Unanswered Nine-Line: The Challenge of Medical Evacuation in Large Scale Combat Operations

A Monograph

by

MAJ Benjamin J. Long
US Army

School of Advanced Military Studies
US Army Command and General Staff College
Fort Leavenworth, KS

2021

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE *(DD-MM-YYYY)*	**2. REPORT TYPE**	**3. DATES COVERED** *(From - To)*
27-05-2021	MASTER'S THESIS	JUNE 2020-MAY 2021

4. TITLE AND SUBTITLE
Unanswered Nine-Line: The Challenge of Medical Evacuation in Large Scale Combat Operations

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)
MAJ Benjamin J. Long

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
U.S. Army Command and General Staff College
ATTN: ATZL-SWD-GD
Fort Leavenworth, KS 66027-2301

8. PERFORMING ORG REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
ADVANCED MILITARY STUDIES PROGRAM

10. SPONSOR/MONITOR'S ACRONYM(S)

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

12. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for Public Release; Distribution is Unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

The Army is accustomed to the rapid one-hour helicopter medical evacuation, now mandated across the Department of Defense and in Army medical regulations, yet current doctrine fails to outline how it accomplishes this in a future near-peer conflict. This monograph presents a structured focus case study comparison of the Vietnam War and Operation Desert Storm in order to extract insights into how the Army is postured to provide a "Golden Hour" medical evacuation in large-scale combat operations. Through the lens of history, doctrine, and capabilities, this study analyzes the impacts, changes, and effects of air medical evacuation in two types of conflict. The insights provided remain applicable to the discussion of casualty management and evacuation in the planning of future combat operations.

15. SUBJECT TERMS
Air Medical Evacuation, Large-Scale Combat Operations

16. SECURITY CLASSIFICATION OF:			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON**
a. REPORT	**b. ABSTRACT**	**c. THIS PAGE**			MAJ Benjamin J. Long
(U)	(U)	(U)	(U)	51	**19b. PHONE NUMBER** *(include area code)* 913 758-3300

Monograph Approval Page

Name of Candidate: MAJ Benjamin J. Long

Monograph Title: Unanswered Nine-Line: The Challenge of Medical Evacuation in Large Scale Combat Operations

Approved by:

__//signed/1APR21/JK//_____, Monograph Director
Justin E. Kidd, PhD

___//signed/2 APR 21/RGB//_ __ _____, Seminar Leader
Gaétan R. Bédard, COL

___//signed/12 May 21/BAP//_____ __, Director, School of Advanced Military Studies
Brian A. Payne, COL

Accepted this 20th day of May 2021 by:

___ _____ _____, Assistant Dean of Academics for Degree Programs
Dale F. Spurlin, PhD and Research, CGSC

The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the US Army Command and General Staff College or any other government agency. (References to this study should include the foregoing statement.)

Abstract

Unanswered Nine-Line: The Challenge of Medical Evacuation in Large Scale Combat Operations by MAJ Ben J. Long, 50 pages.

The Army is accustomed to the rapid one-hour helicopter medical evacuation, now mandated across the Department of Defense and in Army medical regulations, yet current doctrine fails to outline how it accomplishes this in a future near-peer conflict. This monograph presents a structured focus case study comparison of the Vietnam War and Operation Desert Storm in order to extract insights into how the Army is postured to provide a "Golden Hour" medical evacuation in large-scale combat operations. Through the lens of history, doctrine, and capabilities, this study analyzes the impacts, changes, and effects of air medical evacuation in two types of conflict. The insights provided remain applicable to the discussion of casualty management and evacuation in the planning of future combat operations.

Contents

Acknowledgements v

Abbreviations vi

Figures vii

Tables ..... **Error! Bookmark not defined.**

Introduction ..... **Error! Bookmark not defined.**

Literature Review 5

Methodology 8

Vietnam War 1965 Case Study 11

Vietnam War 1970 Case Study 22

Operation Desert Storm Case Study 35

Analysis and Conclusion 44

Bibliography 47

Acknowledgements

I sincerely thank Dr. Justin Kidd for his guidance, direction, and redirection throughout the monograph process. He alone assisted me in shaping this monograph into a thought-provoking analysis, for which I am extremely grateful. I also thank my family for their love and support throughout this process. They provided me with the necessary time and space to spend great lengths writing and editing.

I am humbled and indebted for the mentorship of seminar six through this novel academic year. We rapidly adapted to change, reframed problems, and discovered new ways of seeing. I thank each of them for a year of hard work and their positive impression.

Lastly, I earnestly thank Colonel Bédard for keeping the ship on the right course throughout the year. He fostered a learning environment which stimulated critical thought and encouraged teamwork. His dedication left a lasting impression on every member of seminar six. Merci beaucoup et à la prochaine fois!

Abbreviations

AEROMEDEVAC	Air Medical Evacuation
ARVN	Army of the Republic of Vietnam
CTZ	Corps Tactical Zone
KIA	Killed in Action
MASH	Mobile Army Surgical Hospital
MCAA	Medical Company Air Ambulance
MDHA	Medical Detachment Helicopter Ambulance
MTF	Medical Treatment Facility
MEDCOM	Medical Command
MEDEVAC	Medical Evacuation
RVN	Republic of Vietnam
RVNAF	Republic of Vietnam Armed Forces
SODR	Senior Officer Debriefing Report
WIA	Wounded in Action
USAMEDCOMV	United States Army Medical Command, Vietnam
VN	Vietnam

Figures

Figure 1. Corps Tactical Zones in Southern Vietnam. 12

Figure 2. Casualty Survival Rate in the Vietnam War 18

Figure 3. Rates of Injury in Vietnam, 1965-1970 19

Figure 4. Medical Support Echelons of the Medical Brigade. 21

Figure 5. Evacuation Flow of Casualties in Theater 22

Figure 6. Cambodian Incursion May-June 1970 24

Figure 7. Theater Evacuation Flow. 34

Figure 8. Operation Desert Shield Timing of Attack Execution 38

Figure 9. Air and Ground Medevac Assets During the Operation 40

Figure 10. Extended Lines of Communication 42

> In May 2009, I visited the surgical hospital and helicopter medevac unit at Forward Operating Base Bastion in Helmand province in southern Afghanistan. One of the surgeons there told me that prior to the additional medevac assets, they often could not save the life of a soldier or Marine who had lost both legs; now they did so routinely.
>
> —Robert Gates, *Duty: Memoirs of a Secretary at War*

Introduction

The *Golden Hour* in combat casualty care centers around the principle that the faster the critically injured soldier receives medical attention, the greater his chances of survival are. Since the Korean War, the US Army has used helicopter medical evacuation (MEDEVAC) to quickly transport causalities to a medical treatment facility.[1] In subsequent wars, the US Army deliberately planned for and used air MEDEVAC operations to preserve life and reduce the number of losses. Army health service support doctrine describes MEDEVAC as "dedicated medical platforms staffed and equipped to provide en route medical care," with a focus on "timely, efficient movement and en route care of the wounded, injured, or ill persons from the point of injury to MTFs[medical treatment facilities]."[2]

With its recent pivot to large-scale combat operations (LSCO), the US Army could face a near-peer adversary which could result in a high number of casualties. Ground units will likely have to rapidly advance the fight forward to meet its objectives. The Army may not be capable of sustaining the Golden Hour medical evacuation standard due to operational tempo, extended lines of communication, battlefield geometry, and available assets and capabilities in the area of operations. Instead it may use ground MEDEVAC and non-standard casualty evacuation (CASEVAC) to transport wounded soldiers to medical facilities.

---

[1] Peter Dorland and James Nanney, *Dust off: Army Aeromedical Evacuation in Vietnam* (Washington, DC: Center of Military History, United States Army, 2008), 11.

[2] US Department of the Army, Field Manual (FM) 4-02, *Army Health System* (Washington, DC: Government Printing Office, 2013), 15.

The challenge for the Army as the land combat component will be in applying the right amount of maneuver and sustainment units to the operation. Medical support, as one of the sustainment elements, enables operational reach and freedom of action by caring for wounded soldiers and moving them quickly to an appropriate level of care. In describing LSCO, Army sustainment doctrine references World War Two where "American Soldiers were wounded or killed at a rate of several hundred per day."[3]

The Golden Hour carries significant emotional weight. From the public's perspective, it wants to know that its wounded sons and daughters receive rapid evacuation, medical care, and are not dying from survivable wounds on the front lines. From the military perspective, soldiers trust the Army to rapidly evacuate its injured in order to save lives. In fact, calling for a nine-line air MEDEVAC request remains a basic soldier task.[4] From an operational perspective, the ability to rapidly evacuate casualties represents the command's ability to preserve combat power and extend its operational reach. Former Secretary of Defense Robert Gates formalized the Golden Hour concept when he standardized the one-hour window to move a severely injured soldier from his point of injury to a medical facility capable of stabilizing him or her.[5] This standardized the Golden Hour across the military for certain types of injuries.

The purpose of this study was to determine how the Army is postured to maintain the Golden Hour in LSCO; a scenario potentially distinct from Iraq or Afghanistan, and more akin to the Vietnam War and Operation Desert Storm. The study analyzed those two instances of war where the relative conditions might mirror those in future LSCO. Through the lens of history, doctrine, and capabilities, this paper analyzed the Army in two distinct cases in order to determine potential implications for future warfare.

---

[3] US Department of the Army, Field Manual (FM) 4-0, *Sustainment* (Washington, DC: Government Publishing Office, 2019), 20.

[4] US Department of the Army, Soldier Training Publication (STP) 21-1-SMCT, *Soldier's Manual of Common Tasks: Warrior Skills Level 1* (Washington, DC: Government Publishing Office, 2019), 3-164.

[5] Russ S. Kotwal. Jeffrey T. Howard, Jean A. Orman, Bruce W. Tarpey, Jeffrey A. Bailey, Howard R. Champion, Robert L. Mabry, John B. Holcomb, and Kirby R. Gross , "The Effect of a Golden Hour Policy on the Morbidity and Mortality of Combat Casualties," *JAMA Surgery* 151, no. 1 (January 1, 2016): E1, accessed September 10, 2020, https://doi.org/10.1001/jamasurg.2015.3104.

After twenty years of fighting in Iraq and Afghanistan, both the military and public were accustomed to having a golden hour type of care on the battlefield. However, future warfare will likely see multiple corps maneuvering against a peer opponent. While concerned mainly with air MEDEVAC flight time, travel distance, and available aircraft, no study exists which analyzes how the Army is going to provide golden hour care in large-scale warfare. Army Regulation 40-3 states "The Army recognizes the strategic value of the medical evacuation (MEDEVAC) mission and has implemented the aeromedical evacuation standard of a one-hour mission completion time for urgent and urgent surgical missions (time from mission request to delivery of the patient to the appropriate medical care)."[6] Current doctrine, however, does not reflect how the Army accomplishes this in LSCO.

Due to terrain unsuitable for ground evacuation, the Army used air MEDEVAC as its primary means of patient evacuation during the Vietnam War. Units collected casualties, assessed injuries, and if necessary, requested a medical evacuation. Air ambulance units had to maintain good communication with maneuver units and medical facilities; highlighting the importance of its regulation within the theater. As Vietnam evolved into large-scale war in 1965, evacuation by air became crucial to saving lives. By 1970, troop levels began to decline, yet the role of air ambulances in saving lives became more important as operations expanded into Cambodia and Laos.

Operation Desert Storm provides a more recent example of warfare where planners placed a heavy emphasis on the quantity of air evacuation platforms. While major ground combat operations lasted one hundred hours, analysis of the war provided useful insight into MEDEVAC operations and the Golden Hour in America's next major conflict. The hostilities resulted in less than 1,000 US casualties, much less than initially anticipated, yet serve as a recent example of a large-scale combat operations.

The significance of this study is that it used historical case study analysis to extract implications for future large-scale combat. The implications highlighted in this study can inform planners and leaders

[6] US Department of the Army, Army Regulation (AR) 40-3, *Medical, Dental, and Veterinary Care* (Washington, DC: Government Printing Office, 2013), 67.

on the effects of the Golden Hour as it relates to operational reach, tempo, and the arrangement of units on the battlefield. Air MEDEVAC operations can impact unit cohesion as members rely on a quickly arriving helicopter ambulance. With advances in technology and synchronized operations, helicopter evacuation dramatically improves a casualty's chances of survival. However, large-scale combat operations and enemy air defenses may sever this accustomed rapid rearward movement of casualties on the battlefield.

Research Questions

This study used one primary and three secondary research questions to guide its case study analysis. The primary research question was how is the US Army postured to support the Golden Hour in large-scale combat operations? The secondary research questions were how did air MEDEVAC planning change from the Vietnam War to Operation Desert Storm, what organization and doctrinal changes affected the Army's ability to conduct air MEDEVAC operations between the Vietnam War and Operation Desert Storm, and what lessons might the Army learn from air MEDEVAC planning in Vietnam and Operation Desert Storm?

The answer to the first question showed the evolution of air MEDEVAC in practice, which could inform operational planners on its use in future large-scale warfare. The focus of the second question was to analyze doctrine and organizations as they evolved through time. Understanding changes made in a historical context could provide insights into potential future changes for future warfare. The final question looked for lessons learned or key takeaways from each case study, which could be sustained, improved, or eliminated in future practice.

While the focus of this study was to provide implications for future large-scale combat operations, it used both the Vietnam War and Operation Desert Storm as case studies; each occurred over different lengths of time, in different operational environments, and had different outcomes. The Vietnam War section analyzed the war as two case studies: the first case on the introduction of a large American ground force in 1965, and the second case on the war in 1970 as troop numbers began to decrease. The

Operation Desert Storm case study analyzed the force buildup through Operation Desert Shield and execution of the ground campaign during Operation Desert Storm.

