

THEATER SUSTAINMENT RESERVE FOR THE
RWANDA DEFENCE FORCES

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General Studies

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RUKI KARUSISI, MAJOR, RWANDA DEFENCE FORCES
M.SC., Carnegie Mellon University, Pittsburgh, Pennsylvania, 2010

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Name of Candidate: Major Ruki Karusisi

Thesis Title: Theater Sustainment Reserve for the Rwanda Defence Forces

Approved by:

_____, Thesis Committee Chair
Douglas E. Lathrop, M.A.

_____, Member
John S. Schoen, M.Ed.

_____, Member
Kenneth E. Long, D.M.

Accepted this 10th day of June 2016 by:

_____, Director, Graduate Degree Programs
Robert F. Baumann, Ph.D.

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ABSTRACT

THEATER SUSTAINMENT RESERVE FOR THE RWANDA DEFENCE FORCES, by Major Ruki Karusisi, 91 pages.

This thesis will evaluate the theater sustainment reserve required for the Rwanda Defence Force (RDF) to support combat operations. Logistics provide the backbone for Army combat operations. “The endurance of Army forces is primarily a function of their sustainment.” (Army Doctrine Reference Publication 4-0, iv) Rwanda primarily faces a threat from the “Front Democratique pour la Liberation du Rwanda-Interahamwe” (FDLR-Interahamwe), a rebel group operating from the Democratic Republic of Congo (DRC) whose ideology threatens the existence of a developmental state in Rwanda. Over the last decade, Rwanda has launched operations to dismantle this terror group resulting in interstate conflict between Rwanda and the DRC. To support its combat operations, Rwanda, realistically a double landlocked country, relies on two major corridors for supplies. The Northern corridor from the port of Mombasa-Kenya via Uganda to Rwanda, and the central Corridor from the port of Dar es salaam-Tanzania to Rwanda. The reliability of both corridors has varied over time. Consequently, to achieve freedom of action the RDF should integrate a robust logistical structure to meet future challenges. The reserve requirement will be a key feature of the needed aforementioned structure.

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ACRONYMS

APOD	Aerial Port of Debarkation
DR	District Road
DRC	Democratic Republic of the Congo
FAR	Forces Armées du Rwanda (Armed Forces of Rwanda)
FARDC	Forces Armées de la République Démocratique du Congo (Armed Forces of the Democratic republic of Congo)
FDLR	Forces Démocratiques de Libération du Rwanda (Democratic Forces for the Liberation of Rwanda)
GLOC	Ground Lines of Communication
KIA	Kigali International Airport
M23	Mouvement du 23 Mars (March 23 Movement)
MAGERWA	Magasin Généraux du Rwanda (General Stores of Rwanda)
MINAFFET	Ministère des Affaires Etrangères et de la Coopération (Ministry of Foreign Affairs and Cooperation)
MINICOM	Ministère du Commerce (Ministry of Commerce)
MININFRA	Ministère des Infrastructures (Ministry of Infrastructure)
MONUC	Mission de l'Organisation des Nations Unies en République démocratique du Congo (United Nation Observer Mission in the Democratic Republic of Congo)
MONUSCO	Mission de l'Organisation des Nations Unies pour la Stabilisation en République démocratique du Congo (United Nation Stabilization Mission in the Democratic Republic of Congo)
NR	National Road
QLET	Quick Logistics Estimation Tool
RCAA	Rwanda Civil Aviation Authority
RDF	Rwanda Defence Force

SPOD	Sea Port of Debarkation
UN	United Nations

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CHAPTER 1

INTRODUCTION

Background

Sustainment remains a substantial factor for Armies' mission accomplishment. To build combat power and maintain Army readiness, armed forces synchronize logistic operations from the strategic to the tactical level. This is accomplished through the integration of allocated financial resources to ensure the armed forces are trained, equipped and ready to accomplish the full spectrum of combat missions. "The quality of force readiness is measured by its sustainment. Sustainment maintains the Army forces by manning it with trained Soldiers and leaders; funding it with required resources; equipping it with the materiel (individual and unit); maintaining Soldier and Family readiness; and sustaining it for decisive action" (Department of the Army 2012, 1-1). This entails logistics, personnel services and health service support.

This proposal will test the above hypothesis in the context of the Rwanda Defence Force (RDF) core mission to protect and defend the nation. The instability of the Great Lakes region has been largely influenced by the presence of the *Forces Démocratiques pour la Libération du Rwanda* (FDLR), a terror group based in the eastern Democratic Republic of the Congo (DRC). These militias have regrouped there and continue to launch cross-border operations into Rwanda. Over the past decade, Rwandan troops crossed into the DRC to crack down on this militia group. The campaign was later transferred to the international community under a United Nations (UN) peacekeeping operation for the DRC. This mission has not been successful in uprooting these militias from the eastern DRC. Desiring to continue their genocidal ideology, and the failure by

the international community to dismantle the militia group, the FDLR continues to pose a challenge to Rwanda's development.

The *Interahamwe*, which can be loosely translated as “those who fight/attack together” in Rwanda's national language, is a Hutu extremist paramilitary organization. This organization is founded on key principles of a genocidal ideology. This ideology is based on the premise that one of the ethnic groups, called Tutsi, which lives currently mainly in Rwanda, eastern DRC, Burundi and Uganda, should be exterminated. According to this ideology, extermination of this group would ensure national and regional peace and prosperity.

Prior to April 1994, The Forces Armees Rwandaise (FAR) constituted the Rwandan national Army and were therefore equipped, trained and organized as such. The members of the FAR in turn organized and trained the *Interahamwe* as a militia force to provide support to the FAR during the execution of the 1994 Genocide. The militia therefore enjoyed the backing of the Hutu-led government in the preparation and execution of the Genocide against the Tutsi. In 1994, both forces were defeated by what now constitutes the RDF. The *Interahamwe* has since been reconstituted as the FDLR.

In July 1994, upon military defeat and the establishment of a new government in Rwanda, the FDLR fled out of Rwanda, to what is now the DRC. The FDLR have used the DRC as a base to reorganize, recruit members and spread their genocidal ideology in the Great Lakes region of Central Africa. Its members still make regular attempts to destabilize Rwanda by taking part in raids and insurgency across the DRC-Rwanda border. In 1999, FDLR attacked and kidnapped a group of 14 foreign tourists in Bwindi

National Park, Uganda underlining FDLR's will to destabilize other countries in the Great Lakes Region. The latest such incident was officially reported in June 2014.

The FDLR is predominantly considered a terrorist organization by most western governments, as well as several African countries (including Rwanda, the DRC, and several others) due to its ideology and brutal attacks on civilians.

In 1996, the First Congo war began; at the time, the new Government of Rwanda grew increasingly concerned that members of FDLR, carrying out cross-border raids from DRC, were planning an invasion of Rwanda. The militia had entrenched itself in refugee camps of eastern DRC and operated with full impunity.

The new government of Rwanda (in power from July 1994) protested officially to the continuous violation of Rwandan territorial integrity by extremist groups based in the DRC. The Mobutu government, of what was then called Zaire, denied these accusations and took no concrete steps to address the threat posed to Rwanda by the FDLR.

A new military rebel movement led by Laurent-Desire Kabila was formed against the government of Mobutu. This rebel movement moved methodically down the Congo River, encountering only light resistance from the poorly trained, ill-disciplined forces of Mobutu's crumbling regime. In March 1997, Kabila's forces launched an offensive and three months later, Mobutu fled to Morocco (where he died four months later). Kabila was therefore proclaimed President of the country in May 1997. The relations between Rwanda and Kabila's DRC soured rapidly due to the lack of common understanding regarding how the FDLR threat ought to be addressed.

On 6 November 1998, Rwandan President Paul Kagame officially acknowledged the presence of Rwandan Defence Forces in the DRC as a means to preserve the security

of the Rwandan national borders. At the same time, various members of the Southern African Development Community, to which the DRC is a member, deployed armed forces to support the DRC Armed forces. This triggered the Second Congo War. In July 1999, Rwanda, Uganda, Angola, Namibia, and Zimbabwe agreed to a ceasefire at a summit, which took place in Lusaka, Zambia.

Following this ceasefire, the UN Security Council established the United Nations Organization Mission in the DRC (MONUSCO) by its resolution 1279 of 30 November 1999. The initial mandate of this peacekeeping mission was to “plan for the observation of the ceasefire and disengagement of forces and maintain liaison with all parties to the Ceasefire Agreement.” Additionally, through several UN Security Council resolutions, this mandate was expanded to include the supervision of actual execution of the ceasefire agreement as well as implement multiple political, military, rule of law and capacity-building tasks (MONUSCO 2015a).

On 1 July 2010, the Security Council further extended the mandate of the mission to authorize the MONUSCO to use all necessary means to carry out its mandate. The mission included, among other things, the protection of civilians, humanitarian personnel and human rights defenders under imminent threat of physical violence as well as the support of the government of the DRC in its stabilization and peace consolidation efforts (Vogel 2014).

The Council decided that MONUSCO would comprise, in addition to the appropriate civilian, judiciary and correction components, a maximum of 19,815 military personnel, 760 military observers, 391 police personnel and 1,050 members of formed police units. Part of MONUSCO’s mandate inevitably included uprooting FDLR based

militias from eastern DRC. By then, these Hutu militias had become notorious for committing human rights atrocities such as rape, torture and kidnapping of Congolese civilians (Hatcher and Perry 2012).

The MONUSCO, created to contain the Congolese conflict, is one of the largest and most expensive missions in the UN's history. Since 1999, the UN peacekeeping effort in the DRC has spent over \$9 billion, and by 2011, the total number of UN troops exceeded 20,000. These troops have been contributed by more than 30 nations from different continents.

A mission of this size and scope has inevitably met with several challenges such as delays in funding, long waits for the United Nations Security Council's authorization to deploy personnel, as well as a lack of a common language and training methods. Unity of command and execution is often difficult to achieve in UN operations given the diversity of contributing states (Menoji 2013).

In March 2013, the UN Security Council authorized a special "Intervention Brigade" to be set up for an initial period of one year and within the authorized troop ceiling of 19,815. It would consist of three Infantry Battalions, one Artillery Unit and one Special Force and Reconnaissance Company with headquarters in Goma (eastern DRC), and operate under direct command of the MONUSCO Force Commander. This force was comprised of forces from South Africa, Malawi and Tanzania. Its responsibility was to neutralize armed groups with the aim to reduce the threat posed by armed groups to state authority and civilian security in the eastern DRC.

The same UN resolution strongly condemned the 23 March Movement (M23), the Democratic Forces for the Liberation of Rwanda (FDLR-*Interahamwe*), the Lord's

Resistance Army “and all other armed groups and their continuing violence and abuses of human rights.” It tasked the new brigade with carrying out offensive operations, either unilaterally or jointly with the Congolese Armed Forces; “in a robust, highly mobile and versatile manner” to disrupt the activities of those groups (Menodji 2013).

Operations to defeat the FDLR by MONUSCO remained at the stage of repeated announcements. To date the longest-serving, most resilient armed rebel group on DRC territory still includes perpetrators of the genocide against the Tutsi subject to international prosecution yet serving at their highest level of command. Genocidal ideology remains part of its military and political education, despite the fact that many of its current fighters (mainly those under 30 years old) did not participate in the 1994 Genocide.

In December 2013, MONUSCO announced the start of anti-FDLR operations but to no avail. In May 2014, a second official announcement was made pertaining to a joint operation with the Congolese Armed Forces (FARDC) in western Rutshuru territory of North Kivu Province. This operation failed due to the persistence of certain FARDC-FDLR networks at the local level, but also from reluctance within the Intervention Brigade.

The Intervention Brigade was credited with ground success regarding fighting other rebel groups but was heavily criticized for its lack of action against the FDLR group. In December 2014, media reports supported Human Rights Watch contentions about massacres in Beni, North Kivu Province. Human Rights Watch reported that rebels brutally murdered more than 180 civilians in eastern DRC within three months. Furthermore, The UN Head of Mission in the DRC, Martin Kobler, conceded that the

FARDC, has had “little appetite” to carry out missions against these perpetrators (Hatcher and Perry 2012).

Various stakeholders have independently confirmed that currently the Intervention Brigade (Tanzanian and South African troops) do not have the clearance to engage in fighting with the FDLR, leaving the Malawian battalion as the only force that could engage. It is still unclear to date which strategy has been chosen by the Intervention Brigade and the FARDC to defeat the FDLR as per previous international commitments.

In a letter addressed to the UN Security Council on 9 July 2013 by the UN Ambassador from Rwanda, Eugène-Richard Gasana, the Government of Rwanda made the three following accusations against the Government of the Democratic Republic of Congo:

- (1) Senior commanders of the MONUSCO Force Intervention Brigade held tactical and strategy meetings with FDLR commanders, thereby causing serious concern to Rwanda;
- (2) Enhanced collaboration between FARDC and FDLR is taking place, with the knowledge and support of MONUSCO Force Intervention Brigade commanders; and several FDLR units or commanders have been integrated into FARDC-Interahamwe commando units deployed near the border with Rwanda, and in some cases, certain MONUSCO brigade commanders are aware and supportive of such instances;
- (3) There are deliveries of large quantities of weapons and ammunition to FDLR by FARDC officers, with the knowledge and support of MONUSCO Force Intervention Brigade commanders. (UN Security Council 2013)

Further, the Rwandan Ambassador concluded that the above mentioned elements raise a significant threat to the security of his country and seriously challenge the credibility and reliability of MONUSCO (UN Security Council 2013).

