NATIONAL DEFENCE UNIVERSITY-KENYA

MILITARY OPERATIONS AND SECURITY IN ARID ENVIRONMENTS IN ETHIOPIA: A CASE OF ENDF SIXTH MECHANIZED DIVISION IN THE DANAKIL DESERT

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DECLARATION

I solemnly declare that this thesis is my original work and has not been presented
degree in any other university or college that all sources of materials used in the t
have been fully acknowledged.

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LIST OF ABBREVIATIONS

C2: Command and Control

ECCM: Electronic Counter Countermeasure

EMOND: Ethiopian Minsters of National Defence

ENDF: Ethiopian National Defence Force

ENDHQ: Ethiopian National Defence Head Quarter

FGD: Focus Group Discussion

FM: Field Manual

FMFRP: Fleet Force Reference publication

ISR: Intelligent Surveillance and Reconnaissance

MD: Mechanized Division

NATO: North Atlantic Treaty Organization

NOE: Nap-Of- The Earth

TPLF: Tigre People Liberation Front

UAV: Unmanned Aerial Vehicle

USFM: United State Field Manual

ABSTRACT

The main objective of this study was to identify the influence of Danakil desert weather conditions and land features on the readiness of combatant units of the 6th Mechanized Division to conduct operations. Extreme weather conditions affect the military communication systems in the Danakil desert. Danakil desert has no reference points to give and receive missions, such as to indicate the way of enemy movement, the area for the subunits to join each other, and the mission area of the unit. Danakil's land features mostly vast open spaces, natural obstacles, and military maneuverability and communication difficulty. Under these full challenges, commanders must plan how to use specialized equipment and continuous training for troops in order to navigate and operate effectively. The study aimed at achieving the following specific objectives: To evaluate the effectiveness of command and control systems in coordinating situational awareness in the arid environment of ENDF 6th MD of Danakil Desert; To identify the specific logistical and supply chain difficulties encountered by the ENDF 6th MD in sustaining operations; To explore the role of training and operational preparedness in enhancing the operational efficacy of the ENDF 6th MD in the arid environment of Danakil Desert; and To assess the impact of the arid environment on the operational readiness of personnel and equipment's of the 6th MD in the Danakil Desert. The study was guided by the Integrated Terrain Forecasting (ITF) Theory. The study employed purposive sampling to select its research respondents. The study employed a qualitative research approach. Data was collected using interviews, observation, and FGD guides, the validity of which was established through consultation with experts, supervisors, and faculty members who advised on their construction. The qualitative data was presented descriptively. The study found that in the Danakil desert operation, extreme weather conditions challenge C2. It focuses on how effective combat readiness is ensured in the challenging weather conditions and harsh land features of the Danakil desert. It was found that C2 is core to the readiness of combatants for desert operations. The research identified desert challenges for combat readiness, such as high temperature and terrain features. Furthermore, the current infrastructure status, like the poor road conditions, the absence of enough electric power supply, and the lack of standardized comfortable housing, were the challenges that impeded the effectiveness of the logistics supply system compared with the effect of the weather conditions. Command and control in the Danakil desert present unique obstacles for military operations. However, military operations can overcome these challenges through proper planning, training, and adaptation. Specialized equipment like desert combat vehicles, advanced communication technology, and aerial support can provide crucial advantages in desert environments. To ensure command and control in the 6th Mechanized Division in the Danakil desert, it is vital to gather detailed information about the target area. This includes studying the terrain, identifying the potential threats, and understanding weather patterns.

CHAPTER ONE

BACKGROUND

INTRODUCTION

1.1 Introduction

Desert is a region that as a result of limited rainfall, can accommodate few plants and, at best, they are large and few; or may not accommodate any vegetation at all; any area that cannot sustain life due to lack of water, frost prevails throughout the year, or lack of soil (Martin, 2009). Desert warfare entails operations in desert or similar conditions of arid or semi-arid areas. To this term belongs military activity affected by such areas training, climate, resources, as well as by strategies and tactics used by military forces operating in these conditions. US Department of the Army (1993) indicated that the primary challenges encountered in desert warfare stem from extreme heat and scarcity of moisture, influencing the tactics, techniques, and procedures employed.

Gebremedhin (2013) explained the experience of Ethio-Eritrea war at Bure front; it was very difficult for the military's command and control, maneuverability and communication due to the extreme wether condition land harsh land future. Missing direction was widely happened in most infantry units, for the reason similarity of Bure terrain. The Danakil desert in northeast Ethiopia is an exceptionally harsh and inhospitable environment, marked by scorching temperatures, sparse vegetation, and limited water resources. This arid region poses significant challenges for military operations, as the extreme climate and rugged terrain can severely impact readiness, mobility, and overall effectiveness of armed forces. The Ethiopian National Defence Force (ENDF) has a dedicated 6th Mechanized Division tasked with maintaining security and conducting operations within the Danakil desert. As a specialized unit trained to operate in such demanding environments, the 6th Mechanized Division's experiences offer valuable insights into the unique considerations and adaptations required for military forces to succed in arid, remote, and resource-constrained regions.

This research paper aims to examine the military operations and security environment faced by the END 6th Mechanizzed Division in the Danakil desert. It will explore the division's strategies, tactics, and equipment employed to overcome the substantial logistical, environmental, and

operational challenges inherent to this harsh terrain. Furthermore, this research shall also investigate factors of national security in connection with measures the ENDF has been implementing to secure stability with a view of protecting the nation's interests within this though strategic but more or less arid area in Ethiopia. Based on the analysis of activities performed by 6th Mechanized Division, this research will advance the understanding of how military forces can successfully maneuver and control desert terrains, provoking the frame of the Ethiopian armed forces strategy and execution.

1.2 Background of the Study

Deserts occupy about one third of the Earth's land space, and they are as varied as peurile people would like to imagine them as deserts of sand. There are deserts globally and all these deserts have their unique features different from the other Containing high amounts of salt. While every desert is different – from the giant sand waves of the Sahara to the cold ice plains of Antarctica and the coastline of the Atacama Desert in the Pacific Ocean. Despite their contrasting features, they are all scientifically categorized as deserts due to a shared characteristic: receiving less than 10 inches (250mm) of rainfall annually. In Ethiopia, examples of deserts include the Danakil, Ogaden, and North West lowlands. While these desert areas differ in land features, they typically have a hilly, sloping, flat, rocky, and sandy terrain (Kleynhans, 2022).

Some of these characteristics include; low precipitation, high temperatures, humidity is low in the day and high at night, deficiency of rainfall, droughtiness, high wind velocity and low cloud cover, water vapor in the air is low, intensity of solar radiation is high or maximum and number of sunshine hours is very large, maximum evaporation potential nearest to theoretical maximum, most deserts have loose and sandy soil that is poor in organic carbon, nitrogen, moisture Biologic soil is the volume of soil into which the plant root penetrates, and is the only source of water that can be directly offered to the plants (Diksha, 2008).

Approximately, one-third of the Earth's surface area is that is covered by deserts. However, the deserts of the world are way beyond sand dunes alone but rather come in a different version or type. Deserts on Earth are very many and they differ from each other in many ways as will be demonstrated below. Namib desert which consists of the dunes of the Saharan desert, the cold icy surface of the Antarctica and the coastal range of the Atacama Desert is comprised of a desert. That is right; despite the differences to which we have referred they are all scientifically classified as

deserts. But it is quite simple, really, as they all share one common trait that qualifies them as a desert region: they all get less than 250mm of rainfall per annum Due to this, there is classification of the deserts based on this definition into the following; Sub Tropical deserts, Cool Coast deserts, Cold winter deserts, and Polar deserts. (Kashyap, 2009)

A crucial special emphasis is needed to grasp the environment, to engage in combat operations in the desert and, respectively, to ensure the necessary combat service support for operations in this theater. Desert is an abode of sand and dust, unfriendly to human beings as most of the surfaces lacks fresh water. When a unit is alerted for operations in a desert environment, the commander must know everything his unit would need to know and everything it would require both for planning and prosecution of combat operations in the desert. Huddlestone and Pike (2017) listed consideration as establishing of the particular climatic and ground conditions for deployment and readiness. The study on the particular topic points that stressing supply, especially the provision of sufficient water, is vital during the desert combat operation.

The sever desert creates its own problems in the biomedical risks that soldiers face. On its impact on man, it influences the water consumption, adjustment, metabolism and disposition of casualties and sick, among others due to its high temperatures and low humidity. Other issues unrelated to heat, arid humidity and medical concerns are diseases, snakes and chemical substances. Medical problems also arise from metrological conditions including glaring sunlight, wind storms and scorpion as well as direct change in temperature within a single day. The United States Marine Corps (2014) stated that the greatest challenge in operating in a desert warfare environment: environmental condition by changing from our habitual climatic environment where heat stress, wind, and high water loss are the main factors affecting military personnel.

The Army Center of Initial Military Training talks about the Army combat readiness test which is an event aimed at preventing injury and is intended to replace the current Army physical fitness test. Kraemer, Feltwell, and Szivak (2017) establish that preparing a combat unit for operation remains challenging for military personnel, even in a desert that is relatively warm but not hot. Psychologically, it has preparedness and, physically, it has readiness. The Danakil depression in Ethiopia in one of the places that receive extremely high temperatures each year, concrete temperatures for the year here range about 350 C (95F). It’s not a question of protection from rain or wind, no shelter, just the continual beating of the sun (Ypte, 2018).

Ethiopia experienced desert operations during Serdo, Tesene, and Bure operations. For the preparation of the Serdo operation, "logistics supply like food, medicine and medicine equipment, and camels for transportation, as its plan it was considered ten days, but it was taking twenty days". On the other hand, the main weakness lesson learned from the Serdo operation was that the TPLF troops did not pay attention to the fact that the most important commodity of the desert operation was water. As a result, of 59 TPLF died, 27 died of thirst for water, and 10 of them died due to the hot weather conditions of the desert (ENDF, 2011).

In May 1998, the Eritrean aggressor force initiated an invasion of the northern territories of the sovereign Ethiopian nation, advancing along three primary axes. After this incursion, the conflict manifested across four principal fronts: Badime, Tsorena, Zalanbessa, and the Danakil Desert at the Bure front. Notably, the Bure front presented distinctive characteristics distinct from the other theaters of engagement, primarily owing to its location within the arid expanse of the Afar depression.

Within the context of the Ethio-Eritrean war, the Bure front emerged as a pivotal battleground wherein both nations confronted each other over territorial disputes. The harsh desert terrain of Bure served as the backdrop for diverse military operations orchestrated with varied strategic objectives in mind.

1.3 Statement of the Problem

The concept of warfare is unique because it is conducted in a desert which is unfriendly for human beings. Sandy environment tactical activities feature fast, dynamic topography and maneuver combat often with dispersed formations. In general, the desert climate negatively affects the availability and efficiency of the combatant's force and equipment (FMFRP 0-58). Combat ant Battle effectiveness in desert needs, for training and material testing, to be attained and known by the combatants lying in these circumstances. As McDonald et al. (2016) pointed out terrain conditions being combined with a general unfamiliarity with desert environments that previously hindered U.S. military operations in North Africa during the World War I in operation Torch.

According to Major Micheal and R. Macedonia (1992), explained about US army experience during operations desert Shield and desert Storm communications were critical to controlling the scope of operations. During these operations command and control expriences in desert operation,

that the US army faced challenges with coordinating large scale troop movements and logistics through the vast and featureless desert terrain. Effective satellite communications and GPS were critical for navigation and situational awareness. The relied heavily on air power and advanced technology like patriot missile defence systems to offset the Iraqi army's numerical advantages. Effective integration and coordination among ground farce, air support and intelligence assets was essential for the coalition's decisive victory.

Military commanders should prepare their units to conduct combat missions to ensure operational efficacy in arid environments. Readiness in desert areas is too difficult due to the water shortage and hot weather conditions. As the Ethiopian National Defence Force experienced war with Eritrea in 1998-2000 at the Bure front in the Danakil desert, it was too challenging to ensure combatant readiness and to conduct war in the area, particularly for infantry force that moves on foot were the worst. During the Ethio-Eritrean war, both sides deployed infantry troops as a main force in all battlefields with a few mechanized units. The mechanized units couldn't carry out any mission independently because of the small amount in number and low capacity. Their role was only supporting infantry by fire. From the beginning to the end, infantry troops conducted most battles on both sides. Because of improper use of force and lack of experience in desert operations, the Bure operation experienced massive scarification both on friendly troops and enemies due to the hot weather conditions of the Bure front.

The extreme heat of the Danakil region poses intricate challenges for military operations, affecting both soldiers and equipment. The exceptionally high temperatures not only strain soldiers physically but also impact the accuracy of equipment like artillery fire, increasing the range of fire beyond normal parameters and decreasing accuracy on target due to thermal expansion. Additionally, the rocky terrain of the Danakil area exacerbates the danger posed by enemy fire, as shells easily fragment upon impact, causing significant casualties among friendly forces.

Moreover, the hot weather disrupts command and control processes by interfering with communication equipment, creating barriers to effective communication among units. The movement of soldiers is impeded by the harsh conditions, compounded by the lack of reference points in the desert, making navigation challenging. These adverse weather conditions further contribute to psychological and morale issues among troops, affecting their readiness and performance.

Evacuating injured soldiers and equipment becomes increasingly challenging in such conditions, necessitating comprehensive written guidance for desert operation preparation and execution at the National Defence level. Drawing from this experience, the researcher aims to explore the challenges posed by desert weather conditions in the Danakil region compared to other areas and their impact on the readiness of combatant units for desert operations.

1.4 Objectives

1.4.1 General Objective

The main objective of the study was to assess the operational efficacy of the ENDF 6th Mechanized Division in conducting military operations in the arid environment of the Danakil desert, Ethiopia.

1.4.2 Specific Objectives of the Study

a. To evaluate the effective of command and control systems in coordinating situational awareness in the arid environment of ENDF 6th Mechanized Division of Danakil Desert

b. To identify are the specific logistical and supply chain difficulties encountered by the ENDF 6th Mechanized Division in sustaining operations

c. To explore the role of training and operational preparedness in enhancing the operational efficacy of the ENDF 6th Mechanized Division in the arid environment of Danakil Desert.

d. To assess the impact of the arid environment on the operational readiness of personnel and equipment of the 6th Mechanized Division in the Danakil Desert.

1.5 Research Questions

Therefore, based on the background information mentioned above, the guiding research questions for the assessment of arid environment challenges during combat operations to ensure operational efficacy in the case of the Ethiopian National Defence Force, Danakil desert, the study was guided by the following questions: -

(i) How effectives are command and control systems of ENDF 6th Mechanized Division effective in conducting operations in the arid environment of the Danakil Desert?

(ii) What are the specific logistical and supply chain difficulties encountered by the ENDF 6th Mechanized Division in sustaining operations?

(iii) How is the role of training and operational preparedness in enhancing the operational efficacy of the ENDF 6th Mechanized Division in the arid environment of Danakil Desert?

(iv) To what extert the arid environment is effect the operational readiness of personnel and equipment's of the 6th Mechanized Division in the Danakil Desert?

1.6 Justification of the Study

1.6.1 Academic Justification

This research aims to enhance understanding of the factors contributing to the inadequate readiness and execution of desert operations in Ethiopia's Danakil desert. It addresses the existing gap in strategies for effectively ensuring the readiness of commanders and troops, both physically and psychologically, to undertake offensive, defensive, and retrograde operations in this challenging environment. The harsh weather conditions and unique terrain of the desert significantly affect troop morale, prompting commanders to continually evaluate and bolster morale levels to prepare for desert operations. Achieving this requires comprehensive planning at all levels of command, encompassing aspects such as troop morale management, communication infrastructure throughout the hierarchy, and administrative considerations, all aimed at optimizing readiness for desert operations.

Regarding military tactics, commanders in the Danakil desert must continually engage in offensive operations to maintain the combat readiness of their units. Offensive operations aim to defeat or neutralize enemy forces and gain control of their territory. Military commanders also employ offensive actions to disrupt enemy resources, seize strategic terrain, deceive or divert the enemy, gather intelligence, or hold enemy forces in position. However, in the Danakil desert, where there is a lack of natural cover, such as trees for concealment against direct sunlight, commanders must deploy reconnaissance units extensively ahead of the main force to provide early warning and prevent enemy observation. Leaders at all levels analyze and exploit the terrain to gain tactical advantages over the enemy. Nevertheless, the scarcity of significant terrain features in the Danakil desert constrains commanders' ability to maneuver their forces effectively.

In the Danakil desert, commanders play a critical role in ensuring their unit's readiness for defensive operations, which are conducted to repel enemy attacks, conserve resources, and create conditions conducive to offensive and stability operations. Defensive operations encompass three

main types: area, mobile, and retrograde. Typically, defensive strategies do not aim for decisive victory but instead, buy time for commanders to bolster their forces and prepare for a transition to offensive actions. Defending commanders often face inherent disadvantages when confronted with attacking forces. Therefore, the outcomes of this research endeavor to address these gaps and provide valuable insights to scholars studying desert operations.

