in mountainous terrain. By playing and analyzing many serious wargames, appropriate mechanics were identified and used to create the *Carpathians' Eagles* wargame, using the traditional wargaming formula of space, time, assets, and resolution.

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Sometimes it just takes a little longer to get to your destination, but if you make sure to enjoy the journey, eventually you will get there. (Rachel Morrison)

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## ACRONYMS

AGM	Air-to-Ground
ATP	Army Techniques Publications
D6	Six-sided dice
D10	Ten-sided dice
Dr.	Doctor
Ed.	Edition
EA	Engagement Area
FARP	Forward Arming and Refueling Point
FM	Field Manual
HLZ	Helicopter Landing Zone
ID	Identification
Kg	Kilogram
Km/h	Kilometer/hour
LZ	Landing Zone
Mm	Millimeters
NATO	North Atlantic Treaty Organization
PZ	Pick-up zone
U.S.	United States

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## CHAPTER 1

### INTRODUCTION

#### Background

In today's uncertainty, most countries have become concerned about their security due to the threats and conflicts that knock on their doors. Romania, a European Union member state<sup>1</sup>, is located on the eastern border of the Union, having as neighbors Ukraine to the North, Moldova and Ukraine to the East, the Black Sea to the South-East, Bulgaria to the South, Serbia to the South-West, and Hungary to the West.<sup>2</sup>

The annexation of Crimea by the Russian Federation in 2014<sup>3</sup> directly influenced Romanian Government decisions in the following years. Starting in 2018, Romania allocated two percent of its Gross Domestic Product to the defense sector,<sup>4</sup> ensuring that the North Atlantic Treaty Organization expectations were met. As a result of the increased budget for the defense sector, the Romanian Armed Forces has implemented

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<sup>1</sup> "Romania," European Union, February 6, 2019, accessed May 15, 2019, [https://europa.eu/european-union/about-eu/countries/member-countries/romania\\_en](https://europa.eu/european-union/about-eu/countries/member-countries/romania_en).

<sup>2</sup> "Romania," The World Factbook, Central Intelligence Agency, May 7, 2019, accessed May 15, 2019, <https://www.cia.gov/library/publications/the-world-factbook/geos/ro.html>.

<sup>3</sup> "Crimea profile," *BBC News*, January 17, 2018, accessed May 15, 2019, <https://www.bbc.com/news/world-europe-18287223>.

<sup>4</sup> "Buget 2018," Ministerul Finantelor Publice, November 29, 2017, accessed November 25, 2018, [http://discutii.mfinante.ro/static/10/Mfp/SINTEZABUGET2018\\_29noiembrie2017.docx](http://discutii.mfinante.ro/static/10/Mfp/SINTEZABUGET2018_29noiembrie2017.docx).

the endowment plan that was previously approved by the Supreme Defense Council in August 2017.<sup>5</sup>

One major endowment program is the acquisition of 24 attack helicopters and 21 utility helicopters for the Romanian Land Forces. After a rigorous analysis of the market and multiple meetings with “representatives of US defense industry,”<sup>6</sup> the Romanian Ministry of Defense decided to purchase 24 attack helicopters, Bell AH-1Z Viper, and 21 utility helicopters, Bell UH-1Y Venom.<sup>7</sup>

Since the Romanian Land Forces has never had organic air capabilities in their history, in the Land Forces current doctrine there are no references regarding the planning and conducting of airmobile operations. Across Land Forces, little is known about the use of air capabilities in all terrain operations. The few individuals from Land Forces that have some knowledge in this area are the Romanian officers that have planned and conducted airmobile operations with the support of US air capabilities in Afghanistan or

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<sup>5</sup> “Planul de inzestrare a Armatei Romaniei 2017 - 2026 a fost aprobat in sedinta CSAT,” *Stirile Pro TV*, August 5, 2017, accessed May 15, 2019, <https://stirileprotv.ro/stiri/actualitate/sedinta-csat-ministrul-apararii-ii-va-prezenta-astazi-presedintelui-iohannis-planul-de-inzestrare-al-armatei-romane.html>.

<sup>6</sup> “Întâlniri ale ministrului apărării naționale cu reprezentanți ai principalelor companii din industria de apărare americană,” Ministerul Apararii Nationale, *Biroul Presa*, September 25, 2018, accessed May 15, 2019, [http://www.mapn.ro/cpresa/16047\\_](http://www.mapn.ro/cpresa/16047_).

<sup>7</sup> Gareth Jennings, “Farnborough 2018: Romania moves towards Venom and Viper procurement,” *Jane’s 360*, July 17, 2018, accessed May 15, 2019, <https://www.janes.com/article/81803/farnborough-2018-romania-moves-towards-venom-and-viper-procurement>.

during multinational exercises across Europe.<sup>8</sup> The most experienced personnel in planning and conducting airmobile operations across the Armed Forces are the Romanian Air Force officers and battle staff. Some may say that a Romanian Air Force officer can be the solution for Land Forces to plan and conduct airmobile operations, and even to write the doctrine. There are at least two issues with this approach. First, a Romanian aviation officer may have experience in planning and conducting airmobile operations with Romanian airframes, but he certainly doesn't have experience with the new air capabilities that the Romanian Land Forces intends to purchase. Secondly, the cultural differences between the two branches are an impediment in having a good aviation officer support the Land Forces in this matter.

The problem presented by this thesis is that the Romanian Land Forces lack an understanding for the planning and conduct of helicopter-supported operations within Romania's borders. At this moment, there are no training manuals or publications on how to use air capabilities in support of the Romanian Land Forces troops. The gap explored in this thesis is the lack of Romanian military publications, manuals, and training tools regarding airmobile operations.

According to the Encyclopedia Britannica, "the Romanian landscape is approximately one-third mountainous and one-third forested, with the remainder made up

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<sup>8</sup> "Operation Atlantic Resolve Exercises Begin in Eastern Europe," U.S. Department of Defense, March 24, 2015, accessed May 15, 2019, <https://dod.defense.gov/News/Article/Article/604341/>.

of hills and plains.”<sup>9</sup> Almost all tactical scenarios developed by Romanian officers and battle staff planners include operations in mountainous terrain.

To bridge the gap between the new air capabilities and the lack of knowledge in using this capability in mountainous terrain operations, a wargame would be a great benefit. The purpose of this thesis is to propose a wargame that would help the Romanian brigade officers and battle staff learn to use helicopters in mountain operations.

### Research Questions

The proposed research question is, can the use of air capabilities in Romanian mountainous terrain be effectively represented in a competitive wargame to train the Romanian mountain brigade officers and battle staff on airmobile mountain operations?

To answer this question, several other questions needed to be answered first, including:

1. How do we conduct airmobile operations in mountainous terrain?
2. What are the requirements to sustain the airmobile operations?
3. What are the key considerations for airmobile operations in general, and in mountainous terrain?
4. What should the Romanian mountain brigade officers learn about airmobile operations?
5. How can the essential considerations of mountain warfare be effectively represented in a playable model?

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<sup>9</sup> Keith Arnold Hitchins, David Turnock, Vasile S. Cucu, and Ernest Latham, “Romania,” *Encyclopedia Britannica*, last updated May 11, 2019, accessed May 15, 2019, <https://www.britannica.com/place/Romania>.

## Assumptions

The helicopter acquisition process is very complex and time costly. By the time this thesis will be published, decisions to purchase specific helicopters might have changed. The air capabilities used in this wargame are Bell UH-1Y Venom and Bell AH-1Z Viper helicopters. For the functionality and purpose of this wargame, the author assume that the air capabilities mentioned above will be available to support the mountain brigade.

Romanian Air Force purchased “12 F-16 multirole aircrafts from Portugal in 2013”<sup>10</sup> and these will most likely be used in a real military operation in support of the ground forces. Therefore, the author will include the F-16 aircraft support in the game play.

Romanian mountain troops are considered elite troops<sup>11</sup> because they conduct military operations in austere conditions. They have special equipment and they get special training that allows them to survive in all kinds of terrain and weather conditions. Therefore, they are considered better than the opposing forces, who are materialized in the wargame as mechanized units.

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<sup>10</sup> “Romania to buy additional F-16 fighter jets from Portugal,” *Defence* (blog), April 25, 2019, accessed May 15, 2019, <https://defence-blog.com/news/romania-to-buy-additional-f-16-fighter-jets-from-portugal.html>.

<sup>11</sup> “General Leonard Mociulschi,” last modified December 1, 2012, accessed May 15, 2019, [http://www.general.mociulschi.ro/english\\_version.htm](http://www.general.mociulschi.ro/english_version.htm).

### Limitations and Delimitations

Taking into consideration the complexity of creating a wargame, this project used only the crucial variables that demonstrated the functionality of the wargame. This is a wargame for educational purposes and does not fully replicate all aspects of air operations and conceptualizes some aspects of aviation operations in the interest of ensuring playability by the target audience.

Regarding airmobile operations, this thesis relied mainly on U.S Army aviation doctrine. There are two reasons for choosing this approach. The first, and the most important, aspect is that the Romanian Land Forces do not have, at this moment, any publication about the use of air capabilities. Secondly, the NATO doctrine regarding the use of helicopters in land operations is classified. After 1989, U.S doctrine had the most influence when the old Romanian Soviet doctrine was replaced. After becoming a NATO member in 2004, Romania slowly started to integrate more NATO doctrine for its Armed Forces. Nowadays, with the establishment of the Multinational Division Southeast Headquarters in Bucharest<sup>12</sup>, NATO Force Integration Unit in Bucharest,<sup>13</sup> and Multinational Brigade in Craiova<sup>14</sup>, the Romanian doctrine become more NATO centric.

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<sup>12</sup> “Romania,” NATO Headquarters Multinational Division Southeast, accessed May 15, 2019, <http://www.en.mndse.ro/about>.

<sup>13</sup> “NATO Force Integration Unit,” NATO Force Integration Unit Romania, accessed May 15, 2019, <http://www.nfiu.ro/despre>.

<sup>14</sup> Ministerul Apararii Nationale, “Declararea capacității finale a Comandamentului Brigăzii Multinaționale de la Craiova,” *Biroul Presa*, November 15, 2018, accessed May 15, 2019, [https://www.mapn.ro/cpresa/16123\\_Declararea-capacitatii-finale-a-Comandamentului--Brigazii-Multinationale-de-la-Craiova](https://www.mapn.ro/cpresa/16123_Declararea-capacitatii-finale-a-Comandamentului--Brigazii-Multinationale-de-la-Craiova).

Therefore, even if the Romanian Land Forces would most likely choose the NATO doctrine for airmobile operations, the author cannot use it in this thesis due to its classified status. For ground combat operations this thesis relied mainly on the Romanian publications because they best describe the particularities of Romania's mountainous terrain, the effect of the environmental factors on mountain operations, and the consideration of mountain operations in Romania's mountainous terrain. To integrate the effect of weather on game play, the author decided that the game will occur during the summer season. The reason of choosing the summer season was because is the rainiest season in Romania, and therefore it can affect the airmobile operations.

The opposing forces' air capabilities are not simulated in this wargame. Firstly, the author wants the Blue player to focus on the process of planning the airmobile operations. Secondly, integrating the air capabilities of the opposing force will make the wargame more complex and it will require more time to integrate the mechanics. Since the opposing force does not have air capabilities, the Blue player does not have air defense capabilities in this wargame.

Supply during an operation is very important because it allows units to conduct extended missions over time. In this wargame, the author decided to integrate the supply mechanic only for isolated units. Therefore, the Blue player is forced to plan air lift missions to provide supplies to isolated units, while the other forces are considered to receive supplies by wheeled vehicles.

### Significance

This wargame will bridge the gap described above because there is no readily available commercial or military alternative. The desired outcome of this wargame is to

provide the brigade officers and battle staff planners with a better understanding of airmobile operations in mountainous terrain. They will understand how to use air capabilities in mountain operations, what are the limitations of their use, and what factors should be taken in consideration while planning an operation in mountainous terrain.

### Summary

The recent threats force countries to adapt in order to maintain their integrity and sovereignty. This translates into new technologies and updated doctrine that can defeat any threats. All these changes require many resources, but most importantly a lot of time to purchase new equipment, to train personnel, and to implement the new changes into the new system.

To get to the root of the problem it is important to understand what caused it and what is the best solution to fix it. Also, in the attempt to solve the problem, it is important to establish the important factors that need to be studied and the things that can be omitted.<sup>15</sup>

In this chapter, the author restated the problem and is trying to overcome it by designing a wargame. The purpose of this wargame is to provide a training tool for brigade officers and battle staff that will allow them to plan airmobile operations in Romanian mountainous terrain. This wargame will not replace any publication or manual, but it can be a first training tool that will contribute to the professional development of Romanian airmobile planners.

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<sup>15</sup> Headquarters, Department of the Army, Army Doctrine Reference Publication 5-0, *The Operations Process* (Washington, DC: Government Publishing Directorate, May 17, 2012).

## CHAPTER 2

### LITERATURE REVIEW

#### Introduction

Multiple sources of information contributed to the completion of this thesis and to the development of *Carpathians' Eagles* wargame. During the A211 Research Methods I class, Dr. Prisco Hernández emphasized that “a brilliant research plan cannot succeed without a thorough review of the literature.”<sup>16</sup> Based on this premise, the author reviewed many publications and manuals that covered several relevant domains such as wargaming and the conduct of military operations, as well as airmobile operations in mountainous terrain. In addition to this literature review, the author played several wargames. The goal was to gain insights and a better understanding on how to design a wargame and understand how the mechanics of wargaming are used in the making of a “professional wargame.”<sup>17</sup>

The first important research area was wargaming. The author decided to use wargaming as a method to answer the problem statement. Wargaming could be used as a tool to help the brigade officers and battle staff understand how to plan airmobile

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<sup>16</sup> Prisco Hernández, “A211 Fundamentals of Research Part 1” (PowerPoint Presentation, U.S. Army Command and General Staff College, Fort Leavenworth, KS, September 13, 2018).

<sup>17</sup> John Curry and Peter Perla, *Peter Perla's The Art of Wargaming: A Guide for Professionals and Hobbyists* (Annapolis, MD: United States Naval Institute, 1990), 24.

operations in mountainous terrain. This method was chosen because it is a fast process, it is cost effective, and most importantly, it “provides many opportunities for learning.”<sup>18</sup>

The second research area focused on the conduct of military operations in Romania’s mountainous terrain. The target audience for this wargame are those Romanian senior officers and battle staff from a mountain brigade who are involved in planning military operations in mountainous terrain. The wargame action occurs in Romanian mountainous terrain involving a Romanian mountain brigade opposed by two Red force mechanized infantry brigades.

The third research area was airmobile operations in mountainous terrain. *Carpathians’ Eagles* wargame focuses on the Blue force player’s ability to plan and effectively conduct airmobile operations in mountainous terrain. To effectively appreciate and fully understand the challenges involved in planning and conducting an airmobile operation, it is essential to study the appropriate military doctrinal publications and how-to-fight manuals. The result of that research clearly indicates that wargaming methods are proving to be excellent and useful tools for training the target audience.

### Wargaming

The author considered the most important book that covers this subject is *Peter Perla’s The Art of Wargaming: A Guide for Professionals and Hobbyists*, by Peter Perla and John Curry.<sup>19</sup> The reason for choosing this book is because Peter Perla is considered

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<sup>18</sup> Curry and Perla, *Peter Perla’s The Art of Wargaming: A Guide for Professionals and Hobbyists*, 23.

<sup>19</sup> Ibid.

“the leading wargaming expert in the United States,”<sup>20</sup> according to game designer Larry Bond. After studying this book and following all steps described by Peter Perla, anyone without any experience in wargaming can create a payable wargame. This book provided the author a better understanding of the wargaming domain, and resulted in wargaming being used as the foundation for designing the *Carpathians’ Eagles*. This was accomplished by simply following Peter Perla’s “fundamental principles of wargame design.”<sup>21</sup> These principles are: “specify objectives,” “identify players, their game roles, and the decisions they will be expected to make,” “identify the information feedback required to achieve the game’s objectives,” “devise the tools needed to make the process work,” and “document the results of the effort.”<sup>22</sup>

Another important book studied by the author was *A Theory of Fun for Game Design. 2nd ed*, by Raph Koster.<sup>23</sup> This is an easy book to read that covers the main aspects of a game, such as the importance of having fun while playing a game and its purpose. The book highlights that games are “fundamental and powerful learning tools.”<sup>24</sup> The author kept these aspects in mind while designing the *Carpathians’ Eagles* wargame and constantly tried to keep a balance between the fun aspect and the game as a

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<sup>20</sup> Curry and Perla, *Peter Perla’s The Art of Wargaming: A Guide for Professionals and Hobbyists*, back cover.

<sup>21</sup> *Ibid.*, 180.

<sup>22</sup> *Ibid.*

<sup>23</sup> Ralph Koster, *A Theory of Fun for Game Design*, 2nd ed. (Sebastopol, CA: O’Reilly Media, Inc., 2014).

<sup>24</sup> *Ibid.*, 36.

learning tool. As an example, in order to make the wargame more attractive for the players, the author included AH-Z1 and UH-1Y 1:600 miniature helicopters and F-16 1:600 miniature aircraft.

*Simulating War: Studying Conflict Through Simulation Games* by Philip Sabin<sup>25</sup> was another key book studied by the author that addresses the wargaming domain. This book focuses on the mechanics used in wargames<sup>26</sup> and provides several games as examples, including the game pieces for play.<sup>27</sup> This book proved to be very inspirational for the author while writing the *Carpathians' Eagles* rules of play, especially while establishing the “victory conditions.”<sup>28</sup>

*Transforming Naval Wargaming: A Framework for Operational- Level Wargaming* by Peter Perla, Michael Markowitz, Christopher Weuve, Stephen Downes-Martin, Michael Martin, Paul Vebber<sup>29</sup> emphasizes how to transform naval wargaming. This publication was particularly important because it provided the author the formula of “time, space, forces and effects”<sup>30</sup> that was used in completing chapter 4 of this thesis.

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<sup>25</sup> Philip Sabin, *Simulating War: Studying Conflict Through Simulation Games* (New York, NY: Continuum International Publishing Group, 2012).

<sup>26</sup> Ibid., 65.

<sup>27</sup> Ibid., 133.

<sup>28</sup> Ibid., 123.

<sup>29</sup> Peter Perla, Michael Markowitz, Christopher Weuve, Stephen Downes-Martin, Michael Martin, and Paul Vebber, *Transforming Naval Wargaming: A Framework for Operational- Level Wargaming* (Alexandria, VA: The CNA Corporation, September 2004).