More recently, the role of FLDR-*Interahamwe* spilled over to Burundi. Indeed, during the crisis that started earlier in 2015, the Government of Burundi has been accused

by the Government of Rwanda of using FDLR to support Burundian security forces in repressing protesters (Ministry of Foreign Affairs and Cooperation of Rwanda 2015).

On 25 April 2015, the ruling political party in Burundi, the National Council for the Defense of Democracy-Forces for the Defense of Democracy, confirmed that President Pierre Nkurunziza, would run for a third term in elections to be held in the same year. The opposition had long argued that President Pierre Nkurunziza was not eligible for a third term as per the current constitution. The announcement by the National Council for the Defense of Democracy-Forces for the Defense of Democracy of the third term intent triggered violent protests and demonstrations by the opposition and selected civil society groups in the capital city of Bujumbura.

In May 2015, the Minister of Foreign Affairs of Rwanda, Louise Mushikiwabo, stated in an official statement that “We take seriously the reports of links to FDLR, the hundreds refugees crossing into Rwanda daily and above all the imperative of protection of civilians. We appeal to leaders of Burundi to do everything in their power to bring the country back to a peaceful situation. We will continue to work with the region and the international community to support peace” (Ministry of Foreign Affairs and Cooperation of Rwanda 2015).

Since this statement was made, diplomatic relations have significantly deteriorated as illustrated by Burundi’s decision to expel a Rwandan diplomat in October 2015. Allegations surrounding the role of FDLR’s role in the Burundi crisis are at the heart of diplomatic tensions between the two countries.

In conclusion, the Rwandan Defence Forces must be postured to face the challenges posed by FDLR forces. These challenges can be manifested through a direct

violation of Rwanda's national borders or through proxy conflicts with its neighbors. The FDLR therefore still affects national security along with regional foreign diplomatic relations.

In view of this threat, the RDFs must rely heavily on regular and reliable access to imported military goods to cover its logistical needs. This is not without its own challenges as Rwanda is also a geographically landlocked country situated in between Central and East Africa. Rwanda essentially trades its imports and exports through;

1. the Port of Mombasa-Kenya, via Uganda on the Northern Logistics Corridor,
2. the Port of Dar es Salaam- Tanzania on the Central Logistics Corridor.

These two corridors constitute the mainstay for bulk national supplies.

Figure 1 shows the East African trade routes.

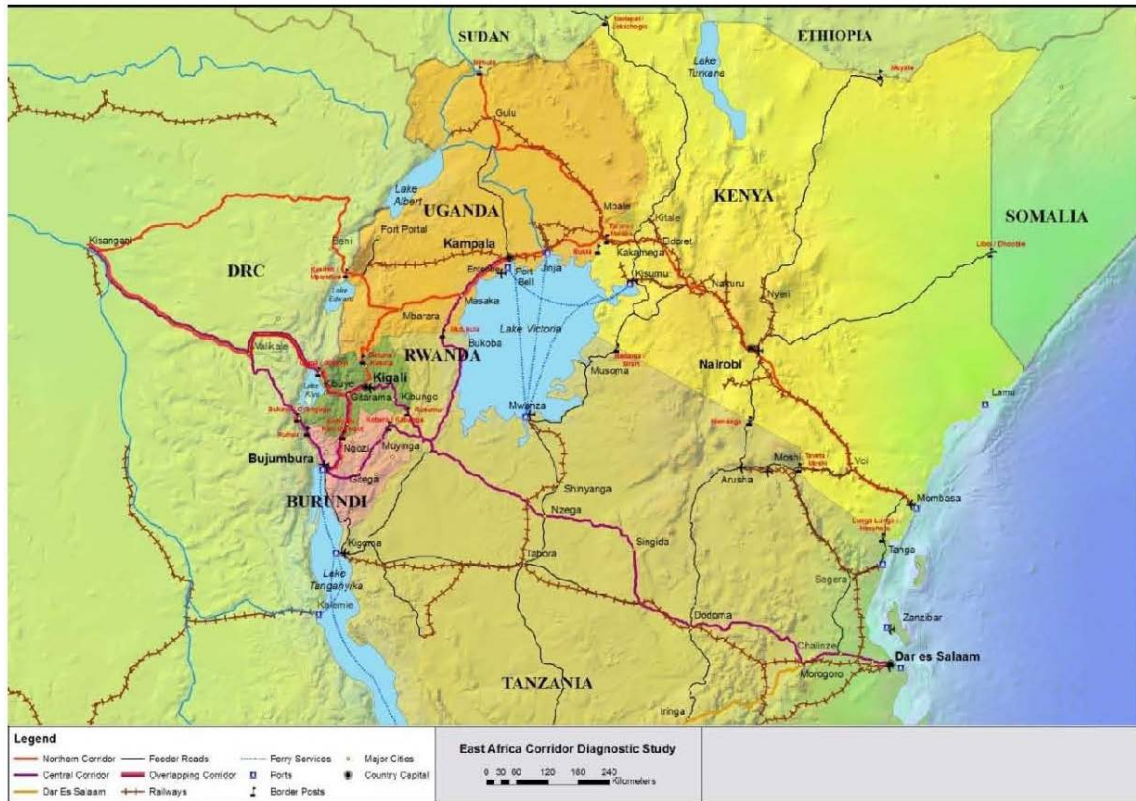


Figure 1. East African Trade Routes

Source: Nathan Associates Inc, *Corridor Diagnostic Study of the Northern and Central Corridors of East Africa* (Action Plan submitted to Task Coordination Group, Chaired by EAC, Alloys Mutabingwa, Deputy Secretary General Planning and Infrastructure, Arusha, Tanzania, 15 April), accessed 5 March 2016, <http://www.nathaninc.com/sites/default/files/Pub%20PDFs/CDS%20Action%20Plan%20Volume%201.pdf>.

The Northern Corridor is heavily dependent on the security situation in Kenya. In the past four years, Kenya has been subject to several terror attacks from Al-Shabaab, an outgrowth of the Islamic Courts Union. It identifies itself as waging war against “enemies of Islam” (i.e., Jihad), and is engaged in battlefield operations against the Federal Government of Somalia and the African Union Mission in Somalia. Al-Shabaab has been designated as a terrorist organization by Australia, Canada, the United Arab Emirates, the

United Kingdom and the United States (The National Counterterrorism Center 2015). “In 2008, the US Government classified Al-Shabaab as a Foreign Terrorist Organization under Section 219 of the Immigration and Nationality Act (as amended) and as a Specially Designated Global Terrorist entity under Section 1(b) of Executive Order 13224 (as amended)” according to the U.S. National Counterterrorism Center. In 2012, the United States offered rewards for the capture of several al-Shabaab leaders (The National Counterterrorism Center 2015).

In October 2011, a mission led by the Somali Army with the support of the Kenyan Defense Forces was launched in Southern Somalia against Al-Shabaab. Since June 2012, the Kenyan forces have been officially integrated into African Union Mission in Somalia. With 3,664 people deployed, Kenya provides fewer personnel to African Union Mission in Somalia than Uganda, Ethiopia or Burundi (U.S. Department of State 2012). However, since 2011, Kenya has suffered the most from violent retribution from Al-Shabaab. Several factors have rendered Kenya more vulnerable to terror attacks. These include but are not restricted to;

1. a porous border with Somalia,
2. unstable neighbors,
3. Islamic fundamentalism and
4. high inequality with pockets of poverty among the unemployed youth

(Bremmer 2015).

Since 2013, Al-Shabaab has launched high-profile operations. Most publicized among those are the September 2013 Westgate Mall attack in Nairobi and the May 2014 attack against a restaurant in Djibouti. The Westgate attack killed 67 Kenyan and non-

Kenyan nationals. Since 2012, Al-Shabaab has carried out several attacks in Garissa (situated near the Somali border) amassing over 170 casualties (Bremmer 2015).

Al-Shabaab also claimed responsibility for the twin suicide bombings in Kampala, Uganda on 11 July 2010 that killed more than 70 people. It is worth noting that Uganda is one of the largest contributors of troops and logistics to African Union Mission in Somalia. Ugandan security services have several times issued public warnings against possible terror attacks on its territory.

Al-Shabaab has in the past focused terror attacks specifically on Mombasa, the city where the main port of the Northern Logistics Corridor is located. On 14 March 2014 in Mombasa two terrorists were arrested while driving a car carrying two improvised bombs. Once again, on 3 May 2014, a twin terrorist attack was carried out in Mombasa thereby killing two people. On 23 May 2014, two people were injured as Al-Shabaab operatives threw a grenade at a police vehicle (Aronson 2013).

Over the recent years, Kenya and Uganda have been targeted by Al-Shabaab due to their pro-active engagement in the fight against terrorism. As a result, they have both been prone to terror attacks. Kenya has however been more targeted than Uganda. The city of Mombasa has been one of the key targets of Al-Shabaab; this could raise concerns on the security and reliability of its port as the main gateway to the Northern Logistics Corridor.

The Central Logistics Corridor relies entirely on the Tanzanian port of Dar es Salaam. This port serves Malawi, Zambia, Burundi, eastern DRC, and Rwanda. In May 2013, The World Bank issued a Country Update Report which detailed the inefficiencies faced by the port of Dar es Salaam. The World Bank reported, "In 2012, the total global

welfare loss resulting from inefficiencies at the port was estimated to reach a value of U.S. \$ 1.8 billion for the Tanzanian economy and US\$ 830 million for the neighboring countries. These losses were equivalent to approximately 7 percent of Tanzania's annual GDP, and affected a wide range of local consumers, businesses and government agencies" (The World Bank 2013).

The World Bank Report also states that as of mid-2012, ships were waiting up to 10 days on average just to access the port and were incurring an additional 10 days in order to offload their merchandise. This can be compared to a one-day delay in Mombasa for similar operations. Additional delays were experienced once the ship completed berthing namely to process customs clearing, processing and storage requirements. Fees charged in Dar es Salaam by Port authorities and clearing agencies were found to be on average 74 percent higher than in Mombasa. The report also identified corruption as another key factor contributing to the poor performance of the Dar es Salaam Port, as "both a source of inefficiency and a direct result of inefficiency" (The World Bank 2013).

The performance of the port of Dar es Salaam presents significant risks concerning potential delays pertaining to the logistical requirements of the RDFs. To date, despite the inefficiencies highlighted above, approximately 60 percent of Rwandan imports use the Central Logistics Corridor mainly because it is a shorter driving distance from Kigali to Dar es Salaam, 1475Km, compared to 1685Km from Kigali to Mombasa (Safari and Murenzi 2014). Moreover, imports using the Central Corridor face only one border crossing while those using the Northern Corridor face two border crossings (i.e., from Kenya to Uganda and from Uganda to Rwanda).

As argued in this thesis, both corridors present significant risks of delays. The Northern Corridor is vulnerable to potential terror attacks whilst the Central Corridor is subject to bureaucratic and corruption related delays. Consequently, adequate domestic storage capacity is essential to maintain the necessary logistics and enhance the Army's endurance. The logistic strategic reserve required by the RDF will be pivotal to provide options for military commanders to protect Rwanda's sovereignty from FDLR associated threats.

Research Questions

The RDF mission statement provided in Rwanda's constitution is to defend the Country's territorial integrity and national sovereignty. To support its mission should the RDF, given its geopolitical context, build an integrated sustainment reserve in support of future contingency operations? From this primary question, a few secondary questions must be examined. The secondary questions follow a logical progression of thoughts to arrive at the desired end state. Key among them is:

1. What is the RDF force structure and logistical requirement?
2. What is the mission profile of high operational tempo (OPTEMPO) during an emergency operation?
3. What are the operational regions and their characteristics?
4. What are the consumption factors for planning?
5. What are the risks and mitigating measures identified on the Rwanda supply routes?

Significance

The objective of this study is to evaluate the sustainment reserve required to support the RDF combat operations. This sustainment operational concept will analyze the provision for logistics, health service support and personnel services to be stored in country in order to prolong RDF combat operations in the event ground lines of communication (GLOC) are cut off. Historically Rwanda's GLOC have been linked to the political environment surrounding the region thereby affecting the entire import and export distribution. The air mode of transportation relies heavily on support infrastructure to complete air operation deliveries. Despite the recent expansion of the Kigali International Airport (KIA), the throughput capacity remains limited. The throughput is the quantity of cargo passing through the airport on a daily basis from unloading an aircraft to clearing the airport.

This study also seeks to contribute to the RDF acquisition policy change by analyzing the infrastructure gap, the resources required to optimize a robust sustainment plan, and overall life-cycle cost and effectiveness. This analysis will simulate an estimated cost as a percentage of the defense spending of the identified logistical supplies to be pre-stocked and to establish a supply network to effectively support the RDF combat operations.

Assumptions

The political ramifications associated with the FDLR threats facing Rwanda are tangible. This thesis bases its premise on the worst case scenario that Rwanda will remain under constant threat from these negative forces with external political actors that can affect the regional geopolitical situation and disrupt the country's main supply routes.

Furthermore, the insecurity of the individual countries that these main supply routes cross will influence the ability to move and sustain goods from the Indian Ocean to Rwanda. It also assumes that RDF coalition partners will provide assets required for strategic airlifting in the event the main supply routes are cut off for essential logistical items. This study also aims at identifying the necessary supplies required to support defense operations during the time it would take to reestablish aerial and ground resupply from coalition partners. Until the RDF manages to preposition a robust logistical support for its contingencies, it remains vulnerable to the regional political and security environment. Conceivably a stockage of critical combat supplies would provide options to RDF commanders until the GLOCs are opened.