Generally, this research paper investigates the operational efficacy of the 6th Mechanized Division in the challenging arid environment of the Danakil desert in Ethiopia. The study aims to analyze the division's operational strategies, identify key factors influencing their effectiveness, and propose recommendations for enhancing operational efficacy in similar arid environments. The research used qualitative methods that include face to face interview, group discussion, and observation. The findings provide insights, into the division's strengths, lessons learned, which can be used to inform future military operations in Danakil desert arid environments

1. 6.2 Policy Justification

Regarding policy justification, the study emphasizes the pivotal role of commanders in adequately preparing, training, and provisioning all necessary logistical supplies for combatant units operating in the Danakil desert. The extreme heat in the desert results in higher water consumption compared to other operational environments, creating a disparity between water demand and supply for troops. Additionally, medical unit requirements for desert operations largely align with those for temperate climates, with each unit needing an attached environmental sanitation team. Moreover, operational logistics play a crucial role in desert operations, even during peacetime and training, necessitating a framework to address the logistical disparities between operational and tactically forward-deployed forces in the Danakil desert.

Commanders need to set a program through which their unit will be raised to a level that will enable it to undertake operations in the difficult climatic conditions of the Danakil desert. To do this first, establish a list of priorities for individual and unit training. The individual training's main focus is to build the individual to be operational in the desert setting. Insofar as possible, troops should modify long before arrival in the area of desert operations. If possible, commanders of all learning unit leaders should strive make an effort to appreciate the desert landscape from firsthand experience in a terrain as close to the probable combat theater as possible.

Before deployment, commanders prioritize gathering information regarding the distinctive weather patterns and terrain characteristics of the Danakil desert compared to other highland areas. To effectively engage in and endure desert operations, troops must thoroughly understand how to acclimate to the Danakil desert environment. This encompasses awareness of the extreme temperatures and their impact on soldier health and equipment functionality. Moreover, considerations regarding the availability and condition of roads for communication and unit support are crucial. Continuous training in the area should include ongoing assessments of the effects of desert temperatures on human health. This paper advocates for comprehensive preparation for desert operations and emphasizes the continual influence of individual and unit training. Furthermore, it highlights the importance of closely integrating logistics into campaign planning, particularly preparing for desert operations.

1.7 Chapter Summary

In this chapter the mission of the 6th Mechanized Division of Ethiopian National Defence Force (ENDF) has tasked with maintaining security and conducting operations in the Danakil desert. The background provides context on the Danakil desert's harsh conditions and the security threats in the area. The topic aims to provide insights that can inform policy decisions, military planning, and development of best practices for operating in arid environments. The research on military operations and security in the Danakil desert, as experienced by the ENDF 6th Mechanized Division, is justified by its strategic importance, the unique environmental challenges, the limited existing research, the potential for practical applications, and contribution it can make to the academic field.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introductions

The interplay between military operations and environmental conditions is a critical area of study, particularly in a regions characterized by arid landscapes. This literature review examines the military operations and security dynamics in arid environment in Ethiopia, with a focused case study on the Ethiopian National Defence 6th Mechanized Division operating in the Danakil desert. This region, known for its extreme temperatures and challenging train poses unique operational challenges and security concerns that influence military strategy and effectiveness.

This review aims to synthesize existing research on military operations in arid contexts, with a particular emphasis on the ENDF's operational framework, the implications of environmental challenges on security, and the broader impact on regional stability. By analyzing relevant studies, military studies, military reports, and environmental assessments, this literature review will contribute to a nuanced understanding of how military operations are conducted in some of the most inhospitable environments on Earth, ultimately informing policy and operational strategies for the ENDF and similar forces engaged in arid region.

2.2 Literature Review

2.2.1 The Effectiveness of Command and Control Systems in Coordinating Situational Awareness in the Arid Environment of ENDF 6th Mechanized Division of Danakil Desert

It is imperative to understand that command and control concept is no more a luxury, rather a necessity. Command and control is a necessity for substantial advancement on defance transformation or success in twenty first century military operations. The early battle management has become more complex by challenges of the 21st century in military command and control mission. Fortunately, there are new concepts of operations and approaches to command and control that offer considerably more capabilities for addressing these issues (Alberts, 2006).

Thus, according to Alberts (2006) command and control today's missions are different form traditional military missions different not only at the margins but qualitatively. The missions of the modern world present so many challenges on one hand and are much more diverse and active in achieving their goals than the missions of the earlier periods, which means that in order to solve

them many organizations and their unified efforts are required. They are complemented, however, by increasingly narrow opportunities to influence responses to threats, as well as the need to better understand command and control as well as organisational resources and formations for an effective coalition. Classic command and control structures are simply inadequate to the task. Plainly said, they lack the nimbleness needed in the third millennium.

In US Iraq war (2003-2011) urban combats in cities like Fallujah presented challenges for army command and control requiring flexible and decentralize operations by small units. Roadside bombs and insurgent attacks disrupted communication networks and made it difficult to maintain a common operational picture. The army utilized advanced unmanned Arial vehicles, signal intelligence and biometric databases to enhance intelligence gathering and targeting of insurgents. Interoperability among the army, coalition partners, and Iraqi security forces was an ongoing challenge that impacted coordination and information sharing.

US Department of the army (1993) indicated that the primary challenges encountered in desert warfare stem from extreme heat and scarcity of moisture, influencing the tactics, techniques, and procedures employed. Desert Warfare means warfare executed on sand terrains, or similar barren and semiarid terrains. This term relates to military operations affected by the nature of training, climate, resources; and the strategy and techniques used by military forces in counter-insurgency within such difficult terrains. Generally, the desert environment has necessitated the US army to develop robust, networked and adaptable command and control capabilities to achieve battle field dominance. Key lessons include the critical roles of communications, intelligence, air support integration, and multinational coordination.

The control structure in the form of command and control has its roots in the 1890s when tacticians from Prussian- German were dissatisfied with high d rectiveness of such command developed a more elastic conception called Auftragstaktik giving discrete authority to subordinate commanders. The United State Army Functional concept for Mission Command could be “translated roughly to mission type tactics” and in the end, “bound every German commission and noncommissioned officer to do whatsoever seemed necessary to him in the situation, as he personally saw it.”wered subordinate commanders to exercise initiative. The United State Army Functional concept for Mission Command, “translate roughly to mission type tactics” and essentially “held each German commission and noncommissioned officer duty bound to do

whatever the situation required, as he personally saw it." This concept was crucial for subordinate to make judgements and use his/her initiative in an operational environment where communications were slow; where a 'decentralized approach to or Auftragstaktik was found to be more efficient than highly centralized control (Carpenter, 2016).

As Ramezanale (2011) described the level of commanders, it is possible to classify available information and decision making levels of the command and control centers in the military field. The establishment of strategic, tactical, and operational command and control centers is for the same reason. For instance, at strategic level of military field, the name command and control center is proper for, would identify master strategies and priorities, the master plans of strategic directions that is adequate for massive orientation and establish the foreign policies of any country. While tactical planners only concern with the utilisation of certain militarycommodities for the attainment of certain political objectives. Thus, it is essential to have a complete set of installed tools and instruments that would allow for conquering the enemy enjoying strategic goals. Information of operations can be contained within such tools. This kind of separation of powers may also be true for crisis management because the total problem is the same and only the details of the programs, methods of performance may be different.

As US field manual 7-100.1 pointed out about the structure of command and control at each of the levels of command, they are the same in structure, and are focused on survivability at the local level using mobility, redundancy, and security.The more extensive up high the larger and more composite are the staffs…Suppositions each staff is a series of multiple command positions, and communications systems, as requisite for the flexible and frequently motile, let alone deadly battlefields.. The higher level of command the larger and more complex the staffs, supporting each staff is a series of multiple command positions, and communications systems, providing the flexibility required on a highly fluid, lethal battlefield. The idea of command and staffs' professional training underlines the Staffs planning procedure everywhere and uniformity on all levels of command. While fostering responsive planning in the command and control process, has in the end given rise to skilled trained staff officers. Being graduated in strategic, operation as well as tactic levels, officers of MOD Malaysia are fully equipped to work in strategic, operational and even in tactical plan. Operational commanders need to be ready and capable of handling all aspects of Combined arms, Joint, Inter-organizational, International activity.

The decisions made in the military operation supported by the system are followed as a set of activities. Certain decision-making situations are handled through routine by system operators while others are handled through commanders or their close subordinates. Major decision-making processes are not a monster to meet at night but a tool that belongs to the military and has to be understood and practice by all relevant staffs involved in creating the operations, plans and orders of the military. What it is Systematic processes that facilitate commanders and their staffs to employ reason and invention and doctrine in dilemma solving as well as provide the structure and environment by which commanders can make the right decision. However, like all others in the army, is takes both time and capacity building for the staff to master the approach. Truths from the observations made in the combat training centers and the mission command training program have always supported the argument that the commanders and staffs are more successful when they have done the hard work of training the in the run-up to their rotation (Army 2022). As it is well understood, control and command remain essential in all military operations. Command and Control (C2) is a term that is associated with many definitions. Interpreting an older version of U.S. Army FM 3-0 C2, in a military organization, the act of the commander or supposed leader of forces to direct and coordinate assigned and attached forces to complete a given mission. It may also be used in reference to command and control systems.

Shattuck and Woods (2000) noted that NATO described command and control or C2 as "direction and authority of operations through a designated person for assigned resources towards the achievement of an agreed-on mission". The definition applied by the Australian Defence Force is also close to the NATO one and according to it "C2 is the system which enables the specified person to exercise the legal right of command and control of the forces for the performance of missions and tasks" (Warner, 2004). Thus the doctrine of Australia is clear that employing agreed terminology and definition is indispensable to any C2 system and developing joint doctrine and procedure. The descriptions that follow enjoy some international consensus; however, all prospective friends will not use the terms identically.

The problems and concerns that arise with the definition of command and control are outlined by Canadian Defence scientists Ross Pigeau and Carol McCann in an article in the Canadian Military Journal (McCann & Pigeau, 1999). According to the work done by Vassiliou, Alberts and Agre (2014) and Vassiliou (2010), there are different definitions of the above mentioned concepts. The

best understanding of what it refers to has been offered by Vassiliou, Alberts, and Agre (2014) who generalize it and most of the commonly accepted definitions. C2 is defined by " They argue that command and control ", which characterizes the organizational and technical features as well as the processes used to manage human, physical and information assets to address challenges and achieve goals.

In any environment including the desert, the implication of an attack is to wipe out the enemy as mentioned above. The enemy can be defeated using a concentration of friendly forces at a vulnerable area of the enemy's Defence and neutralizing enemy combatant formations or use penetration into the depth of the enemy territory to eliminate his combat support and combat service support and disrupt his logistical chains. The principle of combat service support spells it that no force can exist in the desert (Vassiliou, Alberts & Agre, 2014). An imaginative commander is not limited by terrain factors when looking for the enemy and annihilating it. Because vital ground in the desert area is rare, the only limitation generally to be imposed on a manoeuvring force will be the force's capacity to receive a flexible level of combat support and how to defend its combat support against the enemy.

In the terrain of a desert the state of mind of the operations will usually relate the communication that is available. They have to be active, incessant and assertive to initiate and sustain the communication processes. The unit training should be in the ECCM technique. During the field training, higher formations can also support by joining small team to join the unit nets. Indeed, Gordon & Vassiliou, 2013 posit that units should rehearse measures to be adopted whenever there is a loss of radio communication because of heat and other unfavorable weather conditions.

Clearly, the mission challenges of the 21st century are more complex. However, it is possible to ensure that new conceptions of operation, and new ways of organizing command and control, give greater capacity to combat these threats. Many of today's missions contrast with regular military missions, not on the fringe, but fundamentally. Modern-day missions are challenging and unsimplify and demand the synergy and competencies of several organizations to achieve Guttieri, Franke & Civic, 2014). They rightly observe that achieving this need for synchronizing a variety of capabilities and organisations into an effective coalition is achieved by narrowing time windows of response opportunity. This they claim traditional approaches to organization of command and

control are ill-equipped to deal with such a challenge hence they are not agile for the 21st century (Albert, 2005).

2.2.2 Logistical and Supply Chain of the ENDF 6th Mechanized Division Difficulties Encountered to Sustaining Operations

Similar to Leighton (2018) describing logistics – in context of military science, all the actions of armed force staves in non-combat or mobilization-support roles such as transportation, supply, signals, medical, etc. In the conduct of war, war making activity behind the cutting edge of combat has always to do with a simple definition. The military analogy is much more restricted and the general descriptive terms that we have are administration, services and the French intendance, but all are coarse by reason of over use and none of them embrace the whole field covered by 'non-combatant'. All bear other, through related, meanings which render them as having more than one meaning.

Logistics always accompanies the military actions. Transferring forces to hot spots around the world, feeding and supplying them, evacuating and repatriating them once the crisis is over, is the large and complex business of logistics. Preparing for the challenges of this and future decades will demand a large logistics capacity, and the character of that capacity will not be the same as it formerly was. Present and future requirements for force employment means that our forces must have less logistic support effort (larger teeth; smaller tail). The logistics supply chain need to be responsive and are capable of being mobilized to address these requirements. Improved logistic procedures enable the department of defense to deliver greater combat effectiveness. Correctly managing this change is critical so that its influences reach deeper than the personnel, business, and processes of financial management of the US military and its associates; it also affects technology architecture (Babbitt 2016).

As Mokonen (2017) indicated briefly, the activities of logistics encompass various material designs, improvisation, and upgrading, production, collection, storage, distribution, preservation, maintenance, and repair tasks, evacuation and distribution of materials, transportation and evacuation of personnel and their equipment, rendering health service, and providing support to combat and other military operations. Therefore, logistics is a major strength of armed forces that needs the whole integration of activities to combine successfully achieving their military tasks have been played a decisive roles in each level of operation.

Another aspect which is very relevant is probably the supply in logistic since any military operation needs its basis in logistic especially when it comes to operation in desert region. Out of all logistical supplies, the absence of water is the greatest feature that define the desert. Intermittent may be located too deep beneath the ground or available in such scant measure that wells should typically not supply many people. Hence it is understood that water supplies to be potable can never be over looked, though there must be a continuous decent supply. Consequently, a large natural water source can be a tactical and strategic structure that may turn into an object of the political decision instead of military due to its lasting influence on people who live nearby (US Department of the Army, 1993, P.2-9).

In the words of Beaumont (2014), military logistics thus remains as closely tied to combat for it is involved in moving forces to hotspots globally, supporting their requirements while in a theatre of war, and repatriating them once the fighting calms and as part of a cycle of military logistics. The principal lead indicators indicate that the generation of substantial logistic capability will be needed to meet the challenges of the next decades and that the form of this logistic capability will differ from that which has existed in the past. These needs must be met by a flexible and easily mobilizable logistic supply chain. In this case, optimistic changes in the logistical processes can assist the Department of Defence to create more combat capability. The adoption of this change is central and the impact should crosscut people, process, and technologies in the military and its partners (Babbitt, 2016; Babbitt, 2017).

Basically, logistics encompasses the activity of material design, improvisation, and upgrading, production, collection, storage, distribution, preservation, maintenance and repair tasks, evacuation and distribution of materials (struck off and disposition of worn-out and unusable materials), transportation and evacuation of personnel and their equipment, rendering health service, and providing support to combat and other military operations (Chauhan, 2015). Therefore, logistics is a major strength of the armed forces. It needs the whole integration of activities to successfully achieve its military tasks, which play a decisive role in each level of operation (Mekonen, 2017, p. 7).

2.2.3 The Role of Training and Operational Preparedness and Effectiveness in Enhancing the Operational Efficacy of the ENDF 6th Mechanized Division in the Arid Environment of Danakil Desert

According to Ethiopian Ministry of National Defence (2005), the development of purpose of army training management has to be the prime focus during the phase of peace in order to liberate for the upcoming and unforeseen war.ar. Training management is the procedure utilised by army leaders in order to identify training needs and the then plan, resource, undertake and assess the training. Both at organizational and sub organizational levels of command and control, the training meeting is one of the key components of the training management process. Briefing meetings are formal meetings that involve commander's periodic training sessions which: entailing a review of prior training, upcoming training scheduling and preparation, and the sharing by and between the participants of timely training information.

