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Airborne Forcible Entry Operations:
USAF Airlift Requirements

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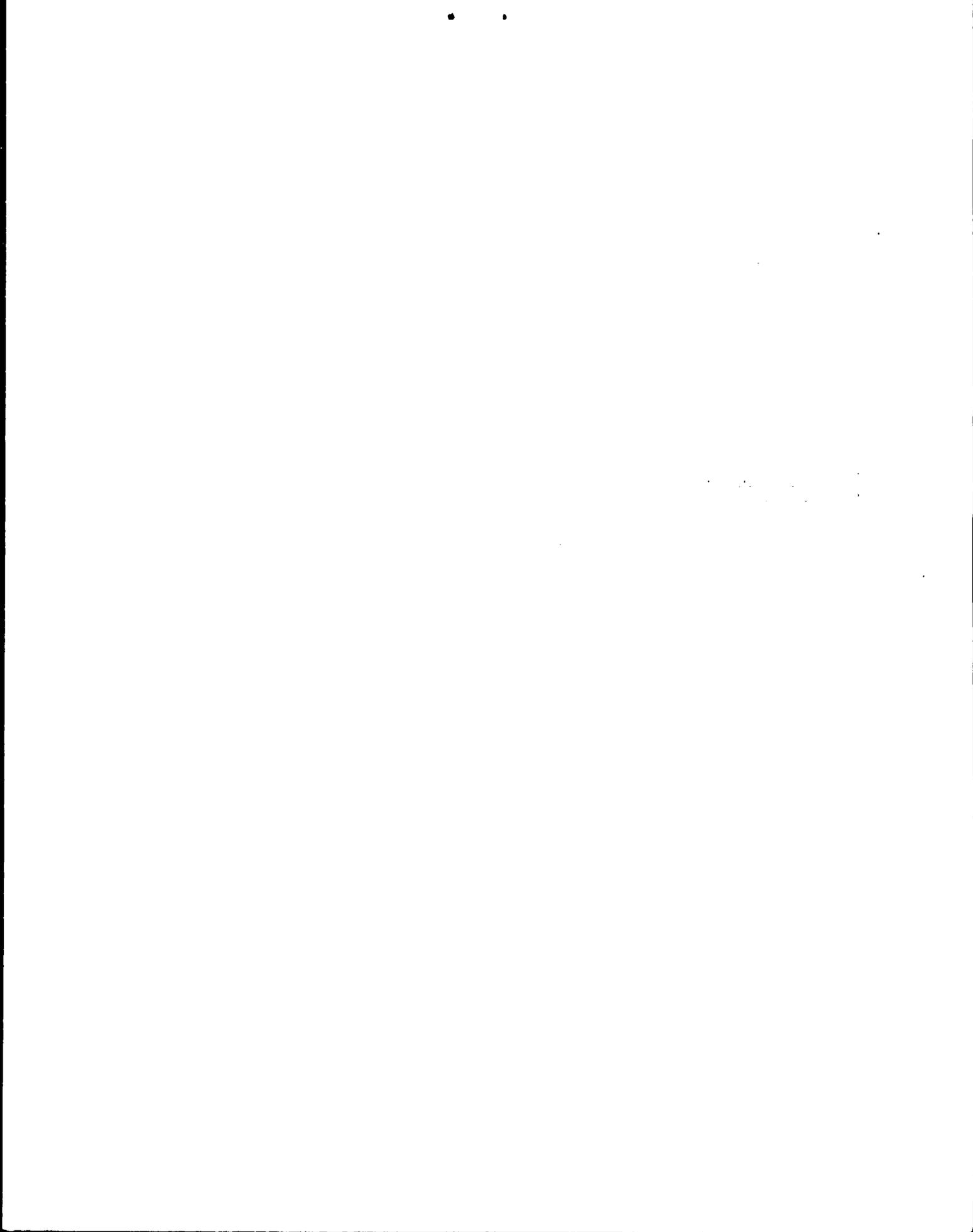
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As the United States transitions towards a national military strategy based on power projection instead of forward deployed armed forces, contingency forces and their capabilities will become increasingly more important. A key capability required to successfully implement a force projection defense strategy is the ability to conduct a forcible entry. In a forcible entry situation, either airborne or amphibious forces could secure a lodgment and prepare for the introduction of follow-on combat forces. This study investigates the requirements USAF airlift forces must meet to successfully support airborne forcible entry operations. It reviews airlift contributions to past airborne operations in World War II, Grenada, and Panama. Then this study surveys the current world situation to determine what distances airlift forces must cover and the threat environments they must penetrate to successfully deliver airborne forces to potential target areas. Potential airborne forcible entry targets are developed by listing countries involved in armed conflict, drug trafficking, or state-sponsored terrorism, and removing littoral areas. This study then determines lift, distance, threat survivability, and training requirements for USAF airlift forces to successfully support airborne forcible entry operations.

Airlift, Airborne Operations, Parachute Operations,
Forcible Entry, Airfield Seizure



AIRBORNE FORCIBLE ENTRY OPERATIONS:
USAF AIRLIFT REQUIREMENTS

A thesis presented to the Faculty of the U.S. Army
Command and General Staff College in partial
fulfillment of the requirements for the
degree

MASTER OF MILITARY ART AND SCIENCE

by

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M.P.P., Harvard University, Cambridge, Massachusetts, 1985
B.S., U.S. Air Force Academy, Colorado Springs, Colorado, 1983

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MASTER OF MILITARY ART AND SCIENCE

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

TABLE OF CONTENTS

	<u>Page</u>
APPROVAL PAGE.....	ii
ABSTRACT.....	iii
LIST OF TABLES.....	v
LIST OF FIGURES.....	vi
CHAPTER	
1. INTRODUCTION.....	1
2. LITERATURE REVIEW.....	14
3. HISTORICAL BACKGROUND AND LESSONS LEARNED.....	27
4. POTENTIAL AIRBORNE FORCIBLE ENTRY SCENARIOS.....	69
5. CONCLUSIONS.....	94
ENDNOTES.....	109
APPENDIX	
A. THREAT SYSTEM CHARACTERISTICS.....	116
B. FIGURES.....	120
BIBLIOGRAPHY.....	127
INITIAL DISTRIBUTION LIST.....	130

LIST OF TABLES

<u>Table</u>	<u>Page</u>
1. List of Armed Conflicts in the World, 1992.....	72
2. U.S. International Narcotics Control Targets, 1991.....	74
3. Potential Airborne Forcible Entry Locations.....	76
4. Capabilities of FY 93 Airlift Force.....	77
5. Distance To Potential Airborne Forcible Entry Locations....	79
6. Threat Categories for Airlift Aircraft.....	85
7. Threats to Airlift Aircraft by Country.....	87
8. Distance and Threat Survivability Requirements.....	93
9. 82nd Airborne Division Light Infantry Battalion Force List	98
10. 82nd Airborne Division Airfield Seizure (Medium) Force List	98
11. 82nd Airborne Division Force Package Airlift Requirements..	99
12. Airborne Interceptor Threats.....	116
13. Air-to-Air Missile Threats.....	117
14. Surface-to-Air Missile Threats.....	118

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1. Operation Husky Airborne Missions.....	120
2. Operation Neptune: Routes of Troop Carrier Missions.....	121
3. Operation Market Garden: Routes of Troop Carrier Missions..	122
4. Operation Urgent Fury: Airdrop at Point Salines Airport....	123
5. Operation Just Cause: The Rangers Seize Rio Hato.....	124
5. Operation Just Cause: Ranger Assault at Torrijos/Tocumen...	125
6. Operation Just Cause: 82nd Arrives at Torrijos/Tocumen.....	126

CHAPTER 1

INTRODUCTION

Major world events beginning in 1990 caused political and military leaders in the United States to review the nation's security strategy, military strategy, and force structure. The American people followed events in the news and began to question the need for a large military designed to combat a Soviet threat that no longer existed. A consensus formed in the U.S. for cutting the defense budget and force structure. The January 1992 version of the National Military Strategy of the United States accepted the realities of a decreased world military threat and stated that the U.S. could safely reduce some force structure, but warned that the reductions should be made with caution.