Limitations

The foremost limitation to this work is the lack of accurate data on the RDF force structure and capabilities. This would have enabled precise estimates of the logistic support necessary to sustain the RDF until GLOCs are reestablished. Additionally, the budget considerations required to build this robust sustainment structure are beyond the topic of this study. The lack of time and resources did not allow interviews of regional actors and participants to analyze the geopolitical environment of the Great Lakes Region.

In addition, the lack of specific threat data requires making scenario assumptions about the operational environment. The lack of existing planning factors for consumption of the RDF, which requires using U.S. forces planning factors for similar units as well as the unavailability of coalition partner's contingency plan to provide support, requires making additional scenario planning factor assumptions.

Delimitations

The three classes of supplies for the RDF sustainment concept discussed within the scope of this paper are: Class III-package and bulk petroleum, oil and lubricant, Class V-ammunitions of all types and Class VIII-medical material (equipment and consumables). In effect, this study will only consider the consumption factors of high OPTEMPO as well as the worst case scenario. Furthermore, no discussion of the political context of these recommendations shall be discussed during the course of the research.

Summary

Chapter 1 presents an overview of the regional instability caused by the FDLR and the international response that has failed to provide a relative sense of security to Rwanda. In addition, Rwanda being a landlocked country, the impact of non-state actors (such as Al-shabaab) on the country's trade routes, the poor roads infrastructure as well the extensive administrative processes from the foreign ports of entry to Rwanda suggest that the RDF should integrate a prepositioning program into its defense strategy. This chapter consists of the introductory aspect of the study including statement of the problem, research questions, significance, limitations and delimitations, and the organization of the study.

The following chapter addresses the significant literature reviewed and addresses the issues regarding Rwanda's threat and the prepositioning concept as a means to enhance the RDF freedom of action.

CHAPTER 2

LITERATURE REVIEW

Introduction

Information for this study had been obtained from a variety of sources ranging from Rwanda's historical and strategic documents, geopolitical studies of the Great Lakes region, UN reports, and U.S. military reviews, as well as U.S. Army doctrine. This thesis endeavors to extract answers from available literature as to how the U.S. Army has prepositioned its logistics to extend its capability in order to reduce the response time to potential unforeseen global crises and adapt the model to the RDF. The U.S. Army model, however, cannot be literally replicated given the difference in mission, size and budget allocated to the RDF. To understand the RDF logistical requirement, one must examine the means by which the RDF is structured and the budget allocated to support the development and maintenance of the Army.

Origin of the Conflict

Many scholars, journalists, and human rights activists trace the roots of the Rwandan conflict to European colonialists and the post-independence Hutu governments for their premeditated racialization of the Hutu-Tutsi distinction (Berry and Berry 1999). In late 1950s during the African decolonization waves Belgium, the former Rwandan colonial power, ignited the Hutu political movement, which stood to gain from majority of rule against the Tutsi monarchy. In 1959, a violent incident sparked the Hutu "social revolution" in which thousands of Tutsis were killed and others displaced into neighboring countries (Berry and Berry 1999). A cycle of ethnic violence and conflicts

ravaged Rwanda from independence and culminated with the 1994 Tutsi genocide. The defeated FDLR genocidal forces moved into the DRC from where they launched raids into Rwanda.

The DRC's failure to contain these genocidal forces suggests the decay of the state and its instruments of rule as the major determinant of the Great Lakes' instability (Nzongola-Ntalaja 2002, 214). The Conflict Prevention and Peace Forum in their article "FDLR: Past, Present and Policies" argues that "Dismantling the FDLR is one of most urgent challenges the region faces" (DRC Affinity Group 2014).

Many researchers have defined conflicts in Africa with a predominance of internal or inter-group conflict over international conflicts (Vogt and Aminu 1996; Riley 1998). However, the FDLR has fueled political tensions between African nations with a highly internationalized aspect, both in their effects and the various efforts to resolve the problem. The key issues are their influence over the past interstate conflicts and the regional geopolitics.

Wars in the Democratic Republic of Congo (1996 to 2002)

Following the DRC (formerly Zaire) and the international community's inability to resolve the FDLR threat to Rwanda's security, the Rwandan and Ugandan armies backed the Laurent-Desire Kabila invasion in October 1996. The poorly governed Zaire was a sanctuary of many rebel groups fighting Rwanda, Uganda, Burundi and Angola (Stearns 2012, 51). Kabila's forces marched on Kinshasa and overthrew Mobutu's government renaming the country from Zaire to the DRC. The Kabila alliance with his backers (Rwanda and Uganda) did not last long. Christopher Williams in his article

“Explaining the Great War in Africa: How Conflict in the Congo Became a Continental Crisis” discusses that Kabila’s initial failure to separate himself with his backers Rwanda and Uganda exacerbated his ability to expand his domestic political base. In an attempt to curve out his power base, Kabila distanced himself from his allies and established warm relations with the FDLR and Sudan, thus antagonizing his allies’ interests.

The International Crisis Group summarizes the reasons for the growing frustration with Kabila in Rwanda and Uganda. He was seen as:

[I]ncapable of creating a national consensus because he excluded all the opponents from power; incapable of preventing the extremist Hutus (FDLR) and the Ugandan guerillas of the Allied Democratic Front (Islamic and supported by Sudan) from attacking Rwanda and Uganda from DRC. (International Crisis Group 1998)

Jason Stearns argues that Kabila believed he needed his own mercenary force to legitimize his power against his former allies. Subsequently, this alliance threatened Rwandan and Ugandan security, which led to the second DRC war in mid-1998.

The Rwandan and Ugandan forces unilaterally invaded the DRC for the second time in a very complex geopolitical environment. Kabila, backed by the Southern African Development Community, obtained military support from Angola, Zimbabwe, Namibia, Sudan, and Chad and blocked the advancing forces on the capital city, Kinshasa. The war expanded quickly into a continental conflict dividing the DRC into two parts with both parties sponsoring proxy rebel groups. The Kinshasa government, with its Southern African Development Community allies, controlled the western half of DRC and much of the eastern half was controlled by Burundi, Rwanda, and Uganda.

In July 1999, a peace accord was signed by the countries involved in the conflict in Lusaka, Zambia and a UN peacekeeping mission composed of 5,000 troops was sent to

monitor the situation. The UN Security Council issued Resolution 1279 on 30 November 1999 establishing the United Nations Organization in the Democratic Republic of the Congo (MONUC) (UN Security Council 1999). In December 2002, Kabila completed a peace deal with internal rebel groups and finally saw Rwanda and Uganda's withdrawal from the DRC.

The International Community's Response

While opposing forces disengaged, MONUC did not establish sustainable disarmament programs for the rebel groups operating in the DRC. Richard Norman noted that "It is far from surprising to see renewed violence in the Great Lakes region." Despite the worrying continued FDLR threats, the UN Security Council transformed the MONUC mandate from a peacekeeping mission to a peace-support mission under the resolution 1925 of 28 May 2010, establishing the United Nations Stabilization Mission in the Congo (MONUSCO) (Norman 2008).

Although the FDLR ability to threaten Rwanda has reduced over time, their presence still presents a unique challenge to Rwanda's security. DRC and Rwanda planned bilateral operations to hunt down the FDLR rebel groups in the Kivu in a quest for regional stabilization efforts. The two countries' initiative was daunted with the multiple interrelated political challenges. Sudarsan Raghavan in "UN Tries to Act with a Fighting Brigade in Congo" (Raghavan 2013) discusses the ability of the regional intervention brigade mobilized by South Africa, Tanzania and Malawi to neutralize those rebel groups following 14 years of inaction of the UN forces. He argues that "The force is an unparalleled gamble for the UN that challenges the basic principles of peacekeeping."

Rwanda has repeatedly denounced the little political will by the international community to resolve the FDLR threat.

FDLR Current Operations

Rwanda's security and stability remain jeopardized by the presence of this rebel group west and south of its borders. On 3 October 2014, the UN Security Council assessed the progress of the disarmament effort and again called for "swift neutralization," noting that the pace of the voluntary surrender had stalled and called on the UN mission and government in Congo to "undertake military action" against FDLR leaders and members who have not yet surrendered (UN Security Council 2004).

The MONUSCO estimates the current FDLR strength to be 2,000 combatants. Despite regional efforts to resolve the crisis, the International Conference on the Great Lakes Region reports indicated that FDLR, instead of surrendering, continued recruitment and collaboration with the Congolese Army throughout 2014 (Times Reporter 2015).

Movement of FDLR combatants towards Burundi was reported reflecting their strategy to exploit troubled areas and continue to threaten regional security. The East African magazine stated that the illegal armed group operating in the eastern DRC was moving into Burundi (Magical 2015). Rwanda's Minister for Foreign Affairs and Co-operation, Louise Mushikiwabo, disclosed in an official statement the move of the FDLR into Burundi territory muddling the ongoing crisis.

Rwanda's Geographical Challenges

Located in central-eastern Africa, Rwanda is a landlocked country with two main transport corridors, the Northern corridor from the sea port of Mombasa, via Uganda to Kigali, and the Central corridor from the seaport of Dar es Salaam to Kigali. Rwanda relies on these two transit corridors as gateways to link it with its overseas partners. The African Development Bank report on the Rwanda Transport Sector Review and Action Plan analyzes the security challenges, transit time delays, reliability and predictability encountered through the Central and Northern corridors (AFDB 2013). Additionally, due to geographical constraints, Rwanda's transport sector is confronted with several other challenges including inadequate air transport infrastructure, the lack of rail, water, pipeline transport and relatively underdeveloped logistics services.

The Al Shabaab presence in the Horn and East Africa remains the main regional security challenge. This terrorist group pledged allegiance to the militant Islamic movement Al-Qaeda. Although they primarily operate from Somalia, Al Shabaab has been spreading terror along the Indian Ocean coast. Rob Wise identifies the shift undergone in 2008 by Al Shabaab, from a nationalist organization, focused on expelling Ethiopia from Somalia, to a transnational terrorism organization increasingly threatening East African security (Wise 2011). Furthermore, since the Kenyan military entered Somalia in 2011 as part of an African Union military mission to support the Somali government fight against Al Shabaab, terror related violence has risen in Kenya, reaching 115 attacks in 2014 (Zadock 2015).

The coastal city of Mombasa, the largest seaport of Kenya, and gateway of the Northern corridor, has experienced violent Al Shabaab attacks since 2002. Human rights

reports and news agencies have linked the Mombasa port's deteriorating security situation to Al Shabaab compounding other mismanagement issues. The increasing deteriorating security has caused significant economic damage over the past decade. Several incidents linked with Al Shabaab activities have halted port operations, with the most recent in September 2015 where the Kenyan military locked down the port as a ship suspected to have been hijacked by Al Shabaab pirates in high seas docked (Kenya Today 2015).

The corridor stretches from Kenya to Rwanda via Uganda. Uganda was the first country to deploy troops under African Union Mission in Somalia, into Somalia in March 2007 (African Union Mission in Somalia 2016). Following the Uganda People's Defence Forces engagement into Somalia battling the Islamist terror group, the Al Shabaab launched several attacks targeting Kampala, the Ugandan capital. To analyze Al Shabaab's operations, it is important to understand the context in which the global jihad is organized. In July 2010, the Shabaab organized twin bombings in Kampala, Uganda that killed 79 people. This attack was planned and executed by an East African operative cell. Moreover, the Ugandan police have issued several warnings of possible Al Shabaab attacks during the past years (Reuters 2015). Although the Northern Corridor partner states have entered into a mutual defense pact to boost security and stability in the region, the presence of the Al Shabaab has resulted in serious economic repercussions. The disruption of the port and regional transport operations and the shortage of supplies (imports) sometimes cause unmeasurable economic costs to member states.

The Al Shabaab networks stretch beyond Somalia, Kenya, and Uganda. Aaron Kliegman, in an article "Suspected Al Shabaab Jihadists Arrested in Tanzania with

Explosives,” describes Tanzania as a logical target for Al Shabaab (Kliegman 2015). Tanzania, located 608 Km south of Somalia along the Indian Ocean coastline, witnessed the bombing of the US Embassy in Dar es Salaam by the Al-Qaeda terror group heavily linked to Al Shabaab in 2008. Dr. Andre LeSage, Senior Researcher at the National Defense University describes the growing jihadist activity in Tanzania. He emphasizes that: “As events over the past few years in neighboring Kenya have demonstrated, today’s seemingly minor and manageable threats can evolve quickly into something far more lethal and intractable” (Le Sage 2014). Tanzania, gateway of the Central Corridor, therefore does not provide a viable alternative as more significant threat to port and transport operations emerge.

The performance and variation in time (reliability) of these corridors are not only influenced by the security challenges but also the inadequate physical infrastructure. The United Nations Conference on Trade and Development technical report argues that the low trade volume of the landlocked least developed countries often do not justify the substantial investments required to improve the corridors’ infrastructure (UNCTAD Secretariat 2013). The report explains that the ports of Mombasa and Dar es Salaam operate far above their design capacity, putting pressure on the existing infrastructure.

The road network of the Northern Corridor that stretches from Mombasa to Kigali is 1,685Km long. In 2010, a road network assessment carried out disclosed that 45 percent of the road was rated poor based on level of service standards defined in Aurecon’s First Order Network Assessment. The road network of the Central Corridor that stretches from Dar es Salaam to Kigali is 1475Km. long. The report showed that these roads require no immediate remedial action and are considered to be in a sound

state. The total travel time varies depending on the number of border crossings, although the Central Corridor to Dar es Salaam is shorter to Kigali, it is faster to ship via the Mombasa Northern Corridor with two border crossing because of its shorter dwell time. Finally, the ongoing regional integration forecasts an increase in traffic, which arguably will place additional pressure on the corridors' infrastructures (Nathan Associates Inc. 2011).