This study focused on history, doctrine, and organizations that related to air medical evacuation. While ground MEDEVAC and nonstandard casualty evacuation can provide adequate means for patient evacuation, they remain outside the scope of this study. The Golden Hour principle itself has received varying levels of analysis since the Vietnam War; some which support it and others that refute it. This study worked on the assertion that the Golden Hour principle is a valid method of preserving the lives of critically injured soldiers when they receive stabilizing medical care within one hour from their point of injury.

This paper contains five sections. The first section is the introduction which described the background of the study, the research questions, and the problem statement. The second section is the literature review, which highlighted existing research and current doctrine related to or impacting the Golden Hour. The third section is the methodology, which described the structured focus case study comparison of the Vietnam War and Operation Desert Storm. The fourth section is the examination of the case studies using the structured focused comparison questions. The fifth section contains the study's analysis and conclusion.

Literature Review

The literature review provides an overview of the resources and existing research on this topic. This section also provides some contextual background into the Golden Hour concept. There is currently a gap in the literature that analyzes the Army's ability to provide Golden Hour care on the future battlefield. This section provides an overview of the Golden Hour, its historical application, and analysis of its efficacy. This section also provides insight into how the Golden Hour moved from idea or theory into practice.

The Golden Hour draws its history from both the American experience in the Vietnam War, and a desire domestically to preserve the lives of severely injured patients. In current civilian medical circles,

the term is understood by emergency medical providers to be a one-hour window of time; outside of this window the patient's chances of survival begin to decrease.[7] Doctor E. Brooke Lerner and Doctor Ronald M. Moscati described the Golden Hour concept in the context of modern medical practice by stating, it "…implies that morbidity and mortality are affected if care is not instituted within the first hour after injury. This concept justifies much of our current trauma system."[8] The idea draws its roots from a civilian doctor in 1971, Dr. R. Crowley, and his desire to create both a civilian trauma center in Maryland, and a helicopter evacuation element to transport patients to the center.[9] Crowley's idea "…likely arose from the military, as many battlefield casualties occur within the first minutes post-injury."[10] Additionally, at the time of Crowley's idea, "…many civilian trauma patients were dying due to a lack of an organized system of trauma care and insufficient pre-hospital treatment."[11]

It's important to note the correlation between the emergence of the Golden Hour within the context of the Vietnam War. Doctor Kendal McNabney pointed out that the war was both "…a controversial…and an emotionally charged topic."[12] Additionally, "Body count, killed in action, and wounded in action information was corroborated by video-taped action on the evening news."[13] McNabney argued that even though unpopular, the Vietnam War saw an improvement in casualty survival rates for patients that reached medical treatment facilities. This was due primarily to the heavy use of air MEDEVAC operations, with a two percent improvement over World War Two and the Korean

---

[7] Frederick B. Rogers, Katelyn J. Rittenhouse, and Brian W. Gross, "The Golden Hour in Trauma: Dogma or Medical Folklore?," *Injury* 46, no. 4 (April 2015): 525, accessed September 18, 2020, https://linkinghub.elsevier.com/retrieve/pii/S0020138314004173.

[8] E. Brooke Lerner and Ronald M. Moscati, "The Golden Hour: Scientific Fact or Medical 'Urban Legend'?," *Academic Emergency Medicine* 8, no. 7 (July 2001): 758, accessed October 21, 2020, http://doi.wiley.com/10.1111/j.1553-2712.2001.tb00201.x.

[9] Rogers, Rittenhouse, and Gross, "The Golden Hour in Trauma," 525.

[10] Ibid.

[11] Ibid.

[12] W. Kendall McNabney, "Vietnam in Context," *Annals of Emergency Medicine* 10, no. 12 (December 1981): 76, accessed September 21, 2020, https://linkinghub.elsevier.com/retrieve/pii/S0196064481800947.

[13] Ibid.

War.[14] For clarification, he noted, "This record was achieved despite the fact that many mortally wounded personnel found alive on the battlefield have come to be counted as hospital deaths."[15] While attributing medical success largely to helicopters, McNabney also highlighted the improvement in patient transportation time by noting, "In World War II it took an average of ten hours…in Korea it was reduced to five…and in Vietnam it was one hour."[16] In a domestic context, he suggested the Golden Hour concept could have emerged as a result of American vehicle accidents, stating "In 1969 alone, 11,000 more fatalities occurred due to motor vehicles than occurred in all 11 years of the war."[17] It is plausible, as one explanation for the Golden Hour, that medical providers compared the Army's casualty management during Vietnam War, and used it to combat what appeared to be a growing issue of automobile deaths.

The idea of a Golden Hour as a validated medical practice received mixed reviews after the term emerged in the 1970s. Doctor Frederick Rogers led a study which analyzed the Golden Hour in terms of it being "dogma" or "folklore,"[18] and highlighted studies which both support and refute the idea of a one-hour time frame improving the chances of survival for certain types of injuries.[19] The ultimate conclusion, however, was that too many variables exist in patient conditions to definitely support or refute the Golden Hour, yet it also stated, "There is an aspect to trauma care that is time dependent."[20] It is also important to note that their study considered the Golden Hour in terms of civilian ground ambulance use for patients with varying degrees of injuries. Rogers' study also implied that the Golden Hour may not have the same impact on domestic situations as it might have in combat.

---

[14] McNabney, "Vietnam in Context," 76.

[15] Ibid.

[16] Ibid.

[17] Ibid., 78.

[18] Rogers, Rittenhouse, and Gross, "The Golden Hour in Trauma," 525.

[19] Ibid., 526.

[20] Ibid.

A separate study analyzed the effect of the Gold Hour in combat. Doctors Russ Kotwal, Jeffrey Howard, Jean Orman, Bruce Tarpey, Jeffrey Bailey, Howard Champion, Robert Mabry, John Holcomb, and Kirby R. Gross conducted an analysis of combat casualties in Afghanistan after Secretary Gates "…mandated prehospital helicopter transport of critically injured combat casualties in sixty minutes or less."[21] The objective of the study was to determine if the new mandate had any impact on casualty rates, and analyzed casualty data in Afghanistan from September 2001 through March 2014. This timeframe provided the authors with substantial data both before and after the mandate. Ultimately, the study found that the percentage of casualties determined to be killed in action was reduced from 16% to 9.9%, "…equating to 359 lives saved."[22] While focused on cases of air MEDEVAC, the study also determined the average mission time after Secretary Gates' mandate was reduced from ninety to forty-three minutes.[23] Mission time includes the time from injury to request, launching the aircraft, aircraft arrival on scene, and movement from scene to military treatment facility.[24] While the study highlights the improvements of a one-hour mandate, it does not account for other variables such as the operational tempo, terrain, weather, enemy situation or aircraft availability. It does, however, point out that that the severity of injury became complex throughout the war, noting "…the prevailing mechanism of injury shifted from gunshot to explosion."[25]

Methodology

This paper used a structured focus case study comparison methodology to produce a qualitative assessment of three historical case studies. The first two case studies analyzed were the Vietnam War in the buildup phase in 1965, and the beginning of troop withdrawal in 1970. The third case study analyzed

[21] Kotwal et al, "The Effect of a Golden Hour Policy," E1.

[22] Ibid.

[23] Ibid., E4.

[24] Ibid.

[25] Ibid., E8.

Operation Desert Shield/Storm. The paper used the same structured research questions across the three case studies in order to maintain its focus.

The structured focus case study comparison is well-suited for this research paper as it allows for "systematic comparison of two unrelated cases," and enables the researcher to "…standardize data collection."[26] Additionally, this method allows the researcher to maintain objectivity "…by asking a set of standardized, general questions of each case."[27] While remaining focused on analyzing a single concept in multiple cases, the researcher produces "…comparable data in comparative studies."[28]

The differences between the Vietnam War and Operation Desert Storm were significant. The Vietnam War spanned nearly ten years, saw nearly 50,000 combat related deaths, and was fought both as a means to protect the government of South Vietnam and prevent the spread of communism.[29] Operations generally occurred from fixed bases, while units used air mobility to insert themselves into both mountainous and jungle environments. The ground campaign of Operation Desert Storm, in contrast, lasted only a few days and had a limited objective of liberating Kuwait from Iraqi forces. The ground war required extended lines of communication and demonstrated America's capacity to conduct rapid large-scale operations. This study used five structured focused comparison questions to analyze each case in order to answer the secondary research questions.

The first structured focus comparison question is where were medical units located with respect to combat operations? The intent of this question was to understand the makeup of the battlefield regarding roles of care and distances between them. The essence to maintaining to maintain the Golden Hour is the ability to evacuate a patient to a treatment facility in sixty minutes. The answer to this question informed the study on how distances between combat operations and treatment facilities

---

[26] Alexander L. George and Andrew Bennett, *Case Studies and Theory Development in the Social Sciences*, BCSIA studies in international security (Cambridge, MA: MIT Press, 2005), 67.

[27] Ibid., 69.

[28] Ibid.

[29] Kotwal et al., "The Effect of a Golden Hour Policy," E3.

impacted the Golden Hour. The second question is what aeromedevac units and capabilities were utilized? The answer to this question enabled a theater perspective on the air ambulance units, and air MEDEVAC helicopters used in each case. It also provided insight into understanding how changes in doctrine and organizations impacted the number of deployed units and assets into the theater.

The third question is what was the casualty survival rate? The rate of casualty survival is a metric to understand the benefits of MEDEVAC operations. The answer to this question informed the research question on lessons learned and how air MEDEVAC impacted casualty survival in each case. The fourth question was how were air MEDEVAC assets controlled and regulated? This question investigated the processes and procedures for using MEDEVACs in each case. It provided insight into how air MEDEVAC units interacted with ground combat forces, treatment facilities, and airspace management entities. The answer to this question enabled the study to qualitatively assess the functionality of MEDEVAC regulation and control.

The last question is how did the current medical doctrine support a Golden Hour of care in theater? To answer this question the study examined operational and medical doctrine to determine if there was emphasis on a time and distance factor in how medical units were arrayed on the battlefield. The answer to this question enabled the study to look at the relationship between doctrine and practice as it relates to air MEDEVAC in each case study.

This study used primary and secondary sources to provide details, data, and evidence for case study analysis and comparison. The sources used provided medical and operational context to inform the answers of the research questions. Additionally, this study used doctrine, policy, regulations, journal entries, reports to congress, and unit histories for analysis. This enabled the study to answer the secondary research questions in the manner of a structured focus comparison. The next section in this study contains the case studies.

Case Studies

Vietnam War 1965

The Vietnam War in 1965 represented a pivot from limited military and government assistance, to large troop deployments aimed at stopping the spread of communism and protecting American forces.[30] The United States involvement in Vietnam stemmed from failed French attempts to prevent the loss of French Indochina to the communists. After much bloodshed, the French facilitated the establishment of North and South Vietnam, separated at the 17th parallel.[31] The communists occupied the north, and the non-communists the south. President John F. Kennedy announced in 1961 that the United States would support the Republic of Vietnam, then led by President Ngô Đình Diệm, with military supplies and combat advisors.[32] The early effort in Vietnam fell under the auspice of the Military Assistance Advisory Group (MAAG), and later the Military Assistance Command Vietnam (MAVC). South Vietnam was divided into four corps tactical zones (CTZ) as depicted in figure 1.[33]

Initially the United States provided approximately 8,000 military advisors to assist the developing South Vietnamese forces.[34] Advisors were focused near major cities, where the communists posed the biggest threat, and received medical support from the 8th Field Hospital, and twelve medical detachments located throughout CTZs I, II, and III.[35] The medical detachments, however, only provided basic medical

[30] John M Carland, *Stemming the Tide, May 1965 to October 1966* (Washington, DC: Center of Military History, Government Printing Office, 2000), 11.

[31] Carland, *Stemming the Tide*, 4.

[32] Dorland and Nanney, *Dust Off,* 5.

[33] Carland, *Stemming the Tide,* 7.

[34] Ibid.

[35] Spurgeon Neel, *Medical Support of The US Army in Vietnam 1965-1970* (Washington, DC: Center of Military History, Government Printing Office, 1991), 9.

care and relied on the hospital for surgery and supplies.[36] Although numerous helicopters were deployed to Vietnam, only one five-helicopter air MEDEVAC unit provided dedicated support to the advisors.[37] The 8th Field Hospital located in Nha Trang provided surgical care, hospitalization, and ancillary services, and received aeromedical support from the attached 57th Medical Detachment Helicopter Ambulance (MDHA).[38]

Figure 1. Corps Tactical Zones in South Vietnam. Jeffrey J Clarke, *Advice and Support: The Final Years* (Washington, DC: Center of Military History, Government Printing Office, 2000), 35.

[36] Ibid., 4.

[37] Dorland and Nanney, *Dust Off*, 24.

[38] Ibid.