Security includes compulsory training that is very important in the military systems. It allows the military personnel to be fully prepared to perform assigned duties in combat operation in the right manner and within the shortest time possible. According to Vuono (1987), it is argued that 'how we train to fight' was a critical way of fight and win our nation's wars at every battles focused training level. Training programmes have to show that soldier and his leaders are tactically and technically proficient, and possess initiative (Kane & Kane, 2012). According to U.S. Army Training and Leader Development 2006, introduced that the purpose of combat training center programs is to enhance tactical readiness of the unit, develop and shape the battlefield leaders, instill principles of doctrine into personnel, to provide feedback to participants about their unit tactical performance and to provide inputs to combat training development process regarding doctrine, organization, training aids, leadership and education, personnel and facilities (Potholm, 2023

From the work by Kahsay (2021), he posits that quality training is the quality of training commitment of all aspects in enhancing quality which is the overall goal of soldier's quality. Therefore, it includes the following competitive: delivery, cost, morale, productivity, profit, product quality, quantity or volume, performance, service, efficiency, safety, environmental issue and the stakeholder's concern. The total quality notion is closely associated with the operation level of an organization. The action planning and forecast outcomes are at this level. Consequently, the implemented activities are evenly balanced in all aspects of excellence. (Kahsay, 2021). For

an organization to have warranted staff to offer quality service, the education and training of staff should be keenly handled. This will mean that, qualified and competent staff would be appointed to work hard in delivery of quality service. It means that staff would do their work effectively when they are provided with the necessary tools, education, and training for their line of work (Colicchia, Marchet, Melacini, & Perotti, (2013); Kahsay, 2021).

2.2.4 The Impact of the Arid Environment on the Operational Readiness of Personnel and Equipment of the 6th Mechanized Division in the Danakil Desert

The desert climate regions have high warm air because they are lacking of water to both in soil surface and within the air. These areas can be described as farfield zone with high power density of radiated input and output. The sky in the desert areas is always clears because there is no water vapors and absence of clouds. However, dust storms may also bring dust into the sky through tiny particles in the sky caused by heating or low pressure areas on the surface. The daytime surface temperature of a desert is very high because of absence of moisture and heat accumulations at the ground surface. It has been observed that on the surfaces within the afternoon, the temperature may be as high as 50 levels Celsius. In extreme instances the surface temperature of the desert range can be as low as 70o C. (Kashyap, 2009)

The normal concept that people around the world have about desert is sand, hot temperature and mirage, no water and even vegetation and animal life cannot survive in such places. Deserts have remained under explored for centuries throughout the time in history (Khormali & Monger, 2020). However, there is one common feature that has been running through all the typology of deserts-water; where it rains once in a year, and the rain is likely to be one severe storm. High surface water runoff results from such storms when the soil is not consistent, and therefore decreasing trainability in wades if the surface covered in loam or increasing it if the terrain is pure sand (Khormali & Monger, 2020).

Sahara in North Africa is one of the most popular deserts and it is hot and dry. The Sahara is one of the driest places on earth, it has been known to have recorded the highest shade temperature of 580C. But the desert is rather sharply continental, and night in a desert may be very frosty, below the freezing point. Danakil depression and Bure area in Ethiopia: the hottest place on earth The average temperature of the whole year is 350 F (95F); there is no shade just the heat of the sun continuing (Ypte, 2018).

The first and foremost challenge in the desert is heat and absence of humidity which impacts a majority of tactics, techniques and procedures employed in operations. Traditional parameters of desterts regions are dry climate, deserts climate, no water in whole season, there are shrubs, sandy regions which people are thin, where agitation does not rise, it is hot in the daytime and chills at night, it is windy often, and often fuggy winds and deserts landscape (Khormali & Monger, 2020). Some parts of Danakil's land feature are maintaining sand, harsh, sloppy, and flat areas. Its features are rocky and sandy, and sharp black spikes of stone formed by volcanic eruption. Most of the land features of the Danakil area are covered by black stone and some of its sand. In some places with sand, volcanic eruptions burned different stone layers. Due to the similarity of Danakil's land features, it is too difficult to identify each other by observation. When observing from a flat area, most of the land is seen as hilly; from afar, it is seen as a farmed black soil area (ENDF, 2011).

2.3 Theoretical Framework

Theoretical frameworks are essential for succinctly outlining the fundamental concepts that define the discussed issues. They also outline the areas of knowledge considered in the research effort, indicating the theoretical assumptions of the study and providing a clear framework for the scope and objectives within academia. The following theory guided the study.

2.3.1 Integrated Terrain Forecasting (ITF) Theory

The Integrated Terrain Forecasting (ITF) Theory originated from the recurring necessity of the U.S. armed forces to conduct operations in the deserts of the Middle East and Southwest Asia. These arid and intricate desert landscapes presented formidable challenges, characterized by swiftly changing terrain conditions and a shortage of actionable information for decision-making purposes. Therefore, a collaborative effort ensued among researchers and subject matter experts, culminating in developing an integrated framework that amalgamates geospatial analysis, earth science research, and predictive modeling methodologies. The core principles of ITF entail systematic analysis of terrain features through Geographic Information Systems (GIS), leveraging advancements in earth science research to uncover relationships among landscape characteristics such as position, soils, vegetation, and geology. This interdisciplinary approach integrates methodologies from diverse scientific domains, including geomorphology, soil science, climatology, and atmospheric science. ITF's predictive mapping capabilities facilitate informed decision-making, supporting strategic planning to tactical execution of military operations in varying desert conditions, thereby enhancing operational effectiveness. Moreover, ITF aids in

identifying and avoiding hazard-prone locations by anticipating soil and terrain conditions and mitigating risks such as extreme dust emissions and other terrain-related hazards (McDonald et al., 2016).

In military desert operation it is mandatory that each vehicle to carry water for the crew endurance period up to the next resupply plus a small margin. It is important that soldiers are taught how best they can conserve water. For instance, water used for washing socks is good enough for a vehicle cooling system. Water must be taken only from approved sources because impure water can cause diseases or water that has been deliberately poisoned. It is necessary and very important to make sure that water is not polluted. If rationing is in effect, water should be issued under close supervision of officers and noncommissioned officers (US Department of the Army, 1993, p.2).

Fight operations in the desert environment have the following challenges. There is very little water in the desert and hence water is a classified supply item which supports our troops and equipment. Any force that seeks to operate in the desert without enough water sources by their side, have always been disastrous. Water supply and water control can be recognized as the key problem of the desert wars. In any case, water will be essential, at least as sources (US Department of the Army, 1993, p.5).

The strategy of maneuver to achieve surprise requires almost invariably to operate in circumstances that are not permissive for observation at night or behind the visible screen of smoke or dust-sand storms. It is however relatively easy to control the maneuver during a sand storm although it may not be easy to maneuver during a sand storm although it may be done with favorable wind to attack or make a maneuver behind the sand storm. In some other condition, it may be to operate where the enemy is able to have a look at the situation at a distance. Next, it is necessary to move at the best possible speed as fires are directed on likely enemy locations by field artillery or massed air (US Department of the Army, 1993, p. 12).

Some issues which are difficult to handle in operations include effect of the desert environment on the cover and concealment and some of the techniques that have to be utilized in the fight. When its navigating through a desert, then terrain masking is possible because extra heavy vegetation or infrastructures are not well developed. To do so when positions are entrenched tanks and personnel carriers irregular shaped scoops approximately two meters deep in the centre and

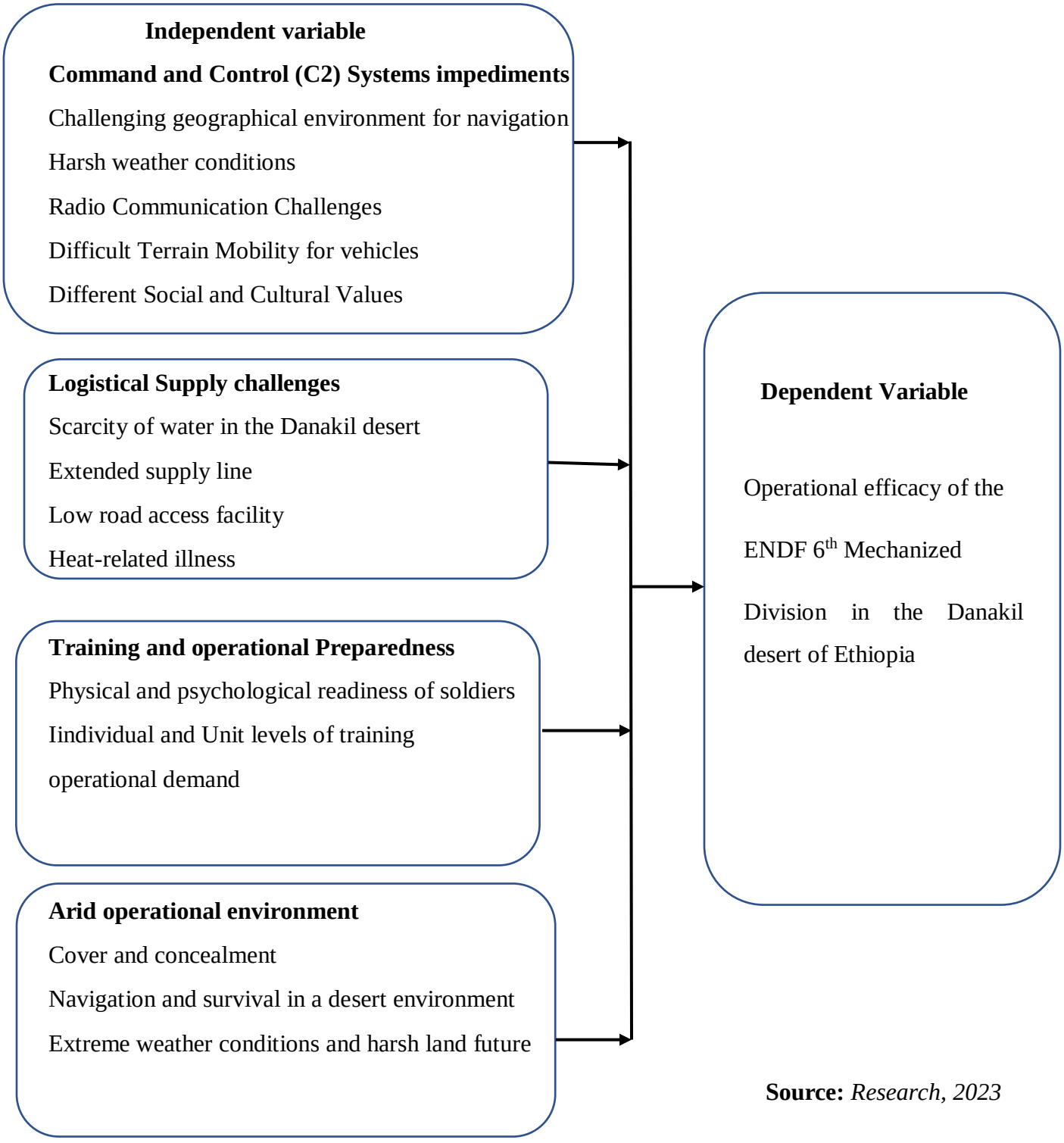
three times the vehicle width in approximate diameter should be employed. These are more resembling to normal pockets that are formed on the desert plain. Only dismounted infantry can use canals; if the ground is very stony and no engineer support is available, they might be constructed. These are constructed from the largest rock available and the rock must be firmly placed with one foot drop on either side of the fourth in height. There are sand bags all over the wall. Complete cover is seldom obtained but realized cover, even though it does not cover an object actually, makes the object visually indeterminable or unreal (US Department of the Army, 1993, p. 4).

The actuality is that the longer the lines of communication become, the more exposed they are in terms of possible breakage. Since the majority of large terrains in most deserts is not very well defended, an enemy force will always be vulnerable to flank attacks. An attacker is required to probe for this flank and strive to out flank the enemy before the enemy can launch a counter move and blockade with mobile reserves. Offensive operations need to be fast, forcible and determined, looking for the enemy's weak points and avoiding showing any to the enemy. However, standing still in this kind of a terrain may just pose the enemy into a dangerous position to defend by attacking. The Battle operational encounter between two aggressive forces will be a series of flank actions with victory to the side that identifies the other's vulnerable flank first (US Department of the Army, 1993 p 4).

2.4 Conceptual Framework

The two variables that influence the Danakil desert environment on combat readiness depend on the impact of desert weather conditions and the environment. The dependent variable is Operational efficacy of the ENDF 6th Mechanized Division in the Danakil desert of Ethiopia. The Danakil desert deployment of troops and readiness for warfare is characterized by challenges complete of a combination of dry weather, lack of water, shrubs, and sandy areas, where the population is dispersed, where vegetation does not grow up, hotter at day and decrease in night time, and windstorms, as well as foggy winds and landscapes. Also, the challenges in the Danakil desert that the system of command and control is discussed. So, the two variables are conceptualized, and the reader will understand and comprehend the context in which they are used in the study. Therefore, the relationships between the two variables are well established.

The conceptual framework of a Danakil desert military operation includes key elements necessary for planning, commanding, controlling, executing, and achieving the mission's success. These elements form the basis of the conceptual framework and guide the strategic and tactical decisions made by military leaders assigned in the Danakil desert.



Source: *Research, 2023*

Figure 2.1: ***Conceptual Framework of Danakil Desert Operation***

Understanding the unique challenges of operating in the Danakil desert environment, including extreme temperatures, limited water resources, and challenging terrain, is the area's most difficult. Commanders must consider how these factors affect troop movements, equipment maintenance, logistic supply management, and overall operational effectiveness. Intelligence gathering and analysis about the enemy, local populations, and potential threats in the Danakil desert Environment. The information is critical for planning and executing military operations and ensuring the safety and success of the mission. Commanders must develop comprehensive plans for logistics supplying troops with food, water, fuel, and equipment in the harsh Danakil desert environment. This includes establishing supply lines, storage facilities, and transportation assets to ensure that troops are adequately resourced throughout the operation.

For the Danakil desert warfare it needs developing well-planned training programs and operational doctrine, ensuring that troops are prepared for the unique challenges of operating in a Danakil desert environment. This includes specialized tactics, techniques, and procedures for combat, medical care, and survival in extreme conditions. Continued training in Danakil desert terrain and utilizing specialized equipment and tactics to overcome the challenges of desert terrain, including armored vehicles, aircraft, and specialized infantry units. Commanders must consider leveraging mobility and maneuvering to achieve strategic objectives and outmaneuver enemy forces. Establishing reliable communication systems and command structures to control subordinate command and units. Coordinate operations and provide situational awareness in a vast and unforgiving Danakil desert environment. Effective communication is essential for maintaining unity of effort and responding to evolving threats.

Understanding the local Afar populations, political dynamics, socioeconomic context, and cultural norms, traditions, and values of Afar people of the Danakil desert region where the 6th Mechanized Division operation was conducted. This knowledge is critical for building relationships with local partners, minimizing civilian casualties, and gaining support for military objectives.

Generally, the conceptual framework of military desert operation is focused on understanding and overcoming the unique challenges of operating in the Danakil desert, leveraging specialized tactics, equipment, and knowledge to achieve strategic and tactical objectives. This requires thorough planning, effective leadership, and adapting to rapidly changing conditions in a harsh environment.

2.5 Literature Gap

In this study, the potential knowledge gap in 6th Mechanized Division operations in the Danakil desert environment is the lack of detailed information on the specific logistical and operational command and control challenges that military forces face. This could include extreme temperatures, lack of water sources, limited infrastructure, and the potential for volcanic and seismic activity. In the Danakil desert environment, there is a lack of information on the unique tactics, techniques, and procedures required for military operations. This includes specialized equipment, training, and planning considerations for operating in a Danakil desert environment with such extreme conditions.

Furthermore, there is a need for further research on the potential impact of the Danakil desert environment on the health and well-being of military personnel, including the risk of heat-related illnesses, dehydration, and other environmental hazards. Generally, addressing these knowledge gaps could help military forces better prepare for and conduct operations in the Danakil desert environment, ensuring the safety and effectiveness of their forces in the challenging environment.

2.6 Chapter Summary

This literature review explores the interactions of military operations and security in aride environments, specially focusing on Ethiopian National Defence Force (ENDF) 6th Mechanized Division in the Danakil desert. The review synthesizes existing research on the unique challenges posed by arid conditions, such as extreme temperatures, limited water resources, and difficult terrain, which significantly impact military logistics, troop mobility, and operational effectiveness. To ensure operational readiness and sustainability it is necessary to know an environmental challenge that highlights how arid environments necessitate specialized training and equipment for military personnel.

As strategic adaption, the ENDF's strategies for adapting to the Danakil desert's harsh conditions are examined, including logistical innovations and the integrations of local knowledge into military planning. The review discusses the broader security concerns associated with military operations in arid regions, including the risk of insurgency and the impact of environmental factors on regional stability. In this case study and comparative analysis it insights from other military operations in similar environments are compared to the ENDF's experiences, providing a broader context for understanding operational strategies. By understanding these themes, the review

underscores the importance of environmental considerations in military planning and the need for tailored approaches to enhance operational effectiveness and security in arid environments. The findings aim to inform future policy decisions and operational frameworks for the ENDF and other military forces facing similar challenges.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter aims at presenting an overview of the research procedure employed in the course of this research. It covers several strategies applied during the research process. It also highlights study area, the research design, target population and sampling technique, method of data collection, and research instruments. It also covers the reliability test, method of analysing data and application of ethical questions. This is crucial in order to enable the study to achieve the deemed objectives and provide answer to the research questions on which the study was founded.