As highlighted, Rwanda depends upon transit states (Kenya, Uganda, and Tanzania) to connect with its international partners. The United Nations Conference on Trade and Development technical report revealed dwell times for cargo destined for Rwanda at the Dar es Salaam port was approximately 13 days in 2011 (UNCTAD Secretariat 2013). Transit time in ports, delays incurred due to lengthy documentation, cargo clearance and the poor regional infrastructure constrained Rwanda's ability to fully control its imports and exports. Similarly, the RDF's ability to continuously and effectively bring products to support its mission is heavily dependent on the status of these corridors. To avoid supply chain disruption, the RDF should develop mitigating measures to avoid possible supply disruptions during major combat operations.

Prepositioning

During major campaigns the strategic capabilities to preposition sustainment stocks has enabled the U.S. to project its military power. Major Paul R. Mogg, in his monograph "Sea Basing: Past, Present and Future," argues that the prepositioning concept gained interest in the U.S. following the deteriorating situation in the Middle-East at the beginning of 1980 with the fall of the Shah of Iran and the subsequent hostage

crisis in Tehran as well as the Soviet Union's invasion of Afghanistan. Many countries restricted access to the U.S. military in the troubled Middle-East region.

The Army initially relied solely on airlifted combat units to respond to those crises. However, airlifting showed significant limitations including embarkation capacity, lack of theater infrastructure, hostile fire in the theater, and shortages of diplomatic clearances, to name but a few. The sea-basing platform promised to mitigate the potential problems airlifting might have caused. In addition, it provided the capability to transport heavier material as well as freedom of maneuver to respond to contingencies despite denial of access by affected countries. The validity of these deployments "called for the construction of 14 prepositioning ships from 1981 to 1986, with the combined capability to transport the materiel for three Marine Amphibious Brigades" (Mogg 2004).

In order to reduce the burden on air and sealift, the Army introduced the Land Prepositioning Concept consisting of storage of equipment and supplies in strategic locations throughout the world. Carl E. Franklin developed the first Prepositioning evaluation criteria in his study entitled *The Efficacy of Prepositioning* (1985). The study laid out many consideration criteria for responsiveness, vulnerability, flexibility, and accessibility that were applicable to land-based prepositioning. The study appeared to be biased toward maritime prepositioning against the land base. However, Franklin did not predict the collapse of the Berlin Wall which changed the security apparatus and especially the U.S. national security strategy.

Major James F. Pasquarette argues in his monograph, "The Army Global Prepositioning Strategy: A Critical Review," that following the Cold War "victory," the U.S. military altered its strategy. Military structures were substantially reduced. Although

forward basing provided the highest deterrence program for the U.S. to protect and defend its national interests, land prepositioning offered a good alternative for the U.S. military in order to maintain the needed level of strategic mobility, given the shrinking budget.

At the end of Operation Desert Storm, the U.S. Army considered prepositioning as key to support the national defense strategy. Prepositioning became one of the three pillars of the U.S. Strategic Mobility Triad as a means to rapidly project combat power to critical regions around the world. The concept is centered off of the forward power projection platform necessary to rapidly mobilize or commit to troubled regions. The pressure of war, unknown duration and the iteration of having to move the logistical supplies from the continental United States or CONUS, explained the cost of building and maintaining basing facilities. The U.S. Army Pre-positioned Stock consists of four different types: prepositioned unit sets, Operational Projects stocks, Army War Reserve Sustainment stocks, and War Reserve Stocks for Allies (Department of the Army 2015). This method proved to be significantly advantageous to the U.S. military. Personnel flew into the area to find the prepositioned sets of equipment to build the units' combat power. The increase in prepositioning suggests an increase in mobility and capacity.

Building on this model, this paper analyzes the logistical requirements for the RDF to speed its response to contingencies as well as prolong its endurance. The logistical area within this proposed program will evaluate the RDF war reserve logistics. Understanding the challenges created by regional transportation limitations reinforces the criticality of the program when immediate response is necessary. Deploying and supplying military forces is complex and dependent on many factors. Furthermore, the

increased mechanization of the RDF over the past years suggests a dependency on fuel. In addition, ammunition requirements will increase as the weight and caliber of ammunition rise. The availability of these logistical supplies constitutes the mainstay of the RDF in order to commit to large scale operations. The capacity to construct the logistical backbone is generally bargained over other national priorities.

This paper suggests that the upfront costs can be offset by the benefits of the resulting effectiveness, efficiency and flexibility the sustainment reserve would provide to the RDF.

Sustainment Planning

Logistics are important factors in strategic and operational planning. The ability to maintain units successfully in the battlefield remains a function of the right supplies, at the right place, at the right time, and in the right quantities. The planning and execution of the sustainment reserve of forces in support of future military operations include the development, acquisition, storage, movement, equipment, distribution, and evacuation functions of supply, field services, maintenance, health service support, personnel, and facilities. The three basic categories of supplies discussed in this paper are fuel, ammunition and health service support. These are logistics resources to the combat elements most essential to mission success. Indeed, close coordination is required to ensure other classes of supply are received, stored to be instantly responsive to the needs of the forces. For Class I–subsistence, the RDF logistics concept is based on “living off the land,” seemingly enhancing the RDF’s mobility.

Field Manual 100-61 defines strategic reserves as the stock of supplies and equipment controlled by the Department of Defense. This refers to the Ministry of

Defence and the Army Headquarters in the RDF scenario. These are an emergency stock of supplies not planned for early use in a conflict.

The level and configuration of these stocks will be determined by logistics planners based on their estimates (units consumption and mission profile) and on the use of all movement resources available.

The RDF does not have a doctrinal approach to estimate mission requirements for logistical supplies. This thesis will use the U.S. Army Quick Logistics Estimation Tool (QLET) to generate the logistical estimates required by the RDF. The interactive tool enables someone to quickly determine which logistical supplies planners will need to support operations. QLET enables users to determine mission requirements for all classes of supplies (except class X) using modular force structures and approved planning rates. Furthermore, the tool uses preloaded list of units and equipment based on the 2014 Force Structure Designs and assigns each task organization a consumption parameter. The consumption parameter set establishes the rates and generates the logistics supply requirements by operational phase, by task organization for mission accomplishment (Department of the Army 2011).

A 30 days stockage assumption will be used to forecast and build the RDF theater sustainment reserve comprised of classes of supplies III, V and VIII given a mission profile of a high operational tempo (OPTEMPO).

Summary

Chapter 2 provides a literature review. This chapter reviews the literature relevant to the study by concentrating on the regional threats, the concepts of prepositioning and strategic supply, as well as aspects of sustainment planning with specific emphasis on

logistics. The next chapter describes the research methodology identified to develop the data points previously discussed in the exploratory questions of the thesis. In addition, a qualitative analysis using QLET was used to estimate the initial stockpiling requirements.

CHAPTER 3

RESEARCH METHODOLOGY

Introduction

The research methodology used for this thesis is a staff study approach. A staff study is a meta-analysis military problem-solving process focused to produce a recommended solution for a proposed question and is one the ways the military profession can conduct the case study method (Long 2015). This methodology is useful for conducting qualitative research for problem areas demanding a deep understanding of context in order to produce informed policy choices (Creswell 2008; Creswell 2013; Creswell 2014; Yin 2014). Case studies are an intense investigation providing an analytical framework, which explains and describes a phenomenon. Furthermore, they are a systematic way of looking at data, analyzing information, and reporting the results (Yin 2003).

This chapter identifies the processes used to answer the primary research question: How could the RDF, given its geopolitical context, build an integrated logistical reserve in support of future contingency operations? The secondary research questions identified within the examination are: What is the RDF force structure and logistical requirement? What is the mission profile of a high operational tempo (OPTEMPO) during an emergency operation? What are the operational regions and their characteristics? What are the consumption factors for planning? What are the risks and mitigating measures identified on the Rwandan supply routes?

The goal of this research is to inform or persuade policy makers about the conditions and context of a setting associated with complex human issues where the goal is to take informed action to improve the situation.

Methodological Approach

The qualitative analysis methodology outlines specific steps necessary to examine, in depth the strategic reserves and infrastructure upgrades necessary to allow the RDF freedom of action over a full spectrum of operations. Focusing on the significance of prepositioned stocks within the country's boundaries helps to answer the primary research question. The staff study methodology analyzes the theoretical propositions. In addition, quantitative data are developed where appropriate and suitable to provide objective evidence to decision-makers when requesting action on a recommendation. The criteria of suitable, feasible, acceptable and level of risk are used for evaluating policy recommendations or courses of action to ensure the problem follows a logical sequence and produce a justifiable solution that would be persuasive to senior decision makers within the profession.

Criteria used to assess suitable, feasible, acceptable, and complete are based upon, the 2011 Joint Publication 5-0 *Joint Operation Planning* and the 2012 Army Doctrine 5-0 *The Operations Process*. Suitability is the effectiveness of a solution that can accomplish the mission across a wide array of foreseeable and unforeseeable environments. Feasibility assesses a course of action (COA) in its ability to accomplish the mission within the established time, space, and resource limitations. Acceptability refers to whether the COA balances costs and risks with the advantage gained, in addition fits within the profession current norms. Distinguishable is assessing how each planned

action differs from current lines of efforts and operations. Complete is assessing how each planned action accomplished the mission through decisive, shaping and sustaining operations (Joint Chief of Staff 2011).

The study identified the gaps in capabilities and-or resources available to develop a list of characteristics for developing an initial assessment of the Rwandan operational environment and follow-on estimates. This analysis determines the sustainment preparation (infrastructure and resources) of the operational environment that will optimize the RDF operational plans. For the purpose of this thesis, only five of the six factors published in Army Doctrine Reference Publication 4-0 apply in the assessment process of the sustainment preparation of the operational environment (SPOE) were used to generate and analyze the logistics running estimate and the concept of support. The factor that was not used in the assessment process is the general skills and labor resources available in country since there is no available data to classify the national labor force resources.

The author focused on the following five sustainment preparation of the operational environment (SPOE) factors in Army Doctrine Reference Publication 4-0:

Geography: sustainment planning is influenced by the geography of the area of operation. These are the principal means of access into the Rwandan theater of operation. The geographical constraints encompass land, space, air and water requiring continuous efforts of coordination which are often critical to mission accomplishment. The thesis analyzes how to integrate these sustainment bases to give valuable insight for the decision-makers. Furthermore, the topography and weather are analyzed to help determine the planning consumption rates applicable in the area of operation.

Supplies and Services: the supply items and services readily available in the area of operation to support the RDF operations are analyzed. The in-country logistics are analyzed to ensure efficient and effective flow and storage of supply items and services from the foreign port of entry to Rwanda.

Facilities: the infrastructure required to support the RDF operations is analyzed. These include Class V (ammunitions) storage, dry warehousing, and hospital facilities. Furthermore, the thesis defines facilities capacity, location and output from the port of entry to Rwanda to optimize RDF operations. The country staging facilities were identified depending on the likelihood of the FDLR contact and engagement in direct combat with the RDF that could also be used for security operations within the borders of Rwanda.

Transportation: the road, air and rail networks are assessed to support the cargo movement from port of entry to its final destination. Rwanda's geographical constraints increase the country's dependence on transport infrastructure. Moreover, the management of movement and storage of goods among different members of the supply chain and across borders is analyzed. This is relevant for appropriate responsiveness of prepositioned stocks and coordination of resources.

Maintenance: the maintenance facilities in support of the RDF operations are assessed. These are sustainment capabilities required to continuously support the RDF (repair, procurement).

Analytical Approach

The sustainment preparation of the operational environment factors is used to evaluate the resources, environmental factors, and capabilities available in country to

facilitate RDF operations. The data on the operational environment collected capture the essence of the operational environment through the analysis and relevance of each of the factors in responding to the primary and secondary research questions. The analysis attempts to provide the strategic rationale for the decision-makers to invest in the preposition program.

The analysis uses a defined scenario for providing the context for military operations in the operational environment, which permits the developed of a detailed requirements list for supporting the operations. These requirements will be costed out using available 1st order estimates for commodities, recognizing that economic variables are subject to considerable change on short notice, given the volatility of world commodity markets.

Quantitative Data Analysis

The QLET is used to compute the logistical estimates for supporting units engaged in military operations. The generated estimates (prepositioned stocks) will provide baseline for determining requirements to support operations for the decision-makers to evaluate. The quantitative data will allow decision-makers to assess the investment needed to build the prepositioned stocks and-or the infrastructure required for support.

The QLET allows the user to build a force file based on the 2014 force structure designs of the U.S. Army. The analysis matches Rwandan land forces to the closest matching U.S. unit in order to generate the first-order estimates of consumption.

Table 1 shows a variety of unit lists based on the 2014 force structure designs.