The level of advisors continued to climb as the South Vietnamese military force numbers expanded. By 1965, there were 25,000 US troops present, and a new US President, Lyndon B. Johnson.[39] However, on 2 August 1964 a tipping point occurred which put the United States on the brink of war. On that date, North Vietnamese forces attacked a US destroyer in the Gulf of Tonkin.[40] This prompted a series of retaliatory airstrikes which led to the Gulf of Tonkin Resolution; enabling President Johnson to apply any means necessary to preserve the safety of American forces in Vietnam.[41] American military officials soon realized the northern communists were growing in manpower and capabilities. Additionally, the monthly number of South Vietnamese casualties grew "…from 1,900 in January 1964 to 3,000 in December."[42]

Attacks on American forces continued through 1965; beginning with an attack at the US Air Base in Pleiku on February 7, 1965. It killed nine American advisors and wounded 108.[43] Over twenty aircraft were destroyed in the attack.[44] On February 9, the communists attacked the Americans at Quy Nhơn, also in CTZ II, killing twenty-three and wounding twenty-one.[45] Aside from the US retaliation, two actions occurred as a result. The first was the execution of a bombing campaign, named Operation Rolling Thunder, which applied increasing pressure on the communists to cease their attacks.[46] As the second action, the Chief of Staff of the Army, General Harold Johnson, went to Vietnam to assess the situation and determine how to change the rapidly deteriorating circumstances.[47]

---

[39] US Military Assistance Command Vietnam (USMACV), *Command History United States Military Assistance Command Vietnam 1965*, (Saigon, Vietnam: Military History Branch, 1965), 269.

[40] Carland, *Stemming the Tide,* 11.

[41] Ibid.

[42] Ibid., 12.

[43] Ibid., 14.

[44] Ibid.

[45] Ibid., 15.

[46] Ibid.

[47] Ibid., 17.

General Johnson returned to the United States with options to improve the situation, and by May 15, President Johnson approved and implemented them.[48] Johnson recommended to deploy one US division to protect key infrastructure in the Republic of Vietnam (RVN), and four additional US divisions to deploy and occupy areas throughout the south. This enabled more responsiveness and provided a capability to conduct ground offensive operations against the communists. By the end of 1965, the 3rd Marine Division, 101st Airborne Division, 173rd Airborne Brigade, 1st Infantry Division, and 1st Cavalry Divisions, a brand-new airmobile division, arrived and began conducting operations against both the North Vietnamese and the Viet Cong.[49] The total US military strength by the end of 1965 was approximately 185,000.[50]

The first question is where were medical units located with respect to the combat forces? In 1965, medical and air evacuation capabilities were increased to support the growth of combat forces. By the end of the year hospital bed spaces grew from 110 to 1600.[51] During the early months of 1965 all medical treatment facilities were concentrated in either Saigon or Nha Trang.[52] The distance from Nha Trang to the northern boundary in CTZ I was approximately 330 miles while the distance from Saigon to the western boundary of CTZ IV was approximately 150 miles.

The 1st Cavalry Division, totaling almost 16,000 troops, occupied CTZ II and located its headquarters in An Khê.[53] The 1st Brigade of the 101st Airborne Division set up its headquarters 150 miles south in the vicinity of Phan Rang, and was tasked with securing the coastal area to enable

[48] Ibid., 19.

[49] USMACV, *Command History 1965*, 300.

[50] Ibid., 275.

[51] Richard V. N. Ginn, *The History of the US Army Medical Service Corps* (Washington, DC.: Office of the Surgeon General and Center of Military History, United States Army, 1997), 309, accessed November 2, 2020, https://archive.org/details/historyofusarmym00wash.

[52] Neel, *Medical Support of The US Army in Vietnam*, 60.

[53] Carland, *Stemming the Tide,* 61.

additional forces to enter the theater.[54] The 1st Cavalry Division, as a newly formed airmobile division, arrived with an organic air ambulance platoon and twelve UH-1D MEDEVAC helicopters. The platoon fell under the division's 15th Medical Battalion and provided direct support to the divisional units.[55] The 57th MDHA provided additional MEDEVAC support, and rearward movement of casualties within the zone. The largest of the four CTZs, zone II, stretched approximately 120 miles from its eastern coastal boundary to its western boundary with Cambodia and Laos. From north to south the zone spanned approximately 300 miles.

The 173rd Airborne Brigade and 1st Infantry Division operated in CTZ III. Neither had organic air MEDEVAC support. The 173rd operated out of Biên Hòa and defended Saigon from an enemy advance.[56] The brigade's second task was to enable the 1st Infantry Division to integrate into the zone.[57] 1st Infantry Division operated primarily around Saigon to prevent the enemy from overtaking the capitol and kept each of its brigades no more than twenty-eight miles apart.[58] Zone III, while it shared roughly the same east to west distance as zone II, had a north to south distance between boundaries of approximately 120 miles. At this period in the deployment, the assigned end strength for the division was 9,600 troops.[59] Area MEDEVAC support for zone III came from various detachments located at Tan Son Nhut Air Base adjacent to Saigon.

The second question is what MEDEVAC units and capabilities were employed? At the beginning of 1965, the total combat force committed by the United States was approximately 20,000, and by its end the number rose to nearly 185,000.[60] With casualties increasing in austere areas, the helicopter became

---

[54] Ibid., 43.

[55] Darrel D Whitcomb, *Call Sign "Dustoff": A History of US Army Aeromedical Evacuation from Conception to Hurricane Katrina* (Frederick, MD: Borden Institute, 2011), 39.

[56] Carland, *Stemming the Tide,* 22.

[57] Ibid., 68.

[58] Ibid.

[59] Ibid.

[60] USMACV, *Command History 1965*, 269.

the preferred method for evacuation due to its speed, and because it could navigate in almost any terrain. The air MEDEVAC program grew from a single five-helicopter detachment covering all South Vietnam in 1961, to fifty-seven helicopters by the end of 1965, providing both direct and area support.[61]

While non-divisional helicopter ambulance units operated from a fixed base, they often provided support outside their CTZ, and to Vietnamese nationals. Stationed in and around Saigon in CTZ III were the 57th, 82nd, 254th and 283rd MDHAs.[62] These detachments later became part of a provisional air ambulance company, which provided area support to CTZs III and IV.[63] While these detachments fell under a single headquarters, their area support mission did not change. These units operated Bell UH-1B Iroquois helicopters with twenty-two platforms across the four detachments.[64]

The 57th MDHA initially provided coverage for the northern zones, but was later absorbed into the newly activated 498th Medical Company Air Ambulance (MCAA).[65] Activated in September, 1965, the 498th operated twenty-five UH-1D helicopters, and was responsible for the execution and coordination of MEDEVAC operations throughout CTZ III.[66] The 498th operated from three locations with nine helicopters in Quy Nhơn, nine in Pleiku, and the remainder, along with the company headquarters, in Nha Trang.[67] The 1st Cavalry Division employed its organic air ambulance platoon in CTZ III, but due to maintenance, damage, and other taskings, the platoon's twelve UH-1D helicopters were not adequate. This became most apparent during the Battle of Ia Drang where three available MEDEVAC helicopters provided anywhere from seventy to 280 MEDEVAC flights per day.[68]

---

[61] Dorland and Nanney, *Dust Off*, 45–53.

[62] Whitcomb, *Call Sign "Dustoff,"* 40.

[63] Dorland and Nanney, *Dust Off*, 52.

[64] Ibid., 53.

[65] Whitcomb, *Call Sign "Dustoff,"* 40.

[66] Dorland and Nanney, *Dust Off*, 50.

[67] Ibid., 51.

[68] Dorland and Nanney, *Dust Off*, 48.

The medical detachment helicopter ambulance was authorized five UH-1B helicopters with a basis of allocation on average of 2.33 detachments per corps.[69] The Army also activated the medical company air company, which was authorized twenty-five UH-1Ds, with one per corps authorized.[70] The air ambulance platoon, organic to the airmobile division's medical battalion, was authorized twelve UH-1Ds.[71]

The UH-1B had a 1,100-horsepower engine, a range of 230 nautical miles traveling at 140 knots per hour, and could transport three litters with a medic.[72] The upgraded UH-1D had a 1,400-horsepower engine, a range of 270 nautical miles, and could carry six litters plus a medic.[73] Both helicopter models could be equipped with a jungle penetrator to reach the ground through the thick tree canopy, and had medical equipment to stabilize a patient en-route to the appropriate treatment facility.

The third question is what was the casualty survival rate? Casualty statistics can be presented through multiple methods and often reflect a war's entire time period. One method available was to analyze the ratio of wounded-in-action (WIA) to killed-in-action (KIA) during the conflict. Colonel Robert Hardaway, a US Army doctor, published an article with his own observations and research in Vietnam. He highlighted that during the Korean War the wounded to killed ratio was three to one, while in Vietnam up to 1967, the ratio was six to one.[74] He attributed this to a number of factors, specifically improvements in medical technology, the use of body armor, and air MEDEVAC operations.[75] Where soldiers previously arrived to a treatment facility already dead, they now arrived bleeding profusely or

---

[69] Whitcomb, *Call Sign "Dustoff,"* 29.

[70] Ibid.

[71] Ibid., 39.

[72] Whitcomb, *Call Sign "Dustoff,"* 45.

[73] Ibid.

[74] Robert M. Hardaway, "Surgical Research in Vietnam," *Military Medicine* 132, no. 11 (November 1, 1967): 874, accessed November 8, 2020, https://academic.oup.com/milmed/article/132/11/873/4918143.

[75] Ibid., 874–875.

going into shock.[76] Because of air MEDEVAC operations, he assessed, most casualties arrived within one hour, with an average time of forty minutes in some locations.[77]

Matthew Goldberg, a US Government statistician, provided another method for war casualty assessment. He defined the casualty survival rate as "…the number of WIA divided by the sum of WIA and hostile deaths- the percentage of troops injured in combat who survive (rather than succumb to) their wounds."[78] This method enables one to produce a "…composite measure of both lethality of enemy weapons and the effectiveness of US battlefield medicine and medical evacuation."[79] Goldberg, as seen in figure 2, determined a casualty survival rate for the Vietnam War over a 10-year period by dividing the total WIA (303,644) by the total WIA and hostile deaths (350,987), equaling 86.5%.

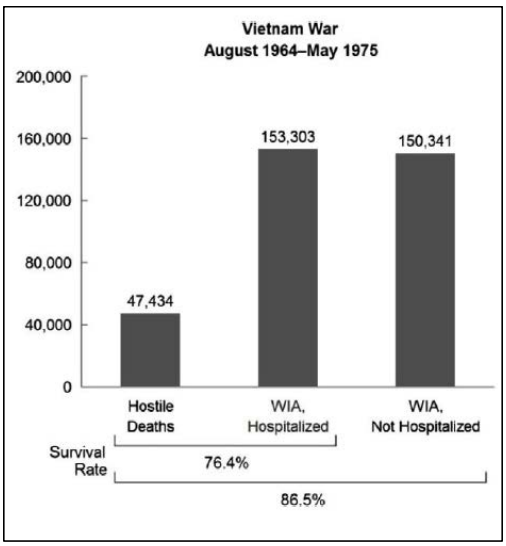

Figure 2. Casualty Survival Rate in the Vietnam War. Matthew S. Goldberg, "Casualty Rates of US Military Personnel During the Wars in Iraq and Afghanistan," *Defence and Peace Economics* 29, no. 1 (January 2, 2018): 12, accessed October 8, 2020, https://www.tandfonline.com/doi/full/10.1080/10242694.2015.1129816.

[76] Ibid., 873.

[77] Ibid., 874.

[78] Matthew S. Goldberg, "Casualty Rates of US Military Personnel During the Wars in Iraq and Afghanistan," *Defence and Peace Economics* 29, no. 1 (January 2, 2018): 10, accessed October 8, 2020, https://www.tandfonline.com/doi/full/10.1080/10242694.2015.1129816.

[79] Ibid., 10.

This paper used Goldberg's method and available data to produce a casualty survival rate specific to Vietnam in 1965. Given the total US presence in Vietnam was approximately 185,000 in 1965, as depicted in figure 3, one can apply the WIA rate of 61.6 to get 11,396.[80] The total deaths in 1965 were 1928.[81] Thus, 11,396 divided by (11,396+1928) equals an approximate casualty survival rate of 85.5% in 1965. In 1965 the ratio of wounded to killed was approximately 5.9 to 1.

SELECTED CAUSES OF ADMISSIONS TO HOSPITAL AND QUARTERS AMONG ACTIVE-DUTY U.S. ARMY PERSONNEL IN VIETNAM, 1965-1970 [Rate expressed as number of admissions per annum per 1,000 average strength]						
Cause	1965	1966	1967	1968	1969	1970
Wounded in action	61.6	74.8	84.1	120.4	87.6	52.9
Injury (except wounded in action)	67.2	75.7	69.1	70.0	63.9	59.9
Malaria	48.5	39.0	30.7	24.7	20.8	22.1
Acute respiratory infections	47.1	32.5	33.4	34.0	31.0	38.8
Skin diseases (includes dermatophyt-osis)	33.1	28.4	28.3	23.2	18.9	32.9
Neuropsychiatric conditions	11.7	12.3	10.5	13.3	15.8	25.1
Viral hepatitis	5.7	4.0	7.0	8.6	6.4	7.2
Venereal disease (includes CRO [1])	277.4	281.5	240.5	195.8	199.5	222.9
Venereal disease (excludes CRO [1])	3.6	3.8	2.6	2.2	1.0	1.4
Fever of undetermined origin	42.8	57.2	56.2	56.7	57.7	72.3

Figure 3. Rates of Injury in Vietnam, 1965-1970. Reproduced from Spurgeon Neel, *Medical Support of The US. Army in Vietnam 1965-1970* (Washington, DC: Center of Military History, United States Army, 1991), 36.

The fourth question is how were MEDEVAC missions controlled or regulated? Requests for air MEDEVAC normally originated near the point of injury. Through 1965, a medical regulating officer (MRO) requested the MEDEVAC.[82] Often embedded at the battalion and above levels, this senior non-commissioned officer sent the request to a nearby treatment facility which could task the evacuation pilots for a mission.[83] If no MRO was present, the medic or aidman sent the request.[84] MROs at various echelons helped direct the wounded to the appropriate level medical facility.

[80] USMACV, *Command History 1965*, 269.