As we reduce and restructure our armed forces in recognition of the realities of the 1990s, it is important to preserve a core capability to deter aggression, provide meaningful presence abroad, respond to regional crises, and rebuild a global war fighting capability.¹

One of the first tasks Secretary of Defense Les Aspin ordered the Department of Defense to accomplish after he took office in early 1993 was a bottom-up review of defense roles, missions, and force structure. During a 1 September 1993 Pentagon briefing on the bottom-up review, Secretary Aspin asked the question, "What do you need defense for?"² He went on to list four primary dangers that U.S. defense programs must defend against: (1) dangers of nuclear proliferation,

(2) dangers of regional conflict, (3) dangers to democracy, and (4) dangers of a weak economy.³

The military strategy Secretary Aspin discussed in the bottom-up review relies less on U.S. military forces being forward deployed to areas where potential conflict may erupt, as they were in Europe to deter the former Soviet Union, and more on U.S. forces being able to deploy from the U.S. to the area where a regional contingency might exist. The new strategy places emphasis on the ability to respond quickly to major regional conflicts, as well as support peacekeeping, peace enforcement, peace engagement, preventive diplomacy, humanitarian relief, and disaster relief operations.⁴ During the bottom-up review briefing, General Colin Powell, Chairman, Joint Chiefs of Staff, noted that in the future, the U.S. would "have to focus on being able to project power anywhere in the world rapidly and not just this massive surge of force across the Atlantic."⁵

In a force projection defense strategy, strategic lift--the ability to move combat forces from their bases in the U.S. to the region of conflict--becomes very important. Strategic lift, however, is only one piece of the puzzle. Expeditionary forces must be alerted, move within the U.S. to a port of debarkation, deploy to the area of operations using strategic lift, secure a lodgment base, build combat capability within the lodgment base, and then conduct military operations.⁶ Strategic deployment of military forces can be either by airlift or sealift.

Entry operations to secure a lodgment base can be unopposed, as they were during Operation Desert Shield and Desert Storm, where U.S.

forces entered the theater peacefully with the assistance of the host nation, or opposed which requires combat operations to land deploying forces in the theater.⁷ If the theater is littoral, amphibious forces would normally make the opposed, or forcible entry to secure the lodgment base. Objective areas far from ocean access and emergency operations without adequate time for amphibious forces to move into position would require forcible entry by airborne forces deployed by airlift.

Purpose

This thesis develops requirements for United States Air Force (USAF) airlift aircraft and aircrews to successfully support airborne forcible entry operations. The study begins with a review of current literature on the topic, then examines historical airborne operations in World War II, Grenada, and Panama. After reviewing historical examples of airborne forcible entry operations, this thesis looked at current world trouble spots to estimate where airborne forcible entry operations could possibly occur in the near future. Using lessons learned from history and likely future employment scenarios, this thesis derived requirements for USAF airlift forces to successfully support the airborne forcible entry mission. Requirements that were developed have implications for future airlift force structure and aircrew training.

Thesis Question

This thesis investigates the requirements USAF airlift forces must meet to successfully support airborne forcible entry operations. The primary thesis question was broken down into four secondary questions to better determine the airlift requirements. The first of these

secondary questions addressed what size Army force must USAF airlift forces be capable of lifting to an airborne forcible entry target area. The second investigated what distances airlift aircraft must travel to transport airborne forces from bases in the Continental United States (CONUS) to a potential airborne forcible entry target area. A third secondary question looked at what type of threat environments airlift aircraft must operate in during potential airborne forcible entry missions. The final secondary question addressed airlift training and doctrine issues based on historical lessons learned from past airborne forcible entry operations.

Significance

The U.S. national military strategy has shifted away from a large, forward deployed military force designed to contain and deter the former Soviet Union toward a CONUS-based military force designed to deploy to potential regional hot spots around the world. This strategy depends on the ability of U.S. forces to deploy to a potential conflict area via strategic airlift or sealift, conduct forcible entry operations to gain a lodgment, then accept reinforcements and prepare to conduct military operations. Forcible entry by airborne forces with airlift support is an important capability U.S. military forces must maintain to support the Nation's national security objectives.

U.S. leaders want the military to have the capability to respond to regional crises using forces deployed from the CONUS. Airborne forcible entry is a key capability U.S. military forces must possess to support the new force projection strategy. Airborne forces need USAF

airlift support to reach the objective area and sustain initial operations.⁸ This thesis is significant because it examined historical airborne forcible entry operations, then looked at possible scenarios where airlift and airborne forces may need to conduct this type of operation in the future. The thesis then developed requirements for airlift forces to support the airborne forcible entry mission based on an analysis of historical experience and potential crisis areas. The requirements presented in this study have implications for future USAF airlift force structure, doctrine, and training.

Background

For nearly fifty years following the end of World War II, the U.S. national security strategy focused on the containment of the former Soviet Union and its communist ideology. The uneasy coexistence between Washington and Moscow provided ample evidence to support the strategy of containment and the high level of U.S. defense spending necessary to meet the Soviet threat.⁹ Events since 1990--the fall of the Berlin Wall, the demise of the Warsaw Pact, the failed coup in the Soviet Union and the eventual disappearance of that empire--caused U.S. leaders to review the national security strategy and make changes to reflect world realities.

General Colin Powell, former Chairman of the Joint Chiefs of Staff, described the strategy reevaluation process in a 1992 Foreign Affairs article. "President Bush saw this historic change. Working together with his advisors, the president and the secretary of defense outlined a new national security strategy."¹⁰ General Powell and his

staff took the new national security strategy and built a supportive national military strategy. This national military strategy is built upon four elements: strategic deterrence and defense, forward presence, crisis response, and reconstitution.¹¹ According to General Powell, "The central idea in the strategy is the change from a focus on global war-fighting to a focus on regional contingencies."¹²

For over forty years, the day-to-day forward presence of U.S. forces in regions vital to national interests provided the key to averting crises and preventing war.¹³ Beginning in 1990, reduced defense budgets and the demise of the Warsaw Pact caused the U.S. to reduce its forward-deployed military forces. This reduction in troops stationed overseas did not mean that U.S. global responsibilities also decreased. The 1992 National Military Strategy of the United States listed the capability to respond to regional crises as, "one of the key demands of our strategy."¹⁴ As a result of the reduction in forward-deployed forces and a shift in strategic interest away from containing the former Soviet Union toward responding to regional contingencies, the capability of the U.S. military to prevail during a future crisis will depend on the ability of CONUS-based forces to rapidly project power into the crisis area.

To project power into a regional conflict, U.S. forces would need to deploy from bases in CONUS and travel to the objective area. To gain access to any crisis area, U.S. forces would have to conduct force entry operations. These force entry operations are defined by the Joint Chiefs of Staff as:

The introduction of an aggregation of military personnel, weapon systems, vehicles, and necessary support, or combination thereof, embarked for the purpose of gaining access through land, air, or amphibious operations into an objective area.¹⁵

If uninvited and opposed, U.S. forces might need to make a forcible entry under hostile fire to establish a lodgment area from which to launch further operations. Forcible entry is the "military lodgment by air, land and maritime forces in the face of armed opposition."¹⁶

Forcible entry operations fall under two broad categories: amphibious and airborne.¹⁷ An amphibious force could secure a port facility or beachhead to accomplish the lodgment phase, then all subsequent forces could flow through the port to accomplish their objectives. However, if the objective area was too distant from a port facility, or if the situation was too urgent to allow for steaming time of naval forces to reach the lodgment area, then an airborne insertion would be the primary forcible entry option. According to U.S. Army FM 100-15, Corps Operations, "Airborne and/or air assault forces are best designed to achieve strategic surprise" during forcible entry operations.¹⁸ The objective area would likely be an airfield assaulted by airborne forces to secure a lodgment base to allow for the subsequent movement of all personnel, supplies, and equipment required to accomplish the mission.

An airborne assault by U.S. Army forces on an airfield would require USAF airlift support to carry the force from its home base or staging base directly to the objective area. USAF aircraft would have to move all personnel, equipment, and supplies the Army needed to accomplish the objective on the ground. Once the lodgment was established, airlift support would be needed to sustain the force and deliver reinforcements necessary to accomplish follow-on missions. USAF tactical

fighter aircraft would also provide fire support to airborne forces on the ground.¹⁹

Successful forcible entry capability is a key factor in the ability of the U.S. military to carry out its new strategy of using rapidly deployable CONUS-based forces to respond to regional crises worldwide. Without well trained and equipped airlift forces airborne troops cannot get to their objective area to establish a lodgment base. Without this lodgment base the forcible entry mission will probably fail. Airlift support would be key to an airborne forcible entry operation.

Assumptions

To provide an objective baseline for the development of requirements USAF airlift forces must meet to successfully support airborne forcible entry operations, the author made the following assumptions:

1. Air National Guard and USAF Reserve forces were not analyzed. Most airborne forcible entry scenarios would not allow enough time to mobilize guard and reserve forces to support the operation. While under certain circumstances some operations may utilize selected reserve component forces and some operations may have enough planning time to mobilize and utilize many reserve component forces, the author believes these cases will be the exception rather than the rule. The primary participants in forcible entry operations are assumed to be active duty forces.