<sup>30</sup> Ibid., 22.

The researcher played many wargames that contributed to the development of the *Carpathians' Eagles* wargame. To name a few, *Napoleon: The Waterloo Campaign, 1815* designed by Tom Dalglish, Ron Gibson, and Lance Gutteridge,<sup>31</sup> *Quartermaster General* designed by Ian Brody,<sup>32</sup> *Kriegsspiel* designed by Georg Heinrich Leopold Freiherrn von Reisswitz and Georg Heinrich Rudolf Johann Baron von Reisswitz,<sup>33</sup> *Friedrich* designed by Richard Sivél,<sup>34</sup> *1944: Race to the Rhine* designed by Jaro Andruszkiewicz and Waldek Gumienny,<sup>35</sup> *Fire in the Lake* designed by Mark Herman and Volko Ruhnke,<sup>36</sup> *Battle for Moscow* designed by Frank Chadwick,<sup>37</sup> *Yom Kippur* designed by Dean Essig and Al Sandrick,<sup>38</sup> *Air & Armor* designed by Bruce S.

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<sup>31</sup> Tom Dalglish, Ron Gibson, and Lance Gutteridge, *Napoleon: The Waterloo Campaign, 1815* (Columbia Games, Inc., Blaine, WA, 1974).

<sup>32</sup> Ian Brody, *Quartermaster General* (Griggling Games, Inc., Woodstock, NY, 2014).

<sup>33</sup> Georg Heinrich Leopold Freiherrn von Reisswitz and Georg Heinrich Rudolf Johann Baron von Reisswitz, *Kriegsspiel*, Bill Leeson, Johan Hörberg, Too Fat Lardies, 1824, accessed May 21, 2019, <https://toofatlardies.co.uk/>.

<sup>34</sup> Richard Sivél, *Friedrich* (Histogame: Berlin, Germany, and Rio Grande Games: Placitas, NM, 2004).

<sup>35</sup> Jaro Andruszkiewicz and Waldek Gumienny, *1944: Race to the Rhine* (Phalanx: London, UK, 2014).

<sup>36</sup> Mark Herman and Volko Ruhnke, *Fire in the Lake* (GMT Games: Hanford, CA, 2014).

<sup>37</sup> Frank Chadwick, *Battle for Moscow* (Victory Point Games: Londonderry, NH, 2009).

<sup>38</sup> Dean Essig and Al Sandrick, *Yom Kippur* (The Gamers Archive, Homer, IL, 1995).

Maxwell,<sup>39</sup> *Next War: India-Pakistan* designed by Gene Billingsley and Mitchell Land,<sup>40</sup> and *Silver Bayonet* designed by Gene Billingsley and Mitchell Land.<sup>41</sup>

By playing these games, the author achieved a better appreciation of the wargame discipline and understood important aspects, such as game design, mechanics, and rules, all of which were used in designing the *Carpathians' Eagles* wargame. The most relevant games that contributed to the development of this thesis were *Battle for Moscow*<sup>42</sup>, *Operation Pegasus: Task Force Game #8*<sup>43</sup>, *Next War: India-Pakistan*<sup>44</sup>, *1944: Race to the Rhine*<sup>45</sup>, and *Silver Bayonet*.<sup>46</sup>

From Frank Chadwick's *Battle for Moscow*<sup>47</sup>, the author implemented, in *Carpathian's Eagles* wargame, the format for the ground combat result table and the terrain effect chart. It also contributed to the development of the initial ground unit graphics and values.

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<sup>39</sup> Bruce S. Maxwell, *Air & Armor* (West End Games: New York, NY, 1986).

<sup>40</sup> Gene Billingsley and Mitchell Land, *Next War: India-Pakistan* (GMT Games: Hanford, CA, 2015).

<sup>41</sup> Gene Billingsley and Mitchell Land, *Silver Bayonet* (GMT Games: Hanford, CA, 2016).

<sup>42</sup> Chadwick, *Battle for Moscow*.

<sup>43</sup> Perry Moore, *Operation Pegasus* (Task Force Games: Amarillo, TX, 1980).

<sup>44</sup> Billingsley and Land, *Next War: India-Pakistan*.

<sup>45</sup> Andruszkiewicz and Gumienny, *1944: Race to the Rhine*.

<sup>46</sup> Billingsley and Land, *Silver Bayonet*.

<sup>47</sup> Chadwick, *Battle for Moscow*.

*Operation Pegasus* is well known for its mechanics to manage the helicopters during combat, reconnaissance, and transport missions.<sup>48</sup> This game inspired the author to use the air capabilities for air assault operations, air lift operations, and reconnaissance operations. Also, this game contributed to the development of the helicopter status display, a tool that was needed do as to track all the air capabilities during the game.

Gene Billingsley's and Mitchell Land's wargame *Next War: India-Pakistan*<sup>49</sup> was a great inspiration in creating the air defense resolution table and contributed to the terrain effect chart. The idea to use miniature helicopters and aircrafts in *Carpathians' Eagles* wargame came while playing this game.

Jaro Andruszkiewicz's and Waldek Gumienny's wargame *1944: Race to the Rhine*<sup>50</sup> inspired the author to use air supply for the units that are executing missions in mountainous areas and units that are executing air assault missions. These supplies are tracked by the players on the Resource Tracker Table.

Gene Billingsley's and Mitchell Land's wargame *Silver Bayonet*<sup>51</sup> was the most inspirational for developing *Carpathians' Eagles*. First, the most important aspect that this game contributed to was the sequence of play. Secondly, the author implemented the fixed wing bombardment and created the air points chart to track these capabilities. This game was a starting point for creating the helicopter status display, which was updated by

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<sup>48</sup> Moore, *Operation Pegasus*.

<sup>49</sup> Billingsley and Land, *Next War: India-Pakistan*.

<sup>50</sup> Andruszkiewicz and Gumienny, *1944: Race to the Rhine*.

<sup>51</sup> Billingsley and Land, *Silver Bayonet*.

establishing two forward arming and refueling points. Last but not least, this game inspired the author to use a die roll to resolve the air defense fire issue.

Playing all these wargames was a critical factor in designing *Carpathians' Eagles*. The more games played, the more ideas and mechanics are discovered, and all of them contribute to the development of a professional wargame. The fun aspect that Raph Koster described in his book *A Theory of Fun for Game Design. 2<sup>nd</sup> ed.*<sup>52</sup>, was present in all the above mentioned wargames.

### Military Operations in Romanian Mountainous Terrain

To describe the military operations in Romanian mountainous terrain, the author relied on Romanian Land Forces manuals. The most relevant manuals were *Manualul de lupta al Brigazii de vanatori de munte*<sup>53</sup> (Mountain Brigade fighting manual) and *Manualul de lupta al Batalionului de vanatori de munte*<sup>54</sup> (Mountain Battalion fighting manual). These two manuals describe the complexity of military operations in mountainous terrain, and the environmental factors that influence these operations. These were the best manuals for developing *Carpathians' Eagles* wargame because they described how Romanian forces conduct military operations in the same area where the wargame action takes place.

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<sup>52</sup> Koster, *A Theory of Fun for Game Design*.

<sup>53</sup> Statul Major al Fortelor Terestre, *Manualul de lupta al Brigazii de vanatori de munte* (Bucuresti, RO: Editura Militara, 2016).

<sup>54</sup> Ibid.

Army Techniques Publication 3-90.97, *Mountain Warfare and Cold Weather Operations*<sup>55</sup> provided additional information about mountain warfare that couldn't be found in the Romanian publications. This information relates to the use of forward arming and refueling points and to the importance of medical evacuation by air.

By studying these manuals, the author was able to determine that the main characteristics that influence military operations in mountainous terrain are terrain and weather conditions.<sup>56</sup> These two characteristics affect the mobility, observation, maneuver, and employment of mountain units and air capabilities.<sup>57</sup> Critical to developing the *Carpathians' Eagles* wargame was the information provided by these manuals regarding mountain brigade task organization, its capabilities, tactics, techniques, and procedures. When the opposing force is attacking with overwhelming combat power, the mountain units retreat into the mountains to dominant heights from which they can harass the enemy and delay his actions long enough to receive reinforcements.<sup>58</sup> This is a very common technique adopted by Romanian mountain units while defending mountainous terrain.

Mountainous terrain affects units differently, and function differently, based on their operational capabilities. Mountain infantry, artillery, air defense, and engineer units

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<sup>55</sup> Headquarters Department of the Army, Army Techniques Publication 3-90.97, *Mountain Warfare and Cold Weather Operations* (Washington, DC: Government Publishing Directorate, April 2016).

<sup>56</sup> Statul Major al Fortelor Terestre, *Manualul de lupta al Batalionului de vanatori de munte* (Bucuresti, RO: Editura Militara, 2016), 13.

<sup>57</sup> Ibid.

<sup>58</sup> Ibid., 259.

are part of mountain's brigade structure and they conduct operations in mountainous terrain combined or independently.

Mountain units are the most effective forces in mountainous terrain operations because of their special training, equipment, and ability to maneuver in very restricted terrain. Their effectiveness can be increased by executing air assault operations behind the enemy lines with the support of air capabilities.<sup>59</sup>

Artillery mobility in mountainous terrain is very limited due to the limited road network, terrain compartmentalization, and weather conditions. Self-propelled artillery is rarely used in mountain operations because it is dependent on road networks. Trailed artillery is more maneuverable because it can move into restricted terrain with the help of trucks, or into severely restricted terrain with the support of utility helicopters. The firing angle is higher in mountainous terrain and the distance is also limited. Therefore, the artillery must be frequently moved to different firing positions, or positioned by air on dominant heights where the visibility is very high.<sup>60</sup>

To be efficient, air defense must be placed along the enemy's flight routes in order to protect the forces from the enemy's airstrikes. Their mobility is negatively influenced by terrain features and weather conditions. An important aspect is the possibility of placing air defense units on dominant heights using air capabilities. This will allow the radars to detect targets from a greater distance and offer friendly units

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<sup>59</sup> Statul Major al Fortelor Terestre, *Manualul de lupta al Brigazii de vanatori de munte*, 100.

<sup>60</sup> Ibid., 92.

more time to engage them. Air defense units must be frequently moved to different firing positions to avoid detection and neutralization by the enemy.<sup>61</sup>

The engineer units are crucial during operations in mountainous terrain. In defensive operations, mountainous terrain is favorable for creating blocking points along the road. This is one of the reasons why the engineer units must be embedded with reconnaissance forces, thus increasing the risk of their destruction. Another important mission is to allow or deny mobility of forces by clearing or placing obstacles.<sup>62</sup>

These publications provided the author valuable information needed to understand the complexity of the military operations in Romanian mountainous terrain and the important factors that affects these operations. It also contributed to *Carpathians' Eagles* wargame development, especially in creating the map and developing the ground forces' game mechanics.

#### Air Operations Training Guidance and Publications

Since there are no Romanian publications to support the brigade officers and battle staff to plan and conduct air operations, and the relevant NATO doctrine is classified, this thesis relied on U.S. Army doctrine. The most relevant publication used for the development of this wargame is the April 2016 ATP 3-04.1, *Aviation Tactical*

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<sup>61</sup> Statul Major al Fortelor Terestre, *Manualul de lupta al Batalionului de vanatori de munte*, 29.

<sup>62</sup> *Ibid.*, 213.

*Employment*<sup>63</sup>, approved for public release by the Department of the Army. This publication provided the author detailed information about air reconnaissance operations and air movement operations.

Another relevant publication that contributed to the completion of the *Carpathians' Eagles* wargame was the *101st Airborne Division's Gold Book*<sup>64</sup>. This is the most complete publication regarding air assault operations. This publication describes in detail the air assault planning process and emphasizes the importance of good planning. By studying this publication, the author was able to understand the particularities of the air assault planning process, a fact that decisively contributed to the development of *Carpathians' Eagles* wargame.

Army Tactics, Techniques, and Procedures 3-18.12, *Air Assault Operations*<sup>65</sup> is very similar to the previous publication. One particularity that this publication covered was the “basic considerations for the planning and execution of air assaults.”<sup>66</sup>

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<sup>63</sup> Headquarters Department of the Army, Army Techniques Publication 3-04.1, *Aviation Tactical Employment* (Washington, DC: Government Publishing Directorate, April 2016).

<sup>64</sup> Headquarters Department of the Army, *101st Airborne Division (Air Assault) Gold Book* (Fort Campbell, KY: April 12, 2010).

<sup>65</sup> Headquarters Department of the Army, Army Tactics, Techniques, and Procedures 3-18.12, *Air Assault Operations* (Washington, DC: Government Publishing Directorate, March 2011).

<sup>66</sup> *Ibid.*, 15.

A key Army publication that discussed the timeline for planning airmobile operations was Field Manual 3-04, *Army Aviation*.<sup>67</sup> This publication highlights the importance of the relationship between ground forces and aviation forces when planning airmobile operations.<sup>68</sup>

The author studied the Joint Publication 3-18, *Joint Forcible Entry Operations*<sup>69</sup> to understand the joint aspect of air operations planning. This particular publication could be a good source of information for future updates of *Carpathians' Eagles* wargame.

A very important publication that contributed to the development of the Fixed-Wing Bombardment Table was Joint Publication 3-09, *Joint Fire Support*<sup>70</sup>. This publication also describes how the laser-guided systems function and how the “environmental factors can affect laser designators.”<sup>71</sup>

The main reason of choosing the United States Army doctrine was that this doctrine was tested and improved over a 50+ year period since 1965, in various environments, and has proved to be a successful method. Another reason of choosing this

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<sup>67</sup> Headquarters Department of the Army, Field Manual 3-04, *Army Aviation* (Washington, DC: Government Publishing Directorate, July 2015).

<sup>68</sup> Ibid., 3-24.

<sup>69</sup> Joint Chiefs Staff, Joint Publication 3-18, *Joint Forcible Entry Operations* (Washington, DC: May 11, 2017 incorporating Change 1, January 9, 2018, validated June 27, 2018).

<sup>70</sup> Joint Chiefs Staff, Joint Publication 3-09, *Joint Fire Support* (Washington, DC: Department of Defense, December 12, 2014).

<sup>71</sup> Ibid., B2.

doctrine instead of the North Atlantic Treaty Organization doctrine is that the latter one is classified and it cannot be used in this thesis.

Two important publications were studied by the author to understand the key considerations of the opposing force: task organization, capabilities, and tactics. The first publication, Field Manual 7-100.4, *Opposing Force Organization Guide*<sup>72</sup>, describes the force structure and task organization of an opposing force created for training purposes. A key publication in creating the opposing force structure for *Carpathians' Eagles* was Field Manual 100-60, *Armor and Mechanized-based Opposing Force*.<sup>73</sup> This publication describes in detail the task organization and capabilities of the opposing force, represented by mechanized infantry brigades in *Carpathians' Eagles* wargame.

### Conclusion

In this chapter the author mentioned the publications and the games that provided the fundamentals of the thesis construction. The quantity and quality of these publications and games provided the author the necessary knowledge to develop the *Carpathians' Eagles* wargame.

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<sup>72</sup> Headquarters Department of the Army, Field Manual 7-100.4, *Opposing Force Organization Guide* (Washington, DC: Government Publishing Directorate, May 3, 2007).

<sup>73</sup> Headquarters Department of the Army, Field Manual 100-60, *Armor and Mechanized-based Opposing Force* (Washington, DC: Government Publishing Directorate, July 16, 1997).

## CHAPTER 3

### IMPORTANT ASPECTS OF DEVELOPING THE WARGAME

#### Introduction

In chapter 3 the author described the design methodology and the most important variables that are included in the wargame. The problem presented by this thesis is that the Romanian Land Forces lack an understanding for the planning and conduct of helicopter-supported operations within Romania's borders. The purpose of this thesis is to propose a wargame that would help the Romanian brigade officers and battle staff learn to use helicopters in mountain operations. Focusing on the statement of the problem and the purpose, several key and essential variables were included in the *Carpathians' Eagles* wargame. Three of the most important variables are the terrain and weather conditions of the Carpathians mountains, the planning factors required for conducting airmobile operations, and the capabilities and limitations of the airframes the Romanian Land Forces are expected to use in the near future. Other important factors that were taken into consideration while creating the *Carpathians' Eagles* wargame included the organization and capabilities of the both the Romanian mountain brigade and the opposing force. These variables were chosen because they present the best challenges and desired degree of difficulty in educating Romanian Land Forces units in the proper conduct of airmobile operations.

#### Design Methodology

As mentioned in chapters 1 and 2, wargaming was selected as the preferred method to solve the problem that this thesis addresses. While there is no perfect solution

on how to create a wargame, Peter Perla provided key insights on some principles that do provide a good and effective solution in designing wargames. In his book, *Peter Perla's The Art of Wargaming: A Guide for Professionals and Hobbyists*, he emphasizes “the fundamental principles of wargame design.”<sup>74</sup> In the following paragraphs the author describes these principles.

The first principle highlighted by Peter Perla in wargaming design is “specify objectives.”<sup>75</sup> The objective in building *Carpathians' Eagles* is to train the Romanian mountain brigade officers and battle staff on how to effectively employ helicopters in Romanian mountainous terrain. Specific Blue and Red player objectives during the game play are described in chapter 4.

His second principle of wargame design is “identifying players and decisions.”<sup>76</sup> As previously mentioned in chapter 2, this wargame can be played by two players. The Blue player is represented by a Romanian mountain brigade opposed by the Red player represented by two mechanized infantry brigades. Both players have to make different and challenging decisions during the game play. For example, the Blue player must decide when to plan airmobile operations while taking into consideration the length of time required to properly execute the airmobile planning process versus the time available. The Blue force must consider the weather conditions, and the resulting Red force speed of attack. Correspondingly, the Red player must decide at the beginning of

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<sup>74</sup> Curry and Perla, *Peter Perla's The Art of Wargaming: A Guide for Professionals and Hobbyists*, 180.

<sup>75</sup> *Ibid.*, 180.

<sup>76</sup> *Ibid.*, 182.

the game where to allocate the artillery units, air defense units, and engineer units, while taking into consideration the terrain restrictions and the limited air defense units.

Throughout the game play, both players are constantly making decisions in order to accomplish the game objectives established in the scenario.