3.2 Research Design

A research design means of approach, course of action, framework, and procedure that is developed to find solutions to research questions or issues. The plan of research practice shows what the researcher did from the formulation of problem, model specification, estimation and the provision of suggestion operational consequences (Kish, 2017). According to Kothari (2004), research design can be described as the overall structure upon which the implementation of research is anchored. Once a research problem has been stated, the researcher must develop a research design to define the direction to be taken in the study in terms of conceptual framework. Thus this design optimizes research by increasing the maximum research outcomes given the minimal research resources used in terms of effort, time and money.

The current study adopted a qualitative research method. All data collected qualitatively were very much analyzed systematically. The analytical designs of the qualitative research were related to the analysis and interpretation of qualitative patterns to arrive at thematic conclusions from the gathered data. According to Flick (2015), when designing a qualitative research, the researcher has a naturalistic method of capturing the in-depth participants' awareness, express experiences, and views of the cause of hitches of the desert in military operations.

3.3 The target population

The target population of this study is the officers of 6th Mechanized Division sub-unit and Staff Commanders deployed in the Danakil desert. The population purposively has taken from Division deputy commander for operation and deputy commander for logistics, Artillery regiment commandant and deputy commander, Tank regiment commandant and deputy commander, Antiaircraft regiment commandant and deputy commander, mortar regiment commandant and deputy commander, and anti-aircraft commandant for interview. Additionally, division operational officers, logistic supply officers, medical officers, communication officers, and engineering officers were present for group discussion.

3.4 Sampling Technique

The study adopted purposive sampling technique in selecting the samples. The term purposive/judgmental sampling is commonly employed in qualitative research to reduce the study sample for achieving convenience in the utilization of the limited resources (Kothari, 2004). This entails a targeting and sampling of skilled and informed populace with a phenomenon of interest. Apart from knowledge and experience, emphasize the accessibility of respondents and their willingness to participate as well as their capability to state and describe experience and opinion distinctly and effectively (Dudovsky, 2016).

But purposive sampling is one of the most inexpensive and efficient ways of the work in many cases among all mentioned above. It is prone to defects of raters where the researcher in charge can make wrong decisions, it has low reliability, contains high bias and cannot be used to extrapolate research findings. Additionally, Dudovsky hypothesized that qualitative studies often experience claims of external validity as an issue of debate. However, it has been stated quite strongly that qualitative data cannot be replicated by other researchers since the analysis of the data is a result of the subjective judgment of the researchers concerned. This helped in choosing this sampling design because the combatant units under investigation are relatively homogenous.

3.5 Determination of Sample Size

The purpose of a qualitative study was to conduct an in-depth investigation. The data saturation point determined the study's sample size (Creswell, 2017). The researcher interviewed 18 officers and focused group discussions with 12 officers from 6th Mechanized Division.

Yogis' (2006) formula typically uses a sample, sometimes suggesting that one should select 10-20% of the accessible population for the sample.

N= Total population

n = 151x20% = 30

Table 3.1*: Sampling of Population Size*

No	Regiment (combatant unit)	population	Sampling size	%	Sampling
1	Division staff officers	59	12	20%	purposive
2	Division deputy commanders	03	02	67%	
3	Artillery regiment officers	24	4	17%	
4	Tank regiment officers	25	4	16%	
5	Antiaircraft regiment officers	22	4	20%	
6	Mortar regiment officers	21	4	20%	
Total		**151**	**30**	**20%**	

Source: *Researcher, 2023*

The target population in 6th Mechanized Division purposively took division staff officers 12 for group discussion. For the face-to-face interviews total 18 officers: deputy commanders of division 02, Artillery regiment officers 04, Tank regiment Officers 04, antiaircraft Officers 04, and mortar Officers 04.

3.6 Research Instruments and Tools

Measurement instrument means or denotes to the different ways that the researcher employ in order to gather data from the respondents for his research study (Japheth, 2011). Assessment instruments are defined as objective, ideal tools employed by the researcher and/or practitioners to measure or evaluate subjects. The instruments are used to assess or record some variables even from the physical, social, physical and psychological domains. Measurement tools are methods and techniques used for collecting data in research and they are composed of observation, interviews, and group discussion.

In one interview the researcher was able to assess competency's mental and physical readiness to fight in desert environment. Furthermore, the ideas also included speaking of the impact of weather

conditions in the desert and the challenging landscape on the forces and apparatus. In other group discussions, issues explored included tactical and organizational control systems, logistics support systems as well as supplies systems in detail. Observer attention was therefore shifted towards; evaluating adequacy of accommodation and other infrastructure for combatant formations and stock/tone of machinery and vehicles.

3.7 Validity and Reliability

Validity means the degree to which something is actually measured. Validity is one with the criteria of truth in pretending not to be dressed, owned or distorted in anyway. In the words of Thanasegaran (2009), construct validity of an instrument is the extent to which the instrument is able to capture what it is supposed to capture. These are internal validity, validity by source, conclusion validity, internal-external validity, the concept of validity and the criterion of validity. Internal validity deals with the extent to which a research design can provide a correct solution to the research questions. External validity is the ability to generalize the findings it is as what inferences can be made about the study population based on the sample. To ensure internal validity the questionnaires have a range of questions on the awareness of the key informant groups on combat readiness for military mission in the desert.

3.8 Data Collection Procedure

To fulfil the research objectives effectively, the selection process began with choosing the Danakil desert as the research setting, followed by the designation of the 6th Mechanized Division as the target population. The study adopted qualitative methodologies: face to face interviews, focus group discussions, and observations. Additionally, a review of pertinent literature, including books and relevant local documents, was undertaken to complement data collection through interviews, focus group discussions, and observations.

The decision not to employ a quantitative approach stemmed from the nature of the research objectives, which did not necessitate quantification. Instead, the focus was on exploring and comprehensively understanding officers with significant experience in Danakil desert operations to fulfil the research aims. In this regard, the following books were used to compare the theories and methods concerning operational effectiveness in arid environments of secondary data: Regarding the military operations in the desert, journal articles are also captured as relevant sources. Concurrently, first hand data were obtained from the research participants with face to

face interviews, focus group discussions and from observation data collection techniques. The following are uniformed below detailing each of the data collection mechanisms.

3.8.1 Face-to-Face Interview

Interview conducted on a one on one basis is sometimes referred to as 'formal or controlled' interview in order to differentiate it from the 'informal or unstructured interviews where the respondent is free to discuss on different dimensions of the concerned subject. As Kothari (2004) was pointing out, some interview studies do not even use questionnaires. Individuals may at times be interviewed for quite a long time say in the course of an extended structured interview so as to enumerate and elicit richer data than what usually comes out of a survey activity.

According to Becker, Bryman, Ferguson & Ferguson (2012), it was apparent that when interviewing, the researcher obtains verbal data on behavior, meanings, attitudes, and feelings that were not witnessed in the act of the interview face to face with the person being interviewed. Furthermore, Nayeem and Huma, (2017) and Flick (2015) maintained that unlike a basic questionnaire or rating, an in-depth interview is carried out with a view of obtaining more detailed elaboration of the experience and perception of the interviewee. These authors also thought that because an in-depth interview is more efficient and has less guided structure, one of the greatest strengths of the technique is that, it reveals complete and further information from other research techniques. For that reason, to capture the study participants' verbal behaviors, meanings and attitudes, interviews with the officers were conducted. The 6th Mechanizzed Division officers who joined face-to-face interview was division deputy commanders 02, regiment commandant 03, regiment deputy commanders 04, regiment staff officers 09 total of 18 officer. The interview time and place were decided depending on the preferences of the interviewees.

3.8.2 Focus Group Discussion

Focus group discussion is a technique in which a number of individuals are selected and asked to sit together and discuss either their response towards a particular item, such as a television commercial or their perception about a development programme for study. A moderator is the one who poses questions in focus group discussion, goes deeper in order to get more elaboration as well as make sure that the discussion does not go astray in order for everyone to put in their opinion and for no one to have a chance to monopolize the discussion.

Deliberate groups are usually large and comprise of 6 to 12 people and a moderator. There is nothing wrong with having eight people in a group because eight is a preferred number in group discussions. The main issue with a group is when it is small, one or two are rowdy and out of control, beyond 10 or 12 it is hard to handle. The participants in a focus-group should be more or less in the same group. The group is guided by the moderator, and among the participants, one or more will feel free to share some confidential information on him or her. When the ice is broken that means others will no longer feel the threatened and come on It is very useful or in any other form when one is dealing with homogenous communities as come across in many studies.

For the above reasons, this research utilized FGD's as a fundamental data collection tool. Carrying out FGDs was an effective tool in this study given that focus group discussion enables a researcher to assemble individuals with similar background or experience in regard with command control and logistic supply in desert operations. The participants in FGD were operation officers; 02, logistic supply officers; 03, medical officers; o2, communication officers; 02, engineering officers; 03 Most of the respondent in FGD were 12 officers in 6th Mechanized Division. Also, the FGD aided in determining the expressed group voice that is represented and the differences concerning the issues among the participants in the group. The participants in the study were led by the moderator, who presented a topic of discussion and assisted the group participants to and express their perceptions and opinions independently. Allowing participants to discuss amongst themselves focused the study towards how a group rationalizes an issue, the divergence of opinion and ideas and the logical gaps and differences that exist as to their experiences during the operation in the Danakil desert.

FGDs provide diverse views and perceptions from the local people, the higher officials and environmentalists. FGDs enable investigate of multifaceted concerns which in the case under consideration is the interaction between the management of resources, traditional practices, and contemporary practices. The participants of this research can themselves come up with operational challenges faced in danakil desert and ideas on how operational challenges can be solved.

3.8.3 Observation

In this case observation is important in capturing the processes involved while other activities are taking place in their natural context. Ethnographers make use of a method for observation as an avenue that is hinged on both listening to people to people and watching them in the natural

environment. To some extend the researcher witnessed road infrastructures of 6th Mechanized Division with regard to accessibility, accommodation, machineries, and vehicle. Facility characteristics of the infrastructure were assessed. In the observation as defined by Creswell (2017), observation can be categorised has one of the important qualitative research methods especially while providing details about the various processes. However, socio-cultural practices, other activities are performed in natural environments. The technique entails observation/ recording to what extent the infrastructure facility in the division mission area is available.

When used in qualitative research observation can also gather qualitative data that may be difficult to mingle into a standard range of value for instance the aesthetic and socio cultural value of the landscape. Moreover, observation enable the researcher to collect data concurrently based on environmental conditions and operation practices. Also the researcher was comprehended how 6th Mechanized Division were managed to operate within extreme and unbearably hot climatic area of Danakil desert.

3.9 Data Processing and Analysis

The study used the thematic approach of data analysis; according to Mugenda and Mugenda (2003), thematic analysis is a method used to describe, classify and incorporate meaning contents in themes emanating from datasets. The strength of Thematic Analysis is in its ability to help the researcher examine meaning together as a patterned social phenomenon through a focus on meaning in a dataset. Thematic Analysis does not concentrate on searching for specific and individual interpretations and occurrences known only in one data item. Such a process is a technique of finding out what is already known with regard to how a topic is being discussed or is being written about and of making sense of that familiarity.

While doing this task, the researcher practiced some approaches or styles of analysis to the data. The data were explored through breaking down the specific type of data into various components. Subsequently, analysis of collected data was made to decide how exactly the 6^{th} Mechanized Division has fulfilled mission in Danakil desert area. Thematic analysis was used in the study and in this method the data collected were. As mentioned earlier, data collected were sorted according to the similarities in ideas presented in them. Interviews, FGDs, and notes compiled from the study were placed in the preliminary related theme of the tentative category. In that manner, the researcher tried to do a quantitative demographic breakdown of the compiled information. The

data obtained from interviews and focus group discussion were analyzed thematically. The data analysis commenced only when the first interview was transcribed and continued until all the data was collected.

3.10 Ethical Consideration

In research, ethical matters are of great importance and for this study while collecting data, ethical perspectives are taken into account. Some of the behaviors in research are harming individuals, violating their confidentiality, using information wrongfully and bringing bias which is considered unethical in any line of work (Kothari, 2004). As Creswell identifies, the law and code of ethics of research entails the following injunctions; one should never harm the subjects unnecessarily or irreversibly, second if possible one should gain prior voluntary consent, third one should not put out harmful information about particular individuals that has been gathered for the purpose of the research.

In this sense, while gathering information from officers of 6th Mechanized Division, ethical consideration was upheld among all the stakeholders. The researcher received a letter of support from the Ethiopian Defence Training main department, and also received permission from the commandant of the 6th Mechanized Division. The study was explained to participants and all participants agreed to participate in the study following explanation to them. Any participant 's name or any other identifiable information other than information thought to be absolutely essential for the study was not obtained. In addition, the researcher ensured the participant that there were no benefits or risks for the participant involved in the study. The research participants also understood and agreed that they had the right to withdraw from the study at any one time. They were told that they could ask the researcher any question of their choice with regard to the topic of research.

3.11 Chapter Summary

This research uses qualitative methods to give an intricate picture of military activities and security force in desert zones and in particular the ENDF 6th Mechanized Division in the Danakil.' The qualitative data used to complete the section is therefore collected by conducting a face to face interview with military officers from the 6th Mechanized Division with experience in military desert operation. This will offer a crash course of sorts on what strategies are being implemented

and what issues are encountered in real practice. Observation was done in other to capture the appropriate operational area and various landmarks within the Danakil desert. In data synthesis the interviews conducted will be transcribed and the data analysed through a process of coding and theming to capture the major trends in the data. The application of this methodology seeks to enhance the improvement of the understanding of the multivariate dynamics of military operations in desert environments as a subject of research in universities and as reference material for formulation of military strategies and warfare.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

4.1 Introduction

This chapter discusses both the lean and the insights of the data that was gathered through face-to-face interviews, group discussions, and field observation. That data was collected from 6th Mechanized Division officers. The main objective of the study was to examine the extent of military tactical success in applying operational manoeuvre in Danakil desert. The analysis aimed to answer the research questions such as: To what extend are Command and control systems of ENDF 6th Mechanized Division efficient in executing operations in the arid terrains of the Danakil Desert? What can be established as the particular problems faced by the ENDF 6 th Mechanized Division in providing continued operations in terms of logistics and supply chain management? Where does training and the operational preparedness play in increasing the operational effectiveness of the ENDF 6th Mechanized Division in the prevailing conditions of the Danakil Desert? How does environment of the Danakil desert impact personnel and equipment's readiness of the 6th Mechanized Division? To answer the above research questions, data was gathered from the following research tools; Interviews, Focus Group Discussions, and Observation.

Generally, the result of the present study was organized and presented with the following four major themes: command and control in desert operation, some mission and problems of logistic supply, combat readiness of forces and problems related to the of operation in desert land features and weather conditions for the execution of mission. This section will describe the detail analysis of the in-depth interview, FGD and observation. The description starts with the overall socio-demographic profile of the participants of the study and then proceeds with the themes and subthemes generated from the research mentioned above questions.

Table 4.2: ***Distribution of Age and Gender of the Respondents***

No	Socio-demographic Characteristic		Face-to-face interview		FGD		Total	
			No	%	No	%	No	%
01	Age	30-35	04	13.33%	03	10%	07	23.33%
		36-40	06	20 %	06	20%	12	40 %
		41-45	05	16.67%	03	10%	08	26.67%
		46-50	03	10%	--	---	03	10%
02	Gender	Mel	18	60 %	12	40%	30	100%
		Female	--	--	--	--	--	--

Source: *Researcher, (2023*)

According to the Table 4.2, out of 18 total interviewed respondents, the socio-demographic characteristics of the participants, drawn from both face-to-face interviews and focus group discussions (FGDs), show that the majority (40%) fall within the 36-40 age range, followed by 26.67% aged 41-45. Regarding gender, the table indicated that all participants are male, with no females involved in the study. Therefore, it seems that the data provided a snapshot of a highly educated group, primarily within the mid-career age range. The study also showed that no female respondents were involved.

Table 4.3: ***Educational Level of the Respondents***

03	**Education**	**12 grade**	**05**	**16.67%**	**04**	**13.33%**	**09**	**30%**
		Diploma	08	26.67%	05	16.67%	13	43.33%
		Degree	05	16.67%	03	10%	08	26.67%

Source: *Researcher, (2023*)

Hence with the valid number of respondents 08, majority of the respondents lie on in terms of education, most (43.33%) hold a diploma, while 30% have completed up to 12th grade, and 26.67% possess a degree. Therefore, this figure indicates majority of respondents were diploma holder.