2. Potential airborne forcible entry locations will be countries where the U.S. has national interests at stake and a reason to

intervene. On the basis of current national security strategy, this thesis compiled a list of countries that included: (1) countries where armed conflict existed in 1992; (2) countries that sponsored terrorism; and (3) countries that were involved in international narcotic trafficking. This list of countries was assumed to be a representative sample of potential forcible entry locations.

3. When determining the size of a U.S. Army force that airlift aircraft would be required to carry to a potential airborne forcible entry target, this study assumed that airlift estimates made by the 82nd Airborne Division were accurate. Airlift estimates were taken from the May 1992 version of the 82nd Airborne Division's Readiness Standard Operating Procedures. This thesis also assumed the 82nd Airborne Division's airlift requirement for a light infantry battalion would be similar to that required by one battalion from the 75th Ranger Regiment.

4. This thesis assumed that all U.S. Army forces would depart from Pope Air Force Base (AFB) to deploy to the objective area. The main Army airborne force is the 82nd Airborne Division, stationed at Fort Bragg, North Carolina, which is adjacent to Pope AFB.

5. The U.S. Army assaulting force must use parachute operations for the initial assault, followed by airland delivery of supporting forces.

6. The objective area of the forced entry operation was an airfield held by hostile ground forces. An airfield was a realistic target because the airborne force would need to establish an airhead to sustain its future operations and allow airland delivery of supporting forces.

Limitations

In order to make this study on airlift requirements for airborne forcible entry operations feasible, the author imposed the following constraints:

1. This thesis will remain unclassified in order to achieve the widest dissemination. The author used credible, unclassified sources to research air and ground threat analysis, and the potential for hot spots around the world. The discussion of capabilities and limitations of USAF aircraft was limited to unclassified terms.

2. Only airborne forcible entry operations were studied. Although amphibious forces can also be used for these type operations, they were not studied.

3. Analysis was limited to the first twenty-four hours of the lodgment phase of a forcible entry operation. Airlift would undoubtedly play a key role in the sustainment of the lodgment force and delivery of reinforcing units, but these issues were beyond the scope of this thesis.

Methodology

The goal of this thesis was to develop requirements that airlift forces must meet to successfully support airborne forcible entry operations. To reach this goal, the author built a four-step process. The first step involved a review of current research into airborne forcible entry operations to determine if a need existed for this type of study. The second step reviewed historical airborne forcible entry operations and derived lessons learned that could be applied to potential

future missions. After a historical analysis, the author turned to the present and analyzed trouble spots around the world to determine potential airborne forcible entry scenarios. The final step summarized findings and presented conclusions.

Chapter 2 examined the current state of the literature in the airborne forcible entry field. Areas investigated included: U.S. military strategy; past works on airborne forcible entry operations; historical airborne forcible entry examples from World War II, Grenada, and Panama; probable airborne forcible entry targets; U.S. Army airborne doctrine; USAF airlift doctrine; and USAF airlift force structure and aircrew training. The primary goals were to show the pattern of research in the field and to illustrate how this thesis filled a gap in the area of study.

Chapter 3 took a historical perspective to help define the requirements for airlift forces to successfully support airborne forcible entry operations. The author reviewed several airborne operations from World War II to the present. The U.S. military has accomplished several airborne forcible entry operations in the past with different results. In World War II, U.S. military forces conducted airborne forcible entry operations in Sicily, Normandy, and Holland. More recent examples include Operation Urgent Fury, the 1983 airborne assault on Grenada, and Operation Just Cause, the 1989 U.S. intervention in Panama.

After this thesis reviewed the history of airborne forcible entry operations, it summarized airlift lessons learned from history that provided insight into how U.S. military forces might conduct future missions. Several common characteristics of past airborne operations were

identified that provided important lessons for the future employment of airlift in support of airborne forcible entry operations. These lessons learned were summarized and used to develop transport aircrew training requirements.

In chapter 4 the author reviewed the current world situation, determined a list of potential airborne forcible entry targets, then used those targets to determine distance and threat survivability requirements. First, this thesis developed a list of possible locations where forcible entry operations could occur. A table was built that listed countries that had armed conflicts ongoing within their borders in 1992, countries that sponsored terrorism, and countries involved in illegal drug trafficking in 1992. After identifying possible forcible entry target areas, the list was narrowed by removing those with sea access. This analysis yielded a list of potential areas for U.S. airborne forcible entry operations.

After the list that included potential airborne forcible entry targets was built, this thesis examined the distances that airlift forces would be required to traverse to deliver airborne forces from CONUS to the target areas. Range capabilities of current airlift aircraft were examined first. Next, the author computed distances airlift aircraft would need to fly from Pope AFB to the potential target areas. These distances were analyzed with the range capabilities of current airlift aircraft to determine the distance requirement airlift forces must meet to successfully support airborne forcible entry operations. Advantages and disadvantages of air refueling, enroute stops, and intermediate staging bases were discussed.

Chapter 4 also addressed the threat survivability requirement. First, threats to airlift aircraft during different phases of an airborne mission were outlined. Then the author defined different threat categories airlift aircraft might need to operate in if they were to successfully support airborne forcible entry operations. Next this thesis analyzed each of the potential target areas to determine what category of threat they represented to airlift aircraft. These threat categories for each potential airborne forcible entry target were used to determine the threat survivability requirement for airlift aircraft to successfully support this mission.

In chapter 5 the author summarized the requirements for airlift aircraft to successfully support airborne forcible entry operations. This thesis used typical airfield seizure force packages and corresponding aircraft load requirements developed by the 82nd Airborne Division to determine the amount of airborne equipment and paratroopers airlift aircraft must transport to a potential target area. The study summarized distance and threat survivability requirements next. Finally, the author presented aircrew training issues and suggested areas for future study.

CHAPTER 2

LITERATURE REVIEW

A review of the literature on the use of airlift to support airborne forcible entry operations provided mixed results. Forcible entry as a topic has received much attention in military journals and research projects since 1985. The majority of this work, however, has been from U.S. Marine Corps officers studying the utility of amphibious forcible entry operations. The author found relatively few works that addressed the necessity of an airborne forcible entry capability. Perhaps the requirement for this capability had been viewed as a given since the establishment of the Rapid Deployment Force, which may have reduced debate on the issue.

Works that did look at the need of an airborne forcible entry force generally fell into two categories: those that covered ground concerns and those that looked at airlift vulnerabilities to modern surface-to-air threats. Articles, theses, and monographs written by U.S. Army officers tended to focus on the combat power and mobility requirements that the airborne ground force needs to survive on the modern battlefield. Most of these works also investigated the air transportability of the ground force, including the threat modern surface-to-air defensive systems pose to transport aircraft, but their analysis usually focused on macro issues, such as number of sorties required to move the ground force. Articles and papers written by U.S. Air Force officers

tended to address a perceived need for newer aircraft, tactics, and defensive systems to make transport aircraft more survivable given the higher threat caused by the world-wide proliferation of modern surface-to-air weapon systems.

Through the literature review the author found that the question of probable forcible entry locations had not been addressed. Most works on the subject assumed a worst-case threat scenario, such as a Soviet-style armored force with radar guided surface-to-air missiles and air-to-air artillery defending an objective airfield, and then conducted an analysis of the survivability of aircraft over the drop zone and the size of the airborne force required to secure the objective. The author found no studies that surveyed the current world situation to determine possible scenarios where U.S. armed forces could be ordered to execute a forcible entry operation.

This study was an attempt to fill this gap and generate airlift requirements for airborne forcible entry operations based on real-world scenarios. The author investigated several different areas of interest in a step-by-step process to build this thesis. Research was divided into the following areas: U.S. military strategy, airborne forcible entry operations, historical examples, probable airborne forcible entry targets, U.S. Army airborne doctrine, USAF airlift doctrine, and USAF airlift force structure.

U.S. Military Strategy

Many articles and official publications have been written since the fall of the Berlin Wall and the demise of the former Soviet Union

outlining the new U.S. military strategy. The transcript of a news conference given by Secretary of Defense, Les Aspin, and former Chairman of the Joint Chiefs of Staff, General Colin Powell, in September 1993 was very helpful in determining the goals of the new administration's defense strategy.¹ The news conference covered the bottom-up review ordered by Secretary Aspin and reinforced the idea that major regional contingencies will be the focus of future U.S. defense efforts.