[81] US National Archives and Records Administration, "Vietnam War US Military Fatal Casualty Statistics," accessed November 9, 2020, https://www.archives.gov/research/military/vietnam-war/casualty-statistics.

[82] Neel, *Medical Support of The US Army in Vietnam,* 74.

[83] Ibid., 74.

[84] Ibid.

By 1963 the call sign "Dust off" was the radio call sign to refer to MEDEVAC pilots.[85] The on-board radios enabled a shared understanding between tactical units, pilots, and treatment facilities. Most MEDEVAC teams could be airborne in less than three minutes and could gain a better understanding of the situation en-route to the pickup site.[86] Once airborne the team could divert to a more serious casualty as it monitored radio requests.[87]

Each CTZ had only one hospital throughout most of 1965, which forced the MEDEVAC teams to cover larger distances. During major operations the medical evacuation system could become backlogged with requests, which diverted air MEDEVAC requests through battalion, brigade, and division to hospitals channels.[88] Helicopters provided an advantage to the wounded with their ability to by-pass brigade and division-level medical clearing stations. The main concern for MEDEVAC teams was the time after patient pickup, and not the distances to facilities.[89] Additionally, the MEDEVAC teams could bypass the nearest medical facility with in-flight coordination through the MROs.[90] Coordination between treatment facilities and arriving helicopters allowed the teams on ground to prepare to receive the casualty. If a hospital was backlogged, the pilots could divert to another facility. MEDEVAC pilots flew 13,004 missions in 1965, which limited the ground MEDEVAC missions to receiving casualties from helicopters and moving then into treatment facilities.[91]

The final question is how did the current medical doctrine support the Golden Hour in theater?

The operations in 1965 Vietnam reflected the descriptions of war described in FM 100-*5, Field Service Regulations Operations.* It stressed the need to be flexible in how one applies assets towards a

---

[85] Ginn, *The History of the US Army Medical Service Corps*, 321.

[86] Whitcomb, *Call Sign "Dustoff,"* 42.

[87] Neel, *Medical Support of The US Army in Vietnam 1965-1970*, 74.

[88] Neel, *Medical Support of The US Army in Vietnam 1965-1970*, 73.

[89] Ibid., 74.

[90] Ginn, *The History of the US Army Medical Service Corps*, 309.

[91] Neel, *Medical Support of The US Army in Vietnam*, 75.

problem or fights an enemy; specifically in reinforcing existing units and adapting to the operational environment.[92] Regarding medical evacuation, it pointed out units should improvise and adapt their operating procedures since ground MEDEVAC may be subject to enemy attack.[93] Notably, FM 100-5 stressed maximum utilization of helicopters to evacuate.[94]

Field Manual 8-16, *Medical Service, Field Army*, provided a breakdown in medical capabilities of the Field Army Support Command, which supported multiple corps. The assigned medical brigade provided one mobile army surgical hospital (MASH) with sixty bed spaces per division, one evacuation hospital in the division rear area with 400 bed spaces, fifteen clearing companies each with capacity to hold 240 casualties, multiple ground ambulance companies, and one convalescent hospital with a 1,500 bed space capacity.[95] The medical brigade's air ambulance medical company could evacuate patients across the battlespace using its four platoons, each with six helicopters. The battlefield geometry of the medical brigade is shown in figure 4, which depicted the medical echelons operating within a field army area of operations.

[92] US Department of the Army, Field Manual (FM) 100-5, *Field Service Regulations Operations,* (Washington, DC: Government Printing Office, 1964), 12.

[93] Ibid., 150.

[94] Ibid., 151.

[95] US Department of the Army, Field Manual (FM) 8-16, *Medical Service, Field Army,* (Washington, DC: Government Printing Office, 1965), 29-37.

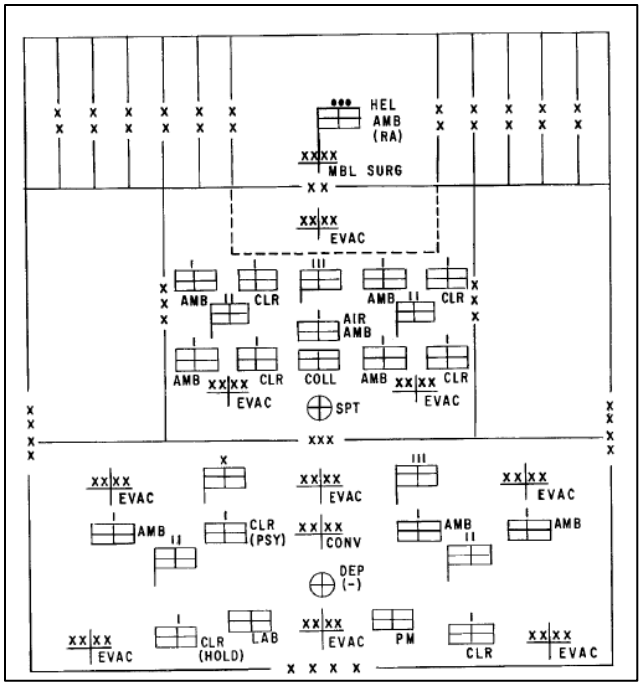

Figure 4. Medical Support Echelons of the Medical Brigade. US Department of the Army, Field Manual (FM) 8-16, *Medical Service, Field Army*, (Washington, DC: Government Printing Office, 1965), 12.

Spurgeon Neel, a former Major General and Army doctor, wrote that the medical doctrine of Vietnam followed that of the Korean War, and relied on the linear evacuation system moving from unit, division, field army and the communications zone, as depicted in Figure 5.[96] However, during the Vietnam War, MEDEVAC teams did not always follow doctrine. The medical doctrine of 1965 was best suited for large-scale maneuver which employed field armies. The emergent widespread use of helicopter evacuation enabled greater mobility and freedom of action. As depicted in figure 4, the doctrinal construct for echelon-above-division medical care likely drove the deployment of treatment facilities in Vietnam. While US forces conducted large operations in 1965, the operating space focused on pockets of enemy strength. This placed medical echelons closer together and enabled the air ambulance teams to move patients to any treatment site within the helicopter's operational capabilities.

[96] Ginn, *The History of the US Army Medical Service Corps*, 308.

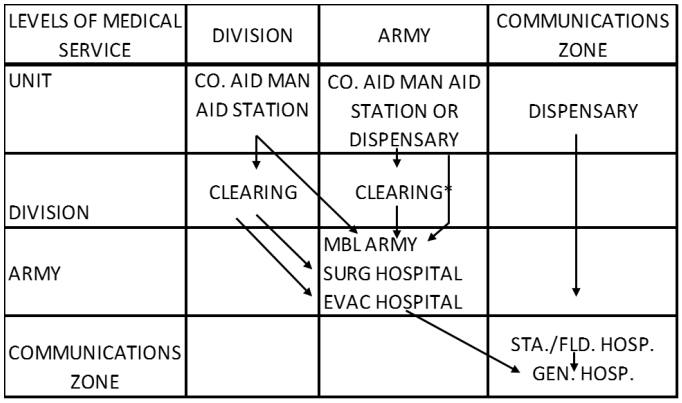

Figure 5. Evacuation Flow of Casualties in Theater. Reproduced from US Department of the Army, Field Manual (FM) 8-10, *Medical Service, Theater of Operations*, (Washington, DC: Government Printing Office, 1962), 6.

Vietnam War 1970

In July 1969, Secretary of Defense Melvin Laird authorized the first group of 25,000 troops to leave Vietnam.[97] To shift from an emphasis on combat, the Nixon administration began touting the policy of "Vietnamization", which looked to the Republic of Vietnam to take full ownership of its self-defense.[98] It called for "…the unilateral withdrawal of American troops from South Vietnam and…the assumption of greater military responsibilities by the South Vietnamese armed forces to make up for that loss."[99]

The United States entered 1970 with 474,000 service members in Vietnam, and ended the year with 335,000.[100] The challenge then became maintaining the gains in strength already made with the Republic of Vietnam Armed Forces (RVNAF), while also reducing American casualties.[101] General Creighton Abrams, the commander of the Military Assistance Command Vietnam (MACV), had to

[97] Jeffrey J Clarke, *Advice and Support: The Final Years* (Washington, DC: Center of Military History, Government Printing Office, 1988), 350.

[98] Ibid., 341.

[99] Ibid.

[100] US Military Assistance Command Vietnam (USMACV), *Command History 1970 Volume I* (Saigon, Vietnam: Military History Branch, 1971), IV–7.

[101] Graham A. Cosmas, *MACV: The Joint Command in the Years of Withdrawal, 1968-1973* (Washington, DC: Center of Military History, Government Printing Office, 2006), 257.

balance US troop withdrawals with a Vietnamese force that was not yet ready to take full ownership. In late 1970, the MACV assessed that the RVNAF's 990,000 members could not "…handle the current combined enemy threat (about 232,000 troops) without direct US. combat assistance."[102]

The ownership transfer to Vietnamese authorities was accomplished through pacification with a set of goals, such as to "…control and secure 90 percent of the population; to eliminate 33,000 Viet Cong cadre…to establish elected local governments in all villages…to recruit the People's Self-Defense Force to 2 million members and arm 400,000 of them."[103] The United States also formalized another plan which focused on the armed forces, called the Consolidated RVNAF Improvement and Modernization Plan, which sought to increase the RNVAF to 1.1 million members.[104] The ultimate goal was "to create an indigenous armed force able to defend South Vietnam and defeat the insurgency with minimal American assistance."[105]

American forces continued to interdict the enemy's supply lines throughout 1970 with aerial bombings in both Laos and Cambodia (Figure 6). The missions to find and destroy transitioned to "…keeping the main forces away from the populated lowlands and uprooting the Communists' supply system by searching out caches and blocking infiltration routes."[106] American commanders began moving forces eastward in CTZs I and II, which signaled to the communists that American forces were withdrawing.[107] In 1970 Vietnamese military deaths surpassed American KIAs in every CTZ except zone I, which was closest to the DMZ.[108].

[102] Clarke, *Advice and Support: The Final Years*, 354.

[103] Cosmas, *MACV*, 265.

[104] Ibid., 270.

[105] Ibid.

[106] Cosmas, *MACV*, 255.

[107] Cosmas, *MACV*, 255.

[108] Ibid., 258.

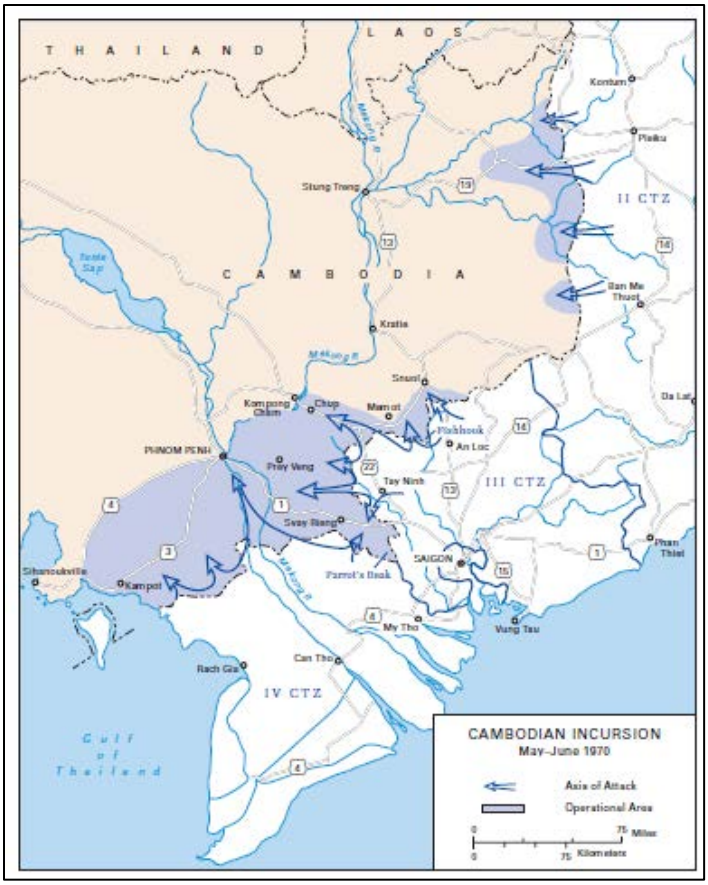

Figure 6. Cambodian Incursion May-June 1970. Graham A. Cosmas, *MACV: The Joint Command in the Years of Withdrawal, 1968-1973*, *United States Army in Vietnam* (Washington, DC: Center of Military History, Government Printing Office, 2007), 299.

The war later detoured into Cambodia, as depicted in figure 6. To combat communist supply sources, the RVNAF regularly executed clearing operations across the border into Cambodia. The country's government and its lack of adequate forces turned Cambodia into a breeding ground for the Viet Cong; allowing them to funnel supplies into South Vietnam. Taking the fight to the enemy created a buffer space between major cities in South Vietnam and built confidence in the RVNAF.