Peter Perla's third principle refers to the "information requirements"<sup>77</sup> and timely feedback<sup>78</sup> necessary "to achieve the game's objectives."<sup>79</sup> In order to make decisions, both players need to have certain critical information such as unit types, number of units, capabilities, movement speed, combat power, and others. According to the scenario developed by the game designer, this information is presented to the players at the beginning of the game, to facilitate player's decisions. For *Carpathians' Eagles* wargame, this type of information is highlighted in Appendix B, Rules of Play.

"Devise the tools"<sup>80</sup> is the fourth principle of wargame design highlighted by Peter Perla. This principle refers to the game mechanics that allow the player's "decisions to be implemented."<sup>81</sup>

The last principle is "document the design."<sup>82</sup> This refers especially to the game rules which describe all the details about the game. Writing the game rules is a very

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<sup>77</sup> Curry and Perla, *Peter Perla's The Art of Wargaming: A Guide for Professionals and Hobbyists*, 188.

<sup>78</sup> *Ibid.*, 180.

<sup>79</sup> *Ibid.*

<sup>80</sup> *Ibid.*, 197.

<sup>81</sup> *Ibid.*

<sup>82</sup> *Ibid.*, 204.

laborious process and requires special attention to the details. *Carpathians' Eagles* game rules are highlighted in Appendix B.

The author opted for Peter Perla's wargame design process because, compared to other models, it is the most comprehensive design, and it fits perfectly in the design and creation of this wargame.

Next, the author described the most important variables included in the *Carpathians' Eagles* wargame.

#### Terrain and Weather Conditions

For *Carpathians' Eagles* wargame the author decided to use a map that replicates a specific mountain region located in the Romanian Oriental Carpathians. This region is characterized by the presence of a wide range of mountains with altitudes up to 1954 meters above sea level, and hills with dense forests.<sup>83</sup> These terrain features have a big impact on mobility because of the limited lines of communications. Narrow and sinuous roads affect movement speed, especially during winter, when they are covered with snow. There are multiple bridges along the roads that are considered critical during military operations. These are key terrain because they can become important obstacles that can slow down opposing force mobility and their movement speed.<sup>84</sup>

When off road, vehicle mobility is restricted because of the dense forests and steep valleys. This is why most of the military operations in mountainous terrain are

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<sup>83</sup> "Carpatii Orientali," Enciclopedia Romaniei, accessed May 19, 2019, [http://enciclopediaromaniei.ro/wiki/Carpa%C5%A3ii\\_Orientali](http://enciclopediaromaniei.ro/wiki/Carpa%C5%A3ii_Orientali).

<sup>84</sup> Statul Major al Fortelor Terestre, *Manualul de lupta al Batalionului de vanatori de munte*, 16.

executed by dismounted units.<sup>85</sup> To overcome this limitation, utility helicopters can be used to transport troops or equipment into areas where wheeled or track vehicles cannot reach.

Mountainous terrain does not allow for many forces to engage in combat at one time, and because of the steep slopes, leaders “increase the intervals between units.”<sup>86</sup> This aspect highlights the problem that the mutual support between units during operations in mountainous terrain is not always possible.

At high altitude the atmospheric pressure decreases, causing helicopter engines to lose power. Losing engine power will result in less lifting capability, increased fuel consumption, and thus decreases flight time availability.<sup>87</sup>

The climate in Romanian mountainous terrain is characterized by a “six to eight-month winter period with snow and blizzards, a two to three-month summer season with rains and showers, and a short spring and autumn periods, that may include ten to thirty days with cold rains, snowstorms and snow.”<sup>88</sup> Weather conditions in the mountains can change very often and quickly with little advance warning, even during the same day. These conditions cause mobility issues and frequently prevent the employment of air

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<sup>85</sup> Statul Major al Fortelor Terestre, *Manualul de lupta al Batalionului de vanatori de munte*, 17.

<sup>86</sup> *Ibid.*, 14.

<sup>87</sup> *Ibid.*, 10.

<sup>88</sup> *Ibid.*, 17.

capabilities. The wind speed, unpredicted heavy rains, and fog, are factors that greatly affect the employment of ground vehicles and air capabilities.<sup>89</sup>

In Romanian mountainous terrain, the average wind speed is 25 km/h on mountain ridges, but maximum speeds can reach values above 200 km/h. In the mountains the winds are more frequent and more violent than in the plains, which can make maneuvering forces and equipment impossible.<sup>90</sup> Precipitation can take the form of “rains, snow, sleet, and hail.”<sup>91</sup> These unpredicted natural phenomena have a critical effect on units, especially on air capabilities. Fog is very frequent in mountain areas and affects the ability to orient, observe, drive, and maneuver troops. On the other hand, the fog can favor bold maneuvers, surprise attacks, with the condition that the forces know the area of operations very well.<sup>92</sup>

These are very important factors that the mountain brigade officers and battle staff must take into consideration while planning operations in mountainous terrain. They must always have a backup plan in case the weather prevents the employment of air capabilities.

The impact of the terrain and weather are two of the most important aspects that the author simulates in the *Carpathians' Eagles* wargame. The reason for simulating these factors is that they directly influence the employment of air assets, and, overall, the

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<sup>89</sup> Statul Major al Fortelor Terestre, *Manualul de lupta al Batalionului de vanatori de munte*, 19.

<sup>90</sup> Ibid.

<sup>91</sup> Ibid.

<sup>92</sup> Ibid., 20.

entire operation. This ensures that the planners will learn and understand the limitations of air assets and the conditions for using them in military operations in the Oriental Carpathians.

#### Planning Factors Required for Conducting Airmobile Operations

This wargame is not trying to simulate the entire airmobile planning sequence. The Blue player will establish the task organization for combat, flight routes, primary and alternate landing zones, air attack reconnaissance support, and the aircraft allocation and type.

The air capabilities can be used in a wide range of missions such as air assaults, air reconnaissance, air movement, and air attack. There are planning considerations for each of these missions.

According to the Army Techniques Publication 3-04.1, *Aviation Tactical Employment*, the air assault operation is “the movement of friendly assault forces by rotary-wing aircraft to engage and destroy enemy forces or to seize and hold key terrain.”<sup>93</sup> A successful air assault operation requires a perfect synchronization between the assault forces and aviation forces, and sufficient “time to plan, rehearse, and brief.”<sup>94</sup>

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<sup>93</sup> Headquarters Department of the Army, Army Techniques Publication 3-04.1, *Aviation Tactical Employment*, 5-1.

<sup>94</sup> Headquarters Department of the Army, *101st Airborne Division (Air Assault) Gold Book*, 1-1.

“Air assault planning is based on careful analysis of the mission and operational variables and a detailed reverse planning sequence.”<sup>95</sup> The reverse planning sequence consists of five plans that must be “developed for each air assault operation.”<sup>96</sup>

Usually, the reverse planning sequence starts with the ground tactical plan which “serves as the basis from which the other plans derive.”<sup>97</sup> As its name says, this plan focuses on the ground forces operation from the helicopter landing zone to the objective. The most important factors included in this plan are: the “task organization for combat,” “fires” available, “scheme of maneuver,” and “commander’s intent.”<sup>98</sup> In the wargame, the Blue player starts the planning by deciding what the assault force task organization is. This factor will dictate the aircraft allocation and type, taking into consideration the limitations of the airframes.

The landing plan includes detailed information about the “distribution, timing, and sequencing of aircraft into the HLZ.”<sup>99</sup> The location of the HLZs is greatly influenced by the ground tactical plan and requires detailed analysis to ensure mission

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<sup>95</sup> Headquarters Department of the Army, Army Techniques Publication 3-04.1, *Aviation Tactical Employment*, 5-4.

<sup>96</sup> Headquarters Department of the Army, *101st Airborne Division (Air Assault) Gold Book*, 1-1.

<sup>97</sup> Ibid.

<sup>98</sup> Headquarters Department of the Army, Army Techniques Publication 3-04.1, *Aviation Tactical Employment*, 5-5.

<sup>99</sup> Ibid., 5-6.

accomplishment.<sup>100</sup> The most important factors in establishing the HLZ are: “location,” “capacity,” “enemy disposition and capabilities,” “unit tactical integrity,” “obstacles,” “identifiable from the air,” and “orientation.”<sup>101</sup> In *Carpathians’ Eagles* wargame, the Blue player has to decide what are the best landing zones while planning the operation, based on the factors described above.

The air movement plan “schedules the movement of troops, equipment, and supplies from the PZ to the HLZ.”<sup>102</sup> An important factor developed in this phase is the planning of primary and alternate flight routes.<sup>103</sup> According to *101st Airborne Division (Air Assault) Gold Book*, the key considerations for planning flight routes are: “always plan alternate ingress and egress flight routes,” plan the flight route start point and release point, use the “terrain features... that facilitate navigation,” “select routes that are as short as possible, tactically sound, and conducive to successful navigation,” “avoid brightly lit areas and population centers,” “select a route with terrain and vegetation that permit masking,” and “avoid known or suspected enemy air defenses.”<sup>104</sup> In the *Carpathians’ Eagles* wargame, the Blue player must plan the flight routes on the Operation Sheet. He

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<sup>100</sup> Headquarters Department of the Army, Army Techniques Publication 3-04.1, *Aviation Tactical Employment*, 5-6.

<sup>101</sup> Ibid.

<sup>102</sup> Ibid., 5-7.

<sup>103</sup> Ibid.

<sup>104</sup> Headquarters Department of the Army, *101st Airborne Division (Air Assault) Gold Book*, 4-3.

must take into consideration the factors described above in order to properly plan the operation.

The loading plan covers the “PZ operations and air loading.”<sup>105</sup> A critical factor during the PZ operation is to ensure that the air assault unit has conducted hot and cold load training prior to mission execution. This training is important because it “mitigates risk and preserves time.”<sup>106</sup> In *Carpathians’ Eagles* wargame, the Blue decides the number of units and the equipment that need air lift.

The last phase of the reverse planning sequence is the development of staging plan. This plan “prescribes arrival times and order of aircraft, ground personnel, and equipment movement to the PZ.”<sup>107</sup> This phase is not implemented in *Carpathians’ Eagles* wargame.

The air assault operations are always supported by attack aviation with two or more attack aircrafts.<sup>108</sup> Moreover, if these capabilities are available, they can conduct “terrain oriented armed reconnaissance up to 48 hours”<sup>109</sup> prior to air assault execution. “The purpose of this armed reconnaissance is to destroy high pay-off targets of opportunity, confirm or deny the suitability of flight routes and LZs, gain information on

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<sup>105</sup> Headquarters Department of the Army, Army Techniques Publication 3-04.1, *Aviation Tactical Employment*, 5-10.

<sup>106</sup> *Ibid.*, 5-26.

<sup>107</sup> *Ibid.*, 5-11.

<sup>108</sup> Headquarters Department of the Army, *101st Airborne Division (Air Assault) Gold Book*, 6-7.

<sup>109</sup> *Ibid.*

the ground routes from LZs to the objectives, and gain information on the objective area.”<sup>110</sup> In *Carpathians’ Eagles* wargame the Blue player must always plan for at least two air attack helicopters while executing air assault missions.

The important factors that influence the air assault planning are the terrain and weather conditions of the Carpathians mountains, the capabilities and limitations of the airframes, the Romanian mountain brigade and the opposing force. These factors are included in *Carpathians’ Eagles* wargame to teach brigade officers and battle staff how to conduct airmobile operations in Romanian mountainous terrain.

Next, the author will continue with planning considerations for air reconnaissance.

According to Army Techniques Publication 3-04.1, *Aviation Tactical Employment*, the “Army Aviation reconnaissance forces conduct combined-arms reconnaissance operations to determine enemy composition and disposition as well as to gather combat information on terrain and populations.”<sup>111</sup> The seven fundamentals of air reconnaissance are: “ensure continuous reconnaissance,” “do not keep reconnaissance assets in reserve,” “orient on the reconnaissance objective,” “report all information rapidly and accurately,” “retain the freedom of maneuver,” “gain and maintain enemy contact,” and “develop the situation rapidly.”<sup>112</sup>

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<sup>110</sup> Headquarters Department of the Army, *101st Airborne Division (Air Assault) Gold Book*, 6-7.

<sup>111</sup> Headquarters Department of the Army, Army Techniques Publication 3-04.1, *Aviation Tactical Employment*, 3-1.

<sup>112</sup> Headquarters Department of the Army, Army Techniques Publication 3-04.1, *Aviation Tactical Employment*, 3-3.

There are four forms of reconnaissance that Army Aviation conducts: “zone reconnaissance,” “area reconnaissance,” “route reconnaissance,” and “reconnaissance in force.”<sup>113</sup> Due to the fact that in *Carpathians’ Eagles* wargame the air attack helicopters are used to locate enemy units and to establish landing zones, only area reconnaissance and reconnaissance in force are discussed here.

Area reconnaissance “focuses on obtaining detailed information about the terrain or enemy activity within a prescribed area.”<sup>114</sup> Landing zone reconnaissance falls under this category and it is usually performed in “advance of a planned air assault or during mission execution.”<sup>115</sup>

The reconnaissance in force is “designed to discover or test the enemy’s strength, dispositions, and reactions or to obtain other information.”<sup>116</sup> During this form of reconnaissance, no terrain focused information is collected.<sup>117</sup>

The air capabilities used in *Carpathians’ Eagles* wargame are the AH-1Z Viper attack helicopters, which are equipped with adequate systems to conduct air reconnaissance missions. The capabilities and limitations of this helicopter are described below. For planning an air reconnaissance mission, the Blue player performs similar steps

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<sup>113</sup> Ibid., 3-9.

<sup>114</sup> Ibid., 3-10.

<sup>115</sup> Ibid., 3-12.

<sup>116</sup> Ibid., 3-16.

<sup>117</sup> Ibid.

to those described for air assault mission. These steps include aircraft allocation, the flight routes, and the type of reconnaissance.

Air reconnaissance operations are very important in mountainous terrain because they provide early warning to the ground forces about enemy activity, location, and size.

The air movement planning considerations are the mission of the unit, the cargo weight, the number of aircrafts, and the priority of movement.

The Army Techniques Publication 3-04.1, *Aviation Tactical Employment* describes air movement as “the air transport of units, personnel, supplies, and equipment including airdrops and air landings”.<sup>118</sup> In mountainous terrain where there are limited roads, the air movement is the preferred solution to quickly move forces and equipment.<sup>119</sup>

The planning process for air movement is “similar to air assault”<sup>120</sup> operations. Air movement operations falls under two categories: tactical and non-tactical. A significant difference between these two categories is that the non-tactical air movement occurs “without the threat of enemy forces”<sup>121</sup>, while the tactical air movement occurs with the “potential threat of enemy forces.”<sup>122</sup>

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<sup>118</sup> Headquarters Department of the Army, Army Techniques Publication 3-04.1, *Aviation Tactical Employment*, 6-1.

<sup>119</sup> Ibid.

<sup>120</sup> Ibid.

<sup>121</sup> Headquarters Department of the Army, Army Techniques Publication 3-04.1, *Aviation Tactical Employment*, 6-1.

<sup>122</sup> Ibid.

A critical step in planning air movement operations is to determine “the number and types of aircraft required to support the movement mission.”<sup>123</sup> This is a challenge that the Blue player faces while planning air movement operations because there are limited air capabilities that can support the operation. Another challenge is to establish the “priority of movement within the unit for personnel and equipment.”<sup>124</sup>

The air capabilities used in *Carpathians’ Eagles* wargame that can perform these operations are UH-1Y Venom utility helicopters. The capabilities and limitations of this helicopter are described below.

Next, the author described the air attack planning considerations. The air attack planning considerations are the number of air assets, the air route, the logistical requirements, and the target type.

The Army Techniques Publication 3-04.1, *Aviation Tactical Employment* highlights that the “Army Aviation attacks are executed in support of friendly forces in close enemy contact or against enemy forces out of contact with friendly forces.”<sup>125</sup> The air attack planning process has five phases: “EA development,” “route planning,” “sustainment,” “review and refine,” and “rehearsal.”<sup>126</sup> The *Carpathians’ Eagles* wargame is not trying to simulate the entire planning process. For air attack missions in this game the focus is on route planning and sustainment phases.

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<sup>123</sup> Ibid., 6-3.

<sup>124</sup> Ibid.

<sup>125</sup> Ibid., 2-5.

<sup>126</sup> Headquarters Department of the Army, Army Techniques Publication 3-04.1, *Aviation Tactical Employment*, 2-29.

The route planning for air attack operations is determined by the mission and by operational variables.<sup>127</sup> The flight routes must be planned considering aspects such as: enemy air defense disposition, fuel requirements, FARP locations, communications, terrain features, weather conditions.<sup>128</sup>

The sustainment phase is critical while planning air attack operations, especially if there are limited air capabilities that can be employed. The planners must anticipate any “logistics requirements needed to support the plan.”<sup>129</sup> In the *Carpathians’ Eagles* wargame the sustainment phase is simulated on the Helicopter Status Table by integrating the FARP and Grounded options. This table simulates the maintenance operations, the weapons load, and the refueling, which are included in the sustainment phase.<sup>130</sup>

Time is one of the key factors when planning any airmobile operations. The planning times vary for each type of operation, and are directly influenced by the habitual relation between the ground forces and the aviation forces.<sup>131</sup> For example, the planning times for an air assault operation “can range from as short as 30 minutes for habitual quick reaction force missions up to 96 hours”.<sup>132</sup> The publications from literature review do not mention a timeline for planning air reconnaissance, air movement or air attack.

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<sup>127</sup> Ibid., 2-39.

<sup>128</sup> Ibid.

<sup>129</sup> Ibid., 2-40.

<sup>130</sup> Ibid.

<sup>131</sup> Headquarters Department of the Army, Field Manual 3-04, *Army Aviation*, 3-24.

<sup>132</sup> Ibid.

All airmobile operations follow different planning sequences, but there are certain considerations that are the same, such as number and types of air assets, air routes, weather effect, mission, and objective. The planning factors described above are included in *Carpathians' Eagles* wargame to help the brigade officers and battle staff learn how to plan airmobile operations in Romanian mountainous terrain.

### Air Capabilities and Limitations

The air capabilities that the Blue player is using in *Carpathians' Eagles* wargame are AH-1Z Viper attack helicopters<sup>133</sup>, UH-1Y Venom utility helicopters<sup>134</sup>, and F-16 aircraft<sup>135</sup>. The author decided to use these helicopters in the wargame because these are the airframes that Romania is intending to purchase. The F-16 aircraft have been part of the Romanian Air Force since 2016<sup>136</sup> and the author decided to use this capability in the wargame to increase the realism.