"U.S. Forces: Challenges Ahead," an article by General Powell in Foreign Affairs, was a key source for determining the current U.S. military strategy. In this article General Powell reviewed the world changes that prompted the U.S. review of its national security strategy and military strategy in 1990 and how it led to the publishing of the National Security Strategy of the United States in January 1993 and the National Military Strategy of the United States in January 1992. Both of these official publications were also key sources when investigating U.S. military strategy. The National Military Strategy was particularly helpful in this study because it listed U.S. national interests, defense foundations and strategic principles, and regions important to the U.S. It also explained how U.S. military forces plan to employ forces in regional contingencies.

Airborne Forcible Entry Operations

Several official publications pointed to the use of airborne forces to accomplish the forcible entry mission. Field Manual (FM) 100-5, Operations is the U.S. Army's keystone war fighting doctrine. The June 1993 version of this document had an entire chapter dedicated to

force projection operations. This publication was helpful for this study because the force projection chapter contained a good discussion of the forcible entry operations a deploying force might face. FM 100-15, Corps Operations also had a chapter dedicated to contingency operations requiring deployment of U.S. forces to project power. The manual discussed the airborne forcible entry option and how to phase contingency operations. Examples of contingency operation phases included deployment (forcible entry), lodgment, force buildup, and decisive combat operations. FM 100-15 was a good source for determining how the U.S. Army planned to conduct force projection operations.

A monograph by Major Gordon C. Bonham from the School of Advanced Military Studies at the U.S. Army Command and General Staff College titled "Airfield Seizure: The Modern 'Key to the Country'" contained excellent summaries of past airfield seizure operations, such as Operation Mercury in Crete during World War II, Operation Urgent Fury in Grenada, and Operation Just Cause in Panama. It also was a good source of information on Army tactics used in forcible entry operations. "Forcible Entry--A Hard Nut to Crack" was a Naval War College paper by Lieutenant Colonel J.J. Streitz, USMC, that also investigated forcible entry operations. In this study the author described how airborne and amphibious forcible entry capabilities are important given the new U.S. military strategy. Lieutenant Colonel Streitz argued for more joint airborne and amphibious forcible entry training and doctrine. His paper provided excellent analysis that showed the importance of amphibious and airborne forcible entry operations in a new U.S. national military

strategy that relied more on the ability to project power from CONUS than on forward-deployed armed forces.

Historical Examples

The author found many works that summarized historical airborne operations. Most of the books and articles, however, tended to describe paratroop operations from the perspective of the ground force. It was difficult to locate detailed information on the tactics, techniques, and procedures used by transport aircrews to successfully deliver airborne troops to objective areas. The historical examples reviewed in this study included U.S. airborne operations in World War II, Operation Urgent Fury in Grenada, and Operation Just Cause in Panama.

World War II

The subject of airborne operations during World War II has been studied extensively. The author found several works that proved particularly helpful to this study. Airborne To Battle, by Maurice Tugwell, contained a detailed record of airborne operations in World War II. This book provided an excellent description and analysis of the problems troop carrier leaders had developing doctrine, tactics, and training programs to airdrop paratroopers effectively. A Bridge Too Far, by Cornelius Ryan, described Operation Market Garden, the largest airborne operation attempted during World War II, in detail. Most of the book focused on the ground aspects of the operation, but Ryan devoted several pages to describing the troop carrier effort. The book discussed the routes airlift aircraft took, tactics used, and how troop

carrier and airborne units applied the lessons they learned from the D-Day invasion of Normandy to improve airborne procedures.

One excellent work that addressed troop carrier aspects of airborne operations in World War II was a 1983 Air Force Review article by Major Ronald G. Boston, USAF, titled "Doctrine by Default: The Historical Origins of Tactical Airlift." In this article Major Boston reviewed American World War II airborne operations from an airlift perspective. His analysis concentrated on how troop carrier units developed their tactics for airdropping U.S. Army paratroopers through trial and error. This article contained useful information on numbers of aircraft employed, tactics used by transport aircraft to reach objective areas, and planning factors developed in World War II that are still used today. Operations covered by this article included the invasion of Sicily, the Normandy invasion, and the air invasion of Holland.

The author found several other sources that analyzed World War II troop carrier contributions to Allied airborne operations. Airlift Doctrine by Lieutenant Colonel Charles Miller, USAF, described the evolution of airlift theory and doctrine from the development of military air transportation between World War I and II until the early 1980s. This book contained detailed descriptions of airborne operations in all theaters of World War II, and traced the development of airborne tactics from an airlift perspective. A second excellent source of airlift tactics and techniques used during World War II was a 1962 study by the USAF Historical Division titled USAF Airborne Operations: World War II and Korean War. This book provided a wealth of statistics that detailed the number of aircraft involved in World War II and Korean War airborne

missions, results of those missions, and an enlightening discussion on the development of airdrop tactics by troop carrier aviators. The analysis of lessons learned from each operation were very useful.

Operation Urgent Fury

Urgent Fury by Mark Adkin was the best source of information on the U.S. operation in Grenada found by the author. Adkin's work provided detailed analysis of the military operations that took place during Operation Urgent Fury. His description and analysis of the planning and execution of the airdrop by the Rangers on Point Salines Airport were key to this study. American Intervention in Grenada by Peter M. Dunn and Bruce W. Watson also provided useful analysis of the 1983 airborne forcible entry operation in Grenada. Their study of the political events that led to the invasion was particularly helpful.

Military Incompetence by Richard A. Gabriel was another book that contained a description of the Point Salines Airport airborne operation. The chapter devoted to Operation Urgent Fury provided some information on problems airlift forces had dropping the Rangers on the objective area. In this author's opinion, however, Gabriel's analysis was biased because his purpose was to illustrate what was wrong with the U.S. military in the mid 1980s. His work took a very critical look at the performance of the U.S. military during the operation.

Operation Just Cause

The author located three books that described airborne forcible entry operations during Operation Just Cause. The first work was Operation Just Cause by Thomas Donnelly, Margaret Roth, and Caleb Baker.

This book provided an excellent analysis of the events that led to the U.S. intervention, as well as a detailed description of the airborne operations at Torrijos/Tocumen and Rio Hato Airports. Just Cause: The Real Story of America's High-Tech Invasion of Panama by Malcolm McConnell was another book that described the operation in detail. McConnell's analysis was particularly helpful because it centered more on the military aspects of the operation than the other books. Both of these books, however, concentrated most of their analysis on the contributions made by ground forces and did not cover airlift operations in detail.

The author found Operation Just Cause: The U.S. Intervention in Panama by Bruce Watson and Peter Tsouras to be the best source of information on airlift contributions to Operation Just Cause. One entire chapter of this book was devoted to analyzing the USAF's role in the operation. Watson and Tsouras listed numbers of aircraft involved in airdrop operations and described the tactics used by airlift aircraft to transport paratroopers successfully to objective areas. The author of this thesis found the information on airlift operations during Operation Just Cause in this book very useful.

Probable Airborne Forcible Entry Targets

The October 1993 issue of Air Force Magazine published a map of locations around the world where major armed conflicts had occurred in 1992. The map referenced an excellent article by Peter Wallensteen and Karin Axell in the Journal of Peace Research titled "Armed Conflict at the End of the Cold War, 1989-1992." This article studied the character of armed conflicts around the world during the period from 1989 to 1992.

Particularly helpful to this thesis was the article's listing of wars, major, and minor armed conflicts on a country-by-country basis. Wallenstein and Axell's analysis also listed the different sources of the conflict and the various actors involved in each situation. This thesis used the armed conflicts described in this article to help build a list of potential forcible entry scenarios.

The National Military Strategy of the United States was the source that provided possible reasons why U.S. armed forces might be tasked to conduct airborne forcible entry operations. Two areas of interest described in this document included international narcotic trafficking and state-sponsored terrorism. The U.S. Department of State Dispatch was also very helpful in determining U.S. policy on these issues. Several issues contained listings of countries U.S. monitored to comply with drug enforcement policies. One article listed the countries the U.S. attempted to isolate diplomatically because they sponsored terrorism. The U.S. Department of State Dispatch and the article by Wallenstein and Axell were the primary sources used in this thesis to develop a list of possible countries where U.S. military forces might be ordered to intervene.

After the author determined possible forcible entry locations, it was necessary to examine each one to determine what type of threat military forces in those countries might pose to U.S. armed forces in an airborne forcible entry operation. One very useful source of information on the defense capabilities of every country in the world was the 1992-1993 Military Balance published by the International Institute for Strategic Studies. This periodical listed the ground, air, and naval

forces for each country in the world by region. Country-by-country descriptions in this publication contained useful data on the military capabilities of almost every country in the world, including number of personnel in the armed forces, types of units, models of equipment, and contributions made by para-military forces.