The situation in Cambodia began to rapidly deteriorate when its leader, Prince Sihanouk, left the country in early 1970.[109] By the middle of March the country's National Assembly removed Sihanouk as head of state due to his support to communist logistics, and replaced him with Cheng Heng, who echoed

[109] Cosmas, *MACV*, 293.

the pro-western messaging of Prime Minister Lon Nol.[110] Sihanouk responded with a call to establish a separate government, and publicly urged for open hostilities against the Lon Nol government; placing Cambodia onto the brink of a civil war.[111] MACV intelligence assessed the communists to have three objectives in Cambodia; help Sihanouk establish a new government through local communist leadership, form a pro-communist syndicate in Cambodia, and to improve the effectiveness of Cambodian resistance fighters.[112] Vietnamese communists took the opportunity to occupy much of the area bordering South Vietnam and began providing material support to Cambodian communists.[113] At peak levels the North Vietnamese "…occupied nearly half of Cambodia's land area, the government held the cities, the major towns, and the regions containing most of the people."[114]

By late April, President Nixon authorized attacks into Cambodia using US and RVNAF forces to destroy enemy supplies and command infrastructure, beginning with Operation Toan Thang 43 on May 1st.[115] The American forces could not maneuver more than thirty kilometers into Cambodia and had to be out of the country by June 30th.[116] This limitation was likely based on the Nixon administration's failure to strike an agreement with North Vietnam, planned troop reductions, and growing domestic antiwar movement.[117] An expansion of the already unpopular war would have been politically disastrous for the administration. While US ground actions ceased by June 30th, its air support to RVNAF and the Cambodians continued.[118] The operations in Cambodia strained the US MEDEVAC assets as requests to

[110] United States Military Assistance Command Vietnam (USMACV), *Command History 1970 Volume III* (Military History Branch, 1971), C–11, accessed October 30, 2020, https://apps.dtic.mil/dtic/tr/fulltext/u2/a955417.

[111] Ibid., C–13.

[112] Ibid., C–14.

[113] Cosmas, *MACV*, 293.

[114] Ibid., 309.

[115] Ibid., 297-298.

[116] Ibid., 298.

[117] Cosmas, *MACV*, 143–144.

[118] Cosmas, *MACV*, 298.

support the forces fighting in Cambodia continued. During the two months of operations in Cambodia the United States sustained 284 KIA and 2,339 WIA.[119]

In his Senior Officer Debriefing Report (SODR), Brigadier General David Thomas, US Army Vietnam Surgeon and MEDCOM, Vietnam (USAMEDCOMV) commander, provided his comments from 1970 on the state of medical operations and the RVNAF's ability to execute MEDEVAC operations. He wrote, "As our combat participation decreases it has been bothersome to note that our percentage of ARVN and VN civilians hauled by dustoff [air MEDEVAC teams] has increased, the workload has remained relatively constant, and the personnel death and injury rate as well as the helicopter combat damage rate continues at an unacceptably high figure".[120] Vietnamese forces had dedicated MEDEVAC helicopters; but failed to answer RVNAF requests.[121] In a sarcastic jab, General Thomas suggested that US MEDEVAC unit redeployments be expedited in order to force the RVNAF to fill the void in coverage.[122]

The first questions is where were medical units located with respect to the combat forces? In 1970 there were approximately one hundred-forty air ambulances in South Vietnam.[123] Throughout the year, one field hospital, two evacuation hospitals, and two surgical hospitals left Vietnam, while the helicopter ambulance units remained.[124] As combat operations continued, US Army hospital beds were reduced from 4,800 in January to 3,000 in December.[125] The Army reduced its forces from 330,000 at the start of 1970, to 250,000 by the year's end.

---

[119] USMACV, *Command History 1970 Volume III*, C–51.

[120] US Army Medical Command Vietnam, "Senior Officer Debriefing Report- BG David E. Thomas" (Long Binh, Vietnam: US Army Vietnam, 1971), 5, accessed October 30, 2020, https://history.amedd.army.mil/booksdocs/vietnam/usarv/Thomas_USARV_Surgeon_1970.pdf.

[121] Ibid.

[122] Ibid.

[123] Dorland and Nanney, *Dust Off*, 116.

[124] USMACV, *Command History 1970 Volume II*, IX–139.

[125] USMACV, *Command History 1970 Volume II*, IX–137.

The XXIVth Corps, which was responsible for CTZ I, had its headquarters co-located with the 95th Evacuation Hospital in Đà Nẵng.[126] The northernmost unit in the zone was the 1st Battalion, 5th Infantry Regiment, which was located with the 18th Surgical Hospital in Quang Tri.[127] The 101st Airborne Division headquarters and its organic medical battalion were located in Phú Bài along with the 85th Evacuation Hospital.[128] The most southern unit in the zone was the 23rd Infantry Division which was located with both the 91st Evacuation Hospital and the 27th Surgical Hospital in Chu Lai.[129] Treatment facilities in Zone I were all stationed along the east coast.

The First Field Force headquarters, a corps equivalent command in charge of CTZ II, was headquartered in Nha Trang.[130] The nearest medical facilities were the 67th Evacuation Hospital sixty miles north in Tuy Hòa, or the 6th Convalescent Center twenty miles south in Cam Rahn.[131] The 173rd Infantry Brigade headquarters operated from Bong Son with the nearest medical facility, the 67th Evacuation Hospital, fifty miles south in Quy Nhơn.[132] The 4th Infantry Division was located further inland at Pleiku, with the nearest medical facilities being eighty miles away in Quy Nhơn or 100 miles away in Tuy Hòa.[133] The division was replaced by a Vietnamese Army regiment by late March, and by December the entire division had redeployed to the United States.[134] Treatment facilities in Zone II were also located along the east coast.

---

[126] Ibid., IX–136.

[127] Ibid.

[128] Ibid.

[129] Ibid.

[130] USMACV, *Command History 1970 Volume I*, V–1.

[131] USMACV, *Command History 1970 Volume II*, IX–136.

[132] Ibid.

[133] USMACV, *Command History 1970 Volume I*, V–8.

[134] Ibid.

The Second Field Force headquarters, responsible for CTZ III, and the 199th Infantry Brigade, were located in Long Bình.[135] In the same location was the 24th and 93rd Evacuation Hospitals.[136] The 11th Armored Cavalry Regiment (ACR) was located closest to the Cambodian border in Quan Loi while the nearest medical facility was in Long Bình fifty miles away, or the 1st Cavalry Division and its medical battalion located thirty-two miles away in Vĩnh Phúc.[137] The 3rd Field Hospital was located in Saigon and was sixty miles away from the 11th ACR or thirty-three miles from the 1st Cavalry Division.[138] While no combat forces were in CTZ IV, the 3rd Surgical Hospital was centrally located in Cần Thơ to support advisors and the RVANF.[139] It was approximately eighty miles away from Saigon and seventy miles from the Cambodian border.

The second question is what MEDEVAC units and capabilities were employed? In Zone I there were five coastally based helicopter ambulance detachments along with the organic air ambulance platoon of the 101st Airborne Division.[140] The 237th MDHA was located at Phong Điền and was less than thirty miles from treatment facilities to its north and south.[141] The 572nd MDHA was located at Phu Bai, along with the 101st Airborne Division's air ambulance platoon and a hospital.[142] The 238th MDHA was located in Da Nang and was also collocated with a hospital. In Chu Lai both the 54th and 68th MDHAs supported the southern portion of the zone while co-located with two hospitals.[143]

The largest zone, CTZ II, had three helicopter ambulance detachments and one helicopter ambulance company. The 283rd MDHA was stationed in Pleiku, approximately forty-five miles from the

---

[135] USMACV, *Command History 1970 Volume II*, IX–136.

[136] Ibid.

[137] Ibid.

[138] Ibid.

[139] Ibid.

[140] Neel, *Medical Support of The US Army in Vietnam,* 2.

[141] Ibid.

[142] Ibid.

[143] Ibid.

Cambodian border, and was eighty miles from the hospital in Quy Nhơn where the 498th MCAA was located, or 106 miles from the hospital in Tuy Hòa.[144] The 254th MDHA was stationed at Nha Trang and was sixty miles away from the field hospital in Tuy Hòa to its north, or fifteen miles from the hospital to its south in Cam Rahn.[145] The southernmost detachment in Zone II was the 247th located in Phan Rang, which was approximately thirty miles south of the hospital in Cam Rahn.[146]

The third CTZ's two air ambulance detachments were more centrally located than those to their north and were located approximately twenty-five miles from the hospitals in Saigon or Long Bình. The 159th MDHA was located at Củ Chi while the 57th MDHA was stationed at Lai Khê.[147] At Vĩnh Phúc was the 1st Cavalry Division's air ambulance platoon, which likely provided some support to the 11th ACR thirty miles to its north in Quần Lợi.[148] The 45th MCAA was based out of Long Bình, farthest from the Cambodian border, and was approximately fifty-three miles away from the 11th ACR in Quần Lợi.[149] The 82nd MDHA, located with the hospital in Cần Thơ at Bình Thủy Air Base, supported CTZ IV.[150] As of the late summer 1969, there were no longer combat forces in CTZ IV, however the military advisors remained.[151] By 1970, all MEDEVAC units operated the upgraded UH-1H helicopter which produced 300 more horsepower than its predecessor, and had a range of 270 nautical miles.[152]

The 1970 version of Field Manual 8-10, *Theater Support,* described the two types of air ambulance units with the first being the medical air ambulance company. It operated four platoons each

[144] Neel, *Medical Support of The US Army in Vietnam,* 2.

[145] Ibid.

[146] Ibid.

[147] Ibid.

[148] Ibid.

[149] Ibid.

[150] Ibid.

[151] USMACV, *Command History 1970 Volume II*, VII–84.

[152] Whitcomb, *Call Sign "Dustoff,"* 45.

equipped with six helicopters, and had a basis of allocation of one per corps.[153] Its main function was "Aeromedical evacuation of critically wounded patients who are not transportable by other means to the nearest medical unit capable of providing required surgery and medical treatment."[154] The second unit described was the helicopter ambulance detachment, equipped with six helicopters. Its basis of allocation was one per division and was assigned to the field army medical brigade. It could also be assigned to the theater medical command on a basis of two per supported corps.[155] The detachment could be tasked within the combat zone to move casualties to the nearest medical facility, or within the communication zone to move patients to a higher level of care.[156]

The third question is what was the casualty survival rate? Deaths in 1970 declined from 11,780 in 1969, to 6,173.[157] As a broad statistic that spanned the entire Vietnam war, "…only 2.8% of patients who reached a hospital died in Vietnam."[158] This low rate could be attributed to the use of MEDEVAC. However, that statistic only accounted for casualties who made it to a hospital and did not account for KIAs or those who died from wounds en-route. Hospitals also began changing wound management through "…delayed primary closure for wounds with a high likelihood of infection."[159] Combined with helicopter evacuation this improved the chances of survival during the Vietnam War.

To determine the casualty survival rate in 1970, the same methodology was applied from the previous case study by using the formula of WIA / (WIA+KIA). The US National Archives on the

---

[153] US Department of the Army, Field Manual (FM) 8-10, *Medical Support Theater of Operations,* (Washington, DC: Government Printing Office, 1970), E-16.

[154] Ibid.

[155] US Department of the Army, Field Manual (FM) 101-10-2, *Extracts of Nondivisional Tables of Organization and Equipment,* (Washington, DC: Government Printing Office, 1969), 6-21.

[156] US Army, FM 8-10 (1970), E-17.

[157] US National Archives and Records Administration, "Vietnam War US Military Fatal Casualty Statistics."

[158] Sanders Marble, *Skilled and Resolute: A History of the 12th Evacuation Hospital and the 212th MASH, 1917-2006* (Fort Sam Houston, TX: Borden Institute US Army Medical Department Center & School; Office of the Surgeon General United States Army, 2013), 55.

[159] Ibid., 56.

Vietnam War casualties provided the deaths as 6,173 and WIA as 15,296.[160] Thus, the casualty survival rate calculation for 1970 was 15,296 / (15,296+6,173), which produced an approximate rate of 71.2%. Compared to 1965, the number of WIA in 1970 increased by 3,900 and the KIA increased by 4,245. While the number of KIA decreased from 1969, the casualty survival rate dropped fourteen percent from the 85.5% casualty survival rate in 1965.

The fourth question is how were MEDEVAC missions controlled or regulated? The medical command was reorganized in early 1970 and merged the theater medical brigade staff with that of the US Army Vietnam surgeon.[161] The command was titled the US Army Medical Command Vietnam, or USAMEDCOMV, and was commanded by General Thomas, US Army Vietnam surgeon.[162] The MEDCOM commanded and controlled two medical groups, where previously there were four (generally one per CTZ). The 67th Medical Group was responsible for CTZs I and II and the 68th Medical Group for CTZs III and IV.[163] The groups controlled all air ambulances in Vietnam apart from the airmobile divisional assets.[164]

Requests for MEDEVAC went through MROs as in previous years, and by 1970 the 125th Aviation Company operated a theater-wide air traffic network.[165] This network provided navigational aid to MEDEVAC pilots in poor weather conditions, could track their movements, and enabled pilots to better respond to MEDEVAC requests.[166] An updated version of the USARV Regulation 40-10, *Aeromedical Evacuation*, was included in General Thomas's SODR, which established additional control

[160] US National Archives and Records Administration, "Vietnam War US Military Fatal Casualty Statistics."

[161] Neel, *Medical Support of The US Army in Vietnam*, 28.

[162] Ibid.

[163] Neel, *Medical Support of The US Army in Vietnam*, 29.

[164] Whitcomb, *Call Sign "Dustoff,"* 46.

[165] Ibid., 48.

[166] Ibid.

measures and procedures for air MEDEVAC support.[167] It established limits on use for planned missions, emergent situations, and request procedures.