Table 4.4: ***Military Rank of the Respondents***

04	**Rank**	**Colonel**	**02**	**6.67%**	**--**	**--**	**02**	**6.67%**
		L/C	03	10%	03	10%	06	20%
		Major	06	20%	04	13%	10	33.33%
		Captain	07	23.33%	05	%	12	40%

Source: *Researcher, (2023*)

As the above Table 4.4 indicated that, out of the 18 respondents regarding military rank, Captains constitute the largest group (40%), followed by Majors (33.33%), while a smaller portion are L/C (20%) or Colonels (6.67%). This survey results indicates that majority of respondents were captain.

Table 4.5: ***Religion Composition of the Respondents***

05	**Religion**	**Christian**	**16**	**53.33 %**	**12**	**%**	**28**	**93.33 %**
		Muslim	02	6.67%	--	%	02	6.67%

Source: *Researcher, (2023*)

The overwhelming majority of participants (93.33%) are Christian, with 6.67% identifying as Muslim. Hence, this study result showed almost all participants are Christian.

Table 4.6: ***Duty Position of the Respondents***

06	**Position**	**Division DC**	**02**	**6.67%**	**--**	**--**	**02**	**6.67%**
		Division Staff	--	--	12	--	12	40%
		Regiment commander	03	10%	--	--	03	13.33%
		Regiment DC	04	13.33%	--	--	04	13%
		Regiment Staff	09	30%	--	--	09	30%

Source: *Researcher, (2023*)

Regarding to table 4.6 indicated that, out of the 18 respondents, as for their roles, 40% of FGD participants are Division Staff, while Regiment Staff account for 30% of the overall group, with other positions including Regiment Commanders (13.33%) and Regiment Deputy Commanders (13%). Therefore, it seems that significant positions were hold by Regiment Staff

Table 4.7: ***Experience of Respondent in Danakil Desert***

No	Socio-demographic Characteristic	02 Year service		03 Year service		04 Year service		05 Year service	
		No	%	No	%	No	%	No	%
01	Division DC	--	--	--	--	--	--	02	11.11%
02	Division Staff	--	--	02	50%	01	16.66%	09	50%
03	Regiment commander	--	--	---	--	01	16.66%	02	11.11%
04	Regiment DC	01	50%	01	25%	--	---	02	11.11%
05	Regiment Staff	01	50%	01	25%	04	66.66%	03	16.66%
Total		02	100%	04	100%	06	100%	18	100%

Source: *Researcher, (2023*)

As seen from Table 4.7, all the study participants were experienced in Danakil desert. The minimum service of respondent was two years and they were two. The respondent served in Danakil desert for three years were four whereas six respondents were served four years. The maximum numbers of respondent served five years were eighteen. These respondents were experienced in Danakil area with the cultural awareness, understand local context, familiarized with local population's customs. They engaged continuous personnel training exercises specific to desert operations. Furthermore, they were managed well relations with local clan leaders and able to get people's support for their mission execution and they gave experienced and knowledgeable enough respond for this study. Thus, it can be concluded that the respondents used their developed experience to carry out their responsibilities effectively and had a thorough understanding of both the local people and the targeted area.

4.2 Analysis of Regiment Commanders Responses for Interview Questions

The major focus of this study was to enhance understanding of the factors contributing to the inadequate readiness and execution of desert operations in Ethiopia's Danakil desert. Thus, three interviewees were interviewed face to face. Almost all of them have a similar response on the interview questions.

According to respondent 1, the extreme weather condition and harsh land feature of Danakil desert can affect equipment and personnel. Similarly, Major Michael and R. Macedonia (1992) explained that during operations desert Shield and desert Storm communications were critical to controlling the scope of operations. Beside these, the sand and dust in the desert can damage machinery and obscure visibility. Similarly, the result is inconsistent with some studies, such storms can cause high surface water runoff, depending on soil consistency, reducing trainability in wades where the surface is covered with loam or improving it if the terrain is pure sand (Khormali & Monger, 2020).

Moreover, in the Danakil desert there is no water resource to use and it requires significant logistical effort to store and transport. This result is consistent with Huddle stone and Pike (2017), considerations involve determining the specific climatic and terrain conditions for deployment and preparation. Emphasizing logistic support, particularly ensuring adequate water supply, is crucial during a desert combat operation.

In Danakil desert there is high terrain challenges that the sand dunes and rocky areas complicate vehicle movement. Maintaining fuel supplies is critical but challenging. The extreme temperature of Danakil desert most of time scores above 50^0C risk heat-related illnesses such as heat exhaustion and heat stroke. In night time the temperature drop significantly, leading to hypothermia if personnel are not adequately prepared. Likewise, (Khormali & Monger, 2020) agree , desert warfare is characterized and challenged by a combination of dry weather, lack of water, shrubs, and sandy areas, where the population is dispersed, where agitation does not grow up, hot at day and decreases in the night time, and wind storms, as well as foggy winds and landscapes.

According to respondent 2, in Danakil desert sand dunes and rocky of Danakil desert areas are complicate vehicle movement. Maintaining fuel supplies for vehicles is critical but challenging. The supply routes in the Danakil 6^{th} Mechanized Division are vulnerable to enemy guerrilla fighters. Also the harsh conditions of the area can accelerate equipment degradation and difficulty in transporting spare parts to maintain operational readiness. The harsh terrain of Danakil desert is difficult to navigate, hindering movement and logistic supply synergy. In supporting this result, Gebremedhin (2013) explained the experience of Ethio-Eritrea war at Bure front; it was very difficult for the military's command and control, maneuverability and communication due to the extreme weather condition land harsh land future. Missing direction was widely happened in most infantry units, for the reason similarity of Bure terrain.

In addition to respondent 1 and 2, respondent 3 has also a similar response that the harsh conditions of the area it affect by decreasing the troop's moral and increased fatigue. Similar to this study finding, US Department of the army (1993) indicated that the primary challenges encountered in desert warfare stem from extreme heat and scarcity of moisture, influencing the tactics, techniques, and procedures employed. For the purpose of mission accomplishment the harsh geographical feature condition of the area can interfere with communication system. In Danakil desert ensuring a stable supply of nutritious food is difficult and it is withstand high temperatures. The remote location of Danakil desert is affecting the moral and psychological readiness of troops. Logistic supply is crucial for military operation success, especially in arid environments. Among logistical supplies, the lack of water is the most important characteristic of the desert.

4.3 Operational Mission of 6th Mechanized Division in Danakil Desert

As 6th Mechanized Division deputy commander explained, the mission of 6th Mechanized Division in the Danakil desert is securitizing the Danakil area from any attack against governmental and public institutions and organizations' property. The risks are terrorism, illegal human traffic, and contraband in the area of the Danakil desert at the borders of Eritrea, Djibouti, and Ethiopia. This makes it a high-risk area for potential terrorist activities, illegal human traffic, and contraband, including kidnappings and robbery. The presence of armed rebel organizations like the Afar Liberation Front later agreed with the government, but there are still guerilla fighters. When these groups get favorable conditions, they engage in criminal activities, including robbery and extortion. Illegal armed groups targeted tourism in the area in 2007, 2012 and 2017. Additionally, the road from Addis Ababa to Djibouti port is through the Danakil desert, where more than 95% of Ethiopian imports and export commodities are transported. So, securitizing this area is the issue of survival as a country.

In general, the 6th Mechanized Division deputy commander explained the execution of their mission at the Danakil desert area. Even though there were so many challenges in the area, the 6th Mechanized Division could securitize the area for a long time, especially the road to Djibouti.

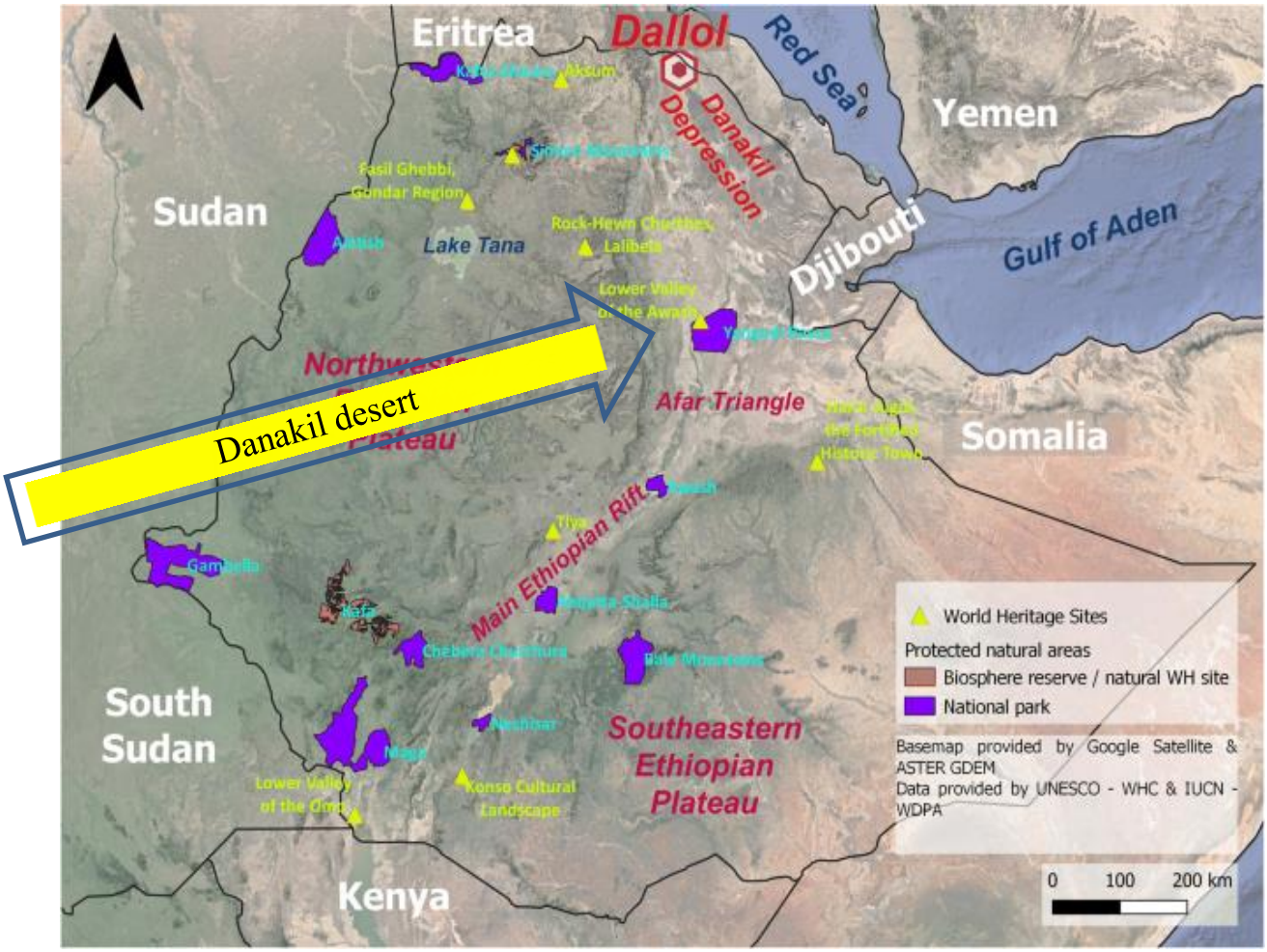


Figure 4.2: ***Map of the Mission Area of the 6th Mechanized Division***

Source: *Google Maps*

The Danakil desert region or Afar triangle desert presents a significant challenge in terms of the scale of its expanse relative to the security resources allocated to it. The interviewee highlighted the discrepancy between the vastness of the area and the limited number of security personnel deployed there. This mismatch is attributed to the activities of contrabandists who illegally import goods from neighboring regions such as Somali land, Eritrea, and Djibouti. These individuals traverse the area in various directions, often equipped with communication devices and firearms, and operate in well-organized groups. Consequently, the division command is compelled to deploy small units across numerous locations to intercept and deter contraband activities effectively.

Mulugeta (2011) and Gebremadihn (2013) explained the experience of the Ethio-Eritrea War 1998-2000 at the Bure front; it was challenging for the troops' maneuverability due to the volcanic land feature, and the weather conditions were scorching. The temperature area was a minimum of 38^0C and a maximum above 45^0C. These harsh weather conditions affected the effectiveness of the communication system and caused catastrophic water thirst, which insightfully affected the operation. The entire land feature is the same, and there is no reference point to keep direction. For these problems in combatant units, missing direction was widely observed in most infantry units (Gebremadihn, 2013). The respondents support this idea that the Danakil desert is known for its extreme temperature and harsh environmental conditions. These can pose significant security risks to travelers and workers, including heat-related illnesses and dehydration on each soldier.

4.3.1 Guerilla Fighter Groups and Their Tactics in the Danakil Desert

Adversaries carrying out operations in Danakil desert conditions, for example, Baggins (2005) Guerrilla warfare, have been utilized through history with enough frequency and under various situations for the accomplishment of various goals. It has recently been involved in many people's struggle for liberation when the 'advance guard' of a people have opted for guerrilla warfare against oppressor's hosts who possess superior firepower (Baggins, 2005; Lockyer, 2018). Guerilla or irregular warfare fighters or double-tap or 3-3 call or mob or hit-and-run fighters is a term that describes and other unconventional tactics used by a number of unfavourably matched fighters against a large and heavily armed enemy force. Guerilla warfare, when it is boiled down to its fundamental concepts, is the smallest quantity of force used to neutralize the biggest amount of the enemy, while the smallest loss of the side employing guerilla tactics; everything else is secondary.

Although guerrilla is one of the subversive ways of fighting to change an existing political system, it relies greatly on flexibility within a range of force – from talking, to terrorism and open conventional war. Guerrillas are small formations that act out of organizational centers. Their advantages are familiarity with population, terrorist modus operandi, flexibility, and numerical strength at a chosen point of contact (Beachman, 1989). Guerrilla groups aim at the dislikes of a populace; the media is used for conveying information and ideas, raising queries, and advertising

actions. It also turns into a weapon to seduce people and increase the number of guerrillas.In the same way, Beachman (1989) and Tareke (2000) described that because guerrilla forces are few in number, they can only afford to fight the military where and when the guerrillas are stronger in number.ves. Lately, it has been engaged in various people's wars of liberation when the vanguards of a people have chosen the road of irregular armed struggle against enemies of superior military power (Baggins, 2005; Lockyer, 2018). Guerilla or irregular warfare fighters is a term that describes stealth-based, hit-and-run tactics and other unconventional tactics employed by small groups of fighters against much larger or better-armed forces. At its core, guerilla warfare is about maximizing damage to the enemy while minimizing risk to one's own forces; all other considerations are secondary.

Guerrilla warfare is part of a subversive effort to overthrow an existing political system; it uses flexibility in a span of coercion that extends from conversation through terrorism and open conventional war. Guerrillas are small bands that operate from base areas. Their advantages are knowledge of the population, terrorist tactics, mobility, and numerical superiority at a selected point of action (Beachman, 1989). Guerrilla groups focus on the dissatisfactions of a population and use the media as a forum to present ideas, pose questions, and publicize activities. The media also becomes a recruitment tool to expand the number of guerrillas.

Similarly, Beachman (1989) and Tareke (2000) explained that since guerrilla forces are relatively small, they must only engage in military confrontations at points and times when they have numerical superiority. In essence, they advance, attack, and soon retreat just before the enemy is able to get backup. I note with concern that the giant integrated mass, strike, and disperse are critical strategic manoeuvres that contribute to the effectiveness of guerrilla warfare. Guerrilla actions are espionage, propaganda, demolition, targeted killing and acts of terror designed to spread chaos among the people. When reaching the maximum level of irregularity, a guerrilla group increases in numbers and acquires territory through conventional warfare, and coalesces along with the formation of a political organization. Some of the guerrilla operations include spying, publicity, sabotage, extermination and sometimes terrorism whose aim is to frustrate the people.

All level commanders in the 6th Mechanized Division mission area should also know the principles of guerilla warfare and the attendant tactics to use, neutralize, or avoid where necessary. Therefore, commanders have to be ready for contingency and adjust the approach they use to facilitate command and control for counteracting these measures and for successful completion of a mission.

4.4 Command and Control System in Desert Operations

As Col Frederick Coleman (2022) explained, in military command and control, an army commander lawfully exercises over subordinates to assign missions. It describes command as "the art of motivating and directing people and directing people and organizations to accomplish mission" (Coleman, 2022). Military command and control is crucial in all military operations, including those conducted in desert environments. Desert operations present unique challenges and require specific strategies and tactics to ensure success. Command and control in desert operations involves coordinating and directing forces to achieve particular objectives while adapting to the harsh and dynamic desert conditions.