The AH-1Z Viper is a modern attack helicopter developed by Bell Helicopter Textron Inc. in United States. The state of the art technology and weapons systems installed on this 2 crew served helicopter allows for the execution of air missions “in day,

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<sup>133</sup> “AH-1Z Viper,” Military.com, accessed May 19, 2019, <https://www.military.com/equipment/ah-1z-viper>.

<sup>134</sup> “UH-1Y Venom,” Military.com, accessed May 19, 2019, <https://www.military.com/equipment/uh-1y-venom>.

<sup>135</sup> “F-16 Fighting Falcon,” Fortele Aeriene Romane, accessed May 19, 2019, [http://www.roaf.ro/?page\\_id=4757](http://www.roaf.ro/?page_id=4757).

<sup>136</sup> “F-16 Fighting Falcon,” Fortele Aeriene Romane.

night or adverse weather conditions.”<sup>137</sup> Being equipped with 20 mm cannon, anti-tank missiles, anti-ship missiles, and air-to-air missiles, this helicopter is capable to execute “close air support, anti-armor, armed escort, armed/visual reconnaissance, and fire support.”<sup>138</sup> The two engines ensure a maximum speed of 337 km/h and a range of 425 km, which can be extended up to 715 km if additional external fuel tanks are used.<sup>139</sup>

The UH-1Y Venom is a modern utility helicopter developed by Bell Helicopter Textron Inc. in United States under the same program as the AH-1Z and it has “85 percent identical parts with the AH-1Z.”<sup>140</sup> This two engine helicopter can transport 8 soldiers, crew chief, a gunner, pilot and copilot with a maximum speed of 315 km/h and a range of 238 km. The Venom can be equipped with a machine gun, cannon, and air to ground rockets.<sup>141</sup> This utility helicopter is perfect for executing air assault missions or to transport equipment up to 3000 kg<sup>142</sup> in areas where wheeled or tracked vehicles don’t have access.

Both helicopters can fly at high altitudes of over 6000 meters which makes them perfect for executing airmobile missions in mountainous terrain.<sup>143</sup> These helicopters are

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<sup>137</sup> “AH-1Z Viper,” Military.com.

<sup>138</sup> Ibid.

<sup>139</sup> Zaal Tchkuaseli, “AH-1Z Viper Attack Helicopter,” *Military Today*, accessed May 19, 2019, [http://www.military-today.com/helicopters/ah1z\\_viper.htm](http://www.military-today.com/helicopters/ah1z_viper.htm).

<sup>140</sup> “UH-1Y Venom,” Military.com.

<sup>141</sup> “UH-1Y Venom,” Military.com.

<sup>142</sup> Tchkuaseli, “UH-1Y Venom.”

<sup>143</sup> Ibid.

used in *Carpathians' Eagles* wargame for air assault, air reconnaissance, air movement, and air attack missions.

The F-16 Falcon is a combat proven aircraft that can be used in air to air and ground attack missions. It can reach a maximum speed of 2180 km/h and a maximum range of 4400 km with additional fuel tanks. The F-16 is equipped with a 20 mm canon, and can carry up to 11 rockets with a maximum weight of 7700 kg, Mark-83, and Mark-84 bombs.<sup>144</sup> In *Carpathians' Eagles* wargame the F-16 Falcon execute air strikes against hostile targets that were already identified by the air reconnaissance assets or by ground forces.

Next, the author described the Romanian mountain brigade and the opposing force capabilities.

### The Romanian Mountain Brigades

Romanian mountain brigades are probably the best trained units in the Romanian Army. They are considered to be elite troops<sup>145</sup> because they fight in very complex mountainous terrain that requires specific techniques and special skills. Besides the Romanian Special Forces, they are the only units that can conduct operations in mountainous terrain, regardless of the season and weather conditions.<sup>146</sup> Because of the geography of the Carpathians, almost any attack on the Romanian soil will have to take

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<sup>144</sup> "F-16 Fighting Falcon," *Fortele Aeriene Romane*.

<sup>145</sup> "General Leonard Mociulschi."

<sup>146</sup> Statul Major al Fortelor Terestre, *Manualul de lupta al Batalionului de vanatori de munte*, 11.

place in the mountains. These were the factors that were taken into consideration while deciding what units to simulate in the wargame.

The Romanian mountain brigade's main objective is to eliminate the opposing force located in key points and to "conquer and maintain dominant heights."<sup>147</sup>

A Romanian mountain brigade consists of three maneuver battalions, one artillery battalion, one logistics battalion, and one air defense battalion. Each maneuver battalion consists of three maneuver companies, one field artillery company, and one combat support company who also has in its task organization a reconnaissance platoon and an engineer platoon.<sup>148</sup>

The ground forces units that are played in this wargame are companies and platoons. The reason for choosing this was to avoid having too many pieces on the map. Battalion level units are not used in the wargame because there are insufficient air capabilities that can airlift such a unit at once.

Since the Red force player has no air capability in this wargame, the author decided that the Blue force air defense units are not a necessary part of the *Carpathians' Eagles* wargame. The sustainment units are also not included in the game because the units are considered to be resupplied by wheeled vehicles, and, for isolated units in the mountains, the Blue player uses air capabilities to deliver all the supplies.

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<sup>147</sup> Statul Major al Fortelor Terestre, *Manualul de lupta al Brigazii de vanatori de munte*, 32.

<sup>148</sup> "Wikipedia: 2nd Mountain Troops Brigade (Romania)," Wikimedia Foundation, last modified September 24, 2018, 18:26, accessed February 2, 2019, [https://en.wikipedia.org/wiki/2nd\\_Mountain\\_Troops\\_Brigade\\_\(Romania\)](https://en.wikipedia.org/wiki/2nd_Mountain_Troops_Brigade_(Romania)).

The mountain brigade task organization in *Carpathians' Eagles* wargame consists of 12 mountain infantry companies, one reconnaissance company, 8 Artillery Batteries, 4 reconnaissance platoons, and 4 engineer platoons. The mountain brigade is supported by the following air capabilities: 24 attack helicopters AH-1Z Viper, 21 utility helicopters UH-1Y Venom, and up to 12 sorties of F-16 aircraft.

### The Opposing Force

For this wargame the author decided to use the *Opposing Force Organization Guide* (FM 7-100.4, May 2007)<sup>149</sup> and *Armor and Mechanized-based Opposing Force* (FM 100-60)<sup>150</sup> as a starting point for simulating the enemy. Focusing on the purpose of this wargame, only a few capabilities were used, such as mechanized infantry forces, reconnaissance forces, artillery forces, engineer forces, and air defense forces.

Red player's units consist of 3 reconnaissance companies, 18 mechanized infantry companies, 5 air defense batteries, 6 artillery batteries, and 3 engineer companies. The opposing force air capabilities are not simulated in this wargame because the author wants the Blue player to focus on the process of planning the air assault and air movement operations. Also, several other capabilities of a standard mechanized infantry opposing force such as armor, antitank, signal, maintenance, chemical, medical, and materiel support units, were not included in the *Carpathians' Eagles* wargame because the author considered them to be not relevant in the scenario.

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<sup>149</sup> Headquarters Department of the Army, Field Manual 7-100.4, *Opposing Force Organization Guide*.

<sup>150</sup> Headquarters Department of the Army, Field Manual 100-60, *Armor and Mechanized-based Opposing Force*.

Player's capabilities are not the same. Red player capabilities are superior to Blue player, but they are not suitable for mountain operations. Blue player has greater mobility and the advantage of knowing the terrain very well.

### Summary

These are several factors included in the *Carpathians' Eagles* wargame. The terrain and weather, the planning factors required for conducting airmobile operations, the capabilities and limitations of the airframes, and the ground forces are the factors that provide the necessary effects needed for the players to understand some of the important aspects of planning airmobile operations. Chapter 4 illustrates how these factors were modeled into the wargame.

## CHAPTER 4

### CARPATHIANS' EAGLES WARGAME DESIGN

#### Introduction

The purpose of this thesis is to create a wargame that would help the Romanian brigade officers and battle staff use helicopters in mountain operations. Given the factors described in chapter 3, designing the *Carpathians' Eagles* wargame presented a significant challenge.

The reason for designing this game was for an educational purpose, “focusing primarily on providing an active learning experience.”<sup>151</sup> The *Carpathians' Eagles* learning objective is to develop rotary-wing deployment skills while conducting operations in mountainous terrain. The objective for the Blue player is either to prevent the Red forces from occupying the 3 cities on the map, or to gain 15 victory points that represent 15 Red units eliminated from the map. The 3 cities are located behind a natural barrier, the Carpathian mountains, and they are the last defensive line against the enemy. If the Blue player successfully defends the mountains, the enemy cannot expand his influence to the west. By eliminating 15 Red units from the map, the Red player won't have enough combat power to continue the attack and can no longer win. The 3 cities are marked on the map with the color gray and with the city symbol, each city having its own coordinates. The objective for the Red player is to have at least one mechanized infantry unit in each city. If the Red player does not conquer the 3 cities by the end of turn 20, the

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<sup>151</sup> Curry and Perla, *Peter Perla's The Art of Wargaming: A Guide for Professionals and Hobbyists*, 181.

Blue player is the winner because it is considered to be receiving support from NATO response forces located south of Romania. If the Red player conquers the three strategic cities, Red forces can advance and expand their influence to the west.

To successfully design this wargame, the author considered the following relevant and applicable variables: the terrain and weather conditions of the Carpathians mountains, the planning factors required for conducting airmobile operations, the capabilities and limitations of the airframes the Romanian Land Forces are expected to use in the near future, and the capabilities of the both the Romanian mountain brigade and the opposing force. In order to simulate all these factors, many serious games had to be analyzed and played in detail. This allowed the author to identify and to use the appropriate mechanics in this wargame to accomplish the desired objective. The author is using the wargaming formula of space, time, assets, and resolution<sup>152</sup> to highlight the key dimensions of *Carpathians' Eagles* wargame.

### Space

The simulation takes place in Romania, in a mountain area located in the Oriental Carpathians. To create the *Carpathians' Eagles* map, the author used as the source Google map<sup>153</sup> software, delimitating an area by the following Military Grid Reference System coordinates: 35TMM0928035348, 35TNM0152935387, 35TNL1293561102, 35TLL9922165412. The hex-based map is approximately 55 km in length and 35 km

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<sup>152</sup> Perla et al., *Transforming Naval Wargaming: A Framework for Operational-Level Wargaming*, 15.

<sup>153</sup> Google map, accessed May 21, 2019, Map Data 2019, <https://www.google.com/maps/@46.1079047,26.5498997,9.74z>.

wide. Each hex on the map represents an area about 1 kilometer square. This area of 1 kilometer square for a hex was chosen because this is a company level wargame and a company can execute operations in the mentioned area. Terrain types for the hexes include forest, hills, mountains, and town, with linear features such as roads and rivers. The game's map is a replica of the above mentioned area and it was reduced to 1:2 scale from the original map in order to include all terrain features. Not all the roads, rivers or cities are included in the game's map, because, during the tests it was discovered that it took too much time to cross all the rivers and get to the actual fight. The reason for splitting the mountains was to create an opportunity for the Red player to advance with his units independently of road networks, on the established avenues of approach. Also, during the testing, it was found to be too difficult for the Red player to advance on the road once the bridge was destroyed. Creating the corridor through the mountains allows the Red player to better position his troops on the map. The reason for creating these alternate avenues of approach was to prevent the Red player from massing all his forces on a road. First, the terrain does not allow massing two brigades in mountainous terrain, fact that was demonstrated during the testing when the Red units were blocked near the river. Secondly, the objective of this game is to help the Blue player understand how to use the air capabilities in mountainous terrain. In order to do so, the Red player must array his forces so that the game will be playable.

There are several bridges across the map that do not correspond to the real map. The reason for creating them on the map was to prevent the Red player from advancing too fast. During the testing it was proved that the enemy was advancing too rapidly and the Blue player did not have the time to execute air missions. Also, destroying a bridge

forces the Red player to array his units in fragmented terrain, which allows the Blue player to plan air missions in depth and provides more variability to play.

The terrain affects movement as follows: movement in a hex with mountains costs 4 movement points, movement in a hex with forest costs 3 movement points, movement in a hex with hills costs 2 movement points, and movement in a hex with road costs 1 movement point. The most significant obstacle is the river, which costs 6 movement points if the bridge is destroyed. The cost for crossing the river is associated with the lowest movement allowance for a unit. In this case, the player will have the opportunity to cross the river once a bridge is destroyed. The mechanized unit march speed is approximately 20 km/h<sup>154</sup> when there are no threats. Taking into consideration Romanian infrastructure and the fact that the units move tactically into a new area, the Red player advance rate can get as low as 3 km/h. A turn in the game represents 2 hours. A movement point translates to 1 kilometer on the map. For example, a unit that has 8 movement points can move tactically on a road with a speed of 4 km/h, respectively 8 km or 8 hexes per a game turn. In the mountains, a unit with 8 movement points can move 2 km or hexes per turn, which translates into a speed of 1 km/h. Units have different movement points according to their type. The Blue player can move faster than Red tactical speed because he already knows the terrain and is trained to conduct operations in mountainous terrain. The artillery and air defense units, for both Red and Blue players, can move only on roads and hills. One particularity for the Blue player is that he can move artillery by air using the utility helicopters. The mountain and mechanized units can

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<sup>154</sup> Gheorghe Pavel, *Curs de arta militara, Tactica genurilor de arma – infanterie*, Universitatea Nationala de Aparare, 2006, 10.

move on all terrain features. The urban areas represent a valuable target because the enemy gains victory points if he controls them.

The air capabilities and some of the ground forces do not start on the map because their initial location is outside of the simulated area. Their movement is tracked by the Blue player drawing the air corridors on an Operation Sheet, during the planning phase. The Operation Sheet is a reduced version of the game map on which the players draw their operations. The Operation Sheet includes the following information: planning time, mission type, location, execution time, number of helicopters, air routes, and additional notes. In the additional notes field the Blue player will automatically include instructions of what to do in case the operation fails or cannot be executed.

All the operations executed in this game are affected by the terrain, starting with the movement costs for the ground units, and continuing with the establishment of the landing zones, the air or ground observation, the ground and air attacks. The enemy faces serious challenges to eliminate units that are in mountain areas because the mountains offer natural obstacles and provide cover and concealment. Moreover, the mountain troops are trained to conduct operations in this complex environment and they can quickly withdraw, causing the enemy to slow his advance.<sup>155</sup>

Stacking is not permitted in this wargame. This is because the complexity of the terrain does not assure the necessary space to add more troops on the same location. Each unit located on the map has a zone of control around it. The zone of control represents the range of small arms and crew-served weapons within units that extend to the tiles

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<sup>155</sup> Statul Major al Fortelor Terestre, *Manualul de lupta al Batalionului de vanatori de munte*, 16.

adjacent to the unit's tile. Units may engage in combat from adjacent hexes. In case that a unit needs to retreat, this unit must retreat into a hex that is both uncontested and not adjacent to other enemy units.

The Blue player has the possibility of establishing new landing zones on the map. They are not materialized on the map at the beginning of the game because it proved to be too predictable for the Red player and that player focused all his units to prevent air operations in those areas. For this reason, the landing zones are added during the game by using markers.

### Time

Time is probably the most important factor in the wargame system. The Blue player is challenged to plan airmobile operations that can be executed later in the game. The Red player is always concerned to move fast through the mountains in order to conquer the three cities on the game map before the end of turn 20, when the game ends.

Each turn represents two hours. This represents the average time for the helicopter to accomplish a flight mission in mountainous terrain. In normal conditions, the air assets used in this wargame have an endurance of approximately 3.18 hours.<sup>156</sup> As mentioned in chapter three, at high altitudes, helicopter fuel consumption rate increases. This is the reason why the author decided to establish a two-hour time scale for helicopter missions, and therefore two hours per turn.

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<sup>156</sup> "AH-1Z Viper SuperCobra," Global Security, accessed May 21, 2019, <https://www.globalsecurity.org/military/systems/aircraft/ah-1z-specs.htm>.

The weather in mountainous terrain is unpredictable. To simulate the effect of weather over time on the air assets, the author implemented a weather check phase for each turn. It is obvious that in real life the weather does not change so often, but for simulating the weather effect, a D6 dice is used to determine if the air assets can or cannot be utilized in that phase.

Taking into consideration that the Romanian mountain brigade does not have any habitual relationship with air aviation units, the author considered that at least a 48-hour timeframe is needed to plan for air assault missions, and air attack missions. Instead of using the 48-hour timeframe in the wargame, the author opted for 8 hours because 48-hour in-game play appeared to be too long and in this amount of time the ground forces situation changes too quickly within the game without the Blue player ever having the chance to execute the air missions. For air lift, the author opted for a 4-hours planning timeline, and for air reconnaissance, the author opted for a 2-hour planning timeline. In this way, the learning audience is able to actually use the air capabilities while reinforcing the positive, rather than negative, aspects of planning.

The author repeatedly adjusted the time planning factor in order to make the game playable. During the tests it proved that increasing the time for planning resulted in making it impossible for the Blue player to execute the missions because the Red player moved too fast, so the mission objective for the Blue player changed.

### Assets

In this wargame there are two groups of combatants: Blue forces comprising the Mountain brigade and supporting air capabilities, and the Red forces comprising two mechanized infantry brigades. Each type of unit has different combat power, movement

points, and defensive strength. The Red forces are better equipped and tend to be stronger in game play, although the mountain troops are very well trained and they move faster. The Blue forces capabilities consist of mountain companies, engineer companies, reconnaissance platoons and companies, artillery batteries, utility and attack helicopters, and fixed wing aviation. The Red forces capabilities consist of mechanized infantry companies, engineer companies, air defense units, reconnaissance companies, and artillery batteries. Initially, the Red player had, as reinforcements in turn 12, one armored brigade, but testing proved that, because of the fragmented terrain and low mobility, it took too much time for them to get to the destination. Therefore, the armor brigade is no longer included in the game, though this can be an extension that can be developed in the future.

The ground units are represented in the game by colored wooden blocks. The author chose blocks instead of counters because it prevents the opponent from seeing the type and strength of the unit. The blocks are also very easy to play with when it comes to managing the three step losses. The blocks contain the following information: unit type, unit size, attack strength, range, air defense range, defense strength, movement allowance, unit ID, and combat power. The air capabilities are represented by 1:600 miniature helicopters and F16 aircraft. Orange plastic cubes are used to track the supply status for units that need resupply by air.