The forward positioning of air ambulances now had to be requested through the CTZ Surgeon who would then pass the request to the supporting medical unit.[168] The regulation established the order of precedence for MEDEVAC starting with the United States and allies, RVNAF, prisoners of war, and lastly Vietnamese civilians.[169] The regulation clarified patient categories and noted that patients suffering from a fever should not be given priority for evacuation.[170] It required that patients be classified as urgent only if life or limb would be at risk within two hours, or if more than twenty percent of the patient was burned.[171] Lastly, the regulation required medical personnel to submit a report for any patient over-classified in an attempt to halt the excessive use of the MEDEVAC requests.[172]

To curb support to the RVNAF, the regulation stipulated that US forces would not support their priority or routine requests, and would only support urgent missions after the request was processed by the RVNAF Direct Air Support Center.[173] The United States could accept the mission only if the RNVAF had a MEDEVAC backlog of more than two hours, and a valid reason why it could not support the mission.[174] From January through September 1970, MEDEVAC teams flew over 78,000 missions evacuating 146,000 personnel, of which only 44,000 were American.[175] General Thomas later wrote that "…missions are routinely overclassified and are also often completely unjustified;" likely his explanation

[167] US Army Medical Command Vietnam, "Senior Officer Debriefing Report," C–19.

[168] Ibid., C–20.

[169] Ibid.

[170] Ibid., C–21.

[171] Ibid.

[172] Ibid., C–22.

[173] US Army Medical Command Vietnam, "Senior Officer Debriefing Report," C–24.

[174] Ibid.

[175] US Army Medical Command Vietnam, "Senior Officer Debriefing Report," B-18.

for the high number of MEDEVAC missions flown given the troop drawdown in effect.[176] Lastly, General Thomas wrote, "As the war becomes less hazardous for the infantryman, danger increases for the dustoff crew member and his patients."[177]

The last question is how did the current medical doctrine support a Golden Hour of care in theater? The USARV Regulation 40-10, *Aeromedical Evacuation* had the intent of using MEDEVAC only for urgent situations, which enabled medical groups to better manage air missions. The "Army's policy was to keep about 40% of hospital beds in Vietnam empty in case of a major offensive," which in turn provided MEDEVAC crews with more flexibility on the patient drop-off location.[178] Medical doctrine in 1970 reflected a move toward flexibility, adaptability, and responsiveness of the medical system to the demands of the operational environment.

Field manual 8-10, *Medical Support, Theater of Operations,* 1970, defined MEDEVAC as "…the movement of patients to and between treatment facilities by aerial vehicles that are specifically crewed and equipped to accommodate patients and to provide required in-flight medical care."[179] This allowed the aircraft to best-support the patient by moving him to the most appropriate level of care and not necessarily the closest. Field Manual 8-10 also stated, "Any medical facility may be bypassed when the condition of the patient warrants such practice, and the evacuation means permit such movement," which is reflected in Figure 7.[180]

---

[176] Ibid., 5.

[177] US Army Medical Command Vietnam, "Senior Officer Debriefing Report," B-18.

[178] Marble, *Skilled and Resolute*, 66.

[179] US Army, FM 8-10 (1970), 1-1.

[180] Ibid., 6-2.

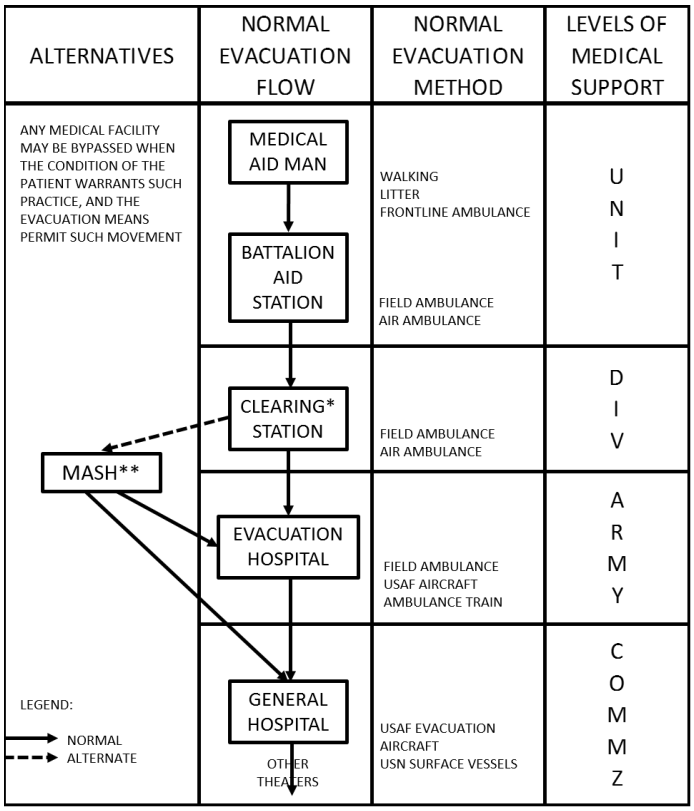

Figure 7. Theater Evacuation Flow. Recreated from US Department of the Army, Field Manual (FM) 8-15, *Medical Service in Divisions, Separate Brigades, and the Armored Cavalry Regiment* (Washington, DC: Government Printing Office, 1968), 1-4.

With regard to speed it stated "…medical means must be as close to casualties as time/distance factors and the tactical situation permits…," while "…speed with which medical treatment can be initiated is extremely important in reducing morbidity and mortality."[181] While the manual did not specify a time requirement for patients to arrive at treatment facilities, it did state, "When evacuation time exceeds that period considered necessary to hold morbidity and mortality to a minimum, the medical treatment facility must be moved closer to the patient, or faster, more efficient evacuation provided."[182]

The 1968 version of Field Manual 8-15, *Medical Service in Divisions,* described the changes in division-level capability with the emergence of the airmobile division. It stated, "Evacuation by air becomes the rule rather than the exception," however this appeared to become the rule for all units in

[181] US Army, FM 8-10 (1970), 2-2.

[182] Ibid.

Vietnam and not just the airmobile divisions.[183] It described the benefit of MEDEVAC in desert, mountain, jungle and cold weather environments in that "The reduction of time between injury and treatment is a determining factor in the success of medical treatment and the time required for a patient's recovery."[184] In specific reference to jungle operations, similar to Vietnam, the manual stated, "Battalion aid stations may be bypassed by air ambulances, and patients taken to division clearing stations."[185] This appeared to align medical doctrine and the Golden Hour concept since average flight times in Vietnam were less than forty minutes, while "The more seriously wounded usually reached a hospital within one to two hours."[186]

Operation Desert Storm

Operation Desert Storm was a US-led coalition response to the Iraqi invasion and occupation of Kuwait. It was a combination of three operations from August 1990 through February 1991; Operations Desert Shield, Storm, and Sabre. Effectively sequenced, the plans enabled an allied troop build-up to defend Saudi Arabia, an air campaign designed to weaken much of Iraq's defense infrastructure, and an offensive ground campaign to defeat and expel the Kuwaiti occupiers.

Iraqi armored divisions, by order of President Saddam Hussein, crossed into Kuwait on August 2, 1990, and began their occupation.[187] Whether an act of retribution, or an attempt to gain resources and leverage, Saddam's move shocked the international community. Iraq had been struggling financially after an expensive eight-year war with Iran. While both Iraq and Kuwait were oil exporters, Kuwait slighted Iraq through overproduction; crippling Iraq's ability to pay off its war debt.[188] Additionally, Hussein

---

[183] US Department of the Army, Field Manual (FM) 8-15, *Medical Service in Divisions, Separate Brigades, and the Armored Cavalry Regiment,* (Washington, DC: Government Printing Office, 1968), 2-21.

[184] Ibid, 4-9.

[185] Ibid.

[186] Neel, *Medical Support of The US Army in Vietnam,* 70.

[187] John R. Ballard, *From Storm to Freedom: America's Long War with Iraq* (Annapolis, MD: Naval Institute Press, 2010), 1, accessed October 30, 2020, https://ebookcentral.proquest.com/.

[188] Ibid., 2.

made overtures that Kuwait belonged to Iraq.[189] On August 4, the US Central Command (CENTCOM) commander, General Norman Schwarzkopf, provided President George H.W. Bush with an overview of the operations plan which later became Operation Desert Shield, with the purpose of defending Saudi Arabia from an Iraqi invasion.[190] Previously, CENTCOM had identified Iraq as a potential aggressor in a wargaming exercise, which "…simulated sending forces to the Middle East to deter an attack by 'Country Red,' to defend critical port and oil facilities, and to defeat enemy forces."[191]

Secretary of Defense Dick Cheney met with Saudi King Saud and gained his support for the US plan to defend its borders. With approval from President Bush, "Cheney issued a directive assigning Central Command the mission to deter and counter any Iraqi aggression against Saudi Arabia."[192] On 8 August, the 2nd Brigade, 82nd Airborne Division, part of the XVIIIth Airborne Corps, mobilized and deployed to Saudi Arabia. By August 24th, the entire division was there.[193] As part of Operation Desert Shield, the subsequent months saw approximately 150,000 US forces arrive in Saudi Arabia.[194] They consisted of the XVIIIth Airborne Corps headquarters, the 101st and 82nd Airborne Divisions, "…the 24th Infantry Division (Mechanized), the 1st Cavalry Division, the 3rd Armored Cavalry Regiment, and portions of the 2nd Armored Division".[195]

Hussein's refusal to leave Kuwait led President Bush to begin planning another mission, the liberation of Kuwait. As part of this plan, he authorized the deployment of the VIIth Corps from Europe,

---

[189] Ballard, *From Storm to Freedom*, 1.

[190] Ibid., 5.

[191] Frank N. Schubert and Theresa L. Kraus, eds., *The Whirlwind War: The United States Army in Operations Desert Shield and Desert Storm*, (Washington, DC: Center of Military History, United States Army, 1994), 48, accessed October 15, 2020, https://ebookcentral.proquest.com/.

[192] Ibid., 50-51.

[193] Ballard, *From Storm to Freedom*, 52.

[194] Whitcomb, *Call Sign "Dustoff,"* 140.

[195] Ibid.

which arrived in December.[196] By mid-January, the Army had 245,000 troops in Saudi Arabia as part of a total US force of 422,000. Including allied partners, the total number of ground troops was in excess of 956,000.[197] After several opportunities to leave Kuwait, Iraq failed to abide by UN Resolution 678, which established a January 15, 1991 deadline to withdrawal.[198] On January 17th, phase I of the air campaign of Operation Desert Storm began with an Army helicopter infiltration into Iraq, along with the destruction of radar sites bordering Saudi Arabia.[199] The air campaign was aimed at destroying Iraqi command and control structures, gaining air superiority and eliminating enemy ground-to-air defenses, battlefield preparation and elimination of chemical weapons, and lastly support to the ground offensive.[200]

The air campaign lasted until February 24th and disabled 1,700 Iraqi tanks and 1,400 artillery pieces.[201] Operation Desert Sabre, depicted in Figure 8, began on 24 February with two corps attacking into Iraq, lasted one hundred hours, and forced the Iraqis to leave Kuwait.[202] After the ceasefire decision by President Bush, Iraqi Army losses were approximately "…20,000 killed, 75,000 wounded, and 80,000 captured," while coalition loses were less than one percent of those numbers.[203]

---

[196] J. P. Riley, *Decisive Battles: From Yorktown to Operation Desert Storm* (New York: Continuum, 2010), 203, accessed October 15, 2020, https://ebookcentral.proquest.com/.

[197] Riley, *Decisive Battles*, 199.

[198] US Department of Defense, *Conduct of the Persian Gulf War: Final Report to Congress Volume 2* (Government Printing Office, 1992), B-3, accessed October 30, 2020, https://www.google.com/books/edition/Conduct_of_the_Persian_Gulf_War_Appendic/8em6AAAAIAAJ?hl=en.

[199] Ballard, *From Storm to Freedom*, 51.

[200] US Department of Defense, *Conduct of the Persian Gulf War: Final Report to Congress* (Government Printing Office, 1992), 98–99, accessed October 30, 2020, https://apps.dtic.mil/dtic/tr/fulltext/u2/a249270.pdf.

[201] Ibid., 188.

[202] Ibid., 312.

[203] Riley, *Decisive Battles*, 209.

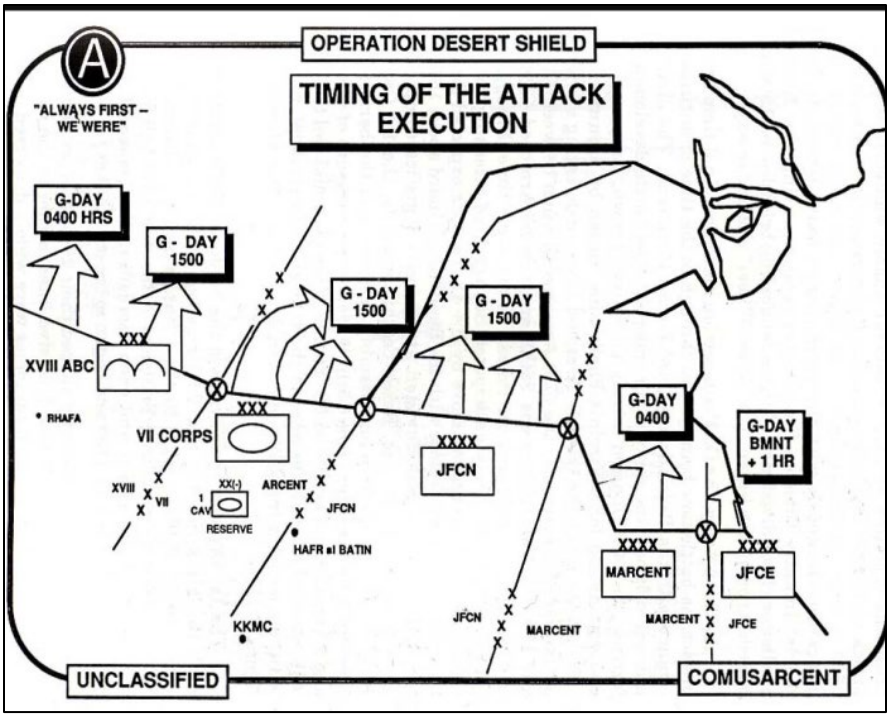

Figure 8. Operation Desert Shield Timing of Attack Execution, Perry-Castañeda Library Map Collection, accessed October 10, 2020, http://legacy.lib.utexas.edu/maps/historical/timing_of_attack.jpg.