Command and control centers in desert operations are typically established to provide centralized leadership and decision-making. These centers include senior military commanders, staff officers, and support personnel responsible for planning, coordinating, and executing operations. Their primary focus is to gather and analyze relevant intelligence, assess the situation, and develop effective operational plans. Effective command and control in desert operations requires a thorough understanding of the environment and its impact on military operations. Extreme temperatures, limited water resources, vast open spaces, and challenging terrain characterize desert landscapes. These factors can affect mobility, logistics, communication, and combat effectiveness.

To overcome these challenges, military command and control in desert operations emphasizes the importance of effective communication and coordination. It relies on advanced communication technologies and infrastructure to ensure rapid and reliable exchange of information between different units and command centers. Commanders must use advanced maps, satellite imagery, and other geospatial tools to understand the terrain, identify potential obstacles, and develop effective routing and maneuver plans.

Maintaining situational awareness is another crucial aspect of command and control in desert operations. This involves continuously monitoring the battlefield, tracking the movement of friendly and enemy forces, and assessing the overall operational picture. This information is vital in decision-making, enabling commanders to adjust their plans, allocate resources, and coordinate forces accordingly. Additionally, command and control in desert operations emphasizes the effective use of combined arms tactics. Desert environments demand a combination of infantry, armor, artillery, and air support to overcome the challenges posed by the terrain and the enemy. Commanders must integrate these different elements and coordinate their actions to achieve synchronized and complementary effects on the battlefield.

4.4.1 Command and Control System in 6th Mechanized Division Danakil Desert

Respondents in the Danakil desert area explained that communication challenges affect the region's command and control activity and that resources such as water, fuel, and food are often scarce. Their reason is the extreme weather conditions of Danakil, known for its harsh and extreme weather conditions, including high temperatures during the day and freezing temperatures at night. These conditions can affect the performance of communication and command systems, making it challenging to maintain effective command and control. The consumption of water for each soldier is high, and there is no water point in the area even though it is difficult to transport. The interest in transportation and fuel consumption is high in the area. Every food needs a refrigerator to keep fresh and dry rations that expire before their expiration date. This presents a challenge for command and control as commanders need to prioritize allocating these resources to maintain operational effectiveness while ensuring the well-being of their forces.

The respondents explained that mobility in the Danakil desert terrain often consists of dunes, rocky terrains, and vast open spaces, which can pose challenges for mobility and deployment of forces. The fluid and unpredictable nature of desert environments can make it difficult for commanders to efficiently and rapidly coordinate movements and react to changing situations. Limited visibility: Sandstorms and dust clouds are expected in desert environments, severely limiting visibility. This makes it challenging for commanders to gather real-time intelligence, monitor the battlefield, and make informed decisions. Camouflage and concealment: Desert environments offer limited natural cover and concealment, making it challenging to hide troops, vehicles, and

equipment from the enemy. Commanders must employ effective camouflage and concealment techniques to avoid detection and maintain the element of surprise.

4.4.2 Communication of Combatant Unit in the Danakil Desert

Danakil desert areas' vast and open nature can hinder communication and result in limited or disrupted connectivity. Commanders must rely on robust and reliable communication systems, including satellite radio, to ensure effective command and control. As the communication officer of the division explained, the problem of communication in the area is that dust and sandstorms are prone to frequent dust and sandstorms, which can severely limit visibility and disrupt operations. These storms can also damage equipment and compromise the functioning of sensitive electronic communication systems. Also, the scorching heat in the area limits communication signals compared with other regions.

4.4.3 Communication with Local Community

Military operations in desert environments may involve interactions with local populations and cultures, presenting unique challenges regarding language barriers, cultural misunderstandings, and potential conflicts with local customs. A lack of local knowledge can complicate decision-making processes and create difficulties in understanding and addressing the dynamics of the local environment. The Ethiopian army mostly comes from Ethiopian highland areas, and operating in Danakil desert environments often involves dealing with unfamiliar cultures and languages of Afar peoples' terrain. Soldiers of 6th Mechanized Division were adopting themselves after a long time.

Cooperation and communication with local people are necessary when every training is conducted to maintain the security of local people. As the division deputy commandant revealed during the interview, the local people support their division by giving information about the enemy. The division supports local people by providing daily water supply for those who live in remote areas. These activities indicate the relationship of 6th Mechanized Division with local people was good for supporting each other

4.4.4 Observation and Fields of Fire Problems in the Danakil Desert

Direct-fire weapons can reach their maximum range in the typically flat desert landscape. However, the terrain isn't uniformly flat, necessitating strategic weapon placement for mutual support similar to temperate climates. When setting up defensive positions, assessing them from the enemy's perspective is crucial to maximize available cover and concealment. The open terrain and mostly clear atmosphere generally provide excellent long-range visibility. However, visibility may be compromised or distorted at certain times of the day due to heat effects. Dust kicked up by helicopters flying at nap-of-the-earth (NOE) altitudes can be spotted from 20-30 kilometres. At the same time, vehicle columns are easily discernible from observation posts atop dominant terrain, even at over 5 kilometres away. Initial signs often manifest as glints from windscreens or optics rather than the accompanying dust column. For optimal observation, positions should ideally have the sun behind them and be elevated as much as possible to mitigate mirage effects and heat radiation from the ground. In situations where dominant terrain is lacking, observation may be restricted to aerial scouts or limited to short-range observations by tank commanders (US Department of the Army, 1993, p, 4).

Observation of fires, especially direct fires, may be difficult. High-velocity, direct-fire weapons can throw up considerable dust clouds. Calcium chloride distributed in front of a position may lessen them; however, burst-on-target corrections may be almost impossible. Crews may have to use flank observers to report elevation and azimuth errors. Correction of field artillery fires, especially those of larger pieces, may be complicated by dust hanging in the air following the impact of ranging rounds. Forward observers should, therefore, place initial rounds beyond a target rather than short of the target. (US Department of the Army, 1993, p.4)

As regiment commanders revealed, the barren and open terrain of the Danakil desert provides most of the area, while some limited opportunities for cover and concealment exist. This makes it challenging for military facilities to camouflage their movement and protect themselves from potential threats and pose to observation of the enemy. Danakil desert operations often involve remote locations with large distances between military facilities and supply routes. This can increase logistical challenges and the time and effort required for transporting personnel, equipment, and supplies. The Danakil desert lacks natural cover; the desert's open landscape lacks

natural cover and concealment, making it challenging to practice tactics such as camouflage and stealth. This limitation necessitates the development of alternative strategies and tactics to adapt to the desert environment.

4.5 The 6th Mechanized Logistic Supply in the Danakil Desert

4.5.1 Food and Water

As US FM-58 stated food problems in desert areas state: The nutritional requirement of troops in desert areas does not differ from those in other parts of the world, except for the increased water requirement. The messing system includes all aspects of food processing, preparation, service, and storage. Due to the desert climate, it faces unique sanitation and spoilage problems, making it a potential source of gastro-intestinal diseases. The ever-present water shortage compounds the issue of sanitation throughout the messing system, since there are large quantities of water. In 6th Mechanized Division regarding food supply, a group discussion ensured that each regiment had a bakery and that the combatant unit gets fresh bread daily. However, as a challenge, the main problem of the food supply is that most of the food, especially meat, and vegetation, is purchased and transported from far distances to all divisions of subunits in the area. It took more than six hours for all units to arrive; after arrival, it rotted quickly due to the high local temperature.

The U.S. FM 89-3 states the unique problem of water in desert operations in this way: Combat operations in the desert pose some unique issues. Because there is so little water and our troops and equipment cannot survive, water is a critical supply item in the desert. Forces trying to survive in the desert without adequate water supplies have always met with disaster. Finding and keeping water sources may be the most crucial issue in desert conflicts. At the very least, water sources will be critical. (US Department of the Army, 1993, P. 2) As the 6th Mechanized Division deputy commander for logistics, the researcher ensured that in the Danakil desert, managing logistical support for combatant units requires extensive logistical support to sustain the forces' operation. The long supply lines, limited infrastructure, and challenging terrain pose logistical challenges in transportation, maintenance, and supply chain management.

According to the respondents, there is insufficient demand and water supply. Upon observation, the researcher noted that although there are two water point supplies, they were located

considerably from each regiment. The closest regiment is 12 km from the water point, while the farthest is 60 km. Water is transported by car daily to each regiment, including division staff. A reserve waterhole was also prepared if the others dried up, ensuring continuous water supply readiness. The water tankers of the regiments are steel tankers, and the water is then transferred to plastic barrels. However, these barrels are susceptible to exposure to sudden eruptions of foggy dust mixed with sand, resembling storms. Despite attempts to cover the barrels, the dust storm can contaminate the water. Initially, when filled, the water in the barrels is too hot for consumption or washing. It must be cooled down by air for an extended period under the shade of a building before it can be safely consumed. Furthermore, there is no 24-hour electric service and insufficient refrigerators to cool the water for drinking purposes. This situation is especially critical for small units assigned to remote areas.

As the researcher gathered data from open-ended questions and group discussions, the respondents ensured there were insufficient cars and spare parts for water supplier cars. In the discussion, division logistic supply leaders revealed that only a few vehicles transported water repeatedly daily to supply water for all units. Due to this reason, more consumption of fuel occurred, and a tire of cars rasped by areal sharp stones and exploded earlier than in other places in the Danakil desert. In his "Military System Magazine," Tony put the criticality of water supply in desert operations as follows: Fuel and water are critical to successful military operations wherever they occur. Without these, a force quickly comes to a halt. Water is the very lifeblood of the human body, and without fuel, the plethora of electronics on the battlefield today would soon stop functioning. In the desert climates of the Arabian Peninsula, re-supplying has real challenges regarding temperature and distance. In the day's dry heat, the human body loses large quantities of water, which needs to be continuously replaced (Tony, 2015).
As the division deputy commander for logistics explained, the Danakil Desert is a region with minimal natural water sources. There are very few oases and rivers in Danakil, and groundwater is often scarce and of poor quality. Securing access to these limited water sources for their division operations can be a logistical challenge. In addition, the division deputy logistics commander ensured the Danakil desert's temperature was scorching their soldiers' bodies, especially during July and August. During the daytime, the local temperatures often exceed 50 degrees Celsius.

This extreme heat can lead to rapid dehydration and water loss, making it essential to ensure an adequate and constant water supply to keep military personnel hydrated.

During the focus group discussion, one respondent explained that transporting water to military personnel stationed in the Danakil Desert can be difficult and costly. The region's rugged terrain and lack of infrastructure can make it challenging to access remote locations where 6th Mechanized Division operations occur. The limited water sources in the Danakil desert have poor quality and are contaminated with salts, minerals, and other impurities. Ensuring that water is treated correctly and safe for consumption is crucial to prevent waterborne diseases and safeguard the health of military personnel. Given the limited water availability in the Danakil Desert, sustainability is a significant concern when supplying water for military operations. It is essential to carefully manage and conserve water resources to ensure they can meet the long-term needs of military personnel without depleting local water sources.

Generally, the 6th Mechanized Division needs additional cars to transport water and spare parts in the Danakil desert area. For this reason, the consumption of fuel increases. Almost all desert areas have no natural water resources, so the unit must excavate underground water. Ensuring water supply for combatant units in desert areas poses extra work fatigue and costs to logistic staff. The Danakil desert has arid, barren landscapes and little vegetation. The lack of water sources poses a challenge for sustaining a military facility and providing necessities. Additionally, the sandy terrain can create difficulties in transportation supplying water for military operations in the Danakil Desert, which presents significant challenges due to the harsh environment, limited water sources, high temperatures, transportation difficulties, water quality issues, and the need for sustainability. Addressing these challenges requires careful planning, resource management, and innovative solutions to ensure the health and well-being of military personnel operating in this extreme environment.

4.5.2 Transportation

Each time, when one puts a foot on the desert ground, the dust and sands rise up. Secondly, the ever blowing wind transport dust in columns to the height of a house churning well-formed whirlwinds or dust devils. At the outset the German troops in the desert were adversely affected by dust and was fighting against depression. But they soon got used to this system and the quantity

of their fighting strength was not significantly reduced by it. It important to know that the dust which is in Africa does not pose any threat to health since it is not angular or sharp that can lead to lung related illnesses as stated in the US Department of the Army 1993. Regarding this, the respondent testified, thus, Armature service respondent to overcome the dust problem, the soldiers in dust goggles were useful to the men, particularly the times when columns of giant dust in the moving vehicles formed were involved. Thus, as a precaution, every soldier in the Danakil desert had two dust masks on him.

The deputy commander for logistics of the 6th Mechanized Division said it thus all the weapons and equipment, including all the vehicles that rather considerate of the concerns of the crew members in every navigation of the desert. Thus the dust had the greatest impact on every vehicle and equipment because the dusty air that entered the cylinders wore out the cylinders and pistons rather quickly. Special air filters stand for the less wear but could not stop that process in any way. In general-purpose cars air inlet ducts were provided in the body structure to supply absolutely pure air to the engines. In fighter tanks, the debris and fresh air was sucked out of the battle compartment. The other parts of motor vehicles such as for brakes, chassis and any part that could be affected by dust, were far much wearier than under normal circumstances. On this point, no figures are available. One thing which is beyond doubt is that motor vehicles when operating in the desert require more lubricants than any other theatre of operations. No specific greases and lubricants were employed in the experiment.

According to US Department of the Army (1993), dust impaired barrels of guns and all moving parts that are without protection. In consequence of this the wear on barrels was a good deal greater than in the Europeans theatre of war. Breech loading rifles and other small arms were the categories most affected simply because since these were most often fired from the surface of the ground, they stood most risk of being damaged by dust. Consequently, it was essential that all the parts within guns and equipment- most of all the breechblocks- be safeguarded by such measures as when not needed, they had to be wrapped up, covered with shelter halves or anyhow. The tubes of artillery pieces and rifles had to be fitted with muzzle protectors whenever the pieces were not in use. In view of what had been discussed regarding the effects of dust, extra emphasis was placed on the care of weapons and equipment and washing them often. The ad hoc form of dust defending

cover has been described in details in the ex-German manual' Combat in Deserts and Steppes' and, therefore, the subject will not be recalled further.

The desert has often been likened to a well-fortified fortress for those familiar with its challenges, yet a dangerous trap for the unprepared. Successfully navigating this environment requires soldiers to be equipped and mentally prepared to operate at peak performance levels. Maintaining high morale among personnel in the desert is crucial due to the harsh conditions and the unfamiliarity many may have with such climates. In this barren landscape, there are few sights to behold that can serve as distractions, and within vehicles, the only sensations are the rumble of engines and the smell of burning fuel. Consequently, the relentless dust storms and austere living conditions can significantly impact personnel morale, leading to heightened stress during training and increased casualties. Therefore, prioritizing and enhancing personnel morale becomes paramount (Pike, 2017).

Regarding the accessibility of the transportation service, the respondents in the group discussion explained that the accessibility of the transportation service delivery is not enough compared with the demand of units in the division. The respondent explained the accessibility of transportation in the 6th Mechanized Division is very limited in number. There is no significant difference in opinion among the respondents in the group discussion face-to-face interview. This result also indicates that the limitation of access is affecting the transportation service negatively. The transport department and regiment commanders also acknowledge this. Therefore, transportation services have considerable limitations regarding vehicle availability. This indicates that the serviceable condition of vehicles has significant limitations in the division.

4.5.3 Road Access

The researcher observed the Road accessibility of 6th Mechanized Division, and the road facilities in Danakil desert operations face several problems due to the harsh and bleak nature of the region. As a result of the observation, the key challenges are as follows: The 6th Mechanized Division in the Danakil desert is characterized by rugged, uneven terrain, including rocky surfaces and sand dunes. These unstable conditions make it difficult to construct and maintain stable roads. Additionally, as the respondent explained in the group discussion, frequent erosion, shifting sand, and volcanic activity add to the instability, making road construction and upkeep a constant challenge. Also, the desert's extreme climate, with scorching heat and temperature fluctuations,

poses a significant challenge for road infrastructure. The intense heat can cause asphalt to soften and degrade quickly, leading to rapid wear and tear. Extreme temperature variations can result in road surfaces cracking and becoming hazardous for military vehicles.

The respondent further explained that water scarcity in the Danakil desert makes constructing and maintaining road facilities challenging. Adequate water supply is essential for road construction, as it is required for mixing concrete, stabilizing soil, and controlling dust. The lack of nearby water sources makes sustaining road construction projects in the region challenging. In addition to this, the Danakil desert region has limited existing infrastructure, including roads. The remote location and hostile environment make deploying heavy machinery and equipment required for road construction challenging. The lack of proper access roads to construction sites further complicates the process. Due to the isolated and challenging conditions in the Danakil desert, maintenance and repair of roads have become a continuous struggle. In the entire Danakil area, the lack of facilities and resources to conduct regular maintenance results in deteriorating road conditions, making it difficult for the mission 6th Mechanized Division for operations to navigate effectively. To address these road facility problems, military operations in the Danakil desert should focus on conducting thorough terrain assessment and engineering studies to identify suitable routes for road construction.