The reconnaissance units have the capability to detect the enemy 2 hexes away. This is very helpful, taking into consideration that the air assets can be used to target the enemy. Also, these units have high mobility, especially because they know the terrain, they are very well trained units, and because they have light military vehicles. The

mountain companies are the main troops used in combat by the Blue player. These units can be positioned on the map with the support of the utility helicopters, with proper planning.

The main purpose of the engineer units in this game is to repair or destroy bridges in order to allow or deny freedom of movement. To repair or destroy a bridge, an engineer unit must be positioned on the road, in the hex that touches the river stream. A bridge is repaired in the turn the engineers move into the correct hex and units can use the bridge the next turn. If the player decides to cross the river without repairing the bridge, it costs 6 movement points. During the testing it was proved that the Red player needs to protect his engineer units in order to allow his freedom of movement on the roads. They are a high value target for the Blue player, who will constantly try to eliminate them. Blue engineering units are an equally high value target for the Red player. Blue player can use the utility helicopters to move engineer units in order to destroy bridges.

The artillery units are very efficient if they are positioned at key points in the mountains where they can achieve the greatest effect.<sup>157</sup> Artillery cannot conduct fires over the mountains if their position is less than 2 hexes from mountainous terrain. When they are in the mountains where there are no ground lines of communications, air resupply is needed to conduct fires attacks.

In this wargame, the air defense units are very useful to counter attack the Blue player's air assets. Once the radar is active, the air defense units become vulnerable by revealing their position. They become a target for air strikes or artillery fires. The Red

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<sup>157</sup> Statul Major al Fortelor Terestre, Manualul *de lupta al Brigazii de vanatori de munte*, 92.

force has only two air defense units and three ground units with air defense capabilities. The author decided to eliminate one air defense unit from the Red's organic structure because otherwise the risk for Blue air capabilities was too high to execute missions. Another reason for eliminating one air defense unit is to make the Red player think where to put his air defense units in order to provide support for his own units.

The fixed wing air bombardment is simulated in this wargame by using a number of air points that the Blue player determines by rolling a D10 dice at the beginning of the game. In each turn, the Blue player can use a maximum of two air points. The maximum points that the Blue player can get is 12, which corresponds to the number of F-16s that Romania bought from Portugal.<sup>158</sup> These capabilities are not affected by the Red player's air defense because they are considered to conduct the bombardment above 3500 meters, and the altitude for Red air defense capabilities is a maximum of 3500 meters.

The helicopters are the main elements used in this wargame by the Blue player. The Blue player has the option to plan air lift missions, air assault missions, air reconnaissance missions, and air strike missions. Every lift or air assault mission requires two air attack helicopters that provide security. Due to their capacity limitations, 9 utility helicopters are needed to air lift a company, and 3 helicopters to air lift one platoon. When conducting air assault missions, one company can be moved by 6 helicopters. The reason behind this is that the helicopter can be prepared for the air assault mission by eliminating the non-essential equipment or materials from the helicopter. Air reconnaissance missions are very important. In order to execute air strikes on a target, the

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<sup>158</sup> "Romania to buy additional F-16 fighter jets from Portugal," Defence Blog.

Blue player must first reveal the unit that he wants to attack. All air capabilities are tracked on the Helicopter Status Table. Once a helicopter has finished a mission, it goes automatically to a forward arming and refueling point. This solution was adopted by the author to simulate the limited time for executing air missions with air capabilities and to simulate the refueling time necessary for each helicopter. After a helicopter has executed its third mission, there is a 25% chance for the helicopter to move to grounded 1 and grounded 2. The pilots can execute only a certain number of missions, so this mechanic exists to simulate maintenance time and the pilot's fatigue.

### Resolution

In this wargame, the author uses several tables and dice to model the combat results. The fixed-wing table is used to determine how many air points the Blue player has. This is to provide some variability to the amount of fixed-wing assets during subsequent play and to promote planning in the absence of significant fixed-wing air support. To determine the result, player rolls a die and looks the result up in the fixed-wing points table. To determine the fixed-wing bombardment combat results, the player rolls a D6 and looks up the result in the fixed-wing bombardment table. The values in the fixed-wing bombardment table were based on the laser-guided system characteristics<sup>159</sup>. The fixed-wing capabilities used in this wargame are the F-16s that have laser guided missiles. The line of sight between the designator and the target represents a critical factor in marking a target.<sup>160</sup> The terrain directly affects the line of sight and therefore the

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<sup>159</sup> Joint Chiefs of Staff, Joint Publication 3-09, B-1.

<sup>160</sup> Joint Chiefs of Staff, Joint Publication 3-09, B-1.

fixed-wing bombardment table reflects the bombardment results according to the terrain features.

For the weather check, the Red player rolls a die every turn to determine if the Blue air capabilities can be emplaced. There is about a 17 percent chance to roll 1 and to have bad weather and about an 83 percent chance to have good weather. In the Romanian mountains, during the summer, showers and thunderstorms are common. The summer season in Romania starts on 22 June and ends on 23 September, and historically it is the season with the highest precipitation.<sup>161</sup> The forecast for 22 June-21 July 2019 period in the game's region shows an average of 2.1 hours precipitation per day with an expectation that 6 days out of 30 are without any precipitation.<sup>162</sup> Taking in consideration that the game has 20 turns, there will be approximately 3.5 hours of precipitation per game, which translates to an approximately 5% chance of rain during any one turn. During the game tests, it proved that it was almost impossible to simulate weather conditions by keeping the 5% chance of precipitation, therefore the author decided to increase the chances to 17% to maintain the variability of play.

In the reconnaissance phase, the Blue player can use air capabilities or ground units to reveal enemy units. The Blue player can conduct air reconnaissance with groups of two helicopters. If the defender declares the use of air defense, that unit is automatically revealed. The process continues with the air defense resolution by rolling a

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<sup>161</sup> "Arhiva precipitatii," *Administratia Nationala de Meteorologie*, accessed April 22, 2019, <http://www.meteoromania.ro/servicii/date-meteorologice/arhiva-precipitatii>.

<sup>162</sup> "Vremea in Oituz, Romania," AccuWeather, accessed April 22, 2019, <https://www.accuweather.com/ro/ro/oituz/282149/daily-weather-forecast/282149?day=62>.

die to determine if the air defense was effective or not. If the air defense is a success, the air capabilities will end the mission and apply the results described in the Air Defense Resolution Table. To create the Air Defense Resolution Table, the author researched open source capabilities of the air defense systems that Red player is using. The SA-14 maximum range of fire is approximately 4.5 km and the maximum altitude is 3 km.<sup>163</sup> The hit probability against a target is 31-33% but this number can be “reduced if the target uses countermeasures.”<sup>164</sup> From a smaller distance it is fair to assume that the probability of hit increases at least 10%, since the target won’t have too much time to react. The SA-19 maximum range of fire is 8 km, and the altitude is 3.5 km.<sup>165</sup> The probability of hitting helicopters is 70-75% with surface-to-air missiles, and 50%-74% while using the guns.<sup>166</sup> The author decided to add into the Air Defense Resolution Table the maximum probability hit at a distance of 1-3 km, and decreasing the probability of hit for targets situated at a greater distance, because the helicopters used in this wargame have countermeasures systems that can be used in time. The SA-15 maximum range of fire is 12 km, while the maximum altitude is 6 km.<sup>167</sup> The probability to hit helicopters is

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<sup>163</sup> “Strela-3,” *Military Today*, accessed April 22, 2019, [http://www.military-today.com/missiles/strela\\_3.htm](http://www.military-today.com/missiles/strela_3.htm).

<sup>164</sup> *Ibid.*

<sup>165</sup> “2S6 Tunguska,” *Military Today*, accessed May 21, 2019, [http://www.military-today.com/artillery/2s6\\_tunguska.htm](http://www.military-today.com/artillery/2s6_tunguska.htm).

<sup>166</sup> “Anti-aircraft Gun-Missile Complex Tunguska (SA-19 Grison),” UKROBORONSERVICE, accessed April 24, 2019, <https://en.uos.ua/produktsiya/tehnika-pvo/68-zenitniy-pushechno-raketniy-kompleks-tunguska-sa-19-grison>.

<sup>167</sup> “Tor: Short-range air defense system,” *Military Today*, accessed May 21, 2019, <http://www.military-today.com/missiles/tor.htm>.

50-88% depending on “the target altitude.”<sup>168</sup> To simulate the hit probabilities, the author created, in the Air Defense Resolution Table, a hit probability depending on distance. If the target is located at a distance of 1-3 km, or 1-3 hexes, the hit probability is approximately 80%. The hit probability decreases when the target is located at a greater distance. If the air defense fails, the Blue player continues the mission and applies the results specified in the Air Observation table and Attack Helicopter Table. The AH-1Z Viper helicopters are equipped with AN/AAQ-30 target sight systems that can “acquire, track and designate targets at maximum weapon range.”<sup>169</sup> Typically, the Viper carries up to 16 AGM-114A/B/C Hellfire anti-tank missiles and pods with 70 mm unguided rockets, with a maximum range of 9000 meters.<sup>170</sup> During testing it proved that the helicopter range was too high and the enemy air defense systems couldn’t detect them. For this reason, the author decided to limit the helicopter range to 5000 meters and to create the Air Observation Table and Attack Helicopter Table based on distance and terrain features. Therefore, it is harder in the game to detect or eliminate a target located in mountains, cities or forests than a target located on roads or hills.

For the ground forces combat resolution, the combat strength of the attacking units is divided by that of the defending units to determine the odds ratio. To resolve the combat, players roll a die and look the result up in the Ground Combat Results Table.

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<sup>168</sup> Ibid.

<sup>169</sup> “TSS Target Sight System,” Lockheed Martin Corporation, accessed April 22, 2019, <https://www.lockheedmartin.com/en-us/products/target-sight-system-tss.html>.

<sup>170</sup> “AGM-114 Hellfire, Anti-tank guided missile,” Military Today, accessed April 22, 2019, <http://www.military-today.com/missiles/hellfire.htm>.

The Ground Combat Result Table was inspired from *Silver Bayonet's* Maneuver Combat Table where both the attacker and defender are incurring damages. The very first Ground Combat Result Table was inspired by *Battle of Moscow* where, almost all the time, the defender is taking all the damage. During testing with the initial table, it proved that the Red forces cannot be stopped or eliminated, though the Blue ground forces mission is to delay the enemy's advance towards the three cities. Therefore, the author decided to add resolution for both players, including step losses and retreat options. Both players have a Terrain Effects Chart and a sequence of play in order to facilitate game play. During ground combat, both players can use the artillery, if it is in range, and it counts as a column shift in the Ground Combat Results Table.

Both players can also execute artillery fires independently and apply results in the Artillery Resolution Table. Blue player artillery fires capabilities consist of 76 mm mountain howitzers<sup>171</sup> with a range of 8.6 km, and 98 mm mountain howitzers<sup>172</sup> with a maximum range of 11 km. The Red player artillery fires capabilities consist of 2S12 heavy mortars with a maximum range of 7.1 km<sup>173</sup>, and 2S9 gun-mortars with a range of up to 12.8 km.<sup>174</sup> The Artillery Resolution Table was created by taking into consideration

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<sup>171</sup> George GMT, "Istoria Artileriei Romane: Tunurile de munte," *Romania Military*, March 12, 2012, accessed May 21, 2019, <https://www.rumaniamilitary.ro/istoria-artileriei-romane-tunurile-de-munte>.

<sup>172</sup> Ibid.

<sup>173</sup> "Wikipedia: 2S12 Sani," Wikimedia Foundation, last modified April 29, 2019, 04:41, accessed May 10, 2019, [https://en.wikipedia.org/wiki/2S12\\_Sani](https://en.wikipedia.org/wiki/2S12_Sani).

<sup>174</sup> "2S9 Nona-S: 120 mm self-propelled mortar system," *Military Today*, accessed May 21, 2019, [http://www.military-today.com/artillery/2s9\\_nona\\_s.htm](http://www.military-today.com/artillery/2s9_nona_s.htm).

the historical artillery accuracy of different systems and the terrain features.<sup>175</sup> Therefore, a target located in mountain, city, or forest, has more chance of survivability because of the cover and concealment possibilities.

### Summary

The development of the *Carpathians' Eagles* wargame required the implementation of multiple mechanics that had to be interconnected in order to obtain an effective simulation. The terrain and weather conditions, the planning factors required for conducting airmobile operations, the capabilities and limitations of the airframes the Romanian Land Forces are expected to use in the near future, the Romanian mountain brigade, and the opposing force are the factors simulated in *Carpathians' Eagles* wargame that help the mountain brigade officers and battle staff to visualize and to understand the complexity of air mobile missions.

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<sup>175</sup> David Isby, "Historical Probability of hit (PHit) and Probability of kill (PKill) Percentages," *Alternate Wars*, March 5, 2014, accessed May 21, 2019, [https://www.alternatewars.com/BBOW/Weapons/Historical\\_Phits\\_Pkills.htm](https://www.alternatewars.com/BBOW/Weapons/Historical_Phits_Pkills.htm).

## CHAPTER 5

### CONCLUSIONS AND RECOMMENDATIONS

#### Conclusions

Can the use of air capabilities in Romanian mountainous terrain be effectively represented in a competitive wargame to train the Romanian mountain brigade officers and battle staff on airmobile mountain operations? To answer this primary research question, the author focused on studying U.S. airmobile doctrine and Romanian doctrine, and applied all the relevant information to creating the *Carpathians' Eagles* wargame.

This game proved to be a significant challenge because the author had no previous experience in designing a wargame, nor in planning airmobile operations. The decision to use Hexographer<sup>176</sup> proved to be the best solution for this wargame because it allowed the creation of a map similar to the actual terrain features. The ground units were personalized by using sticky paper on wood blocks, and for the air units, the author decided to purchase 1:600 scale miniatures<sup>177</sup> of the actual air capabilities used in this wargame. The terrain markers were created entirely by the author to simulate landing zones, destroyed bridges, and disrupted lines of communications. The wargame design is very simplistic and low cost but it requires a plotter to print the map to scale. The costs can be decreased if the air capabilities are replaced with plastic cubes.

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<sup>176</sup> “Hexographer,” accessed April 24, 2019, <http://www.hexographer.com/free-version/>.

<sup>177</sup> “AH-1Z Viper,” *PicoArmor*, accessed April 24, 2019, <https://www.picoarmor.com/product/ah-1z-viper-8-pcs/>.

A valuable lesson learned from developing *Carpathians' Eagles* is that a game designer at his first project cannot succeed without professional support. The most important aspect identified is that the game-testing requires at least two categories of personalities in order to provide valuable feedback that will contribute to the development of the game.<sup>178</sup> First, a professional gamer can immediately identify flaws in the mechanics and can recommend some options to improve the game. Secondly, subject matter experts in the domain are required to test the game to identify any inconsistency with reality. Another lesson identified is that the designer must come to the point when to say stop and finalize the product. Any new ideas can be implemented later on by creating updates or extensions to the game.

This wargame is a very good tool to help the brigade officers and battle staff understand how to plan airmobile operation in mountainous terrain. It is not intended to replace any manual or publication that covers airmobile operations and should be used accordingly.

*Carpathians' Eagles* wargame mechanics can be used in any mountainous terrain outside the Romanian borders, that have similar terrain characteristics, capabilities and threats.

### Recommendations

This version of game has multiple limitations, but it can be improved in the future by adding additional rules and new capabilities, and by refining the unit and map

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<sup>178</sup> Rex Brynen, "Teaching professional wargaming," PAXsims, October 17, 2015, accessed May 27, 2019, <https://paxsims.wordpress.com/2015/10/17/teaching-professional-wargaming/>.

graphics. For example, the Red player can get air capabilities and armor units, while the Blue player can get air defense units and more artillery. Including additional units in the game would contribute to the realism of how wars are fought today. Doing this requires more working hours, additional rules and many testing sessions. The biggest wargame design aspect that I would recommend for future development is to implement air capabilities for the Red player. This aspect will make the game more complex but will provide better training for both players. Another aspect that can be implemented in the game is to utilize new modern artillery capabilities that have been developed in the last few years. The author decided to avoid using long range artillery because it was too destructive and prevented the Blue player from executing ground missions, with the result that the game became an artillery fire support wargame. Once the new systems are developed in the future, they can be implemented in the game by updating the rules and Combat Result Tables according to the new capabilities. For example, the author offers a reconnaissance unit the ability to identify enemy units from 2000 meters, because of the actual capabilities and specialty training. When new capabilities, such as drones, are fielded to reconnaissance units, the game rules may be adjusted accordingly.

Since there is no doctrine or publication in the Romanian Land Forces Staff regarding the planning, preparing and execution of air mobile operations, all the brigade planners should try this wargame to understand how to use the air capabilities when they become available. Moreover, battalion staff and company level leadership can get a better understanding regarding the limitations, restrictions, and capabilities while requesting air support during operations.

The final version of this game proved to be a playable version that simulates airmobile operations in mountainous terrain in support of a mountain brigade. This is just a small tool that can contribute to the development of the military planners.