Airlift Operations in Hostile Environments by Lieutenant Colonel John Skorupa, USAF, was a good source of information for defining the types of surface-to-air and air-to-air threats faced by airlift aircraft when conducting airborne operations. This work provided clear definitions of the threat levels used in the analysis of aircraft survivability. Skorupa's study contained an excellent analysis of the employment of airlift aircraft in a modern threat environment. The background information on anti-aircraft weapon systems, employment techniques, and airlift countermeasures provided by this book was key to developing the airlift survivability requirements in this thesis.

U.S. Army Airborne Doctrine

Field Manual 90-26, Airborne Operations, was an excellent starting point to begin an examination of U.S. Army airborne doctrine. It contained some information on planning airfield seizure operations and described planning factors that the Army used to develop aircraft load plans required to employ airborne forces. While FM 90-26 was helpful in determining general U.S. Army airborne doctrine, it did not provide sufficiently detailed descriptions of the actual forces that might be employed. The author fortunately acquired a May 1992 copy of the 82nd Airborne Division Readiness Standing Operating Procedures. This

document listed general force packages that an airborne division might employ in several possible scenarios.

A 1993 Master of Military Art and Science thesis by Major James Lunsford, USA, titled "Keeping the Airborne Division a Viable Force," provided additional information for determining the composition of airborne forces U.S. Army planners might use in a forcible entry scenario. Lunsford used troop and equipment lists from 82nd Airborne Division standard operating procedures that proved valuable when building a list of troops and equipment U.S. airborne forces might take into combat.

USAF Airlift Doctrine

The author found that airlift doctrine for the support of airborne operations was less extensive than the doctrine developed by the ground forces who would jump into battle. In general, most articles written by airlift operators questioned the lack of current official airlift doctrine. In his 1992 Airpower Journal article titled "The New AFM 1-1: Shortfall in Doctrine?" Lieutenant Colonel Robert Boudreau, USAF, pointed out that the Air Force's current doctrine focuses almost exclusively on combat at the campaign level. He argued that the Air Force's new doctrine does not sufficiently address airlift issues given the current world situation.

Air Force Manual (AFM) 1-1, Basic Aerospace Doctrine of the United States Air Force, discussed the principles of war and defined the aerospace environment. It also reviewed the roles and typical missions of aerospace power, listing airlift as a mission under the "force enhancement" role. AFM 1-1 stated that, "Sufficient strategic and theater

airlift must be available to respond quickly to worldwide threats and to sustain deployed aerospace and surface forces." One paragraph in the force enhancement chapter of Volume II briefly mentioned possible forcible entry operations but did not provide any detailed guidance.

Two articles that provided good insights into the current debates involving airlift doctrine were "Doctrine by Default: The Historical Origins of Tactical Airlift" by Major Boston and an Airpower Journal article titled "Tactical Airlift Tactics and Doctrine: More Carts, More Horses" by Colonel Paul Wilke. Colonel Wilke's article also looked at what types of missions airlift forces should be tasked to accomplish given the proliferation of air defense weapons throughout the world. Both authors argued that current USAF airlift doctrine was not well defined. These articles were typical of most written by airlift operators. They called attention to the valuable contributions airlift forces have made to the ability of the U.S. to rapidly respond to a crisis while arguing that official USAF doctrine does not adequately address airlift issues.

AFM 2-4, Aerospace Operational Doctrine: Tactical Air Force Operations - Tactical Airlift stressed the combat orientation of tactical airlift forces. The manual emphasized the requirement for airlift forces to deliver combat forces directly into an objective area. This was a useful source when analyzing current USAF airlift doctrine and looking at C-130 aircraft capabilities, but somewhat dated because it had not been updated since 1966. AFM 2-21, United States Air Force Strategic Airlift, described the specific roles and missions of strategic airlift. It discussed the necessity of strategic airlift forces

being able to augment theater airlift forces in airland and airdrop operations in the combat zone if required. This document was also useful for getting information about C-141 aircraft and analyzing airlift doctrine, but, similar to AFM 2-4, has not been updated since 1972.

Air Mobility Command Regulation 55-130, C-130 Operations, contained a great amount of information pertaining to employment tactics and capabilities of C-130 aircraft. Detailed information on C-141 operations was found in Air Mobility Command Regulation 55-141, C-141 Operations. Aircrews have relied on these regulations as their primary sources of airlift doctrine and have used them to guide planning for the employment of airlift forces when supporting airborne forcible entry operations in the past.

USAF Airlift Force Structure

Jane's All the World's Aircraft, edited by John W.R. Taylor, listed detailed information on aircraft performance, modifications, and design history. This British publication, published yearly, contained the latest specifications and developments in the world of aviation. Another good source of information on USAF force structure were annual aviation reviews in Air Force Magazine. This magazine had some of the most up-to-date statistics on number and types of aircraft assigned to active and reserve component units. The author used Air Force Pamphlet (AFP) 76-2, Airlift Planning Factors to determine the capabilities of airlift aircraft analyzed in this thesis. Data on ranges and payload capacities found in AFP 76-2 were particularly helpful.

CHAPTER 3

HISTORICAL BACKGROUND AND LESSONS LEARNED

This chapter will examine historical examples of airborne forcible entry operations, then look at lessons learned during those operations to forecast how similar missions might be executed in the future. Research focused on contributions airlift operators made to these operations and how airborne tactics and techniques evolved through trial and error. First, the author reviewed several airborne operations from World War II to the present, then examined how airlift tactics have evolved to draw several lessons on how U.S. military forces might conduct future airborne forcible entry operations.

The U.S. military has accomplished several airborne forcible entry operations in the past with differing results. In World War II, the invasions of Sicily, Normandy, and Holland by Allied armed forces were forcible entry operations conducted in the European theater. More recent examples included Operation Urgent Fury, the 1983 airborne assault on Grenada, and Operation Just Cause, the 1989 U.S. intervention in Panama. These operations offered valuable lessons concerning the requirements airlift and airborne forces must meet to support the forcible entry mission.

World War II

During the years before World War II, the American Army experimented with parachute troops and techniques but never in a very serious way. The invasion of Holland on 10 May 1941 and Crete on 20 May 1941 by German airborne forces sparked renewed American interest in the use of paratroops. Urged by the Army chief of infantry, the War Department organized an airborne force, the 501st Parachute Company, at Fort Benning, Georgia, in July 1940.¹ By the end of the war, the U.S. had deployed five airborne divisions and one airborne corps headquarters. These airborne troops were carried into battle by troop carrier aircraft from the U.S. Army Air Forces (USAAF).

At the beginning of World War II, USAAF transport resources were divided into two organizations: one for strategic air transportation and one for troop carrier aviation. Troop carrier units were responsible for theater logistics support and training with paratroop units to perform airborne operations. This was similar to the organization of C-130 tactical and C-141 strategic airlift forces today. In 1940, USAAF troop carrier units were strained to support paratroop training requirements because they only had slightly more than 100 aircraft available. Since bomber and fighter aircraft had priority for production, the build up of enough transports to mount any serious airborne operation was slow. The Army was fortunate that the civilian DC-3 airliner could be readily adapted for both logistics and troop carrier roles. The USAAF received the first DC-3 (designated the C-47) in September 1941 and had 500 of these aircraft by the following summer. Production reached 100 per month by mid-1943. With a payload of three tons

or 18 paratroopers, it had limited capabilities, but it met many demands for troop carriers during the years ahead.²

In March 1942, the Army consolidated its paratroop units into an airborne command. In an effort to provide better airlift support to airborne paratroopers, the USAAF established the Air Transport Command the following month. Its purpose was to:

Organize and train Air Transport units for all forms of Air Transport with special emphasis on the conduct of operations involving the air movement of airborne troops, glider infantry and parachute troops.³

In June 1942, the command was redesignated the Troop Carrier Command. Troop carrier forces were dedicated as theater resources responsible primarily for airborne operations, but they were also tasked with logistics support within a theater of operations. The same order transformed the old Air Ferrying Command into a new Air Transport Command responsible for air logistics between theaters.⁴