4.5.4 Health Service in the Unit

It is notable that recurrent environmental events such as, for example, desert dust and sand storms have been identified to have enormous impacts on health of people globally. Therefore, the purpose of this scoping review was to determine the main health impact of desert dust and sandstorms and the approaches used in the available epidemiological literature to quantify exposure to desert dust. In the review, International scientific journals were searched where the topics included exposure to desert dust or sandstorms, specific desert names or names of sandstorms and different health effects. These health effects were then cross-tabulated with study design variables Listed in the stylized table below (Julia & Fussell, 2021). Several ill health indicators are influenced by desert dust: daily mortality and cardiorespiratory diseases. A recent systematic review and meta-analysis has been conducted to tackle this to consider the relevant dust patterns from source areas and emissions. This effort pointed to raised cardiovascular mortality

and respiratory morbidity. Environmental hazards: Deserts also have various other environmental threats such as; infectious snakes and scorpions and other wild animals. As a result, military facilities have to prevent armed personnel from such dangers and safeguard their lives.

During the interview, the division health leader ensured clinical service in all regiments and gave daily service to regiment members. In addition to this, they gave planned health education twice a month depending on local health problems. On the other hand, the researcher discussed with the division hospital administrator (leader) that their hospital has no surgery group, no medical equipment, and insufficient Doctors. As the division hospital administrator revealed regarding local weather's effect on human health, high temperatures can exhaust too much necessary liquid from our body, causing skin diseases caused by high temperatures and affecting our appetite. Also, the local dusty wind can spray food and water that division members use for nutrition.

In addition to this, Luo revealed the challenge of high temperature for human health: The human body has a normal core temperature between 97˚F and 99˚F, but on average, a normal body temperature is 98.6˚F (37˚C). To maintain this temperature without the help of warming or cooling devices, the surrounding environment must be at about 82˚F (28˚C). High environmental temperatures can be dangerous to our bodies. In the range of 90˚ and 105˚F (32˚ and 40˚C), we can experience heat cramps and exhaustion. Between 105˚ and 130˚F (40˚ and 54˚C), heat exhaustion is more likely. We should limit our activities to this range. An environmental temperature over 130˚F (54˚C) often leads to heatstroke. Other heat-related illnesses include heat exhaustion and heatstroke (Luo, 2017).

4.5.5 Facility of Accommodation

The researcher observed the accommodation of the 6th Mechanized Division, and the area of the Danakil desert is a remote and isolated region with limited infrastructure. Roads, electricity, and communication networks are scarce. The 6th Mechanized Division must address these infrastructure challenges to establish proper accommodation. Building or improving roads, establishing power supply systems (solar power, generators), and implementing effective communication systems are essential to ensure connectivity and logistics for their operations. The mission area of 6th Mechanized Danakil desert's remote location makes it challenging to provide necessary resources for military accommodation. Food, medical supplies, and other essential items

become difficult due to the lack of nearby towns or cities. Military leaders must plan and execute well-structured supply chains to consistently provide resources to sustain soldiers stationed in the region.

The Danakil desert is home to active volcanoes, posing a threat to military personnel and their accommodations. Also, the area is active with storms, which can destroy houses and other facilities. The military must carefully select suitable sites from areas prone to frequent volcanic eruptions or establish protective measures, such as constructing bunkers or reinforced structures, to shield soldiers and their living quarters from potential volcanic activity. Furthermore, as the deputy commander for logistics explained, the extreme weather conditions of the Danakil desert experience scorching temperatures, often reaching above 120 degrees Fahrenheit. Providing suitable accommodation that can withstand such extreme heat is crucial. Buildings or tents must be properly insulated and equipped with air-conditioning or cooling systems to protect soldiers from heatstroke and other heat-related illnesses.

As the 6th Mechanized Division deputy commander for operation explained about their mission area, the desert's remote location and lack of infrastructure pose challenges for military training. Access to facilities for accommodation, training grounds, medical support, and resupply can be limited or non-existent, requiring careful logistics planning and coordination. Overall, the challenges faced 6th Mechanized Division facilities in Danakil desert operations require careful planning, adaptation, and the development of specialized operational procedures to ensure mission success and the well-being of personnel.

In general, as the researcher observed in the 6th Mechanized Division facility, the unit does not have comfortable and sufficient housing. Each company and platoon has its own house, which is not big enough for them. There was a house newly built by defense engineering that was enough for two regiments around Samara at different places. Even though the houses were built for three regiments, only one regiment lived there because it was far from their mission area. It has electric service but not enough air conditioning. The area's weather conditions are too hot from April to September. Even at midnight, the air conditioning service, which is not enough in each house, cannot make soldiers comfortable. No infrastructure is generally suitable for all weather conditions, like refrigerators and air conditioners. In addressing these accommodation problems in

the Danakil desert, the 6th Mechanized Division should collaborate with relevant government agencies, local communities, and other organizations to develop and implement sustainable solutions. It requires careful planning, investment in infrastructure, and innovative approaches to overcome the unique challenges posed by this harsh environment and ensure the well-being of military personnel.

4.6 Mission-oriented Training in 6th Mechanized Division

As Scully (2017) notes, the Danakil desert located in the northeastern corner of Ethiopia near the border with Eritrea, the Danakil Depression has been called "the gateway to Hell" because it is one of the hottest and harshest places on Earth, with a recorded temperature of 125^0F. The respondent ensured that the Danakil desert poses several challenges for military training due to its harsh terrain and extreme environment. Some key challenges include the extreme heat, which can adversely affect soldiers' physical and mental performance, making it difficult to carry out rigorous training activities. The desert is characterized by a lack of water sources, making it challenging to sustain troops during training exercises. Adequate hydration becomes a critical factor, and logistical support for water supply needs to be carefully organized.

The respondent explained that the challenge of the Danakil desert is prone to frequent sandstorms, which can severely limit visibility and create hazardous conditions for military exercises. These storms can damage equipment and disrupt communication systems, especially during training. The rugged and inhospitable terrain of the Danakil desert presents obstacles to military training exercises. The presence of salt flats, lava fields, and sharp rocks can make movement difficult and dangerous, requiring specialized training and equipment.

During the face to face interview, regiment commanders revealed that all level commanders tried to ensure a common consensus to execute the mission that was given to a unit. The mission was given for the 6th Mechanized Division to securitize the Danakil area from any attack against governmental and public institutions and organizations' property. This shows an individual soldier's commitment to the unit to conduct training for desert operations. Conducting continuous training depends on the EMoND training policy, which explains that all soldiers' moral and psychological, military skill, boldness, self-confidence, and love of their unit are determined by

given training. All commanders must ensure and execute continuous training by understanding the necessary type of training.

4.6.1 Discipline of the Soldiers in the 6th Mechanized Division

The respondents' feedback suggests that the unit faced no discipline issues despite the challenging desert weather conditions. The interview data corroborated this, indicating a lack of discipline problems within the unit except for isolated cases involving individuals. The unit's discipline was maintained through rigorous training conducted within the 6th Mechanized Division across all levels of units. This training included physically demanding activities such as 30km and 40km foot marches, 3km, and 5km runs as a unit, as well as company and regimental offense and defense training. Remarkably, every soldier completed these exercises without complaint under the guidance of their leaders. Furthermore, soldiers endured the harsh local temperatures and challenging terrain features of the Danakil desert during these training sessions.

4.7 Impact of Arid Environment on Combat Readiness

The respondents' in-person accounts and the researcher's observations indicated that the Danakil arid environment on military combat readiness is significant and challenging. The Danakil desert areas also have limited water resources and extreme temperatures, which can make it difficult to transport logistic supplies to military units in the field. This can lead to challenges in maintaining a steady supply of food, water, and equipment, impacting combat readiness. Soldiers operating in Danakil desert area are at risk of heat stress and dehydration due to the intense heat and lack of water sources. This can have impaired cognitive function, physical performance, and overall combat effectiveness.

The researcher observed the effect of Danakil arid weather condition can effect military equipment., increasing the frequency of maintenance and repaired equipment. Dust, sand, and extreme temperatures can damage weapons, vehicles, and communication systems, leading to decreased operational readiness. The extreme Danakil desert temperature and train future interferes with communication systems, making it difficult for military units to maintain reliable and secure communication with command centers and each other. This can hinder coordination and decision making combat operations.

4.7.1 The 6th Mechanized Division Combat Readiness in the Danakil Desert

According to Andrews and Shambo (1980) explained about combat readiness is a condition of the armed forces and their constituent units and formations, warships, aircraft, weapon systems, or other military technology and equipment to perform during combat military operations or functions consistent with the purpose for which they are organized or designed, or the managing of resources and personnel training in preparation for combat. Most armed forces maintain varying levels of readiness by the troops to engage in combat due to economic considerations which vary from minutes to months; in modern armed forces, troops designated Special Forces are usually those kept at the highest state of readiness for combat and are often alerted only a few hours before being committed to combat. Where time is of the essence in military action being initiated, the troops, such as pilots of interceptor aircraft, may be kept in a constant state of combat readiness (Andrews & Shambo, 1980).

The concept of "combat readiness" is characterized by many definitions. Schumm, Bell, Rice, and Schuman (1996) state that the evidence for readiness is mixed because of the different definitions used in the major surveys. Res (2015) says that the initial operation delineated combat readiness as a psychological trait about a soldier's determination and perseverance in executing a particular course of action. This definition emphasizes that the outcome of battles hinges not solely on troop numbers but on their resolve to emerge victorious. The author argues that "combat readiness" inadequately connects motivation and morale in military settings. Instead, he proposes assessing human preparedness for combat through three variables: Individual Mental Readiness, Unit Readiness, and Actual Combat Performance. Schumm, Bell, Rice, and Schuman (1996) give a more comprehensive description when they define readiness as the level of preparedness for performing one's combat mission.

The respondent's response to the combat readiness of their unit was continuous indoctrination activity to motivate the morale of individual soldiers in the unit. In addition, the division deputy commandant for operation revealed during the interview that they highly considered the indoctrination activity to keep up the moral readiness of troops to stand with the challenge of local weather conditions and land features. They ensured physical training by conducting a 40km foot march twice a month to adapt to local weather conditions and keep each soldier's physical strength.

On this long distance, the sandy, rocky area was too challenging to march, but no one said negative ideas during the march. The division deputy commander said the commitment of each soldier to execute a long-distance march indicates the result of continuous indoctrination activity in the unit.

4.7.2 Effective physical and psychological readiness of 6th Mechanized Division

During the face-to-face interview, participants disclosed that the unit prioritized effective physical preparedness to cope with the demanding desert climate. Similarly, the researcher noted during the group discussion that the 6th Mechanized Division remained stationed in the area for four years, the duration of the data collection period. Despite including newly recruited soldiers, the division demonstrated prolonged commitment to their mission in the Danakil region, effectively managing challenges with dedication. Consequently, unit members adapted physically and psychologically to the area's adversities. Additionally, continuous structured physical training sessions were conducted in the Danakil desert environment, further aiding in adapting to the region's unique weather conditions.

The field gymnasium gymnastic facility uses a unit to exercise and train support on pull-ups and dig-ups for physical training. These sports (gymnastics) should be daily activities of the military units to develop individual soldier’s physical strength. As respondents responded, there were not enough gymnasiums and gymnastic facilities for companies assigned to remote areas to build the physical strength of individual soldiers of the unit, but they always foot march and other gymnastics. Based on the researcher's observation, the facility field gymnasium gymnastics built in each regiment was sufficient to train all regiment members continuously. But it was built only on the level of the regiment.

The respondent explained that their unit's physical strength achieved the training goal's standard according to the unit’s plan. On this question, as regiment commanders and division deputy commanders revealed during interviews, all physical training conducted in the unit achieved their goal except for a few individual soldiers. When they mention individual soldiers, they mean the unit achieved the training goal as planned, but only individual soldiers were not. For example, the training goal for push-ups to reach 91% as a unit was achieved, but the rest, 09% of the soldiers in the unit, did not achieve the planned standard of push-ups.

Additionally, as respondents insured, interviews and group discussions in all physical training gymnasium gymnastics (push-up, sit-up, dig-up, and pull-up), foot march on different distances, 3km and 5km distance run as a unit achieved their goal as planned in the unit. This unit achievement was not only physical, but the moral to train physical training with discipline was well achieved. Every physical training assessment of the unit ensured that all individual soldiers were trained continuously by accepting the orders given by their higher command. To sum up, the unit achieved the physical training goal as planned, continuously conducting physical training to ensure combat readiness for desert operations. These unit activities enhance the combatant unit members' ability to adapt to local weather conditions.

4.7.3 Continuous Readiness Checkup Activity in the Unit

The respondents revealed there was continuous readiness check-up to be ready for the Danakil desert operation. Additionally, as respondents ensured during the interview, they had the same idea that there was continuous readiness check up to prepare for desert operation. They explained in detail the readiness checkup activity in the unit. They said readiness checkup was the daily activity of all level commanders' activity. When soldiers wake up early for morning sports, there is a checkup of manpower to begin the sport. To ensure combat readiness of the combatant unit for desert operations daily, weekly, and monthly check-ups of combat equipment in the unit where done continuously.

As the regiment commandant revealed, continuous foot marching in the unit based on the local weather and terrain features was effective. This indicates that the continuous execution of the foot march depended on the unit's local land features and weather conditions. Additionally, as the regiment commandant ensured during the interview: "Not only foot march training but also different kinds of training conducted in the unit continuously." The unit executed all necessary checkups on training and administration duties to upgrade the unit's capability to accomplish the given mission effectively. Also, as the division deputy command ensured during the interview, severe weather conditions affected the daily unit activity. From April until September, the local temperature rose to 450C, which was unsuitable even for training. The unit's training was planned and executed during the local temperature decrease from October to March. Continuous training enables soldiers to ensure physical and psychological readiness for desert operations.

4.7.4 Facility of Entertainment Sports Materials in the Unit

The respondents' in-person accounts and the researcher's observations indicated that sports equipment was provided within the unit. Each regiment had football, handball, and volleyball facilities, including playing fields. However, despite the provision of these facilities, some respondents mentioned during face-to-face discussions that the required sports equipment in their unit was not adequately provided. They explained that the sports materials were supplied at the regiment level, which didn't align with the needs of all manpower across the regiments.

Regarding sports competitions in the unit, the respondents explained that sports competitions are continuously planned. Additionally, as the regiment commandant revealed in an interview, sports competition activity was seen as the main activity of indoctrination in the unit to keep the morale of individual soldiers. The sports competition supports all levels of commandant and unit members to keep each soldier's morale. The sports activity starts at the level of platoons and facilitates the day-to-day communication of individuals and units to each other. On the other hand, as the researcher observed, there were no comfortable fields to play on in each regiment. These sports fields were rocky and rough. Some of the fields were full of sand and dusty. For these reasons, they were not comfortable.

4.8 Conclusion

This chapter focused on data analysis and discussion. Based on research questions, the data collected from respondents indicate that the mission given by ENDF Command to the 6th Mechanized Division was achieved. The division's mission was achieved through continuous physical and psychological training to conduct operations in the Danakil desert. Even though the Danakil desert weather conditions and harsh land features were challenging, the combatant unit successfully achieved readiness. Regarding facilities for combatant units, there is no standardized accommodation, no standard road access, and a transportation system with poor water supply. The Danakil's extreme weather and harsh land features are very challenging for the health of soldiers and for machinery and communication equipment. To overcome the challenges posed by the Danakil Desert, military units must conduct training operations in the Danakil Desert carefully, planning and preparing, and considering the unique environmental conditions. Adequate provision

of supplies, equipment, medical support, and appropriate training adaptations will be essential for successful operational efficacy in this challenging Danakil desert environment.

CHAPTER FIVE

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

5.1 Introduction

This chapter provides the summary of the findings from chapter four and also gives the conclusions and recommendations of the study based on the objective of the study, which involved the determination of operational efficacy in arid environments: a case study of the ENDF 6th Mechanized Division's operations in the Danakil desert Ethiopia and to explore the challenges of desert operation. To propose constructive suggestions for effective combat readiness in desert operations and suggest alternative solutions that might help alleviate the problem under study. A descriptive survey method was employed to achieve this purpose. The study attempted to get answers to the following research questions: (1) How effective are command and control systems of ENDF 6th Mechanized Division effective in conducting operations in the arid environment of the Danakil Desert? (2) What are the specific logistical and supply chain difficulties encountered by the ENDF 6th Mechanized Division in sustaining operations? (3) What is the role of training and operational preparedness in enhancing the operational efficacy of the ENDF 6th Mechanized Division in the arid environment of Danakil Desert? (4) What is the effect of the arid environment on the operational readiness of personnel and equipment's of the 6th Mechanized Division in the Danakil Desert? In this chapter, the study's significant findings are summarized, conclusions based on the findings are drawn, and recommendations are given.