## APPENDIX A

### PARTS AND ACCESSORIES

*Carpathians' Eagles* should include:

- a. One map
- b. Playing pieces that represents units or game markers
  - 35 units for Red player
  - 29 units for Blue player
  - 21 x Bell UH-1Y Venom helicopter, miniature 1:600
  - 12 x Bell AH-1Z Viper helicopter, miniature 1:600
  - 12 x F-16 fighter aircraft, miniature 1:600
  - 15 x orange plastic cubes that represents Supply
  - 1 x Game Turn Marker
  - 10 x LZ markers
  - 8 x Disrupted LOC markers
  - 7 x Destroyed Bridge markers
- c. Charts and Tables
  - Terrain Effects Chart
  - Blue Off Map units and Fixed-wing Air Point Tracker
  - Turn Record Track
  - Helicopter Status Table
  - Red player units
  - Operation Sheet
  - Sequence of Play
  - Air Observation Table
  - Attack Helicopter Table
  - Fixed-wing Bombardment Table
  - Air Defense Resolution Table
  - Ground Combat Result Table
  - Artillery Resolution Table
- d. Dice: 1 x D4, 1 x D6, 1 x D10
- e. Game rules (Appendix A)

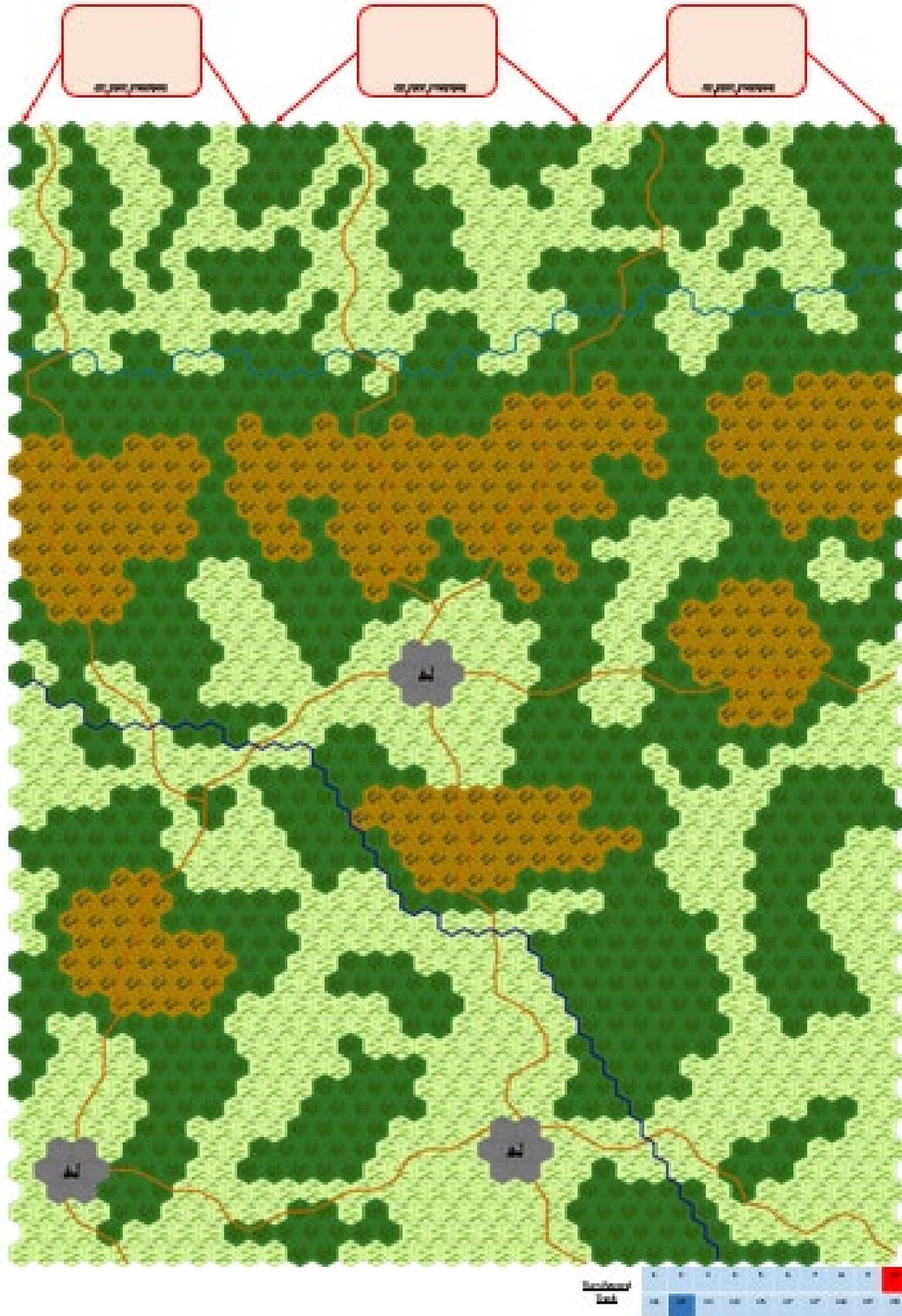


Figure 1. Game Map

Source: Created by author.

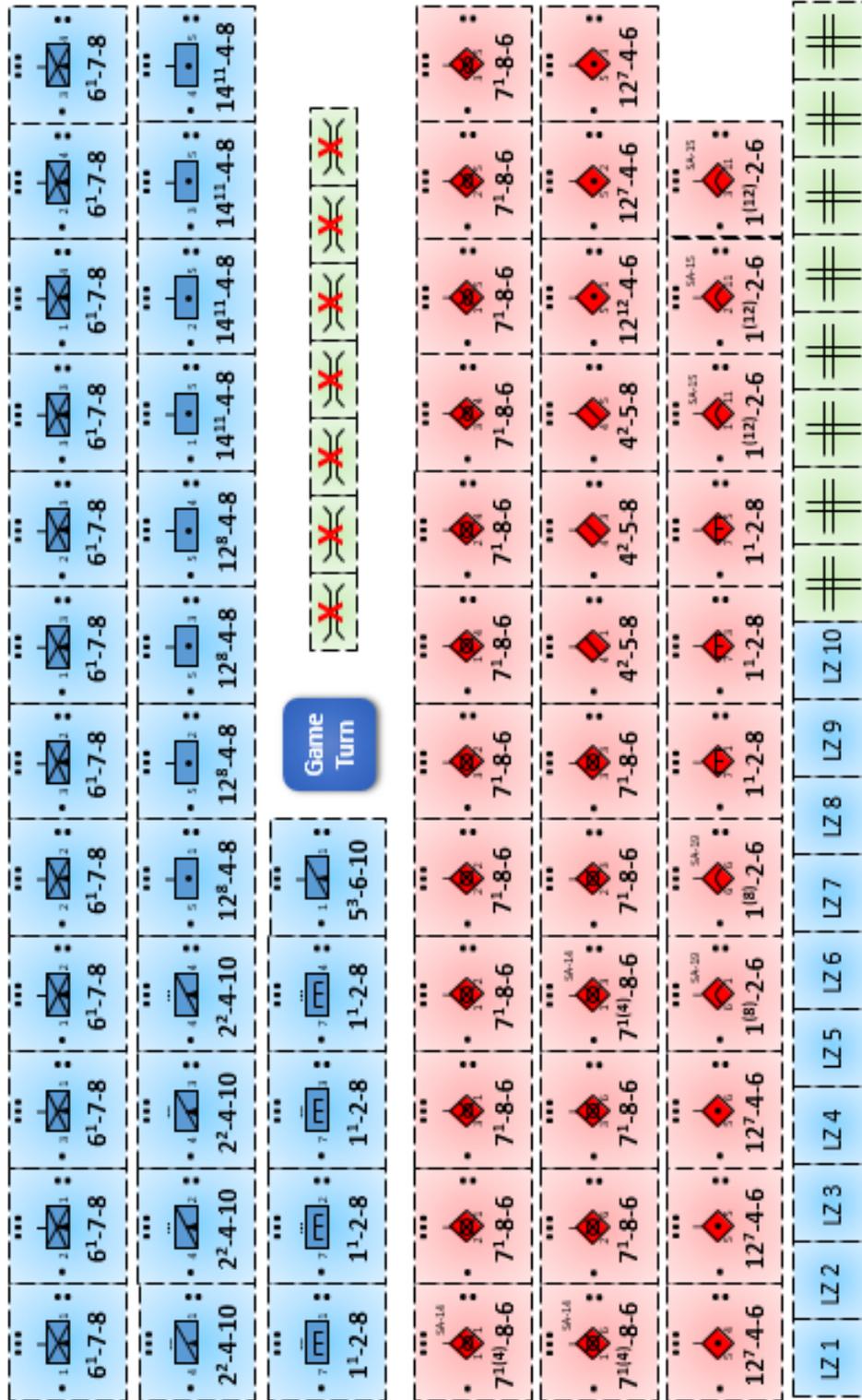


Figure 2. Units and Markers

Source: Created by author.



Figure 3. Bell UH-1Y Venom Helicopter, Miniature 1:600

*Source:* Created by author.



Figure 4. Bell AH-1Z Viper Helicopter, Miniature 1:600

*Source:* Created by author.



Figure 5. F-16 Fighter Aircraft, Miniature 1:600

*Source:* Created by author.



Figure 6. Orange Plastic Cubes for Supply

*Source:* Created by author.

TERRAIN EFFECTS CHART				
Symbol	Terrain	Movement Effect	Combat Effect	Notes
	City	1 MP	Reduce odds by one (1) column	Helicopters can land without Reconnaissance for LZ
	Road	1 MP	No effect	Helicopters can land without Reconnaissance for LZ
	Hill	2 MP	No effect	Helicopters can land without Reconnaissance for LZ
	Forest	3 MP	Reduce odds by one (1) column	- No Air Defense units allowed - No Artillery units allowed (except Blue air lifted)
	Mountain	4 MP	Reduce odds by two (2) column	- No Air Defense units allowed - No Artillery units allowed (except Blue air lifted)
	River	6 MP	Reduce odds by one (1) column	- Rivers cannot be crossed during bad weather

Figure 7. Terrain Effects Chart for Blue Player

Source: Created by author.

TERRAIN EFFECTS CHART				
Symbol	Terrain	Movement Effect	Combat Effect	Notes
	City	1 MP	Reduce odds by one (1) column	Helicopters can land without Reconnaissance for LZ
	Road	1 MP	No effect	Helicopters can land without Reconnaissance for LZ
	Hill	2 MP	No effect	Helicopters can land without Reconnaissance for LZ
	Forest	3 MP	Reduce odds by one (1) column	- No Air Defense units allowed - No Artillery units allowed (except Blue air lifted)
	Mountain	4 MP	Reduce odds by two (2) column	- No Air Defense units allowed - No Artillery units allowed (except Blue air lifted)
	River	6 MP	Reduce odds by one (1) column	- Rivers cannot be crossed during bad weather

Figure 8. Terrain Effects Chart for Red Player

Source: Created by author.

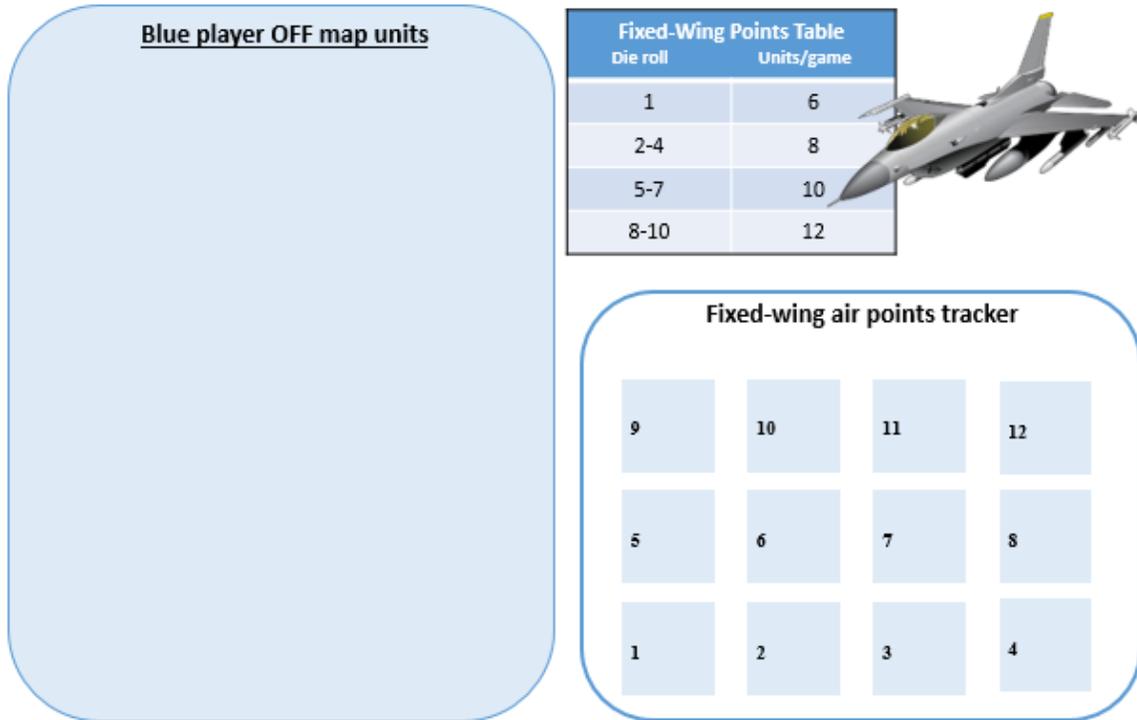


Figure 9. Blue Player OFF Map Units and Fixed-wing Air Points

Source: Created by author.

	1	2	3	4	5	6	7	8	9	10
<b>Turn Record</b>										
<b>Track</b>	11	12	13	14	15	17	17	18	19	20

Figure 10. Turn Record Track

Source: Created by author.

**Helicopter Status Table**

<b>Attack Helicopters READY (24)</b>			<b>Lift/Air Assault Helicopters READY (21)</b>
	Grounded 2	Grounded 2	
	Grounded 1	Grounded 1	
	Mission 3 (D4)	Mission 3 (D4)	
	FARP	FARP	
	Mission 2	Mission 2	
	FARP	FARP	
	Mission 1	Mission 1	

\*Each attack helicopter represents a group of 2

Figure 11. Helicopter Status Table

Source: Created by author.

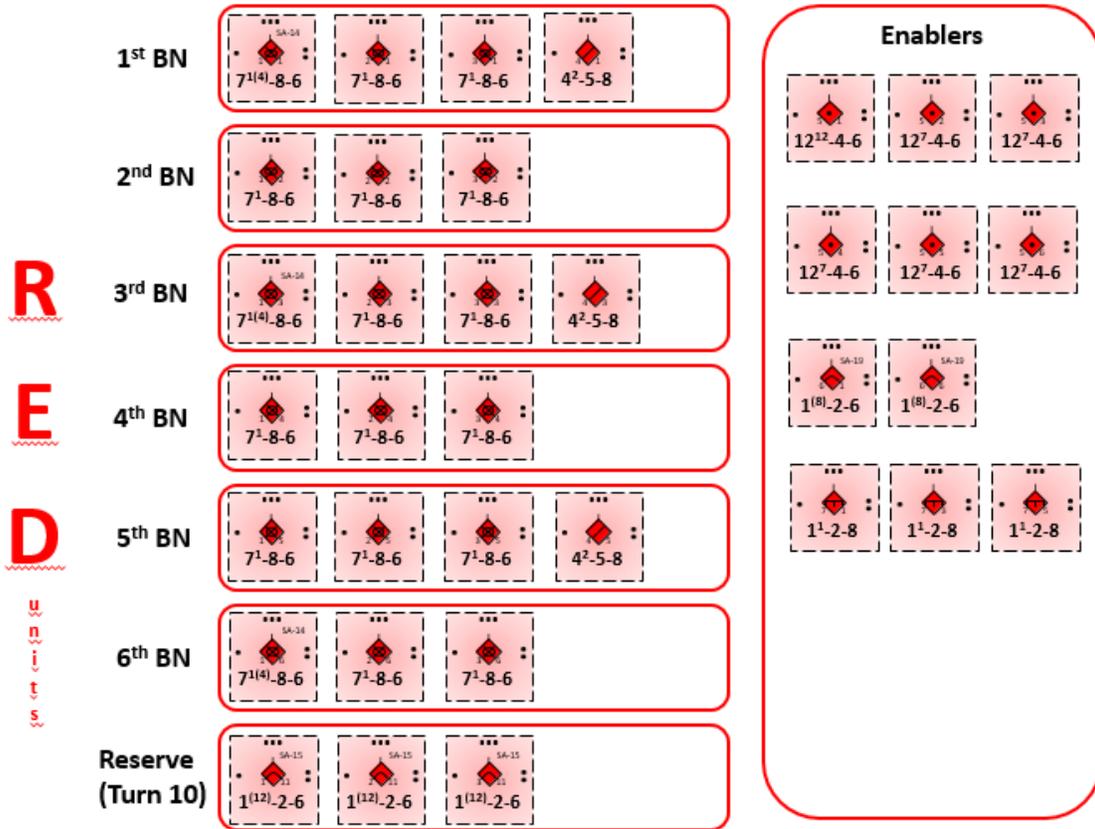


Figure 12. Red Payer Units

Source: Created by author.

Operation Sheet # \_\_\_\_\_

Planning Time: \_\_\_\_\_

Execution Time: \_\_\_\_\_

Mission type: \_\_\_\_\_

Helicopters: Attack \_\_\_\_\_ Utility \_\_\_\_\_

Location: \_\_\_\_\_

Additional notes: \_\_\_\_\_

Planning timeline: Air assault, Air attack: 8h (4 Turns) / Air lift: 4h (2 Turns) / Air reconnaissance: 2 h (1 Turn)  
3 utility helicopter/platoon // 9 utility helicopters/company. For air assault: 2/platoon and 6/company

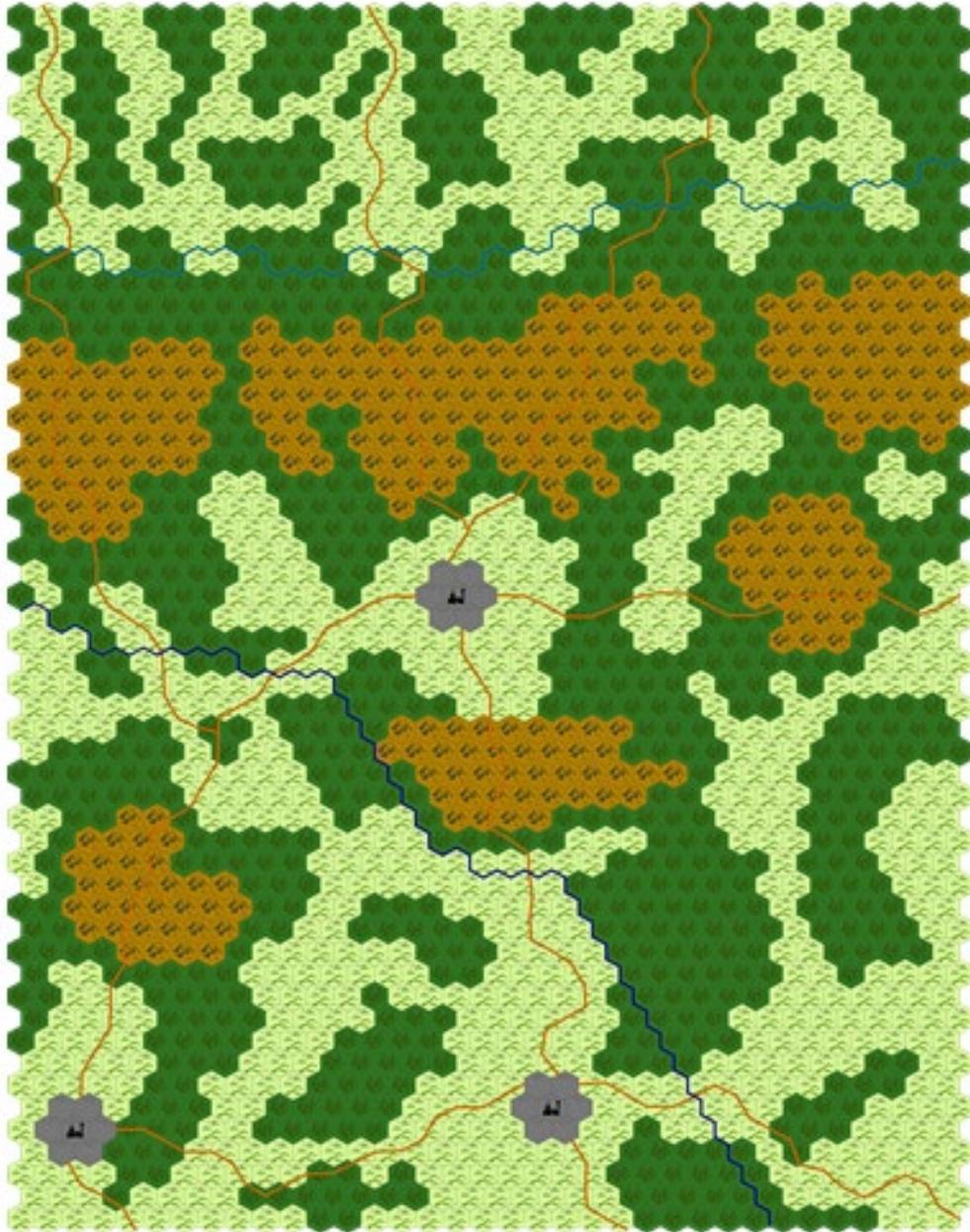


Figure 13. Operation Sheet

Source: Created by author.