The first question is where were medical units located with respect to the combat forces?

The Army sent eight medical groups and two medical brigades to support both the XVIIIth Airborne Corps and the VIIth Corps.[204] In total there were sixty-five hospitals with 13,500 bed spaces available.[205] During Operation Desert Shield the supporting medical facilities were close-to or near their supported units in Saudi Arabia. Supporting VII Corps were five MASH units, five combat support hospitals, and five evacuation hospitals.[206] The XVIIIth Airborne Corps received three MASH units, four combat support hospitals, and five evacuation hospitals, while the echelon-above corps medical command had twelve evacuation hospitals, three field hospitals, one station hospital, and one general hospital.[207] To

[204] Ginn, *The History of the US Army Medical Service Corps*, 428.

[205] Ibid.

[206] John Brinkerhoff, Ted Silva, and John Seitz, *United States Army Reserve in Desert Storm: Reservists of the Army Medical Department* (Washington, DC: Government Printing Officer, 1993), 37, accessed October 30, 2020, https://apps.dtic.mil/dtic/tr/fulltext/u2/a277639.pdf.

[207] Ibid.

enable the rapid establishment of care, nine Army treatment facilities partnered with host nation facilities in Saudi Arabia, Abu Dhabi, and Oman.[208]

The Army deployed both modernized and legacy medical units to the theater.[209] While alone not a major issue, a Government Accountability Office report on Operation Desert Storm noted that hospital units were supposed to follow their supported corps into Iraq in order to provide care closer to the expected combat.[210] Medical units supporting the XVIIIth Airborne Corps were able to accomplish this, but due to their immobility, operated at fifty percent capacity.[211] In the VIIth Corps area, medical units were completely loaded on transportation assets prior to the ground offensive, however "…units could not keep up with the pace of the operations. By the end of the ground war, only one MASH was operational."[212]

The second question is what MEDEVAC units and capabilities were employed? In 1981, the Army began testing and later fielding the UH-60 Blackhawk helicopter to replace older UH-1 variants, the primary MEDEVAC platform during the Vietnam War.[213] It could transport four litter and fourteen ambulatory patients, and had a range of approximately 300 miles traveling at 160 knots.[214] In the late 1980's the Army also began to transition from air ambulance detachments and companies, to air MEDEVAC companies. This restructured company emerged in the 1988 Field Manual 100-10, *Combat Service Support*, however many of the helicopter ambulance units deployed to Saudi Arabia were still in a legacy structure.[215]

---

[208] Brinkerhoff, *United States Army Reserve in Desert Storm*, 40.

[209] Whitcomb, *Call Sign "Dustoff,"* 141.

[210] US Government Accountability Office, *Operation Desert Storm: Full Medical Capability Not Achieved*, GAO/NSIAD-92-175 (Washington, DC: Government Printing Office, 1992), 43, accessed October 30, 2020, https://www.gao.gov/assets/160/152150.pdf.

[211] Brinkerhoff, *United States Army Reserve in Desert Storm,* 43.

[212] US Government Accountability Office, *Operation Desert Storm*, 44.

[213] Whitcomb, *Call Sign "Dustoff,"* 95.

[214] Ibid., 85.

[215] US Department of the Army, Field Manual (FM) 100-10, *Combat Service Support,* (Washington, DC: Government Printing Office, 1988), 3-9.

	UH-60	UH-1	Ambulances
173d Medical Group (Dhahran)	12	12	36
244th Medical Group (Riyadh)	-	6	36
803d Medical Group (KKMC)	-	24	36
332d Medical Brigade (VII Corps)	15	79	144
44th Medical Brigade (XVIII Corps	25	54	144
Total	52	175	396

Figure 9. Air and Ground Medevac Assets During the Operation. Reproduced from John Brinkerhoff, Ted Silva, and John Seitz, *United States Army Reserve in Desert Storm: Reservists of the Army Medical Department* (Washington, DC: Government Printing Office, 1993), accessed October 30, 2020, https://apps.dtic.mil/dtic/tr/fulltext/u2/a277639.pdf. 47.

Three variations of air MEDEVAC units were deployed to Saudi Arabia. In total there were approximately 227 air ambulances deployed to support the operation. A breakdown by echelon is depicted in the figure 9. The first, organic to the air assault division, was the medical company air ambulance with twelve helicopters to support air MEDEVAC, aircraft rescue, and movement of medical supplies.[216] The subsequent units were considered corps assets with the first being the medical company air ambulance. It had twenty-five helicopters and was assigned to the theater medical brigade.[217] Some of the deployed companies had received UH-60 while others did not. For example, the 498th MCAA deployed with thirteen UH-60s and twelve UH-1V helicopters, while the 507th MCAA had twenty-five UH-1V.[218] The planning factor for using this unit was one per 160,000 Soldiers.[219] The third unit type was the air ambulance detachment which provided a six helicopter team to operate either in the combat zone or the communications zone. Its basis of allocation was "…1 per 20,000 personnel in the combat zone plus 1 per 50,000 personnel in the COMMZ."[220]

[216] US Department of the Army, Field Manual (FM) 101-10-1, *Organizational, Technical, and Logistical Date (Volume I),* (Washington, DC: Government Printing Office, 1987), 3-79.

[217] US Department of the Army, Field Manual (FM) 101-10-2, *Extracts of Nondivisional Tables of Organization and Equipment,* (Washington, DC: Government Printing Office, 1977), 6-6 - 6-7.

[218] Whitcomb, *Call Sign "Dustoff,"* 145.

[219] US Army, FM 101-10-2 (1977), 6-7.

[220] Ibid., 6-34.

The third question is what was the casualty survival rate? Medical planners expected upwards of 3,200 casualties per day over a ground offensive expected to last thirty days. Luckily the United States and its allies suffered minimally.[221] Over the course of operations, the total US deaths numbered 382 while 467 were wounded.[222] Applying the methodology of the previous case studies, WIA/WIA+Hostile Deaths, the casualty survival rate was 76.1% (467/614). While this rate appeared than in the Vietnam War, it is important to note that out of the 584,000 US servicemen serving in the Gulf War, only .065% died and .08% were wounded.[223] The wounded to killed ratio for the entire operation was 1.2 to 1.

The fourth question is how were MEDEVAC missions controlled or regulated? As depicted in Figure 10, the lines of communication quickly became extended during the ground offensive, which strained treatment facility mobility and MEDEVAC effectiveness. To account for the long distances, at least thirty Air Force C-130 missions flew to pre-established points in Iraq to assist with patient evacuation.[224] MEDEVAC units supporting the 24th Infantry under the XVIIIth Airborne Corps in the final hours of the war noted there were at least 200 miles between the injured patient and the nearest hospital.[225]

Due to the brevity of the ground operation and low number of casualties, the issues with air MEDEVAC were mitigated through improvisation and adaptation. Given the short duration of the ground attack, medical units caught up to their maneuver units after the ceasefire. The GAO report on the Army

[221] Brinkerhoff, *United States Army Reserve in Desert Storm*, 35.

[222] US Defense Casualty Analysis System, "US Military Casualties - Persian Gulf War Casualty Summary Desert Shield/Desert Storm," accessed October 20, 2020, https://dcas.dmdc.osd.mil/dcas/pages/report_gulf_sum.xhtml.

[223] Ibid.

[224] US Department of Defense, *Conduct of the Persian Gulf War Volume 2*, G-20.

[225] Whitcomb, *Call Sign "Dustoff,"* 151.

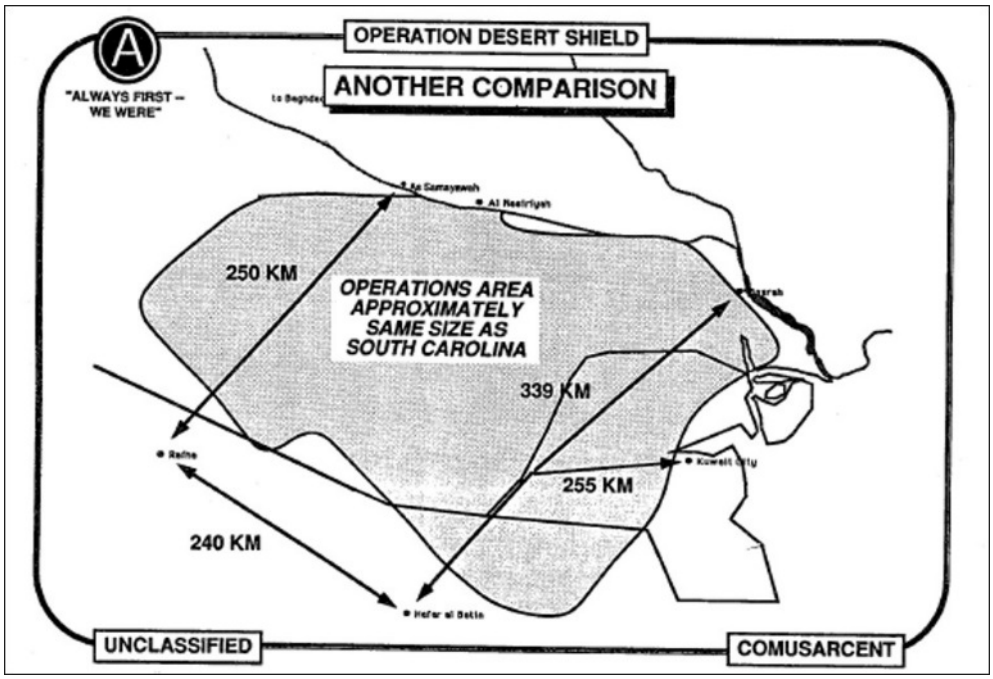

Figure 10. Extended Lines of Communication. Richard Swain, *Lucky War: Third Army in Desert Storm* (Fort Leavenworth, KS: US Army Command and General Staff College Press, 1994), accessed October 30, 2020, https://www.armyupress.army.mil/Portals/7/combat-studies-institute/csi-books/LuckyWar.pdf, 249.

medical performance during the operation cited major issues related to patient movement and communication, while going as far to state, "The Army was fortunate that hostilities had not been more intense or of longer duration because the evacuation system might not have been able to accommodate higher numbers of US. casualties."[226]

According to the GAO report, the UH-1 MEDEVAC helicopter "…could not meet its primary mission of evacuating priority patients"[227] Because the UH-1 could not fly in poor weather conditions, had a degraded lift capacity in hot weather, and the battlefield distances exceed its fuel range, the results were unanswered MEDEVAC requests.[228] The degraded frequency modulation (FM) radio performance reaching 15 miles or less also contributed to the breakdown in medical regulation and patient control.[229]

[226] US Government Accountability Office, *Operation Desert Storm*, 45.

[227] Ibid.

[228] Ibid.

[229] Ibid., 46.

Both corps planned for contingencies. The VIIth Corps created a ring route between the forward line of troops and hospitals in the rear, while the XVIIIth Corps planned to use available C-130 flights.[230] The result was that "…ambulances took patients only to hospitals whose locations they knew," while "…patients would show up at the hospital without notification from the medical regulator or the air ambulances".[231]

The final question is how did the current medical doctrine support the Golden Hour in theater?

The 1978 version of Field Manual 8-10, *Health Service Support in a Theater of Operations,* described a rapidly changing battlefield where units must be prepared to serve in roles different from those described in their authorization and manning documents. It distinguished between the planners who deploy units based on allocations and the operators who employ units based on operational demands.[232] Regarding patient evacuation, the normal flow through medical levels of care could be bypassed if the situation warrants, while the manual emphasized maximum use of "…the available air and surface evacuation means to the advantage of the patient and his specific medical or surgical condition."[233]

The 1988 version of FM 100-10, *Combat Service Support* described the requirements for sustainment and medical units to be capable of rapid adaptation on the battlefield, which stated "As the battlefield becomes increasingly incapacitating, sustaining the health of the fighting forces becomes a critical factor."[234] Even with this changing environment, patient evacuation "…is accomplished within a matter of hours,"[235] This created an expectation that patients be evacuated as fast as possible. Lastly, in order allow the forward momentum of battle, "Health service support units will be required to move

---

[230] US Government Accountability Office, *Operation Desert Storm*, 47.

[231] Ibid.

[232] US Department of the Army, Field Manual (FM) 8-10, *Health Service Support in a Theater of Operations,* (Washington, DC: Government Printing Office, 1978), 2-6.

[233] Ibid., 4-2.

[234] US Army, FM 100-10 (1988), 3-3.

[235] Ibid., 3-6.

rapidly to provide the required support needed to protect and sustain the force and to preserve the initiative."[236]

Analysis and Conclusion

Comparing the Vietnam War at 1965 and 1970, planners realized the impact of restricted terrain on combat operations. Air MEDEVAC planning became the primary means of medical evacuation through a combination of area and direct support to combat units. Planners likely looked to the success of the air MEDEVAC in Vietnam, which enabled a rapid medical response, and applied it to Operation Desert Storm. Its rapid large-scale ground offensive also required responsive air MEDEVAC support with enough platforms to support the estimated casualties. They saw the value in the air ambulance's ability to improve a casualty's chances of survival based on flight times and number of assets.