5.2 Summary of the Findings

Ensuring effective combat readiness in military units is not an easy activity. It includes many kinds of activities for all levels of commanders and requires the commitment of each soldier. Ensuring combat readiness for desert operations is especially challenging than in other areas of operations due to difficult weather conditions and the harsh land features of the desert. From many activities of combat readiness for desert operations, conducting different physical and psychological training played a crucial role. Training individual soldiers to adapt to the desert environment is vital to keep troops psychologically ready.

The research has tried to identify the based on the objectives of the research that the 6th Mechanized Division for desert operation. Based on the major findings of the study, the following summary are drawn:

5.2.1 Effectiveness of Command and Control Systems in Coordinating Situational Awareness in the Arid Environment

In the Danakil desert, operations require effective command and control to counter specific environmental threats. Extreme heat, sandstorms, and limited water sources can significantly impact personnel's physical and mental capabilities. Commanders must consider these factors while planning and executing operations, ensuring troops are adequately supplied with food, water, and protective gear to sustain the mission. The nature of the Danakil desert terrain generally lacks natural landmarks and can be challenging to navigate. Commanding and controlling these operations involves careful planning and accurate mapping. Detailed knowledge of the environment, including potential hazards, geographical features, and possible routes, is crucial. Commanders closely coordinate with intelligence units to gather and analyze relevant data, enabling them to make informed decisions and effectively navigate the desert.

Command and control in military desert operations involve establishing reliable communication networks, addressing environmental challenges, meticulous planning and mapping, and coordinating all combatant unit elements, which is essential for successfully executing operations, ensuring efficient decision-making, and mission accomplishment in the desert. Depending on the above summary in this study, significant achievements and problems were found.

The 6th Mechanized Danakil desert operation involves military operations based on their mission in desert environments. These operations require specifically trained personnel and specialized equipment to navigate and operate effectively in these harsh conditions. Command and control are crucial to any military operation, including those in the desert. Command and control refers to planning, directing, coordinating, and controlling military forces during operations. In Danakil desert operations, command and control become even more vital due to the unique challenges posed by the environment. One of the key aspects of command and control in desert operations is ensuring a clear communication network. This is necessary to enable information sharing among different combatant units and to maintain situational awareness. Danakil deserts often have vast,

open spaces with limited or no natural cover, hindering communication. Therefore, establishing reliable and secure communication channels, such as radio systems networks, is crucial.

5.2.2 Logistical and Supply Chain Difficulties Encountered by the ENDF 6th Mechanized Division in Sustaining Operations

The study revealed that ensuring effective logistical support is the most important activity to ensure combat readiness for the Danakil desert operation. When we look at Ethiopia's highlands, it is evident that its natural features provide the basic human needs, including water and moderate temperature, necessary to survive and accomplish the assigned mission. In the case of the Danakil desert, dominated by extreme weather conditions and harsh land features, it is too difficult to get the natural resources that can sustain the force. The direct sunlight emanates extremely high temperatures, making it too difficult to stay out of the house, especially at noon. There is no tree in the Danakil desert to stay under its shadow to protect the soldiers from direct sunlight. The storms around the entire Danakil desert frequently occurred, destroying houses. During the high-temperature season, staying in a house without air-conditioning is impossible. Based on these, the house building for combat units needs critical consideration, such as the houses must be strong enough to resist these storms and have standard air conditioning.

5.2.3 Training and Operational Preparedness in Enhancing the Operational Efficacy of The ENDF 6th Mechanized Division in the Arid Environment of Danakil Desert

Physical, technical, and tactical training of the 6th Mechanized Division was continuously conducted by determining the effect of the desert environment and its land features. All synchronization of combatant and combat service units determines the effectiveness of training for combat readiness. The combat engineer, military intelligence, communication, fire and maneuver, command and control, and logistical issues properly coordinated during training and committed to withstand the challenges of desert operation. During the training of offense and defense, synchronizing fire and maneuver is critical to prepare a combatant unit for operation.

The study found that the 6th Mechanized Division has tried to achieve all types of training that were continuously conducted in the unit to ensure combat readiness for the Danakil desert operation. The expected progressive result of unit training was achieved in technical, tactical,

psychological, and physical readiness for desert operations, and there is a common consensus to conduct training. The study depicted that the 6th Mechanized Division unit's discipline ensured when difficult training was conducted. The training, which is difficult and causes fatigue on individual soldiers, like 30km and 40km foot march, 3km and 5km run, company and regiment offense and defense tactical training was accomplished with a high degree of commitment by all the unit members. In addition, individual soldiers accomplished this training by resisting the local high temperature and difficult land features.

The physical training in the unit gymnasium gymnastics (push-ups, sit-up, dig-up, and pull-ups), foot march on different distances, at different land features, and 3km and 5km distance run were achieved their goals as planned in the unit. This achievement of the unit's plan was based on physical strength, and the morale of soldiers trained with different training methods and discipline was continuously maintained. Every physical training assessment of the unit ensured that all individual soldiers were trained to accomplish things continuously by accepting the orders given by their higher command.

5.2.4 The Impact of the Arid Environment on The Operational Readiness of Personnel and Equipment's of The 6th Mechanized Division in the Danakil Desert

The study also found that the challenge of the local high-temperature weather conditions affects human health. High temperatures can exhaust too much necessary liquid from our bodies, cause skin diseases, and affect a soldier's appetite. To sustain and keep health care at Danakil desert, additional medical and timely ambulance services are needed to take and save patients to referral hospitals.

5.3 Conclusion

The research has tried to identify the challenges that affect preparing the 6th Mechanized Division for desert operation. Based on the major findings of the study, the following conclusions are drawn:

5.3.1 Effectiveness of Command and Control Systems in Coordinating Situational Awareness in the Arid Environment

Command and control in the Danakil desert present unique obstacles for military operations. The extreme temperatures, limited water supply, harsh terrain, and lack of natural cover can greatly impact the effectiveness of military forces, especially on communication materials, field training, and logistic supply. However, military operations can overcome these challenges through proper

planning, training, and adaptation. Specialized equipment like desert combat vehicles, advanced communication technology, and aerial support can provide crucial advantages in desert environments. Additionally, understanding the desert's natural features, such as sand dunes and mirages, can help military forces navigate and exploit these elements to their advantage. While desert challenges may pose tremendous difficulties, a well-prepared and strategically-minded military force can successfully execute operations in these environments.

5.3.2 Logistical and Supply Chain Difficulties Encountered by the ENDF 6th Mechanized Division in Sustaining Operations

In the 6th Mechanized Division, logistic supply is critical in Danakil desert operations, ensuring the sustained support and mobility of forces operating in these challenging environments. The unique conditions of the Danakil desert, including extreme temperatures, vast and rough terrain, and limited resources, require careful planning and execution of logistic supply operations. Efficient and effective logistic supply in Danakil desert operations relies on several key factors. First and foremost, thorough and accurate logistical planning is essential. This involves estimating the required resources, such as fuel, water, food, ammunition, and medical supplies, based on the mission's duration, the number of personnel involved, and the specific demands of desert conditions.

Furthermore, appropriate transportation and storage systems are crucial in the Danakil desert environment. Specialized vehicles, such as ruggedized trucks and armored personnel carriers, are often required to traverse the challenging terrain. Adequate storage facilities, including refrigeration or climate-controlled options, are needed to preserve supplies and equipment. Supply routes and lines of communication must also be carefully established and maintained. Danakil desert operations often involve long distances and isolated areas, making it necessary to plan for the resupply of forward operating bases and reconnaissance units. Additionally, alternative routes and backup plans should be developed to mitigate the risk of disruptions caused by sandstorms, enemy actions, or mechanical failures.

Effective communication and coordination between logistics personnel, commanders, and field units are critical for ensuring timely and accurate supply delivery. This includes utilizing advanced technologies, such as GPS tracking, communication systems, and unmanned aerial vehicles, to monitor and manage logistics operations in real-time. The training and readiness of logistics

personnel are crucial for successful supply operations in desert environments. Training should encompass the specific challenges of operating in deserts, including navigation, desert survival skills, and proper equipment handling in extreme conditions. It needs highly trained personnel. By prioritizing and managing logistics, military forces can maintain operational readiness, mobility, and sustainment in challenging desert environments.

5.3.3 Training and Operational Preparedness in Enhancing the Operational Efficacy of The ENDF 6th Mechanized Division in the Arid Environment of Danakil Deser

In the 6th Mechanized Division, ensuring combat readiness in the Danakil Desert requires a comprehensive approach that addresses various factors. Proper training and preparations are essential for soldiers to cope with extreme environmental conditions, such as high temperatures and scarce resources. This involves specialized training programs on heat adaptation, hydration, and desert survival techniques. Logistical support plays a crucial role in combat readiness. Ensuring the availability and proper maintenance of equipment, vehicles, and supplies is essential to sustain operations in such harsh conditions. Adequate planning and supply chain management are necessary to prevent delays due to logistical challenges.

Considering its remote and hostile nature, accurate intelligence gathering and situational awareness are essential in the Danakil Desert. Regular reconnaissance missions use advanced surveillance technologies. Establishing strong partnerships, cooperation with regional allies, and collaboration with local communities and nomadic tribes can enhance combat readiness in the Danakil Desert. Joint training, information sharing, and mutual support can improve the overall preparedness and effectiveness of military operations in the region.

In terms of personnel management, ensuring soldiers' physical and mental well-being is of utmost importance. Regular health check-ups, access to medical facilities, and psychological support services are necessary to address the challenges associated with serving in such extreme conditions. By considering these various factors and implementing comprehensive strategies, combat readiness in the Danakil Desert can be ensured, enabling military forces to operate effectively and achieve their objectives despite the challenging environment.

5.3.4 The Impact of the Arid Environment on The Operational Readiness of Personnel and Equipment's of The 6th Mechanized Division in the Danakil Desert

The Danakil Desert presents numerous challenges and potential obstacles for military operations. Its extreme temperatures, rugged terrain, and limited resources make navigating and sustaining military activities harsh. The impact of the Danakil Desert on military operations is significant and requires careful consideration. The unique climate conditions in the Danakil Desert, such as scorching heat and aridness, can seriously threaten soldiers' physical well-being and performance.

However, military operations can overcome these challenges through proper planning, training, and adaptation. Specialized equipment like desert combat vehicles, advanced communication technology, and aerial support can provide crucial advantages in desert environments. Additionally, understanding the desert's natural features, such as sand dunes and mirages, can help military forces navigate and exploit these elements to their advantage. While desert challenges may pose tremendous difficulties, a well-prepared and strategically-minded military force can successfully execute operations in these environments.

In general the significance of adapting military operations and strategies to Danakil desert environments are the key activity of all level commanders. The 6th Mechanized Division of the Ethiopian National Defence Forces (ENDF) underwent specific training and utilized equipment suitable for desert operations to overcome the challenges posed by the Danakil Desert. It needs well managed logistic supply chain in Danakil desert for effective operation. Effective transportation of personnel, equipment and supplies becomes critical, considering the harsh conditions and limited resoureses available in Danakil desert.

5.4 Recommendations

The following recommendations for Ethiopian Defence forces are forwarded based on the study's major findings. To ensure command and control in the 6th Mechanized Division in the Danakil desert, it is vital to gather detailed information about the target area. This includes studying the terrain, identifying the potential threats, and understanding weather patterns. Establish an efficient communication system for military operations in the Danakil desert, which combines various technologies and tactics to ensure effective communication, coordination, and, ultimately, the mission's success. Reliable communication systems are necessary for coordinating operations in the desert. Strong and secure radio networks, satellite communication systems, and backup options

should be in place when communication infrastructure is compromised. Establishing reliable communication equipment is crucial to maintain combat between units and command centers.

Logistic supply in the Danakil desert operation must continuously ensure that military personnel are equipped with necessary vehicles, such as robust off-road trucks, capable of navigating the challenging Danakil desert train. Prioritize vehicles with high ground clearance and good suspension systems. Due to the harsh Danakil desert conditions, secure, reliable water and fuel supply lines. Establish base camps and outposts with sufficient storage capacity to sustain the operation. And implement rationing protocols to avoid shortages. Logistic supply in military desert operations is a complex and demanding task. It requires comprehensive planning, specialized equipment, robust communication systems, and highly trained personnel. By prioritizing and managing logistics, military forces can maintain operational readiness, mobility, and sustainment in challenging Danakil desert environments.

Implementing comprehensive strategies and combat readiness in the Danakil Desert can be ensured, enabling military forces to operate effectively and achieve their objectives despite the challenging environment. Training and adaptation are critical for the Danakil desert operation. Military personnel need to undergo specific training in Danakil desert warfare. This should include familiarization with the harsh desert environment, combat tactics suited for desert terrain, and survival skills in extreme desert conditions. In the Danakil desert operation, to ensure combat readiness, it is more advantageous to use unmanned aerial vehicles (UAVs), helicopters, and other aircraft for surveillance, reconnaissance, and even air strikes when necessary. Leveraging aerial support can enhance overall situational effectiveness.

Utilize advanced intelligent surveillance and reconnaissance (ISR) technologies to effectively monitor and track enemy movements in the desert. Deploy drones, surveillance aircraft, and ground-based sensors to gather real-time information and maintain situational awareness. Additionally, it's vital to have contingency plans in place for unforeseen circumstances or emergencies during desert operations. This includes evacuation plans, medical emergency protocols, and alternative routes or extraction methods if primary plans are compromised.

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LIST OF APPENDIXES

Appendix I: Interview Guide

Face to face Interview guide for 6th Mechanized Division and regiment commanders and senior directing staffs

The purpose of this interview was to gather additional information for the study of operational efficacy in arid environments: a case study of the ENDF 6th Mechanized Division's operations in the Danakil desert.

Please note that any information that you give to each of the interview is kept confidential and thus I request you to feel free and respond to each item without any fear.

Thanks you in advance for your cooperation!

Questions

1. What is your suggestion on challenge of weather condition on individual health?
2. What is your suggestion on enough logistic supplies for combatant unit?
    a. Is there enough water transportation?
    b. Enough and comfortable accommodation?
3. What is your suggestion the challenge of weather condition on execution of training as planned?
4. What is your suggestion enough accessibility of transportation for logistic supply on time?
5. How commanders continuously assess physical and psychological readiness of each individual soldier is ensured to cope up-with the challenge of desert weather condition and land feature?
6. Is there all level commander's continuous assessment of unit readiness for preparation of desert operation
7. Is there pro-active and continuous disease awareness (education) is given for all soldiers depend on desert weather?

8. What is your suggestion combat training to ensure physical and psychological readiness to ensure readiness for desert operation?
9. What are challenges happened during training on soldiers?
10. What is your suggestion the challenge of weather condition on training of artillery and mortar fire execution?
11. What are differences of challenges of the area compering with high land area?

Appendix II: Group Discussion

Group discussion for 6th Mechanized Division deputy commandant and senior directing staffs

The purpose of this discussion was to gather additional information for the study of operational efficacy in arid environments: a case study of the ENDF 6th Mechanized Division's operations in the Danakil desert.

Please note that any information that you discuss on each of the discussion is kept confidential and thus I request you to feel free and respond to each item with tout any fear. For this reason, you are not required to mention your name.

Thanks you in advance for your cooperation

Group Discussion points

1. The challenge of desert to command and control, and logistic support.
    a. Effect of weather condition in all activity of command and control
    b. Challenges of transportation due to harsh land feature and weather condition
    c. Challenges of medication in desert area
2. The challenge of desert area to supply water and food for combatant units
3. About activity of division hospital on health education, treatment and care of patients, and challenge of desert on their activity.
4. For what standard accommodation facility and necessary matchiness facilitated for combatant units?
5. Effect of weather condition on different combatant equipment (machine guns, ammunitions and communication radio) in the area? As experience what challenges happen during training
6. For what level Physical and psychological readiness of each individual soldier is ensured to cope up-with the challenge of desert weather condition and land feature.

Appendix III: Field Observation

Field Observation plan for Danakil areas Mille and Samara (6th Mechanized Division)

The purpose of this observation was to gather additional information for the study of operational efficacy in arid environments: a case study of the ENDF 6th Mechanized Division's operations in the Danakil desert.

Observation Checklist

1. Observation field notes---------- challenge of weather condition and land feature of the area, water supply, accommodation, standard and availability of necessary machines, and road facility
2. Place---------- Danakil areas Mille and Samara Artillery and Tank regiments
3. Observer---------- Col Amanu Magerssa Kicha
4. Supporter of observer---------- Escort team and drivers with two vehicles
5. Role of observers---------- observing and evaluating the water supply, accommodation, gymnasium gymnastic field, and road facility
6. Time and date---------- 07:00 – 10:00 Wednesday & Thursday 27 & 28 December 2023
7. Duration of observation---------- 3:00h each day
8. Generally, the distance of 6th Mechanized Division head quarter (Samara) is 650km from Addis Ababa. It takes one day to go there, two day for data gathering then one day for return back to Addis Ababa totally four days. Depend on this the necessary budget for data collection is as follow.