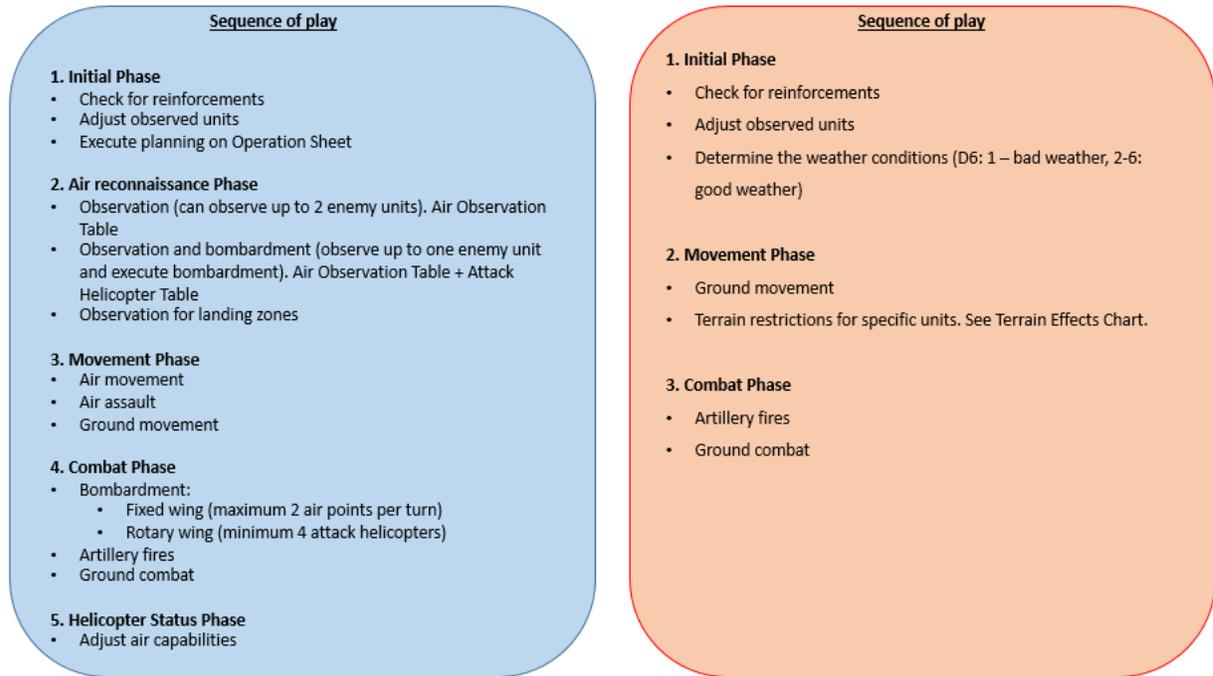


Figure 14. Sequence of Play

Source: Created by author.

AIR OBSERVATION TABLE

Die Roll	Road			Hills			Forest			City			Mountain		
	1-2	3-4	5	1-2	3-4	5	1-2	3-4	5	1-2	3-4	5	1-2	3-4	5
1	R	R	R	R	R	R	R	R	R	R	R	R	R	R	U
2	R	R	R	R	R	R	R	R	R	R	R	U	R	U	U
3	R	R	R	R	R	R	R	R	U	R	U	U	U	U	U
4	R	R	R	R	R	U	R	U	U	U	U	U	U	U	U
5	R	R	U	R	U	U	U	U	U	U	U	U	U	U	U
6	R	U	U	U	U	U	U	U	U	U	U	U	U	U	U

Figure 15. Air Observation Table

Source: Created by author.

**ATTACK HELICOPTER TABLE**

Die Roll	Road			Hills			Forest			City			Mountain		
	1-2	3-4	5	1-2	3-4	5	1-2	3-4	5	1-2	3-4	5	1-2	3-4	5
1	2	2	1	2	1	1	2	1	1	1	1	1	1	1	-
2	2	1	1	2	1	1	1	1	1	1	1	-	1	1	-
3	2	1	1	1	1	1	1	1	-	1	1	-	1	-	-
4	1	1	1	1	1	-	1	1	-	1	-	-	1	-	-
5	1	1	-	1	1	-	1	-	-	1	-	-	-	-	-
6	1	-	-	1	-	-	1	-	-	-	-	-	-	-	-

Figure 16. Attack Helicopter Table

*Source:* Created by author.

**FIXED WING BOMBARDMENT TABLE**

Die Roll	Road	Hills	Forest	City	Mountain
1	1	1	1	1	1
2	1	1	1	1	-
3	1	1	1	-	-
4	1	1	-	-	-
5	1	-	-	-	-
6	-	-	-	-	-

Figure 17. Fixed Wing Bombardment Table

*Source:* Created by author.

### AIR DEFENSE RESOLUTION TABLE

Die Roll	SA-14 4 km		SA-19 8 km			SA-15 12 km			
	1- 2	3- 4	1- 3	4- 6	7- 8	1- 3	4- 6	7- 9	10- 12
1	1	1	1	1	1	1	1	1	1
2	1	1	1	1	1	1	1	1	1
3	1	1	1	1	1	1	1	1	1
4	1	-	1	1	1	1	1	1	1
5	-	-	1	1	1	1	1	1	1
6	-	-	1	1	-	1	1	1	-
7	-	-	1	-	-	1	1	-	-
8	-	-	-	-	-	1	-	-	-
9	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-

Figure 18. Air Defense Resolution Table

*Source:* Created by author.

### RESOURCE TRACKER

Unit ID	1	2	3

Figure 19. Resource Tracker

*Source:* Created by author.

### GROUND COMBAT RESULT TABLE

Die Roll	1:2 or less	1:1	2:1	3:1	4:1	5:1	6:1 or more
1	A3D1	A2D1	A2D2	A1D2	A1D3	A1D3	A0D3
2	A2D0	A2D1	A1D1	A1D2	A0D2	A0D3	A0D3
3	A2D0	A1D0	A0D1	A0D1	A0D2	A0D2	A0D3
4	A1D0	A1D0	A0DR	A0D1	A0D1	A0D2	A0D3
5	A1D0	A1D0	A0DR	A0D1	A0D1	A0D1	A0D2
6	ARD0	ARD0	A0DR	A0DR	A0DR	A0D1	A0D2

Player with more loses will retreat  
If draw, player with less CP will retreat

Figure 20. Ground Combat Result Table

*Source:* Created by author.

### ARTILLERY RESOLUTION TABLE

Die Roll	Road	Hills	Forest	City	Mountain
1	2	2	1	1	1
2	2	1	1	1	1
3	1	1	1	1	-
4	1	1	1	-	-
5	1	1	-	-	-
6	1	-	-	-	-

Figure 21. Artillery Resolution Table

*Source:* Created by author.

## APPENDIX B

### CARPATHIANS' EAGLES: RULES OF PLAY

#### **1.0 Introduction**

**1.1** *Carpathians' Eagles* is a wargame that simulates the actions between Blue forces and Red forces in a fictitious scenario, in Romanian mountainous terrain, in the summer season.

**1.2** The Blue forces are represented by one mountain brigade with rotary wing and fixed-wing support.

**1.3** The Red forces are represented by two mechanized infantry brigades.

**1.4** The Red forces are attacking from the East towards the Carpathian mountains, attempting to fulfill their Victory Conditions.<sup>179</sup> The Blue forces are establishing defensive positions in order to block the Red forces from Carpathian mountains and to fulfill their Victory Conditions.

**1.5** This wargame can be played by two players.

**1.6** Blue player will perform multiple functions including planning missions, air reconnaissance, air defense fire, observation, bombardment, ground and air movement, air assault, air lift, ground combat, and artillery fire.

**1.7** Red player will perform functions including planning missions, ground movement, ground combat, and artillery fire.

#### **2.0 Game Equipment**

*Carpathians' Eagles* wargame includes:

- One map, 30 x 40 inch
- Playing pieces that represent units or game markers
- Charts and tables
- Dice: 1 x D6, 1 x D10, 1 x D4

#### **2.1 The Game Map**

**2.1.1** The game map portrays an area located on Eastern side of Romania, in the Oriental Carpathians. A hexagonal grid is superimposed on the terrain features on the map to coordinate the movement and positioning of the units. Each hexagonal space, hereafter called a hex, represents about one kilometer.

**2.1.2** Stacking is not allowed; each unit occupies one hex.

**2.1.3** Every hex on the map has a unique four-digit number, of this form xx.xx, where xx represent digits. The digits before the decimal represents the row, while the digits after the decimal represents the column. This numbering system is used to identify the hex for various game purposes.

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<sup>179</sup> Philip Sabin, *Simulating War: Studying Conflict Through Simulation Games*, (New York, NY: Continuum International Publishing Group, 2012), 123.

2.1.4 The maps shows important terrain features, such as hills, forests, mountains, roads, cities, rivers, artillery positions, and landing zones. Explanation of the terrain features are found on the Terrain Effects Chart.

2.1.5 Off map units are available and are considered to be in reserve. They come into play in specific turns according to the Sequence of Play.

**2.2 The Playing Pieces**

2.2.1 The playing pieces represent units or game markers and contain symbols and numbers that represent the attack strength, the defense strength, movement allowance, the type of the unit, unit size, range, unit identification, and combat power represented by three step losses markers.

2.2.2 Ground combat units are represented by blue and red 2 x 2 centimeter wooden blocks, covered on one side with sticker paper.

2.2.3 The ground units in this game are companies/batteries or platoons/sections.

2.2.4 Unit types are reconnaissance (Mountain), mountain infantry, engineer, artillery, mechanized infantry, and air defense.

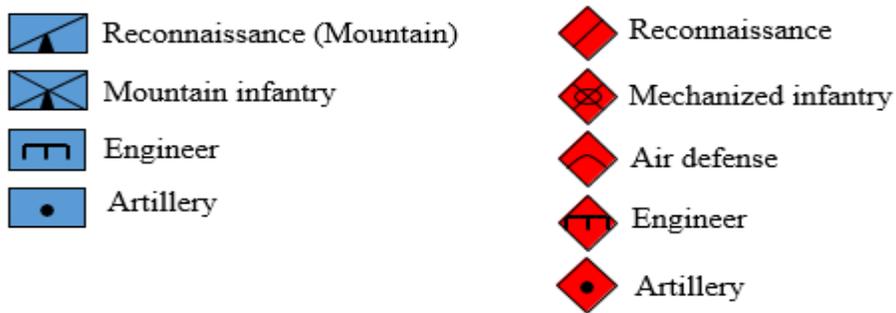


Figure 22. Ground Unit Types

Source: Created by author.

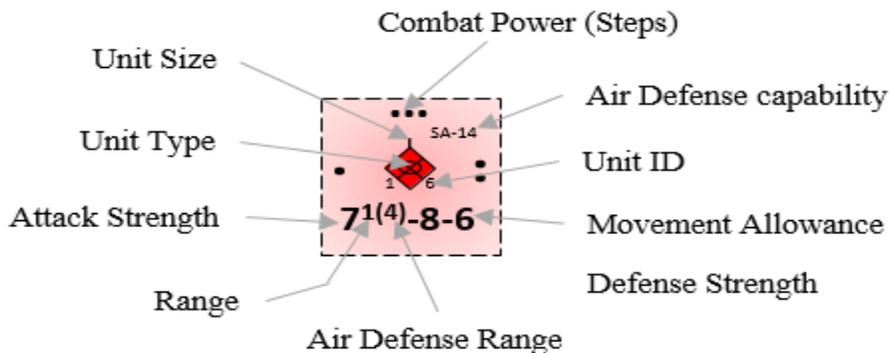


Figure 23. Ground Unit Counter Values

Source: Created by author.

- 2.2.5** The Attack Strength represents the combat value that a unit is using when is attacking during the Combat phase, expressed in attack strength points.
- 2.2.6** The Range indicates the maximum distance in hexes that a unit can fire. For reconnaissance units this value represents the distance in hexes that a unit can discover an enemy unit, the attack distance remaining one hex.
- 2.2.7** The Air Defense Strength indicates the maximum distances in hexes that the air defense units can fire against air units. This value is the Attack Strength superscript value and is marked between parentheses.
- 2.2.8** The Defense Strength represents the value that a unit is using while defending in Combat phase, expressed in defense strength points.
- 2.2.9** The Movement Allowance determines how far the unit can move and is expressed in movement points.
- 2.2.10** Unit ID or identification is included to facilitate the players in setting up the game.
- 2.2.11** All units, except aviation units, have three combat power levels called Steps. When a three-step unit takes step losses, the unit is rotated so the step marker that represents the remaining steps is facing up. When a one-step unit is taking a step loss, it is eliminated from the game. In the ground combat phase, the lead unit must always take the first step loss, then losses are distributed accordingly to the supporting units.
- 2.2.12** All ground units on the map are positioned so the opponent cannot see their faces.
- 2.2.13** The air units are represented by 1:600 miniature helicopters and F-16 aircraft. The helicopters are divided in two types: transport or utility helicopters and attack helicopters. Each attack helicopter miniature, the AH-1Z Viper, represents a group of two helicopters because they fly in pairs. There are 21 utility helicopters, the UH-1Y Venom. The fixed-wing availability is represented by points and is determined at the beginning of the game, and the Blue player can receive a maximum of 12 air points, representing 12 F-16 aircraft.
- 2.2.14** The supply is represented by orange plastic cubes; each cube allows a unit to execute one combat mission. All units are considered to have access to supplies except those units in mountains that are at least 2 hexes from a road, and units where the line of communication is disrupted by the enemy. These units can be resupplied by air. When units are transported by air, they automatically receive 3 orange cubes.
- 2.2.15** Several markers are used to show different actions during the game such as bridge destroyed, game turn, landing zones, and disrupted line of communication.

### **2.3 Charts and Tables**

- 2.3.1** Several game aids are provided for the players in order to simplify and illustrate the game functions.
- 2.3.2** These are: Terrain Effects Chart, Blue off map units, Fixed-wing Air Point Tracker, Helicopter Status Table, Red player units, Operation Sheet, Sequence of play, Air Observation Table, Attack Helicopter Table, Fixed-wing Bombardment Table, Air Defense Resolution Table, Ground Combat Result Table, Artillery Resolution Table, Resource Tracker, and Turn Record Track.

### **2.4 The Dice**

- 2.4.1** This wargame uses one ten-sided die, one six-sided die, and one four-sided die.
- 2.4.2** The dice are used to determine the results of the actions executed during the game.

## **3.0 Game Play**

### **3.1 Preparing for Play**

Both players start by placing the units on the map or on the charts and tables, as follows:

#### **3.1.1 Blue Player:**

- 3.1.1.1 Place Reconnaissance platoons on map: 14.03; 14.13; 12.23; 24.17.
- 3.1.1.2 Place Mountain companies on map: 17.04; 18.14; 15.22; 27.17; 50.02; 50.03; 51.04; 49.20; 49.21;
- 3.1.1.3 Place Artillery batteries on map: 19.06; 18.17; 52.02; 51.20;
- 3.1.1.4 Place Engineer platoons on map: 28.17; 52.03; 50.21;
- 3.1.1.5 Place on the Blue player off-map units' chart: one Reconnaissance company, three Mountain companies, four Artillery batteries, and one Engineer platoon. These units are considered reinforcements and, when they arrive on map, will be placed in the city with the coordinates 50.20, in Turn 12. These units can be air lifted starting with Turn 1, if planned.
- 3.1.1.6 Place on Helicopter Status Table: 12 miniature Attack helicopters in the Attack Helicopter Ready, and 21 miniature Utility helicopters located in Lift/Air Assault Helicopters Ready.
- 3.1.1.7 Player receive Operation Sheets for planning airmobile missions. Each mission requires one Operation Sheet.

#### **3.1.2 Red Player:**

- 3.1.2.1 Place all units on the Red off map chart according to the unit identification.
- 3.1.2.3 In Turn 10, one air defense regiment will show on map on row 01.

#### **3.1.3 All units begin the game at full strength.**

### **3.2 The Game Turn**

**3.2.1** The game is played in successive game turns which consists in several phases known as Sequence of Play.

**3.2.2** There are 20 game turns, each representing approximately two hours.

### **3.3 Carpathians' Eagles Sequence of Play**

**3.3.1** Before Turn 1, players start executing several actions described below:

- 3.3.1.1 The Blue player determines the fixed-wing availability. The Blue player rolls a D10 and determines the number of air points available for the entire game in the Fixed-Wing Points Table. Then, he places miniature F16 aircrafts in the Fixed-Wing Air Points Tracker, equal to the air points number.
- 3.3.1.2 Blue player starts by planning airmobile missions on the Operation Sheet. This is a 2-hour planning timeline. The planning timeline for air assault and air attack is 8 hours, which represents 4 turns. The planning timeline for air lift is 4 hours, and for air reconnaissance is 2 hours. The Blue player can conduct multiple planning cycles simultaneously.
- 3.3.1.3 Blue player marks on the map five landing zones that are considered pre-established by the higher echelon. These landing zones can be positioned on any terrain.
- 3.3.1.4 Red player organizes the forces by assigning the enablers to each battalion, taking in consideration that there are three avenues of approach.
- 3.3.1.5 Then he places the forces on the Ready Boxes on the map as follows: Battalion 1 and 2 will have their starting point on the avenue of approach between 01.01

and 01.10, Battalion 3 and 4 between 01.11 and 01.23, and Battalion 5 and 6 between 01.24 and 01.35.