Table 1. U.S. Army Units and Unit Strength

Unit_SRC(U)	Unit_Title(U)	Unit_Strength(U)
44615R000	ADA BATTALION (AVENGER)	375
44615R600	ADA BATTALION (AVENGER)	385
17307R000	ARMOR COMPANY, COMBINED ARMS BATTALION (HBCT	62
87300R000	ARMORED BRIGADE COMBAT TEAM (ABCT)	3735
87300R100	ARMORED BRIGADE COMBAT TEAM (ABCT)	3800
87310R000	ARMORED BRIGADE COMBAT TEAM (ABCT)	4706
01287R100	ATTACK/RECON TROOP (AH-64/SHADOW)	63
05315R600	BRIGADE ENGINEER BN (BEB), IBCT (RECAP)	422
11307R200	BRIGADE SIGNAL COMPANY (IBCT) (ABN)	40
11307R900	BRIGADE SIGNAL COMPANY (IBCT) (ABN)	41
77305R000	BRIGADE SPECIAL TROOPS BATTALION (IBCT-RECAP	395
77305R100	BRIGADE SPECIAL TROOPS BATTALION (IBCT-RECAP	397
63035R000	BRIGADE SUPPORT BATTALION W/FSC (INFANTRY BC	882
63335R000	BRIGADE SUPPORT BATTALION W/FSC (INFANTRY BC	796
63335R100	BRIGADE SUPPORT BATTALION W/FSC (INFANTRY BC	838
08108F400	BRIGADE SUPPORT MEDICAL COMPANY, BSB (SBCT)	72
05329R600	COMBAT ENGINEER CO, BEB, IBCT	88
05319R600	COMBAT ENGINEER CO, BEB, IBCT	101
08945R000	COMBAT SUPPORT HOSPITAL (248 BED)	495
08547AA00	EARLY ENTRY HOSPITALIZATION ELEMENT (44 BED)	145
08547RA00	EARLY ENTRY HOSPITALIZATION ELEMENT (44 BED)	150
06125R000	FIELD ARTILLERY BATTALION, 105T (IBCT)	293

Source: Created by author.

From the Unit list worksheet the study selects the closest U.S. equivalent units to the RDF units to input into the program that computes the classes of supply estimates by operational phase. The table below shows the built up force of three infantry battalions and the classes of supply by operation phase.

Table 2. Quick Logistics Estimation Tool Estimates by Operation Phase

				Major Combat Operations (Ph I-III)		
SRC	TITLE	Strength	# of Each YOU INPUT!	Fuel III(B) Gallons	Fuel III(B) Gallons	Fuel III(B) Gallons
				Fuel Max	Fuel Min	Fuel Avg
07415R000	INFANTRY BATTALION (IBCT)	659	3	2351.525226	1625.52456	1777.446211

Stabilize (Ph IV)			Enable Civil Auth (Ph V)		
Fuel III(B) Gallons	Fuel III(B) Gallons	Fuel III(B) Gallons	Fuel III(B) Gallons	Fuel III(B) Gallons	Fuel III(B) Gallons
Fuel Max	Fuel Min	Fuel Avg	Fuel Max	Fuel Min	Fuel Avg
1733.35366	479.8108755	1085.529761	483.2991175	423.0356193	454.9060647

Major Combat Operations (Ph I-III)			Stabilize (Ph IV)			Enable Civil Auth (Ph V)		
III(P) Lbs	III(P) Lbs	III(P) Lbs	III(P) Lbs	III(P) Lbs	III(P) Lbs	III(P) Lbs	III(P) Lbs	III(P) Lbs
III(P) Max	III(P) Min	III(P) Avg	III(P) Max	III(P) Min	III(P) Avg	III(P) Max	III(P) Min	III(P) Avg
710.5894554	173.9675723	375.9390734	438.5627215	91.249395	233.1802	80.879947	59.788465	69.04219

(Ph I-III)	(Ph IV)	(Ph V)	(Ph I-III)	(Ph IV)	(Ph V)	(Ph I-III)	(Ph IV)	(Ph V)
Class V LBS	Class V LBS	Class V LBS	Class VII LBS	Class VII LBS	Class VII LBS	Class IX LBS	Class IX LBS	Class IX LBS
750.35228	128.99949	128.9994865	385.80097	29.897849	29.897849	53.3643	53.3643	53.3643

Source: Created by author.

The QLET allows users from the estimates requirement summary to select the joint phase, climate, type of pallets as well as the fuel platform type. The table below shows the estimates requirement summary for the three Infantry Battalions.

Table 3. Estimate Summary Requirements

Force Strength	1,977				
				Pallet Type	Warehouse
Joint Phase:	Major Combat Operations (PH I-III)		Pallet Stacking (Warehouse Only)		Single
Climate:	Tropic			Cargo Platform Type	Supply Van
				Pallets Per Platform	6

To select more than one fuel platform, scroll down to line 59	
Fuel Platform Type	HEMMT Tanker
Fuel Platform Capacity (gal)	2500
Water Platform	HIPPO
Water Platform Capacity (gal)	2000

Class:		Rate	Gallons	LBS
Class I		8.64		17,081
Class II		1.54		3,045
Class III	Bulk	MAX	7,055	
	Package	AVG		1,128
Class IV	Barrier/Fortification	2.34		4,626
	Construction	3.32		6,564
Class V				2,251
Class VI	Basic	0.336		664
	Additional	0		0
Class VII				1,157
Class VIII	(Soldier Based Only)	0.19		376
Class IX				160

Source: Created by author.

The thesis will attempt to show that despite budget constraints and competing resources to build the prepositioned stocks, the RDF requires a large logistical footprint to maintain freedom of action even when only planning for reserve stockages for classes III, V and VIII.

Summary

Chapter 3 is devoted to the methodology used in this study. The chapter illustrates the variables used to describe and analyze the operational area, the development of required resources to support the scenario operations using QLET, and the estimate of cost for producing a prepositioned logistics solution. The following chapter describes the details of the sustainment operational environment depicted throughout the process in order to allow the preposition program. Furthermore, in order to enhance the RDF's responsiveness, QLET was used to determine the initial stockpiling requirements.

CHAPTER 4

PLANNING CONSIDERATIONS

Introduction

Given its geographical location, Rwanda depends on neighboring countries' transit routes to access its overseas partners. This dependence takes at least four forms:

1. dependence on transit infrastructure;
2. dependence on political relations with neighbors;
3. dependence on internal peace and stability within transit neighbors; and
4. dependence on administrative processes in transit.

The capability to preposition class III, V and VIII will enable the RDF a broad range of options across the spectrum of military operations.

The viability of the prepositioned stocks as one of the major pillars of the RDF strategy will be assessed against a set of elements deemed critical to the RDF defense strategy. The RDF defense strategy outlines strategies and programs in support of the national security goals. Furthermore, the defense strategy's overall goal is to generate, employ, and sustain combat-ready, rapidly deployable force to meet contingencies both at home and abroad. The prepositioning program would provide potential freedom of action and reduce the RDF's exposure to regional politics as well as geographical and administrative constraints. The program's efficiency would be measured by responsiveness, flexibility, accessibility and vulnerability. Implied measurements of threat and cost were added to evaluate the effectiveness of the program.

Road to War

Prepositioning requires the ability to anticipate where a conflict is likely to occur. The DRC, bastion of the FDLR, occupies most of Rwanda's western border. Based on the geographical challenges and the relative size and capabilities of the FDLR, two major crossing areas were identified. These volatile crossing sites are in the north western part of Rwanda along the district of Rubavu and in the south western part along the district of Rusizi. Furthermore, the highly mobile FDLR threat force creates the need for equally mobile and lethal forces to counter the threat.

In order to effectively deter the FDLR incursion from the DRC, the RDF's robust military posture in the region is made up of two infantry divisions with detachments of combat support arms. The RDF's military buildup along the border aims at combating the FDLR threat. The deployment is based on a worst-case scenario involving conventional and asymmetric threats. The RDF order of battle is established by a standing Army of a total strength of approximately 32,000 troops organized into four infantry divisions, one artillery division, one armored brigade with the T54/55 as the main battle tank and one marine battalion operating along Lake Kivu. In addition, the combat support battalions directly under the Army Chief of Staff provide the logistics support for all the RDF's defensive and offensive operations (DefenceWeb 2016).

It can be deduced that designing a prepositioning program as one of the strategic initiatives in support of the national defense strategy will ensure a variety of options formulated to deal with the potential challenges. A key aspect of this chapter is to provide a description of the district's infrastructure and to analyze whether the local infrastructure can support RDF's ground operations in the event GLOCs to external resources are

cutoff. In order to support a broader range of potential ground support missions, a detailed understanding of RDF's capabilities and limitations is required.

The two operational regions, Rubavu and Rusizi districts were examined to adopt the RDF tactical and logistical requirements.

Rubavu District

Rubavu district lies on the shore of Lake Kivu and the Virunga national park along the border with North Kivu province in the DRC. The Virunga national park is formed by a forest extending to about 7,900 square kilometers and a boundary of 650 kilometers in length connecting the DRC, Rwanda and Uganda. This park is 95 percent in North Kivu province and only 160 square kilometers of it are in Rubavu district. The volcanic history of the region explains the complex topography of mountains, marshes and swamps at high elevation ranging from 2000 meters to 4500 meters above sea level (Caldecott, Miles, and Annan 2005). In addition, the ecosystem is composed of rain forest formations, bamboo stands and abundant herbaceous vegetation.

The forest has served as a haven for the FDLR troops giving them the flexibility to move between the DRC, Rwanda and Uganda. This rough terrain is a challenge for ground mobility. The lack of mobility through the dense forest, mountains and swamps has limited wheeled vehicle traffic to the existing road network. Consequently, the RDF was configured to support their combat operations with very limited motorized wheel, tracked vehicles and helicopters.

The process of planning, implementing and efficiently controlling the flow of materials, storage, in-process inventory, and relevant information from the point of origin

to the point of consumption determined the imperatives to developing support requirements and selecting areas for sustainment.

The criteria used to identify sustainment and support base locations incorporate the following planning considerations:

Lines of communications (LOCs): Essentially roads and air provide the main transportation infrastructure connecting Rubavu district. Rwanda is relatively a small country; the distance from Kigali, major hub of the country, to the district of Rubavu is approximately 150 Kilometers. Under the Rwanda road act, the Rwanda Transport Development Agency has classified national roads (NRs) paved roads, national unpaved roads and district roads (DRs) class 1 (Rwanda Transport Development Agency 2016, 52). The NR 2 is the primary road suitable for heavy long-haul trucks connecting the capital city Kigali with the district of Rubavu up to the international border crossing. Given the topography of the region, the steep paved road allows very slow travel speed for heavy trucks. The average travelling time from Kigali to Rubavu for a heavy loaded vehicle on NR 2 is approximately three hours.

National Road 18 is the secondary unpaved road allowing access to the Virunga national park. This road is generally acceptable for small trucks (15Mt max) but requires 4WD during rainy seasons. The condition of the steep and narrow NR 18 will allow small trucks of a 10 Mt capacity during dry season and only about 5Mt during the rainy season. A few DRs 32, 33, 35 and 36 can be used as alternate supply routes allowing only small trucks of 5Mt traffic during both seasons.

The Aerial Port of Debarkation (APOD) for Rusizi is the Gisenyi airport in Rubavu district which is a medium size airport with a single asphalt runway that

measures approximately 1,010 meters long and 23 meters wide. This APOD lies approximately 94 kilometers, by air, northwest of Kigali international airport, Rwanda's largest airport (RCAA). This is a civilian airport primarily used for national transportation activities. Currently, there is no air cargo facility at Gisenyi airport. Moreover, the basic length dimensions of the runway can support many fixed-wing and rotary-wing aircrafts except the C-17 requiring a minimum runway length of 1064 meters and 27.4 meters in width. The use of this infrastructure for military purposes will require security improvements given its proximity with the DRC border.

The preposition program suggested is strictly for internal defense operations. The security of the LOCs, both leading to and within the theater operation, as well as the defensibility of the prepositioned stocks, will enhance deployability and augment endurance for the RDF.

Terminal facilities: There are two parastatal warehouses managed by “Magasins Généraux du Rwanda” (MAGERWA) in Rubavu district. These logistics facilities currently provide storage for all the cross-border trade. In addition, this infrastructure only handles dry cargo. The proximity of the warehouse to the international border and inadequate security prohibit the RDF from leveraging the available space for military use for the designed program.

One of the country's petroleum strategic storage units is in Rubavu district. This facility holds approximately five million liters of oil representing 20 percent of the country's monthly consumption (Ministry of Infrastructure Rwanda 2015). Placement of a RDF fuel storage in the area to support combat operations would simplify accessibility during conflict and provide freedom of action. The management and security of these

facilities during peacetime would remain an imperative for the RDF in order to maintain freedom of action.

Transportation network: Rwandan transportation relies solely on its roads network system. In order to move goods from one point to another the current transportation system does not offer multiple forms of mobility and accessibility. The road transportation network is generally good on all classified NRs. However, DRs will allow limited accessibility during rainy seasons and restrict the tonnage capacity.

The air transportation system in Rwanda remains focused on passenger flights with very limited cargo capacity. Rwanda being a small country, the automobile continues to be the most efficient mode of transportation to move heavy loads.

Local supplies: The Gisenyi hospital in Rubavu district provides an advanced laboratory with blood transfusion possibility and surgical facility that can be leveraged by the RDF. In addition, the health-care facility had the possibility to accommodate 300 patients in 2008 (World Health Organization 2016).

Rubavu district is home of the RDF's 2nd Division deployed along Rwanda's Western province. The division is made up of three light infantry brigades with between 5,400 to 6,000 soldiers tailor-made to perform and sustain major tactical engagements. Furthermore, the division's responsibility is to synchronize tactical operations, including maneuvering, organic artillery firing and elements of the Army's combat support unit task organized under the division depending on the mission (armor, artillery and marines). The 2nd Division's ability both to conduct combat operations and sustain forces will depend on logistics. Currently, the RDF has no decentralized depots at brigade or division headquarters. Units are configured to carry their basic loads in order to be

more reactive and rapidly deployable. However, these forces are likely to face an uncertain and potentially hostile environment often requiring the deployment of additional supplies, equipment, and-or personnel. Undoubtedly, the prepositioning program as a power-projection platform regardless of the mission will require a large infrastructure support.