During Operation Desert Storm each corps had dedicated air MEDEVAC assets. However, during the ground operation, both MEDEVAC teams and treatment facilities struggled to keep up with the speed of the war. The failure to synchronize medical support with the operational tempo resulted in a defunct medical concept of support. Given the immature theater, medical units and pilots did not have enough time to mitigate the stress of the environment and its impacts on movement and communication. Planning appeared solely focused on supporting the high casualty estimates and failed to consider both operational speed and the effects of the operational environment. The static nature of medical support in Vietnam did not support the rapid offensive nature of Desert Storm.

In Vietnam air ambulances allowed most treatment facilities to remain in place. Later in the war some treatment facilities saw very few casualties because helicopters routinely bypassed them. The emerging trend of 'wherever and as fast as necessary' brought notoriety to the Army's air ambulance. The publication of tables of organization and equipment (TOE) and doctrine between the two time periods in Vietnam solidified a basis of issue plan, and helped leaders understand how MEDEVAC could benefit

[236] US Army, FM 100-10 (1988), 3-2.

their organizations. This helped to increase the number MEDEVAC units that deployed to Vietnam. The improvements to the helicopter also improved its range and lift capacity. The Army deployed twice the number of air ambulances to Operation Desert Storm than in Vietnam. However, issues with equipment, communication, and distance forced tactical units to improvise their own methods of evacuation.

Lessons learned in both wars showed that MEDEVAC use could improve the chances of a soldier returning to duty or not dying from his or her wounds. The fallacy, however, was in assuming that air MEDEVAC had an unlimited capacity to function in any environment. MEDEVAC pilots in Vietnam enjoyed more freedom of action because of a reduced operational tempo and static areas of operation. From the Vietnam War, going into 1990, the Army thought the speed and responsiveness of the helicopter ambulance could easily sustain a rapid offensive, failing to ensure hospitals could remain close enough to the advancing front. After Operation Desert Storm, planners learned of the need to standardize equipment being used across the force and to synchronize operations. Lastly, air MEDEVAC usage can still result in a lower casualty survival rate, as presented in the Operation Desert Storm case study. The arrangement of medical support on the battlefield in conjunction with helicopter ambulances could improve the rate, when nested with the maneuver plan.

Medical doctrine in 1965 called for flexibility in support and did not reflect the gravitation toward evacuation solely by air. The doctrine of 1970, informed by the positive impacts or air MEDEVAC, stressed the importance of speed and reduced evacuation time; thus, creating a relationship between time and patient survivability. The medical doctrine from Operation Desert Storm retained much of the same support echelons from Vietnam, but now reflected a notion of sending the support wherever its needed. Lastly, the medical doctrine from Operation Desert Storm era discussed air MEDEVAC in terms of hours and most closely aligns with the Gold Hour concept.

Conclusion

How the Army is postured to support a Golden Hour standard of care in large-scale combat depends on a combination of available aircraft, equipment performance, assignment of assets at echelon, communication and control, and synchronization between the medical and maneuver plan. Treatment

facilities could not move as fast as the combat forces. While not exhaustive, these are areas where leaders can work in the present to prepare for the future. The Army must be cautious of practices that worked well in the past, and it must ensure its medical system, including MEDEVAC, can meet the expectations of future combat. While air MEDEVAC operations can bridge some of the distance, planners must account for the helicopter's limits. Medical units should remain poised to displace and advance with the maneuver elements. The MEDEVAC system can function properly only when the patient and its treatment facility are within its range. Lastly, leaders and planners should place limitations on MEDEVAC employment to ensure the most seriously wounded are rapidly transported to a treatment facility. Assets and coverage should be attached based on estimated requirements, and not solely through a basis of issue. They can, however, be diverted if requirements change.

Planners must not limit themselves to doctrine and authorized asset levels. They must identify threats and risks and apply creativity in crafting mitigations. The commander's intent and nature of the operation should drive the placement of assets on the battlefield to achieve the desired effect. In the case of Operation Desert Storm, additional planning for the use of forward refueling points, alternate forms of communication, and casualty exchange points may have saved additional lives. However, it appeared that planners applied a numerical solution (number of MEDEVAC helicopters) to a mathematical problem (projected casualties).

With a plethora of aircraft, the Army's ability to provide Golden Hour care may still be limited. While no one can predict what the next large-scale battle looks like, it could require the speed of Operation Desert Storm, across the distance of Iraq, with the casualty levels of Vietnam. Planners should be informed by the Army's experiences in previous wars but not anchored to them. Reacting to the enemy's actions in war is enough of a challenge; thus, the Army should ensure the battles of training, synchronization and standardization are fought prior to enemy contact.

Bibliography

Ballard, John R. *From Storm to Freedom: America's Long War with Iraq*. Annapolis, Md: Naval Institute Press, 2010. Accessed October 30, 2020. https://ebookcentral.proquest.com/.

Brinkerhoff, John, Ted Silva, and John Seitz. *United States Army Reserve in Desert Storm: Reservists of the Army Medical Department*. Washington, DC: Government Printing Office, 1993. Accessed October 30, 2020. https://apps.dtic.mil/dtic/tr/fulltext/u2/a277639.pdf.

Carland, John M. *Stemming the Tide, May 1965 to October 1966*. Washington, DC: Center of Military History, Government Printing Office, 2000.

Clarke, Jeffrey J. *Advice and Support: The Final Years*. Washington, DC: Center of Military History, Government Printing Office, 1988.

Cosmas, Graham A. *MACV: The Joint Command in the Years of Withdrawal, 1968-1973*. Washington, DC: Center of Military History, Government Printing Office, 2006.

Dorland, Peter, and James Nanney. *Dust off: Army Aeromedical Evacuation in Vietnam*. Washington, DC: Center of Military History, Government Printing Office, 2016.

Gates, Robert Michael. *Duty: Memoirs of a Secretary at War*. New York, NY: Alfred A. Knopf, 2014.

George, Alexander L., and Andrew Bennett. *Case Studies and Theory Development in the Social Sciences*. Cambridge, MA: MIT Press, 2005.

Ginn, Richard V. N. *The History of the US Army Medical Service Corps*. Washington, DC: Office of the Surgeon General and Center of Military History, Government Printing Office, 1997. Accessed November 2, 2020. https://archive.org/details/historyofusarmym00wash.

Goldberg, Matthew S. "Casualty Rates of US Military Personnel During the Wars in Iraq and Afghanistan." *Defence and Peace Economics* 29, no. 1 (January 2, 2018): 44–61. Accessed October 8, 2020. https://www.tandfonline.com/doi/full/10.1080/10242694.2015.1129816.

Hardaway, Robert M. "Surgical Research in Vietnam." *Military Medicine* 132, no. 11 (November 1, 1967): 873–887. Accessed October 8, 2020. https://academic.oup.com/milmed/article/132/11/873/4918143.

Kotwal, Russ S., Jeffrey T. Howard, Jean A. Orman, Bruce W. Tarpey, Jeffrey A. Bailey, Howard R. Champion, Robert L. Mabry, John B. Holcomb, and Kirby R. Gross. "The Effect of a Golden Hour Policy on the Morbidity and Mortality of Combat Casualties." *JAMA Surgery* 151, no. 1 (January 1, 2016): 15. Accessed September 10, 2020. https://doi.org/10.1001/jamasurg.2015.3104.

Lerner, E. Brooke, and Ronald M. Moscati. "The Golden Hour: Scientific Fact or Medical 'Urban Legend'?" *Academic Emergency Medicine* 8, no. 7 (July 2001): 758–760. Accessed September 21, 2020. https://doi.wiley.com/10.1111/j.1553-2712.2001.tb00201.x.

Marble, Sanders. *Skilled and Resolute: A History of the 12th Evacuation Hospital and the 212th MASH, 1917-2006*. Fort Sam Houston, TX: Borden Institute US Army Medical Department Center & School; Office of the Surgeon General United States Army, 2013.

McNabney, Kendall, W. "Vietnam in Context." *Annals of Emergency Medicine* 10, no. 12 (December 1981): 659–661. Accessed September 21, 2020. https://doi.org/10.1016/S0196-0644(81)80094-7.

Neel, Spurgeon. *Medical Support of The US Army in Vietnam 1965-1970*. Washington, DC: Center of Military History, Government Printing Office, 1991.

Perry-Castaneda Library Map Collection. "Operation Desert Shield Timing of Attack Execution." Accessed October 10, 2020. http://legacy.lib.utexas.edu/maps/historical/timing_of_attack.jpg.

Riley, J. P. *Decisive Battles: From Yorktown to Operation Desert Storm*. New York, NY: Continuum, 2010. Accessed October 15, 2020. https://ebookcentral.proquest.com/.

Rogers, Frederick B., Katelyn J. Rittenhouse, and Brian W. Gross. "The Golden Hour in Trauma: Dogma or Medical Folklore?" *Injury* 46, no. 4 (April 2015): 525–527. Accessed September 18, 2020. https://linkinghub.elsevier.com/retrieve/pii/S0020138314004173.

Schubert, Frank N., and Theresa L. Kraus, eds. *The Whirlwind War: The United States Army in Operations Desert Shield and Desert Storm*. Washington, DC: Center of Military History, United States Army, 1994. Accessed October 15, 2020. https://ebookcentral.proquest.com/.

Swain, Richard. *Lucky War: Third Army in Desert Storm*. Fort Leavenworth, KS: US Army Command and General Staff College Press, 1994. Accessed October 30, 2020. https://www.armyupress.army.mil/Portals/7/combat-studies-institute/csi-books/LuckyWar.pdf.

US Army Medical Command Vietnam. "Senior Officer Debriefing Report- BG David E. Thomas." Long Binh, Vietnam: US Army Vietnam, 1971. Accessed October 30, 2020. https://history.amedd.army.mil/booksdocs/vietnam/usarv/Thomas_USARV_Surgeon_1970.pdf.

US Defense Casualty Analysis System. "US. Military Casualties - Persian Gulf War Casualty Summary Desert Shield/Desert Storm." Accessed October 20, 2020. https://dcas.dmdc.osd.mil/dcas/pages/report_gulf_sum.xhtml.

US Department of the Army. Field Manual 4-0, *Sustainment*. Washington, DC: Government Publishing Office, 2019.

———. Field Manual 4-02, *Army Health System*. Washington, DC: Government Printing Office, 2013.

———. Field Manual 8-10, *Medical Service, Theater of Operations*. Washington, DC: Government Printing Office, 1962.

———. Field Manual 8-10, *Medical Support Theater of Operations*. Washington, DC: Government Printing Office, 1970.

———. Field Manual 8-10, *Health Service Support in a Theater of Operations*. Washington, DC: Government Printing Office, 1978.

———. Field Manual 8-15, *Medical Service in Divisions, Separate Brigades, and the Armored Cavalry Regiment*. Washington, DC: Government Printing Office, 1968.

———. Field Manual 8-16, *Medical Service, Field Army*. Washington, DC: Government Printing Office, 1965.

———. Army Regulation 40-3, *Medical, Dental, and Veterinary Care*. Washington, DC: Government Printing Office, 2013.

———. Field Manual 100-5, *Field Service Regulations Operations*. Washington, DC: Government Printing Office, 1964.

———. Field Manual 100-10, *Combat Service Support*. Washington, DC: Government Printing Office, 1988

———. Field Manual 101-10-1, *Organizational, Technical, and Logistical Date (Volume I)*. Washington, DC: Government Printing Office, 1987.

———. Field Manual 101-10-2, *Extracts of Nondivisional Tables of Organization and Equipment*. Washington, DC: Government Printing Office, 1969

———. Field Manual 101-10-2, *Extracts of Nondivisional Tables of Organization and Equipment*. Washington, DC: Government Printing Office, 1977.

———. Soldier Training Publication 21-1-SMCT, *Soldier's Manual of Common Tasks: Warrior Skills Level 1*. Washington, DC: Government Publishing Office, 2019.

US Department of Defense. *Conduct of the Persian Gulf War: Final Report to Congress*. Washington, DC: Government Printing Office, 1992. Accessed October 30, 2020. https://apps.dtic.mil/dtic/tr/fulltext/u2/a249270.pdf

———. *Conduct of the Persian Gulf War: Final Report to Congress Volume 2*." Washington, DC: Government Printing Office, 1992. Accessed October 30, 2020. https://www.google.com/books/edition/conduct_of_the_Persian_Gulf_War_Appendic/8em6AAAAIAAJ?hl=en.

US Government Accountability Office. *Operation Desert Storm: Full Medical Capability Not Achieved,* GAO/NSIAD-92-175. Washington, DC: Government Printing Office, 1992. Accessed October 30, 2020. https://www.gao.gov/assets/160/152150.pdf.

US Military Assistance Command Vietnam (USMACV). *Command History, 1965*. Saigon, Vietnam: Military History Branch, 1966. Accessed October 30, 2020. https://apps.dtic.mil/docs/citations/ADA955669.

———. *Command History 1970 Volume I*. Saigon, Vietnam: Military History Branch, 1971. Accessed October 30, 2020. https://apps.dtic.mil/docs/citations/ADA955379.

———. C*ommand History 1970 Volume II*. Saigon, Vietnam: Military History Branch, 1971. Accessed October 30, 2020. https://apps.dtic.mil/docs/citations/ADA955420.

———. *Command History 1970 Volume III*. Saigon, Vietnam: Military History Branch, 1971. Accessed October 30, 2020. https://apps.dtic.mil/docs/citations/ADA955417.

US National Archives and Records Administration. "Vietnam War US. Military Fatal Casualty Statistics." Accessed December 9, 2020. https://www.archives.gov/research/military/vietnam-war/casualty-statistics.

Whitcomb, Darrel D. *Call Sign "Dustoff": A History of US Army Aeromedical Evacuation from Conception to Hurricane Katrina*. Frederick, MD: Borden Institute, 2011.