**3.3.2** The Red player has the initiative and is following a 3-phase sequence:

3.3.2.1 Initial phase

3.3.2.1.1 Inform the Blue player to advance the marker with the Game Turn on the right position.

3.3.2.1.2 Check if there are any reinforcements.

3.3.2.1.3 Adjust observed units. If the unit is no longer observed, flip it so it cannot be seen by the Blue player.

3.3.2.1.4 The player will roll a D6 to determine the weather conditions. The value “1” represents that the weather is bad and no air capabilities will be used during the turn. The bad weather also prevents the units from crossing a river if a bridge is destroyed. The values “2” to “6” represent that weather is good and all units can be used.

3.3.2.2 Movement phase

3.3.2.2.1 The player can move as many or as few of his own units as he wishes. The exception to this rule applies to the Red player on Turn 1, who is restricted to move only 4 units on each avenue of approach.

3.3.2.2.2 A unit must not exceed the allocated movement points.

3.3.2.2.3 Terrain restrictions apply to all units. Details are on the Terrain Effects Chart.

3.3.2.3 Combat phase

3.3.2.3.1 Conduct artillery fires on enemy targets if they are in range. The Red player declares the target, rolls a D6, and apply the results shown in the Artillery Resolution Table. The defender cannot retreat from the Artillery fires.

3.3.2.3.2 Artillery fires on bridges. The Red player rolls a D6 and the values 1 to 4 means that the bridge is destroyed. The values 5 and 6 means that the bridge was not destroyed.

3.3.2.3.3 Player declares attacks with combat units. The Red player announces all his combats by declaring what enemy units he will attack and with what friendly units.

3.3.2.3.4 The defender declares if he will choose to retreat. In order to do that, the defender must roll a D6. The values 1 to 3 means that the retreat is successful, and the values 4 to 6 means that the retreat has failed. If the retreat is successful, the unit must retreat two hexes out of enemy ZOC. If this is not possible, the unit will not retreat.

3.3.2.3.5 Next step is to determine if the attack is supported. In order to determine if the attacking unit is supported by friendly units (adjacent to the attacked unit), the attacking player rolls a D6 for every eligible friendly unit that can support the attack. The values 1 to 3 means that the attack is supported, and the values 4 to 6 means that the attack is not supported.

- 3.3.2.3.6 Next step belongs to the defender in order to identify if he is supported by friendly units. The defender rolls a D6 for every friendly unit that can support the defense (adjacent to the defended unit). The values 1 to 3 means that the defense is supported, and the values 4 to 6 means that the defense is not supported.
- 3.3.2.3.7 Next step, the attacker totals the attack strength points of all attacking units involved in the combat. The defender calculates the total defense strength point of all his defensive units involved in the combat. Dividing the attack strength points by the defensive points results in a combat odds ratio that is always rounded down to the nearest ratio listed in the Ground Combat Result Table.
- 3.3.2.3.8 Both the attacking and the defending player checks if they have artillery fires that can support the attack and, respectively, defend. If the attacker has artillery that can range the attacked hex, he will apply a column shift to the right for each artillery unit that can do so. If the defender has artillery that can range the attacker's hex, he will apply a column shift to the left for each artillery unit that can do so.
- 3.3.2.3.9 Next step is to determine the effect of terrain. If the attacked unit is on a hex with mountains, the attacker suffers 2 column shifts to the left. If the attacked unit is on a hex with forest, or city, or if the attack requires crossing a river, the attacker suffers 1 column shift to the left.
- 3.3.2.3.10 After determining the correct column in the Ground Combat Result Table, the attacker rolls a D6 and determines the results. The results are applied immediately. The results of the combat will be a series of letters and numbers such as A0DR, where A represents the attacker, and D the defender. The numbers represent the amount of step losses that the units involved in the combat must suffer. The letter R indicate that the player must retreat the unit two hexes. The first loss is always applied to the unit who declared the combat or to the unit that received the attack. Then, the remaining step losses can be split equally throughout the supported units.
- 3.3.2.3.11 The unit cannot retreat into or through an enemy ZOC. If the attacking unit has fewer step losses than the defender, the attacking unit may advance to the defender's hex, ignoring the enemy ZOC, and the defender automatically retreats two hexes. This is not considered movement and it does not require movement points. If the defender cannot retreat under the conditions described above, the unit is automatically removed from the map. The defending unit never advances when the attacking unit retreats.

### **3.3.3** The Blue player is following a 5-phase sequence:

#### **3.3.3.1** Initial phase

- 3.3.3.1.1 Advance the Game Turn marker on the right position. Check if there are any reinforcements.
- 3.3.3.1.2 Adjust observed units. If the unit is no longer observed, flip it so it cannot be seen by the Red player.
- 3.3.3.1.3 Blue player conducts the planning for next turn or turns, on the Operation Sheet.
- 3.3.3.2 Air Reconnaissance phase
  - 3.3.3.2.1 Blue player can conduct air reconnaissance missions with groups of two helicopters, if properly planned during the Initial phase from previous turns. For example, if the player started the planning in Turn 1, he can execute the air reconnaissance mission in Turn 2.
  - 3.3.3.2.2 Player can conduct three types of missions: observation of enemy units, observation and bombardment, and observation for establishing landing zone.
  - 3.3.3.2.3 The Blue player shows the Operation Sheet to the Red player and the Red player determines if the helicopter group is in range of any air defense units. Each operation will have its own Operation Sheet.
  - 3.3.3.2.4 The Red player declares or declines the air defense fire.
  - 3.3.3.2.5 If the defender decides to engage the targets, he will automatically face the unit or units that execute air defense fire face up. The defender rolls a D10 for each group of helicopters and resolves the combat with the Air Defense Resolution Table.
  - 3.3.3.2.6 The observation mission allows the attacker to discover two units that are within the helicopter's maximum range, by rolling a D6 for each unit. The results are shown in the Air Observation Table. If a unit is revealed, it will automatically flip with face up.
  - 3.3.3.2.7 The observation and bombardment mission allows the attacker to conduct observation and attack on a single enemy unit. First, the attacker rolls a D6 to determine if the unit was revealed and applies the result according to the Air Observation Table. Then, if the unit was revealed, the attacker rolls a D6 to determine the enemy step losses according to the Attack Helicopter Table. The range for attack helicopters is 5 hexes.
  - 3.3.3.2.8 The observation for a landing zone is executed in hexes with mountains and forests terrain. The Blue player can automatically identify a landing zone in the selected hex by executing reconnaissance with attack helicopters.
- 3.3.3.3 Movement phase
  - 3.3.3.3.1 The Blue player can move as many or as few of his own units as he wishes.
  - 3.3.3.3.2 A unit must not exceed the allocated movement points.
  - 3.3.3.3.3 Terrain restrictions applies for all units. Details are on the Terrain Effects Chart.

- 3.3.3.3.4 All helicopters and fixed-wing aviation can move any distance on the map and can conduct one mission per phase.
- 3.3.3.3.5 Helicopters can land on roads, cities, hills, and established landing zones in forests and mountains.
- 3.3.3.3.6 New landing zones can be established in forests and mountains by using air reconnaissance capabilities or by coordinating with ground forces. In this last option, the helicopters can land in friendly unit's zone of control.
- 3.3.3.3.7 Every mission conducted by utility helicopters requires an escort of two attack helicopters. If the air attack helicopters are discovered by enemy air defense, the utility helicopters will abort the mission without any casualties. The air defense attack will be solved on the Air Defense Resolution Table.
- 3.3.3.3.8 The utility helicopter transport capacity is as follows: 3 helicopters are required to transport one mountain platoon, 9 helicopters to transport one mountain company, and 8 helicopters to transport one artillery battery. Utility helicopters can also transport supplies. Two utility helicopters can supply one company.
- 3.3.3.3.9 For air assault missions, two utility helicopters are required to transport one mountain platoon, and six helicopters are required to transport one company.
- 3.3.3.3.10 Every air assault mission requires an escort of a minimum of two attack helicopters. The Blue player always has the option to cancel the execution of the mission.
- 3.3.3.3.11 The Blue player shows the Operation Sheet and the Red player determines if the helicopter is in range of any air defense units. The defender declares or declines the air defense fire.
- 3.3.3.3.12 If the defender decides to engage the targets, he will automatically face the unit or units that execute air defense fire face up. The defender rolls a D10 for each group of attack helicopters and resolves the combat with the Air Defense Resolution Table.
- 3.3.3.3.13 If the attack helicopters are detected, the Blue player must abort the air assault mission without any casualties.
- 3.3.3.4 Combat phase
  - 3.3.3.4.1 The Combat phase starts by declaring the bombardment. The Blue player can conduct Bombardment with fixed-wing and attack helicopters.
  - 3.3.3.4.2 Every turn, a maximum of two air points (fixed-wing) can be used to attack revealed enemy targets. The fixed-wing is not affected by the air defense fires and does not require any prior planning.
  - 3.3.3.4.3 The fixed-wing can destroy bridges. If the bridge is destroyed and there are adjacent units to the bridge, each of them will receive a step loss.

- 3.3.3.4.4 The Blue player declares the number of air points used and the designated targets, then he rolls a D6 for each of them and applies the results as shown in the Fixed-wing Bombardment Table. Before the attack, he automatically adjusts the air points in the Fixed-Wing Air Points Table.
- 3.3.3.4.5 The attack helicopters can engage units that are revealed. A minimum of four helicopters are required to conduct this type of mission.
- 3.3.3.4.6 The Blue player shows the Operation Sheet to the Red player and the Red player determines if the helicopters are in range of any air defense units.
- 3.3.3.4.7 The defender declares or declines the air defense fire. If the defender decides to engage the targets, he will automatically face up the unit or units that execute air defense fire. The defender rolls a D10 for each group of attack helicopters and resolves the combat with Air Defense Resolution Table.
- 3.3.3.4.8 If the air defense does not engage the helicopters, the Blue player rolls a D6 for each group of helicopters and applies the results depicted in the Attack Helicopter Table.
- 3.3.3.4.9 Attack helicopters cannot destroy bridges.
- 3.3.3.4.10 The artillery can conduct fires on enemy targets. The Blue player declares the target and rolls a D6 and apply the results shown in the Artillery Resolution Table. The defender cannot retreat from Artillery fires.
- 3.3.3.4.11 Next step is to declare the ground combat. The Blue player announces all his combats by declaring what enemy units he will attack and with what friendly units.
- 3.3.3.4.12 The defender declares if he will choose to retreat. In order to do that, the defender must roll a D6. The values 1 to 3 means that the retreat is successful, and the values 4 to 6 means that the retreat has failed. If the retreat is successful, the unit must retreat two hexes out of enemy ZOC. If this is not possible, the unit will not retreat.
- 3.3.3.4.13 Next step is to determine whether the attack is supported. In order to determine if the attacking unit is supported by friendly units, the lead player rolls a D6 for every eligible friendly unit that can support the attack. The values 1 to 3 means that the attack is supported, and the values 4 to 6 means that the attack is not supported.
- 3.3.3.4.14 Next step belongs to the defender in order to identify if he is supported by friendly units. The defender rolls a D6 for every friendly unit that can support the defense. The values 1 to 3 means that the defense is supported, and the values 4 to 6 means that the defense is not supported.
- 3.3.3.4.15 Next step, the Blue player totals the attack strength points of all attacking units involved in the combat. The defender calculates the

total defense strength point of all his defensive units involved in the combat. Dividing the attack strength points by the defensive points results in a combat odds ratio that is always rounded down to the nearest ratio listed in the Ground Combat Result Table.

- 3.3.3.4.16 Both the attacking and defending player checks if they have artillery fires that can support the attack and, respectively, defend. If the attacker has artillery that can range the attacked hex, he will apply a column shift to the right for each artillery unit that can do so. If the defender has artillery that can range the attacker's hex, he will apply a column shift to the left for each artillery unit that can do so.
- 3.3.3.4.17 The artillery can be used to destroy bridges by rolling a D6. The values 1 to 4 represents that the bridge was destroyed, and the values 5 and 6 represents that the bridge was not destroyed.
- 3.3.3.4.18 Next step is to determine the effect of terrain. If the attacked unit is on a hex with mountains, the attacker suffers a 2 column shift to the left. If the attacked unit is on a hex with forest or a city, or if the attack requires crossing a river, the attacker is suffering 1 column shift to the left.
- 3.3.3.4.19 After determining the correct column in the Ground Combat Result Table, the attacker rolls a D6 and determines the results. The results are applied immediately. The results of the combat will be a series of letters and numbers such as A0DR, where A represents the attacker, and D the defender. The numbers represent the amount of step losses that the units involved in the combat must suffer. The letter R indicate that the player must retreat the unit two hexes. The first loss is always applied to the unit who declared the combat or to the unit that received the attack. Then, the remaining step losses can be split equally throughout the supported units.
- 3.3.3.4.20 The unit cannot retreat into or through an enemy ZOC. If the attacking unit has fewer step losses than the defender, the attacking unit may advance to the defender's hex, ignoring the enemy ZOC, and the defender automatically retreats two hexes. This is not considered movement and it does not require movement points. If the defender cannot retreat under the conditions described above, the units is automatically removed from the map. The defending unit never advances when the attacking unit retreats.

### 3.3.3.5 Helicopter status phase

- 3.3.3.5.1 Last step of this phase is the adjustment of the helicopter availability as shown in the Helicopter Status Table.
- 3.3.3.5.2 The game starts with all helicopters Ready for mission (21 utility helicopters and 24 attack helicopters).
- 3.3.3.5.3 After every mission, the helicopters are moved to the FARP, and then Mission 2 and so on until they get to Mission 3.

3.3.3.5.4 When the Blue player has helicopters in Mission 3, he will roll a D4 for each helicopter or group of helicopters to determine whether they are moved into the Ready box or Grounded 1 box. The value 1 means that the helicopter is moved to Grounded 1. The values 2 to 4 represents that the helicopters are moved to the Ready box. The helicopters in Grounded 2 will move to the Ready box.

#### **4.0 Movement**

**4.1** Each ground unit has a Movement allowance that represents the distance in hexes it can move in each Movement phase.

**4.2** For fixed-wing missions, there is no planning required and the movement path is not traced. Therefore, the air defense units cannot engage the fixed-wing.

**4.3** If an air mission cannot be executed as planned because of the bad weather, it can be executed in the next turn with good weather.

**4.4** Ground Units are moved one at a time, from hex to adjacent hex, paying the appropriate movement point cost for the terrain in each hex entered.

**4.5** A unit cannot enter a hex if it does not have sufficient movement points.

**4.6** The players have three options during the Ground movement phase: to move the units without consuming all movement points, to move the units by consuming all movement points but without exceeding them, or to remain on the same hex. Excepted from this rule are the units that were transported by air. These units will move only half of the movement points during the turn where they were transported by air, then they will have their full movement point allowance in the next turn.

**4.7** A unit can never enter a hex containing an enemy unit.

**4.8** A unit can enter a hex containing a friendly unit at no extra movement point cost only when it is passing through the friendly unit, but the two units cannot be stacked on the same hex at the end of the movement phase.

**4.9** When an enemy unit is in the observation range of a friendly unit, the enemy unit will automatically flip to face up.

#### **5.0 Terrain Effects on Units**

**5.1** Each hex contains a terrain type such as: road, city, hill, forest, mountain, and river.

**5.2** Movement through the hexes that contains roads and cities costs one movement point per each hex. Two movement points are required to pass through hexes with hills, three movement points for hexes with forests, and four movement points to pass through hexes with mountains.

**5.3** The river runs along the hex sides and has an important effect on movement. If the road crosses over the river, it is considered to have a bridge between the two hexes. To cross a unit on the bridge costs one movement point. If the bridge is destroyed, a unit can cross the river by paying 6 movement points. This rule applies subject to taking into consideration the terrain restrictions for each type of unit.

**5.4** All units can enter a hex containing any type of terrain, except for artillery and air defense units, which can enter only on hexes with cities, roads, and hills. An exception to this rule are the landing zones identified by the blue player where he can transport and position artillery units.

**5.5** The artillery units can fire over the mountains if their position is at least two hexes from the mountainous terrain. The exception to this rule applies to artillery units positioned in hexes with landing zones.

**5.6** The terrain plays an important role in determining the action results. Ground combat engagements and artillery fires are influenced by the terrain features as follows: mountainous terrain will shift two columns to the left in the Ground Combat Result Table, and the forest, city, and river terrain will shift the table one column to the left. The effects of the terrain features can be found in the Terrain Effects Chart.

**5.7** The engineer units can destroy or repair bridges. To repair or destroy a bridge, an engineer unit must be positioned on the road, in the hex that touches the river stream. A bridge is repaired in the turn the engineers move into the correct hex and units can use the bridge the next turn. If the player decides to cross the river without repairing the bridge, it costs 6 movement points.

## **6.0. Zone of Control**

**6.1** Each ground unit has a Zone of Control, called a ZOC, that consists of the six hexes surrounding it.

**6.2** The ZOC has important effects on movement and combat. A unit that enters an enemy ZOC must immediately end its movement for that movement phase.

**6.3** Units can leave the enemy ZOC without any penalty or move to another enemy ZOC hex, but it has to stop in that adjacent hex. A unit stops when either leaving or entering an enemy ZOC.

**6.4** Units cannot terminate their retreat in an enemy ZOC. If there are no other options, the unit is eliminated.

**6.5** Combat is not mandatory once a unit enters an enemy ZOC.

**6.6** A unit can attack only once per turn and can be supported by friendly units adjacent to the hex attacked.

**6.7** The defender can receive multiple attacks from different adjacent units and can also receive support from friendly forces adjacent to the attacking units to defend the attacked hex. The defender can refuse the combat and attempt to retreat.

## **7.0 Victory**

**7.1** The Red player wins if he has at least one mechanized infantry unit in each city.

**7.2** The Blue player wins if he accumulates 15 victory points or if he has at least one unit on the map at the end of 20 turns.

**7.3** Every enemy unit eliminated from the map represents a victory point.

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