Rusizi District

Rusizi district is located in the south-west of Rwanda along the southern end shore of Lake Kivu. Rusizi is contiguous to Bukavu city in the south Kivu province of the DRC but separated from it by the Rusizi River. The water obstacle provides an important challenge for the FDLR to project combat power across the Rusizi River into Rwanda. The Rusizi River has two main crossing bridges that allow heavy loads.

The topography of the region is constituted by a chain of mountains swathed in lush vegetation limiting wheeled vehicle traffic to the existing road network. The natural obstacle and the open terrain in the south-west essentially changed the FDLR combatants' tactics to asymmetric cross-border warfare. The FDLR combatants move in small groups blending with the local population doing cross-border business transactions between Rwanda and DRC in order to effect strategic objectives across the border. Subsequently, the RDF is organized to support their combat operations in the south-west with very limited motorized wheel or tracked vehicles. In addition, mounted marine units to monitor the cross-border trade and rotary wings to sustain supplies or reconstitute forces to remote areas of operation substantially augment the logistical size of support required in the south-west.

Certainly, in order to integrate a logistical resource development and management capability, relevant information from the point of origin to the point of consumption will determine the parameters in developing support requirements and selecting areas for sustainment. The criteria used to identify sustainment and support base locations incorporate the following planning considerations:

Lines of communications (LOCs): Roads and air provide the main transportation infrastructure connecting Rusizi district to the rest of the country. Rusizi is the furthestmost locality from Kigali, Rwanda's capital and major logistical and economic hub. The distance from Kigali to the district of Rusizi is approximately 234 kilometers. The transshipment movement of goods between Kigali and Rusizi traffic through NR 1, NR 10 and NR 11 and takes approximately six hours. These are paved roads allowing long-haul trucks. DRs 3, 4, 5, 6, 7, and 8 are secondary unpaved roads with natural gravel surfacing allowing alternative access to remote areas of the district. These roads are acceptable for small trucks (5mt max) especially during rainy seasons (Rwanda Transport Development Agency 2016, 52).

The APOD for Rusizi district is the Kamembe airport, a medium size airport upgraded last year to include an extension of the single asphalt runway from 1,500 meters to 2,200 meters long and a width of 30 meters in order to handle larger aircraft (RCAA). This APOD in the south-west is at 146 km from Kigali international airport, Rwanda's largest airport. Furthermore, this civilian airport is primarily used for passenger air traffic. The recent upgraded runway allows Kamembe to handle larger aircraft such as the C17. The use of this infrastructure for military purposes will require additional security

improvements. However, Kamembe airport remains easily defensible given its location vis-a-vis the DRC border.

Arguably, forward deployable logistical supplies will reduce cost and enhance the RDF ability to support combat operations in crisis.

Terminal facilities: There are two warehouses managed by “Magasins Généraux du Rwanda” (MAGERWA) at Kamembe airport in Rusizi district. The physical assets are capable of handling all dry cargo movement of the cross-border trade. Trucks moving cargo constitute the bulk of the cross-border supply chain. Moreover, although the infrastructure was designed to link air and road network, the facility provides limited services for airfreight.

The current warehousing facility in Rusizi district does not provide storage for petroleum products. Placement of an RDF fuel storage in the area to support combat operations would simplify accessibility during conflict and provide freedom of action. In addition, the management and security of these facilities would remain an imperative for the RDF during peacetime in order to maintain the viability of the program.

Transportation network: As mentioned, Rwandan transportation solely relies on its roads network system for national and international modal integration. Road freight transport remains the most cost effective alternative to move consignments across the country. The road transportation network is generally good on all classified NRs. However, DRs will allow limited accessibility during rainy seasons and restrict the tonnage capacity.

The air transportation system in Rwanda remains focused on passenger flights with very limited cargo capacity.

Local supplies: The Gihundwe Hospital is the Rusizi district hospital which provides an advanced laboratory with blood transfusion possibility and surgical facility. This can be leveraged by the RDF. In addition, the health-care facility had the possibility to accommodate 269 patients in 2008 (OpenMRS 2016).

The fourth RDF division is responsible for the Rusizi district area of operation. The division is made up of three light infantry brigades with between 5,400 to 6,000 soldiers. As previously mentioned, the distance to Kigali, the country's main hub, is longer than Rubavu with difficult terrain often impracticable during rainy seasons. Moreover, this infantry division is also configured with their unit basic loads. The prepositioning program as a power-projection platform would enhance the division's endurance and freedom of action in support of a broader range of ground military operations.

The Map below shows the Rwandan road network and classification.

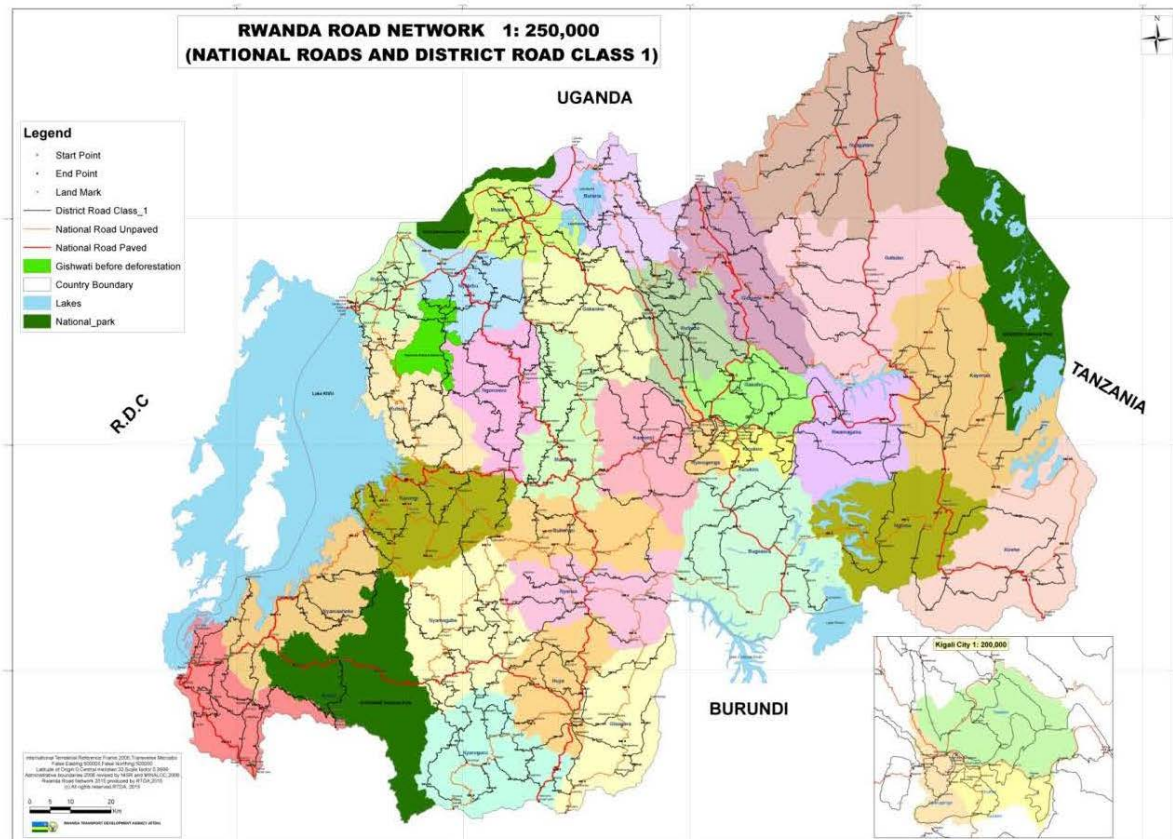


Figure 2. Rwandan Road Network and Classification

Source: Rwanda Transport Development Agency, “Road Network,” accessed 24 March 2016, <http://www.rtda.gov.rw/index.php?id=102>.

Kigali City

Kigali is Rwanda’s biggest logistical and economic center. The central location of the city has facilitated the development and operation of all the transport nodes and freight hubs linking the country with its overseas partners. The intermodal infrastructure enhances the capability to receive and distribute equipment and supplies throughout the country as well as all logistics services that regional shippers require for efficient delivery of cargo.

The FDLR's ability to destabilize or access Kigali during conflict poses little or no concern given the RDF posture. Stability and infrastructure base of the city can be therefore leveraged to develop the proposed preposition program to support RDF operations. The research did not determine a vulnerability assessment of the program against sabotage and terrorism.

In order to ensure adequate integrated supply chain and logistics services, the criteria used to identify sustainment and support base locations incorporate the following planning considerations:

Lines of communications (LOCs): Roads provide the main transportation infrastructure providing direct links to the seaport of Dar es Salaam, gateway and Sea Port of Debarkation (SPOD) of the Central corridor and the seaport of Mombasa, gateway and SPOD of the Northern corridor. For short internal haul and all the regional haul, the road network, although in need of repair in some areas, is able to support all the inward and outward transactions.

Kigali is Rwanda's main hub and harbors the logistics platform that serves the entire country. The travel distance from the SPOD of Dar es Salaam to Kigali is 1,475 km. This transit corridor is most constrained by the East Africa Traffic Act (Cap.403) limiting the axle load for the various axle (wheel) configurations on the road network for container trucks to a maximum gross vehicle weight of 48,000 kg and for tanker trucks to a maximum gross vehicle weight of 35,000 kg (East Africa online Transport Agency 2016).

Furthermore, historical evidence shows that it takes approximately 183.9 hours or 7.6 days for a transporter to load in Dar es Salaam, drive, rest and offload in Kigali. On

the Northern corridor side, the travel distance from the SPOD of Mombasa to Kigali is 1685 km while the travel time is estimated at 221 hours or 9.2 days. (Safari and Murenzi 2014)

The KIA is Rwanda's main Aerial Port of Embarkation—APOD. The airport facility is mainly for commercial activities with a small military wing. The airport has ongoing major upgrades with a new apron, three taxiways and hangars in a quest to improve the throughput. The current runway infrastructure is 3,044 meters length and 45 meters wide and thus capable to support all strategic capabilities. In principle, the single runway can handle 18 aircraft per hour if the spacing is greater than five nautical miles (RCAA). However, despite the improvement in air navigation systems the cargo handling capacity remains inadequate due to the limited ramp space. At KIA, the maximum one-day throughput is estimated at 526 tons. Assuming the terminal is only used for military strategic airlifting “a realistic capacity of five C-141, three C-5, and six C-130 aircraft per day, the airport would have a maximum sustainable cargo throughput of approximately 400 tons daily” (Kuperman 2001).

Consequently, although KIA is Rwanda's main Aerial Port of Embarkation—APOD, the limited air terminal support operations restrict the RDF's material and equipment acquisition as well as deployment to designated tactical assembly areas in support of emergency combat operations.

Terminal facilities: As previously mentioned Kigali is Rwanda's main economic hub and holds most the logistical infrastructure. The Kigali Industrial Zone provides a hinterland facility, dry port in character, with several dry warehousing infrastructures

linking the country's production and consumption center as well as providing the logistics services to local and international shippers.

Currently, Kigali petroleum depots can accommodate approximately 41 million liters most of it dedicated for the Government of Rwanda's strategic reserve with an additional two million liters of jet fuel at KIA. In 2014, the estimated country's fuel consumption was 23 to 25 million liters per month with 8 percent growth (Ministry of Infrastructure Rwanda 2015). Therefore, this simulation shows that the reserve can only last for two months if the GLOCs are interrupted. It is important to note that the RDF does not possess fuel reserve capabilities to support its combat operations.

These vulnerabilities outline the challenges the RDF would have in generating the combat power required in the event GLOCs are interrupted. Consequently, prepositioning would enhance the RDF survivability, combat effectiveness and freedom of action in support of the National Defense Strategy.

Transportation network: Rwanda's transport network is still confronted with challenges including inadequate air transport infrastructure, lack of rail, and lack of pipeline transportation. The existing two-lane road network with only one lane in each direction, and usually no median barrier, constrains the transfer of heavy logistics without interfering with ordinary traffic. All the classified NRs provide adequate delivery capabilities. However, the DRs provide limited connectivity especially during rainy seasons as well as restricted tonnage capacity.

Due to the existing transport and geographical constraints, Rwanda has very high transport costs. Furthermore, with the country trade imbalance with the value of imports is higher than that of exports, limited investments have been made in the transport and

distribution arena. Moreover, the RDF does not have transport capabilities to meet its logistical distribution requirements and heavily rely on contracting. This further exemplifies the RDF vulnerabilities to the transport network services. With this evidence, it is clear that the ability to preposition critical logistics components will enhance the RDF's ability to fight autonomously in a nonlinear or noncontiguous area of operation.

Local supplies: Rwanda is currently a developing country dependent on imports to fulfil its supply lines ranging from refined petroleum and commodities as well as military equipment. Historically, from Napoleon to modern armies the inability to maintain the flow of supplies drastically reduced the effectiveness of military forces. Supply chain management continues to be a very important characteristic for any military organization. Furthermore, before the Rwandan economy is capable of having factories, machinery and skilled labor needed to establish a large manufacturing base, as well as a robust military industrial complex, the RDF's ability to stock the necessary supplies will be critical for mission success in support of the National Defense Strategy.