Troop carrier and paratroop representatives formed the Airborne Operations Board to develop standard altitudes, airspeeds, and in-flight procedures for troop drops, but it gave little thought to planning or executing large airborne operations. The board's work led to Field Manual (FM) 31-30, Tactics and Techniques for Airborne Troops, published in May 1942.⁵ This manual envisioned only small-scale operations to neutralize key objectives or to capture airstrips for landing reinforcements, not the large-scale airborne operations that would occur later in the war. When troop carriers went into combat in North Africa in November 1942, operations generally followed FM 31-30 as loosely assembled groups of 20 to 40 aircraft deployed paratroop units to seize airfields

in the path of Allied ground forces. These operations met little or no resistance until the final troop drop of the North African campaign. In that operation, 530 paratroops easily seized two lightly defended airfields behind German lines near Tunis, but shortly thereafter German fighter aircraft and tanks decimated the small, lightly armed force. Reviews of these operations stressed the need for greater concentrations of paratroops on the objective area and better troop carrier tactics.⁶

Operation Husky: The Invasion of Sicily

Troop carrier units received their first test under fire in operations over Sicily in July 1943. Allied plans called for a predawn drop of British and American airborne units to block access routes to beaches lest German reserves interfere with amphibious landings on the southeastern coast of the island. Although darkness would handicap the units' efforts to assemble on the ground and would make finding drop zones difficult for aircrews, a night airdrop insertion was deemed necessary to preclude interception by enemy fighter aircraft. Figure 1 in appendix B illustrates Operation Husky troop carrier airdrop missions.⁷

Early on 10 July, the first mission of 226 C-47s carrying the 82nd Airborne division departed on a complicated low-level route to avoid overflying Allied maritime convoys. The mission ran into problems immediately. Aircraft had difficulty staying in formation because all lights on the aircraft were extinguished with the exception of a tiny position light; a quarter moon offered little light; and salt spray on the aircrafts' windscreens further reduced visibility. An unexpectedly strong crosswind caused inexperienced crews to cross the coast of Sicily

far off course. Dust and smoke from the preinvasion bombardment obscured the landmarks and drop zones and added to the confusion that left paratroopers scattered for 50 miles along the coast. Only 200 of the 3,400 82nd Airborne Division paratroopers dropped that night landed on the planned drop zone.⁸

On the second night of the invasion, the 504th Regiment of the 82nd Airborne Division made an airborne assault to support the invasion plan. The troop carrier aircraft carrying the paratroopers to the drop zones ran into difficulty when their planned route of flight took them over Allied ships and ground troops near the invasion beaches. Ground and naval troops mistook the troop carrier aircraft for enemy bombers and opened fire with antiaircraft weapons. Of the 144 planes that had left Tunisia, twenty-three were destroyed and thirty-seven were badly damaged--mostly from friendly fire. Of the 2,000 paratroopers involved in the mission, 229 became casualties.⁹

Troop carrier units were literally making up their own tactics for inserting airborne troops during the invasion of Sicily. The drops were planned for night, but the rapid expansion of the troop carrier force meant that most crews were untrained and inexperienced in night navigation. With few experienced navigators to call on, the troop carrier planners turned to tight, nine-ship formations so inexperienced aircrews could follow lead aircraft manned by more experienced pilots and navigators to the objective areas. These formations, however, had difficulty staying together at night because of poor visibility, few lights on the aircraft, and lack of training in formation flying. Tight formations could not overcome the difficulties of navigating at night,

so formations became separated, aircraft lost their way, and very few aircraft dropped their paratroopers on the correct drop zone.¹⁰

In addition, airborne planners expected heavy enemy defenses near the proposed drop zones--especially antiaircraft flak and night fighters--so troop carrier pilots flew low-level routes at 600 feet above ground level to avoid enemy night fighters and reduce the time flak units had to acquire friendly aircraft. However, flying this low made acquisition of the drop zones very difficult for the inexperienced crews. Flying low over the ocean also caused salt spray to cloud many windscreens, lowered visibility for the crew, and made navigation even more difficult. Low-level flying and navigation at night were difficult tasks that required intense training. This choice of low-level tactics, coupled with the lack of proper training for troop carrier aircrews, was a major contributing factor to the high number of paratroopers that landed far from their intended drop zones during this operation.¹¹

Because troop carrier and airborne planners thought the element of surprise was so important, they did not use pathfinders to mark the drop zones in Sicily before the airdrops. Pathfinders were highly trained aircrews with specialized equipment that inserted special paratrooper teams ahead of the main attack. These paratrooper teams marked drop zones with electronic and visual devices to improve drop zone acquisition for subsequent aircrews.¹² Without the pathfinders to mark the drop zones, aircrews got lost, could not find the planned drop zones, and dropped their paratroopers far from intended landing zones.

Despite the circumstances surrounding the insertion of paratroopers during the invasion of Sicily, three of the four airborne

operations were successful. Airborne troopers, once on the ground, proved to be resourceful, adaptable, and very tough fighters who made the most of difficult situations.¹³ Perhaps the most important lesson troop carrier and airborne planners learned from the operation was the importance of pathfinders to mark drop zones at least 30 minutes before the main body of transports arriving over target. Operation Neptune, the airborne portion of the Allied invasion of Normandy, would see pathfinder aircrews and paratroopers used extensively to mark drop zones and landing zones for following troop carriers.

Operation Neptune: The Normandy Invasion

Operation Neptune was the name given the airborne operations that supported Operation Overlord, the Allied invasion of Normandy. General Dwight Eisenhower and Field Marshal Bernard Montgomery planned to use three airborne divisions to secure bridges and road junctions against German reserves that might oppose amphibious landings on the Normandy coast. General Henry H. Arnold, Chief of the USAAF, suggested the Allies attempt a strategic airborne thrust deep into France to sever vital communication lines near Paris. General Eisenhower dismissed this idea because he needed the airborne divisions to support the amphibious assault and increase the initial invasion strength to eight divisions.¹⁴

American troop carrier units in England were organized as the Ninth Troop Carrier Command under the Ninth Air Force, which had been designated the tactical theater air force. British and American theater forces were joined in the Allied Expeditionary Air Force commanded by British Air Chief Marshal Sir Trafford Leigh-Mallory. By late spring of

1944, Ninth Troop Carrier Command had built up its force to 1,166 C-47 aircraft, while total Allied forces could muster 2,591 gliders. Joint practice between troop carrier aircrews and airborne paratroopers began in March 1944. Pathfinder aircrews and ground teams received intense training in navigating to, locating, and marking drop zones. British C-47s even flew missions over Normandy before the invasion where they dropped leaflets and special agents. This gave selected British C-47 squadrons a chance to familiarize navigators with the landfall and significant topographical features they would see again on D-Day. A dress rehearsal in May included 850 aircraft, 110 gliders, and 8,400 troops.¹⁵

Fear of enemy interceptors and ground fire made troop carrier planners turn to some of the same tactics they had used in Sicily. Airborne leaders planned a night drop followed by glider landings of troops, artillery, and supplies. Additional glider and airdrop missions for reinforcement and resupply would be launched during the first two days of the invasion. The rapid C-47 and transport force buildup forced troop carrier units to rely on formation drops into well-marked drop zones because troop carrier aircrews still lacked sufficient night navigation skills to locate unmarked drop zones with any acceptable probability of success. Figure 2 in appendix B illustrates the routes planned for troop carrier missions in support of Operation Neptune.¹⁶

At 0:30 A.M. on 6 June 1944 the months of training and practice culminated as 821 C-47s carrying the 82nd and 101st Airborne Divisions assembled in formation over their English bases and departed for France. Aircraft and gliders marked with white stripes for identification by friendly naval and ground forces flew in radio silence to six drop zones

around the town of Ste. Mere-Eglise. All went well until the force arrived over the French coast and the lead section plunged into an unexpected cloud bank. The formations began to break apart as sections flew into the clouds and lost sight of other aircraft. As a result of the rapid troop carrier force buildup, only three out of five aircraft had navigators aboard, so many stragglers could not find the correct drop zones once they became separated from their flight leaders.¹⁷

Although pathfinder aircraft and teams were sent out to mark drop zones thirty minutes ahead of the main formations, some of the pathfinder aircraft also got lost in the weather and dropped the pathfinders on the wrong drop zone. Other pathfinder teams reached the correct drop zone but could not set out their equipment or mark the drop zone properly with lights because of heavy enemy resistance.¹⁸

Results of the airborne insertion over Normandy were similar to the operation in Sicily. The 101st and 82nd Airborne Divisions were dropped over a fifteen-by-twenty-five-mile area. Of the 13,000 American troops dropped, fewer than 10 percent landed on planned drop zones, but 60 percent landed within two miles of planned drop zones. About 1,500 paratroopers were killed or captured immediately after landing, and 60 percent of the equipment airdropped by C-47s to resupply and reinforce troops was lost in swampy and woody areas.¹⁹