The RDF medical command is based at Kanombe military hospital in Kigali which has surgical and other clinical capabilities. This hospital has positioned itself as a center of excellence in the country for non-clinical disease research (Kanombe Military Hospital 2016). In addition, the city of Kigali has the two biggest teaching national hospitals that can be leveraged by the RDF, the King Faisal Hospital and the University Central Hospital of Kigali. Suffice to note that medical equipment and consumable supplies are imported. In the event GLOCs are interrupted the ability of the RDF to provide adequate healthcare will remain a challenge.

As mentioned previously, Rwandan trade imports are far larger than its exports. All the trade routes are through the Central Corridor to the sea port of Dar es Salaam and the Northern Corridor to the sea port of Mombasa. Among the key planning considerations, perhaps the most important required to support combat operations in Rwanda is the ability to stage logistical infrastructure at both SPODs.

Sea Port of Debarkation at Dar es Salaam

The efficient movement of cargo along the Central Corridor depends on the capability of the port itself to move cargo effectively. Although the port has improved its operations moving from manual to computerized handling, container dwell time was estimated to be over 12 days and berth occupancy greater than 80 percent (Safari and Murenzi 2014). The port has a quay length of 2,000 meters with eleven deep-water berths serving Tanzania as well as neighboring landlocked countries Malawi, Zambia, DRC, Burundi, Rwanda, and Uganda. Currently, the port rated capacity 4.1 million tons of dry cargo and 6.0 million tons of bulk liquid cargo (Tanzania Ports Authority 2016). Several studies have forecasted traffic growth at the Dar es Salaam port; however, the existing infrastructure will not be able to sustain the growth. Therefore, to ensure uninterrupted logistical supply the flow of goods and materials should be coordinated to ensure the optimal mix at the correct time.

Sea Port of Debarkation at Mombasa

While the distance from the sea port of Mombasa to Rwanda is longer, shippers prefer using this port facility mainly because the dwell time is significantly shorter. The container dwell time was estimated to be less than five days. However, distance traveled

and the transit time on the Northern Corridor is higher than the Central Corridor due to the multiple border crossing and weighbridges. The 2009 throughput report recorded 4,641 million tons of dry cargo and 6,431 tons of bulk liquid cargo. Mombasa port has 12 deep-water berths serving Kenya, Burundi, DRC, Ethiopia, Rwanda, South Sudan, and Uganda (Kenya Port Authority). Indeed, the SPOD at Mombasa provides an alternative to Rwanda's trade routes; however, the growing insecurity caused by the Al Shabaab reduces the reliability of this facility for a robust integrated logistical supply chain management.

Given the challenges outlined on the Rwandan trade routes, the RDF operational flexibility is limited by the availability of logistical support. The author derived the RDF logistical support requirements based on the U.S. Army model. Furthermore, because of the considerable uncertainties about the logistics requirements of combat forces and whether in fact this support will be available when needed, this simulation could be used to forecast the RDF logistical foot print required in support of the National Defense Strategy.

Rwanda Defence Force Logistical Requirements

A comprehensive logistics supportability and sustainment planning will provide to the RDF warfighting capabilities that are reliable to ensure National objectives.

Table 4 shows lists of RDF units and the closest U.S. equivalent units.

Table 4. RDF Units and U.S. Equivalent Units

RDF Units		U.S. Equivalent Units			
Unit Title(U)	Unit Strength(U)	Number of U.S. Unit	Unit SRC(U)	Unit Title(U)	Unit Strength(U)
INFANTRY DIVISION	6000	2	77300R100	INFANTRY BRIGADE COMBAT TEAM (IBCT) (W/O MFS)	3502
ARMOR BRIGADE	400	5	17307R000	ARMOR COMPANY, COMBINED ARMS BATTALION (HBCT)	62
		1	06400R100	FIELD ARTILLERY BRIGADE	886
ARTILLERY DIVISION	1800	1	44615R000	ADA BATTALION (AVENGER)	375
AIR FORCE	100	1	01287R100	ATTACK/RECON TROOP (AH-64/SHADOW)	63
SPECIAL FORCE BRIGADE	1800	4	77305R000	BRIGADE SPECIAL TROOPS BATTALION (IBCT-RECAP)	395
ENGINEERING BATTALION	600	1	05315R600	BRIGADE ENGINEER BN (BEB), IBCT (RECAP)	422
SIGNAL BATTALION	100	2	11307R200	BRIGADE SIGNAL COMPANY (IBCT) (ABN)	40
		1	08547AA00	EARLY ENTRY HOSPITALIZATION ELEMENT (44 BED)	145
		1	08640R000	HHC, MEDICAL COMMAND	190
MEDICAL BATTALION	600	1	08945R000	COMBAT SUPPORT HOSPITAL (248 BED)	495
MAINTENANCE BATTALION	400	1	43107R000	FIELD MAINTENANCE COMPANY, BRIGADE SUPPORT BN	360
		1	08497A000	LOGISTICS SUPPORT COMPANY	120
SUPPLY BATTALION	300	1	42447L000	QM SUPPLY COMPANY	121
TRANSPORT BATTALION	200	1	55729R000	TRANS LIGHT-MDM TRUCK CO	167
MILITARY POLICE BATTALION	600	4	19477R000	MP COMPANY, COMBAT SUPPORT	169

Source: Created by author.

As previously discussed, QLET allows logistics planners to calculate all classes of supply usage estimates for varying types of operations. The simulation used U.S. equivalent units to the RDF units for major combat operations for each day spent conducting the mission. Table 5 shows the RDF daily requirement by class of supply.

Table 5. Requirements by Class of Supply

Requirements by Class of Supply								
Class:		Rate	Gallons	LBS	STONS	Pallets	Platforms	% Total Dry Cargo:
Class I		8.64		290,166	145.08	324	40.5	18.8%
Class II		1.54		51,719	25.86	126	15.8	3.4%
Class III	Bulk	AVG	235,909					
	Package	AVG		46,663	23.33	57	7.2	3.0%
Class IV	Barrier/Fortification	2.34		78,587	39.29	81	10.2	5.1%
	Construction	3.32		111,499	55.75	114	14.3	7.2%
Class V				135,106	67.55	90	11.3	8.8%
Class VI	Basic	0.336		11,284	5.64	24	3.0	0.7%
	Additional	0		0	0.00	0	0.0	0.0%
Class VII				66,512	33.26	168	21.0	4.3%
Class VIII	(Soldier Based Only)	0.19		6,381	3.19	10	1.3	0.4%
Class IX				10,700	5.35	18	2.3	0.7%
Water	Bulk Drinking - Potable	5.05	84,800					
	PKG Drinking - Potable	50.0%		707,229	353.61	284	35.5	45.9%
	Other - Potable	0.00	0					
	Non_Potable	2.67	89,669					
Ice		6.00		201,504	100.75	82	10.3	
Mail	Prograde	0.75		25,121	12.56	40	5.0	1.6%
Summary Table								
Cargo Type			Total Gallons	Total Weight (lbs)	Total Weight (ST)	Total Pallets	Total Platforms	% Total Dry Cargo:
Total Dry Cargo w/o Ammunition and Ice				1,405,861	703	1246	157	91%
Total Dry Cargo w/o Ammunition, Ice, Mail and CI VIII				1,374,359	687	1,196	151	89%
Total Ammunition				135,106	68	90	12	10%
Total Ice				201,504	101	82	11	
Total Fuel (Gallons)			235,909				48	
Total Bulk Potable Water (Gallons)			84,800				43	
Total Non-Potable Water (Gallons)			89,669				45	

Source: Created by author.

In addition to the mission parameters, the simulation determined the climate characteristics under which the forces operate. Responsiveness is defined, in the principle of logistics, as the ability to develop a theater logistical system that can support the mission, addressing the composition and concept of operations by anticipating unforeseen operational requirements. To develop a responsive plan, logistics planners should compare the rate of consumption for mission essential classes of supplies required for the theater stock level. The author could not find any historical evidence of the RDF consumption rate in order to assess whether an emergency operation could be supported by RDF's current theater stock level in the event GLOCs are interrupted.

The simulation determined 30 days of supply as the minimum safety requirement based on average consumption rates for the preposition war reserve stocks. The table

below provides the estimated requirements for Class III, Class V and Class VIII in liters and short tons.

Table 6. RDF Proposed Stocks

	Daily Requirement LITERS/S.TONS	30 Days' Supply LITERS/S.TONS
Class III–Bulk Petroleum	893,013 L	26,790,390 L
Class V–Ammunitions	68 ST	2,040 ST
Class VIII–Medical Material (Soldier-based only)	4 ST	120 ST

Source: Created by author.

Prepositioning Assessment

The simulation showed that the RDF would require 26,790,390 liters of fuel, 2,040 short tons of ammunitions and 120 tons of medical material (Soldier-based only) in order to be self-sustaining for 30 days and to support major combat operations. The decision to preposition these classes of supply would address the RDF's flexibility, vulnerability, accessibility and responsiveness in the event GLOCs are interrupted. The aspect of the proposed program requiring close scrutiny in the analysis is Class III.

As described earlier, Rwanda's petroleum strategic reserve is estimated at 50 million liters with the country's monthly consumption estimated at 25 million liters. Hence, the simulation demonstrated that RDF would require more than 50 percent of the government's strategic reserve to support its combat operations for the duration of 30

days. Furthermore, from the simulation analysis, the RDF requires 32 petroleum tankers of 29,000 liters (7.5k gallons) to transport its daily requirement. Contractors generally handle most of this heavy haul trucking, since the RDF transport battalion is not configured with this type of capability.

The author consequently suggested that the RDF invests in logistical infrastructure, especially petroleum storage tanks, in order to adequately cater for the simulated supply quantities. Arguably, 60 percent of the fuel reserve would be stored in Kigali given the centrality of the city and the remaining 40 percent stored in both expected combat regions (Rubavu and Rusizi). The initial capital cost estimate was developed based on Xerxes petroleum storage tanks 2011 price list (Xerxes 2011). In addition to the tank cost, the study assumes 30 percent additional costs for installation. Xerxes 2011 price list estimates \$143,718 U.S. for a 50,000 gallons or approximately 190,000 liters underground tank. Consequently, by storing 60 percent of the fuel in Kigali, the RDF capital cost estimate would be \$15.8 mn U.S. Furthermore, by storing 20 percent in each of the combat regions the capital cost estimate would be approximately \$5.3 mn U.S. per storage facility. The total financing requirement to store the required strategic fuel reserve would total to \$26.4 mn U.S.

The overall capital cost estimate for the fuel storage facility is notably very high compared to the 2014 RDF budget. The Rwandan military budget was estimated to be \$94 mn U.S. dollars in 2014 representing slightly more than 1 percent of the country gross domestic product (militarybudget.org). The proposed infrastructure would require 28 percent of the military budget (excluding the cost of fuel). While the infrastructure investment to support the prepositioning program may seem very high, the degree of

challenge and cost associated with airlifting the supplies in the event GLOCs are interrupted are even higher. For illustrative purposes, the analysis considered the difficulties inherent in moving approximately 26.8 million liters of fuel by air. To understand the magnitude of airlifting costs, the author extrapolated the estimates based on the 2014 World Food Program (WFP) operation in Bangui Central African Republic (CAR). The WFP airlifted 50,000 liters of jet fuel from Nairobi to Bangui in order to continue providing assistance to the people of CAR for a cost of \$200,000 U.S. (World Food Program 2014). Assuming it takes \$200,000 U.S. to airlift 50,000 liters of fuel from a Rwandan strategic partner to Kigali, the RDF would spend approximately \$107 mn U.S. (excluding the cost of fuel) to transport the monthly requirement. This ignores the airport throughput limitations.

As with class V (ammunition) resupply system, the simulation showed that the 30 days ammunition required stock was 2,040 tons. The simulation also provided the daily ammunition transport requirement. The delivery of ammunition in theatre would necessitate twelve, 20 foot container loads or five, 40 foot container loads for daily supplies. Clearly, an ammunition distribution system is paramount for mission success. However, the logistical support requirement is not as heavy as for fuel. In the worst-case scenario, the ammunition requirement would easily be airlifted. Considering the KIA throughput of 526 tons per day, it would take approximately four days of airlifting assuming the APOD is only used for military operations. The World Bank air transport survey suggests air freight rates generally ranging from \$1.5 to \$4.5 U.S. per kg (World Bank Group 2009). The author assumed an average cost of \$3 U.S. per kg. In order to airlift the monthly ammunition requirement the RDF would spend approximately six

million U.S. dollars. Permanent ammunitions storage does not require heavy infrastructure investment; the RDF should therefore consider building decentralized depots to serve Rubavu and Rusizi districts.

For medical supply, the simulation requires nearly 120 tons of supplies to sustain combat operations over the duration of 30 days. The capacity of delivering the medical supply poses little concerns since the relative weight of the logistical stock requirement is low.

To test the validity of the preposition strategy the study evaluated the selection criteria of suitability, feasibility and acceptability for policy recommendations. Art Lykke's theory of evaluating a strategy define suitability as the overall rationale to accomplish the desired effect (objectives), feasibility refers to whether the action be accomplished by the means available and acceptability refers to the expected outcomes or the consequences of cost justified by the importance of the effect desired (Lykke 1989).