Despite problems in making the initial airdrops, quick action and improvisation by 82nd and 101st Airborne Division paratroopers once they landed again ensured mission success. The divisions accomplished all of their assigned tasks in spite of the scattered delivery. British airborne landings near Caen on D-Day were much more accurate because

pathfinders successfully marked drop zones and the troop carrier aircrews were not hampered by the poor weather that plagued American operations. By 8 June all airborne units had made contact with amphibious invasion units. Cherbourg fell to the Americans on 27 June 1944.²⁰

After Neptune, troop carrier units looked back on the operation to see what lessons they could learn from their experiences. Night drops were seen as too difficult given the available training and technology. The Americans, perhaps applying the same lessons that led them to rely on daylight precision bombing instead of night bombing raids as the British employed, pushed strongly for daylight airborne operations in the future. Troop carrier aviators concluded that:

The difficulties of night paratroop operations--the vulnerability of lighted beacons, the limitations of radar, inability to keep formations--appeared to outweigh the hazards of daytime missions. Large night drops did not occur again in World War II.²¹

The Allied air superiority over Europe made losses to enemy fighters much less likely. Also, the Americans felt it was impossible to expect precise night flying in a rapidly expanding troop carrier force--inexperienced aircrews did not have the training time to hone night flying skills.²²

The Normandy airborne operations also reinforced three other lessons troop carrier units had learned in Sicily. One was the importance of pathfinder units to mark drop zones ahead of the main assault. The British landings were much more successful near Caen because pathfinders had succeeded in finding and marking the drop zones before the main waves of aircraft arrived. Another lesson was the need to plan for poor weather. More than 25 percent of American paratroopers landed one

mile or more from their intended drop zones because troop carrier aircrews became disoriented when they flew into unexpected weather. A final lesson was the value of formation tactics for such an inexperienced troop carrier force. Not enough well-trained navigators and pilots were available in the rapidly expanded troop carrier force, so planners had to rely on a few skilled aircrews to lead less-experienced troop carrier flyers to the drop zone.²³

Despite the detailed planning, rehearsals, and training, the Neptune airborne operations had many of the same problems the troop carrier aircrews and paratroopers faced in Sicily. Troop carrier aircrews had difficulty finding the correct drop zones and scattered paratroopers far from objective areas. Some aircraft even dropped their troopers as low as 200 feet above the ground after being engaged by ground flak and enemy fighters. This made the paratroopers' task of assembling after the drops in sufficient force to take assigned objectives very difficult. As a result of these problems in the Normandy invasion, Allied airborne units lost confidence in the ability of the troop carrier aircrews to deliver paratroopers accurately.²⁴ When airborne forces attacked the Germans in Holland during Operation Market Garden in September 1944, however, troop carrier units would prove they had learned valuable lessons in Sicily and Normandy by delivering the airborne troops right on target.

Operation Market Garden: The Invasion of Holland

Field Marshal Bernard Montgomery's plan to outflank German resistance by leaping the Rhine River in eastern Holland gave Allied

airborne leaders an opportunity to demonstrate a more independent role for airborne operations. Heavy tactical air attacks on enemy defenses were to precede an Allied airborne assault to capture key river bridges ahead of an armored corps advancing over roads. The British 1st Airborne Division was given the primary objective of capturing the bridge over the Rhine at Arnhem, and the American 101st and 82nd Airborne Divisions were tasked to seize bridges at Nijmegen and Eindhoven. "Airborne's task was to hold open the canal and river crossings on the Eindhoven-Arnhem road in Holland, thus laying sixty miles of 'airborne carpet' for the ground troops to advance upon."²⁵

After the invasion of Normandy, British and American airborne and troop carrier units were consolidated into the First Allied Airborne Army commanded by USAAF Lieutenant General Lewis H. Brereton. This Allied unit included the British 1st Airborne Corps, with the 1st and 6th Airborne Divisions, and the American XVIII Airborne Corps, which included the 82nd and 101st Airborne Divisions, and the newly arrived 17th Airborne Division.²⁶ The First Allied Airborne Army filled a need for an organization to conduct joint planning between troop carrier commands and airborne forces.

Troop carrier pilots remembered the lessons they learned during the Normandy invasion. They argued that a day assault would be easier to control, more accurate, and more successful than a night assault. Because Allied air power had achieved such overwhelming air superiority over Holland and France, Brereton and other Allied airborne planners opted for a day assault instead of a night drop. Figure 3 in appendix B

illustrates the routes of initial troop carrier missions in support of Operation Market Garden.

Several potential problems were discovered during the planning of Operation Market Garden. First, the availability of troop carrier aircraft became a limiting factor. Transport assets available to airborne units totaled 1,173 U.S. C-47s, 130 British C-47s, 240 converted British bombers, and 2,526 gliders. As a result of the limited number of aircraft and aircrews, three consecutive days of troop drops would be needed to deliver the entire airborne force. Also, the operational plan made no allowances for weather or other delays. These problems later caused the buildup of airborne forces to be delayed which left lightly armed paratroop units dangerously exposed to heavy German defenses.²⁷

No problems, however, arose on the operation's first day. The performance of the troop carriers during the initial airborne assault was a model of perfection. At 9:45 A.M. on a bright Sunday morning, 17 September 1944, the first aircraft of a 2,023 troop carrying armada of planes departed from one of twenty-four U.S. and British bases in England. After two and one-quarter hours the entire force--more than 20,000 troops, 511 vehicles, 330 artillery pieces, and 590 tons of equipment--was airborne and enroute to Holland for the largest airborne operation ever attempted.

The pathfinders' work had been precise--drop zones were well marked and easy for transport aircrews to find. As a result of the pathfinders' work and improved troop carrier aircrew proficiency, the troops and gliders landed with almost perfect accuracy. Although enemy flak was heavy at times, brave C-47 pilots held their course to the drop

zones and delivered the paratroopers right on target. Escort fighters flew low to suppress antiaircraft fire from German positions. Of the 424 C-47s that carried the 101st Airborne Division to its drop zones near Eindhoven, every fourth plane was damaged by enemy fire. Sixteen of the troop carrier aircraft crashed, killing their crews. Despite these losses, of the 6,695 101st Airborne Division troops that enplaned in England all but twenty-six jumped onto their designated drop zones.²⁸

Although fog and rain delayed takeoffs until noon on day two, a force of similar size repeated the successes of the first day. But the element of surprise was lost, and the German defenders began to reorganize and concentrate their defenses on the vital bridges. Airborne units on the ground came under increasingly heavy attack. Poor weather brought air operations to a standstill on days four through six and sporadic attempts to airdrop supplies resulted in heavy losses.²⁹

On 19 September 1944 elements of the British XXX Corps passed through Veghel--the 101st Airborne Division had completed its mission. By 20 September the British XXX Corps troops crossed the Nijmegen bridge with the help of the 82nd Airborne Division and the road to Arnhem was open. Meanwhile, troops in the British 1st Airborne Division were facing fierce resistance from German tank units near Arnhem and were struggling to hold onto the north side of the Arnhem bridge. Throughout 23-24 September British XXX Corps armored troops attempted to break through tough German defenses and link up with 1st British Airborne Division troopers at Arnhem, but armored forces could not reach the bridge in time. On 25 September the British 1st Airborne Division was ordered to withdraw. Operation Market Garden had failed.³⁰

Although troop carrier aircrews and aircraft had supported the airborne paratroopers admirably, the overall operation failed due to energetic German resistance and poor timing. Allied troop carrier and airborne leaders proved that the best way to deliver massed airborne troops to a drop zone was to fly in large formations, in daylight, and rely on pathfinder aircraft to properly mark objective areas. The technology of the day did not allow for accurate night flying by troop carrier aircrews, and the risks to transport aircraft from enemy flak and fighter aircraft were acceptable given Allied air superiority and the relative inaccuracy of World War II antiaircraft artillery.³¹

The lessons troop carrier and airborne leaders learned from airborne operations in World War II still influence airborne and airlift doctrine today. The USAF trains experienced aircrews to use specialized equipment and act as pathfinders to insert USAF combat control teams (CCT) to survey and mark drop zones and communicate with follow-on assault aircraft. Airlift units still train to employ paratroopers from large formations to mass the greatest number of troops on the objective area in the shortest amount of time. Navigating to and correctly identifying the correct drop zone is still easier in the daytime than at night, but changes in aircraft technology and improvements in aircrew training have made night employment much more accurate than it was in World War II. Airlift and airborne forces would get the opportunity to test their new equipment and tactics nearly 40 years after World War II on the tiny Caribbean island of Grenada.