Suitability: The preposition strategy is suitable and compatible within the current political construct. Despite the decade-long international joint military actions against the FDLR, this rebel group has resisted the pressure to disarm and remains a threat to Rwanda's sovereignty. The complexity of this threat has seldom compelled the RDF to cross DRC borders in pursuit of national security objectives. Furthermore, Rwanda has at times been subjected to international sanctions for its perceived involvement in the DRC. The analysis also showed the vulnerabilities that may be encountered along the country's supply chain. Rwanda, a landlocked country, relies heavily on trade facilitation to access its international partners. The performance of the Central and Northern corridors in terms of infrastructure (SPOD and Roads), service delivery, and transport remains

unpredictable. The strategic alternative of not investing into prepositioning would therefore expose the RDF to possible supply shortage thereby threatening their ability to conduct major combat operations.

Feasibility: As outlined earlier, the 2014 RDF budget was estimated at 94 million U.S. dollars. The financial resources required to build the fuel storage infrastructure represent approximately thirty percent of the RDF budget. Certainly, if the project is spread over five to six financial years, the RDF could afford the investment. Moreover, the strategic capability gained is by far more cost effective than the airlifting alternative. In addition, this capability would expand the government strategic reserve which runs very low volumes due to limited storage space.

Acceptability: The proposed prepositioning program is also deemed acceptable and can be evaluated in terms of sustainability. The requirement to maintain adequate supplies to extend the RDF endurance and deployment capability is necessary in order to support the national security objectives. The main obstacle of the application of such a strategy is cost. However, an alternative interpretation of the constant economic value of the infrastructure provides the investment justification versus the risk of not having the stock and the outrageous airlifting costs.

Summary

This chapter examined the sustainment preparation of Rwanda's operational environment identifying the relevance toward the primary and secondary questions of the overall study. The challenges of the operational environment and proposed mitigation measures based on RDF's logistical requirement were identified. The analysis provided initial estimates required for the RDF to support its combat missions over 30 days in the

event that GLOCs are cut off. The subsequent chapter summarizes the research and analysis. In addition, the initial logistical estimates examined provided the basis for conclusions and recommendations confirming the relevance toward the primary and secondary questions of the overall study.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Introduction

The intent of this research project was to analyze whether the RDF, given the regional geopolitical context, should build an integrated sustainment reserve in support of future contingencies. The secondary questions of the study were: What are the operational regions and their characteristics? What are the risks and mitigating measures identified on the Rwanda supply routes? What is the RDF force structure and logistical requirement? What is the mission profile of high operational tempo (OPTEMPO) during an emergency operation?

Summary of Findings from Chapter 4

In order to conduct this research, the sustainment preparation of Rwanda's operational environment was analyzed to understand the challenges and critical factors that affect the logistical requirements in support of RDF combat missions. In addition, the RDF logistical requirements were computed per U.S. equivalent units using the QLET. The analysis focused on the three mission critical classes of supply, Class III, Class V and Class VIII. The simulation provided initial estimates required to support RDF combat missions over 30 day duration. Furthermore, the analysis recognized the supplementary infrastructure required to complete the preposition program.

Interpretation of Findings

Through the logistical requirement analysis and challenges identified along Rwanda's trade routes it can be deduced that without a robust logistical infrastructure

established the RDF's ability to quickly participate in any significant combat operation remains a challenge. The queries focused on building a sustainment reserve given the regional geopolitical context, which have been assessed, and provide an investment justification for policy makers.

Undoubtedly, the lack of a military industrial base in support of defense operations limits the effectiveness of the RDF and thus requires the RDF to procure the bulk of its military supplies from foreign suppliers. In many cases, supplies from external partners are subjected to international politics to the detriment of Rwanda's national security objectives. As an alternative, the sustainment reserve would provide a critical link between the RDF's ability to project combat power and deterring aggression. Although prepositioning requires significant upfront cost to develop the support infrastructure, it is a strategy that would enhance RDF endurance and freedom of action.

Unlike coastal countries, landlocked countries are often dependent upon transit neighbors' infrastructure to transport goods from the SPOD. In order to mitigate these uncertainties, prepositioning would provide the RDF with the strategic agility to meet its contingencies. The sustainment reserve as a means to the Rwanda national security strategy will fill the gap between the RDF capabilities and deployment ability. To support its combat missions the RDF require an extensive amount of logistical support. For fuel, the simulation estimated more than 50 percent of the current government strategic reserve, while for ammunition, the simulation estimated 2,040 tons and for medical supply, the simulation estimated 120 tons.

Logistical infrastructure support and funding affect the operational suitability of the sustainment reserve strategy. The proposed strategy suggested three sets of logistics

bases in Rubavu, Rusizi and Kigali. Furthermore, the rationale for this investment decision is related to the inherent unpredictability of Rwanda's security environment.

Summary and Conclusion

During the conduct of this research, the author examined Rwanda's security challenges, the sustainment preparation of Rwanda operational environment and Rwanda's dependency upon its transit neighbors' infrastructures. These matters directly affect the RDF ability to respond to its future contingencies.

The first conclusion is that the FDLR threat is a reality and continues to disturb the regional security apparatus despite the multiple efforts from the international community. The inability to predict the political environment can severely hamper RDF military operations.

The second conclusion is that the performance in terms of transport time, reliability and cost of the Central and Northern corridors is very poor and has negative economic consequences on Rwanda. Significant resources are required to establish and maintain these unpredictable lines of supply (end to end).

The third conclusion is that the RDF logistical requirements are substantial and necessitate a large infrastructure base in order to enhance its strategic and operational flexibility. The strategy has revolutionary potential and would change the way the RDF fight and win wars.

Recommendations

The RDF should invest in a robust logistical infrastructure to support the sustainment reserve. Although Rwanda is a small country, the land-based infrastructure

should be spread throughout the operational regions (Rubavu and Rusizi) to ensure a smooth logistical sustainment process.

The RDF should request that the government invest in expanding the KIA's throughput as the major Aerial Port of Embarkation—APOD of the country. The relative small size of the country does not provide justification for additional investment for alternative APOD in Rubavu and Rusizi.

In addition, the RDF should develop its indigenous defense research and production facilities. History shows that the failure of armed forces to develop intrinsic capability systems has been detrimental to its evolution as a competent fighting force. An education policy essentially for the military and the military industrial complex is recommended.

Recommendations for Future Studies

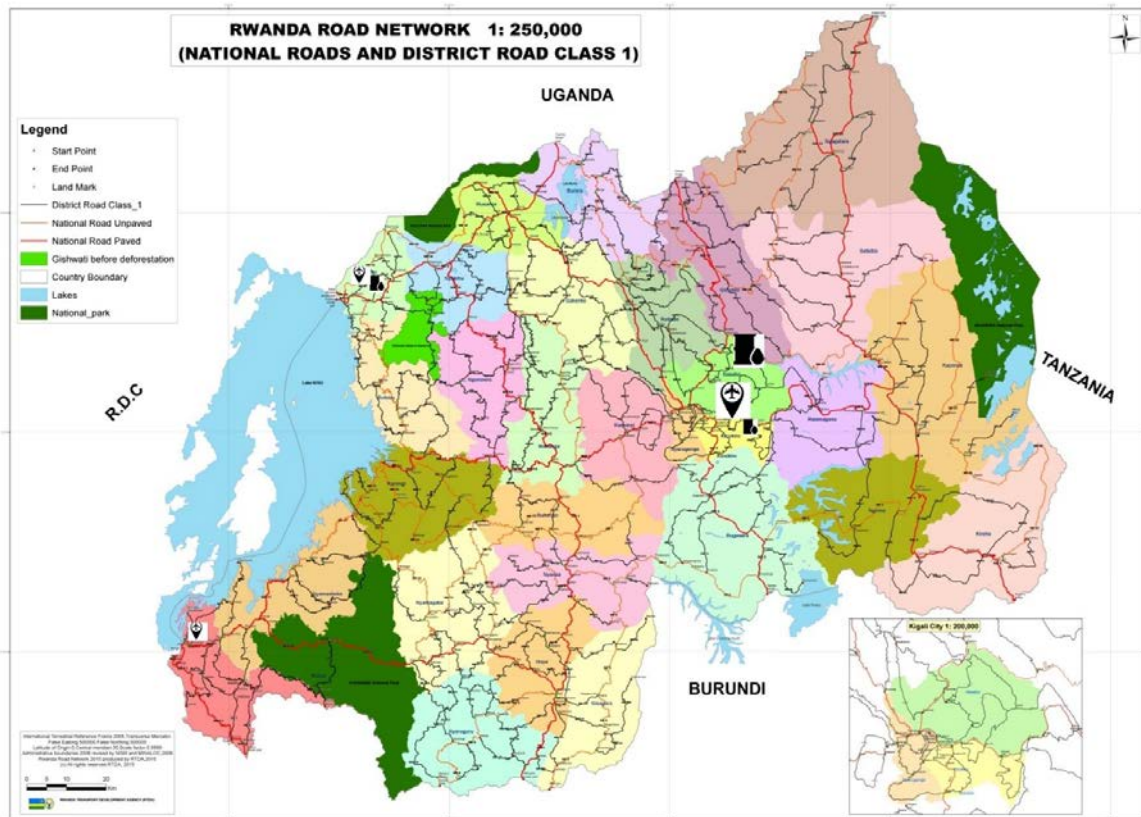
In order to properly inform policy makers on the sustainment reserve, the funding issue will play a major role. Although the study provided an approximate cost for the logistics support infrastructure, a few unanswered questions on the cost of classes of supply may be subject to further research to arrive at a cost estimate for the overall strategy. The research would develop measures of effectiveness and quantify the non-monetary benefits of the program.

In order to get beyond what is reasonable first order estimate of requirements, the RDF should develop an estimation metric tool for strategic and operational planning factors.

APPENDIX A

MAPS

Rwanda's APOD and Oil Strategic Stock.



Source: Modified by author from Rwanda Transport Development Agency, “Road Network,” accessed 24 March 2016, <http://www.rtda.gov.rw/index.php?id=102>.

Legend:



APOD

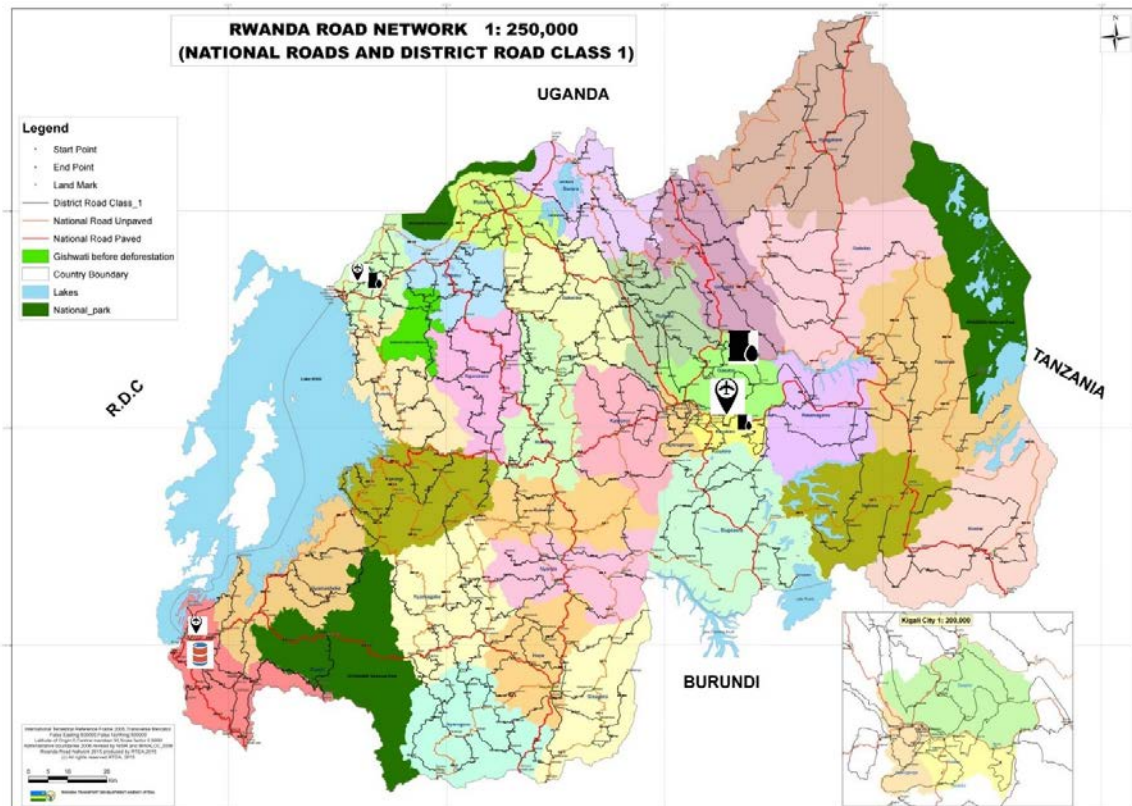


Strategic Oil reserve

As displayed on the map above, Rwanda's APODs and strategic fuel reserve facilities. The strategic fuel storage is in Kigali and Rubavu district. The cost of fuel has a macro-economic impact since fuel represent the bulk of the country's energy resource.

Arguably, the proposed RDF storage infrastructure will provide the capacity to the government of Rwanda to take some of the economic volatility on fuel, which is an important cost component in freight logistics.

Proposed location for new storage facility



Source: Rwanda Transport Development Agency. 2016. "Road Network." Accessed 24 March 2016. <http://www.rtda.gov.rw/index.php?id=102>.

Legend:

-  APOD
-  Strategic Oil reserve
-  Proposed Oil reserve infrastructure

For efficient programming of resources, the map above suggests that the new fuel storage facility will be first built in the district of Rusizi for a comprehensive emergency response plan and thereafter scaled up in the two other regions, Kigali and Rubavu.

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