Operation Urgent Fury: The 1983 Invasion of Grenada

During the late 1970s Grenada became a focus of attention for the United States. The Marxist government of Maurice Bishop signed an agreement with Cuba in 1979 for the construction of a 10,000 foot runway at the southern tip of the island as an initiative to increase tourism. Grenada's strategic location on the Caribbean shipping lanes and the potential for Cuban or Soviet aircraft using the airfield concerned President Ronald Reagan's administration in the United States. In addition, Bishop's anti-American rhetoric and his overtures to the Soviet Union and other Communist Bloc countries aggravated fears of another Cuban surrogate on the United States' southern flank.³²

The fear that Grenada would move closer to Cuba and, by implication, to the Soviet Bloc, grew on 19 October 1983, when Grenadian Prime Minister Maurice Bishop was overthrown and executed by a group of leftist rivals. In response to perceived moderation in the government, Bernard Coard, Deputy Prime Minister and a political fanatic, seized power in a bloody coup. In the middle of the anarchy that ensued were approximately 800 American students at the island's medical school.³³

Dominica, Saint Lucia, Saint Vincent, Montserrat, Saint Kitts-Nevis, and Antigua of the Organization of Eastern Caribbean States (OECS) were concerned by the implications of the disorder on Grenada. On 23 October 1983 the OECS requested their larger neighbors--Jamaica, Barbados, and the United States--intervene militarily and restore stability to the region.³⁴ The invitation from the Caribbean nations and fear that the American students on Grenada might be held hostage by the new revolutionary regime prompted President Reagan to authorize a mili-

tary operation that would be known as "Urgent Fury." U.S. military forces would land in Grenada at 5:00 A.M. on 25 October 1983.³⁵

Admiral Wesley MacDonald, Commander-in-Chief, Atlantic Command (CINCLANT), activated Joint Task Force (JTF) 120, under the command of Vice Admiral Joseph Metcalf, III, to conduct the operation. Metcalf received official notification of the operation thirty-nine hours before it began. Due to the short notification period, Metcalf could not meet with senior ground force commanders until twenty-four hours before the operation. Metcalf listed the following mission objectives: (1) conduct military operations to protect and evacuate U.S. and designated foreign nationals from Grenada; (2) neutralize Grenadian forces; (3) stabilize the internal situation; and (4) maintain the peace.³⁶

The plan used the Greenville--St. Georges Road as a boundary to divide the island in half. Metcalf made TF 124, composed of Amphibious Squadron Four, responsible for the northern half of the island. The 22nd Marine Amphibious Unit (MAU), diverted from its deployment to Lebanon, would conduct an air and amphibious assault to secure Pearls Airfield as an alternate site for the introduction of follow-on forces. A combination of special operations forces and two Ranger battalions, designated TF 123, would secure the southern part of the island. Because Point Salines Airport was a modern 10,000-foot long runway that could handle C-141 aircraft and near the only known location of American students, TF 123 was designated the main effort.³⁷

On the basis of intelligence reports that projected little opposition in the Point Salines Airport area, the Rangers of TF 123 planned for an airland insertion (where the supporting transport air-

craft would land and offload the Rangers on the airport) instead of a parachute assault. Intelligence reports, however, were inaccurate. In reality, the People's Revolutionary Army (PRA) and the People's Revolutionary Militia (PRM) were approximately 5,000 strong, not including the 701 combat engineers and advisors from the Cuban Revolutionary Armed Forces (FAR). Point Salines Airport was defended by a 1,000-man force of Cubans and Grenadians armed with BTR-60PB armored personnel carriers and ZU-23 antiaircraft guns. The defense of Point Salines Airport was oriented to defeat an amphibious assault, but the air threat had also been addressed. The defenders positioned barrels, vehicles, and picket fences on the runway to deny its use. In addition, a high-ranking Cuban military officer sent to Grenada two days before the invasion made other defensive improvements, particularly near the Point Salines Airport.³⁸

Operation Urgent Fury began with several setbacks for the Rangers who were flying to Grenada in five MC-130E Talon special operations aircraft and eighteen C-130E aircraft. First, the USAF transport aircrews and the Rangers had different time schedules because no USAF planners had been present at prior planning meetings. As a result, after much confusion the aircraft carrying the Rangers departed Hunter Army Airfield, Georgia, thirty minutes later than planned. The time for the assault on Point Salines Airport was adjusted to 5:00 A.M. because of a failure to insert a special operations team that was to mark the drop zone and provide reconnaissance. Tactical surprise was lost when Cuban troops detected the special operations team that had the mission to clear the runway of obstacles. An AC-130 Spectre gunship reported at 3:30 A.M. that runway obstacles would prevent the airland operation, so

the Rangers would have to make a parachute insertion instead. This required the Rangers to rig for the parachute drop in flight because they had originally planned for airland insertion. Finally, instrument failure on the lead MC-130 aircraft required a formation change that delayed the assault by an additional thirty minutes. Instead of making an airland assault under the cover of darkness, the Rangers had to make an airdrop in daylight against an alerted enemy.³⁹

The parachute assault did not go well. The first two MC-130 aircraft carrying the assault element from 1st/75th Rangers had to abort their initial run-in to the drop zone because of a rain squall. The third aircraft in the formation--a C-130 piloted by Lieutenant Colonel James Hobson, USAF--dropped the Ranger headquarters element at 5:34 A.M. As the lead and number-two MC-130 aircraft neared the drop zone for a second airdrop attempt they received heavy antiaircraft fire from guns on the north side of the airfield. The formation turned away from the drop zone because of the intense air defense fire. The flight lead suspended drop operations and requested that the AC-130 gunship fire on antiaircraft guns that were a threat to the transport aircraft.⁴⁰

Airdrop operations resumed at 5:52 A.M. after the AC-130 destroyed the ZU-23 air defense gun and continued for more than ninety minutes as aircraft made individual approaches to the drop zone. Intervals of one to ten minutes separated the aircraft as they crossed over Point Salines Airport. The main reason for the delay between aircraft dropping was that some Rangers did not receive the message to make an airdrop instead of an airland insertion until fifteen minutes out from Point Salines. As a result, the Rangers had to re-rig for parachute

operations in the back of the C-130s, which took several minutes. Lack of coordination between USAF airlifters and Army Rangers before the mission caused an airdrop that should have taken two minutes to last more than ninety minutes. Transport aircraft circled in chaos off the coast of Grenada waiting for an opportune time to drop the Rangers on Point Salines Airport. Figure 4 in appendix B illustrates the sequence of events that occurred during the Rangers' airdrop at Grenada.⁴¹

As the MC-130s and C-130s dropped the Rangers at Point Salines Airport they were met with heavy anti-aircraft fire. Aircrews dropped their paratroopers from an altitude of 500 feet above the ground to avoid anti-aircraft fire from high ground that luckily could not hit aircraft flying below 600 feet. Suppressive fire from AC-130 gunships also reduced the effectiveness of ground-to-air defenses around the airfield. Although several aircraft received damage from ground fire, no Rangers were killed by enemy action during the drop.⁴²

Although the airborne insertion of the Rangers did not go as planned, the Rangers overcame the initial obstacles and accomplished their runway clearing mission quickly. By 7:00 A.M. the runway was clear and the Rangers began to assault the hillside north of the runway. At 7:40 A.M. C-130s began airlanding vehicles and weapon systems of the assault force. The first C-141 carrying the 2nd Brigade of the 82nd Airborne Division airlanded the first troops, and all brigade troops were on Grenada by 27 October 1983. Although sporadic sniper fire continued to harass American troops until 2 November, by 28 October all important objectives had been achieved and only mop-up operations remained.⁴³ The operation was declared a success by President Reagan.

The C-130, MC-130, and C-141 aircraft that made the airborne assault on Grenada were all part of Military Airlift Command at the time. Aircrews learned several lessons from the invasion of Grenada. One was the value of always planning for an airborne assault during the first attack on an airfield to prevent the rerigging problems that plagued the Rangers at Grenada and delayed the operation. Although the Grenadians were armed with only small arms and 23mm antiaircraft artillery at Point Salines Airport, they demonstrated once again how vulnerable unarmed transport aircraft were to flak when making daylight airdrops. The problems the Rangers faced on the ground after being delivered onto the airfield in a piecemeal fashion reinforced the World War II lesson of mass on the drop zone and proved again the value of formation tactics during airborne operations.

Operation Just Cause: The 1989 Invasion of Panama

Operation Just Cause was the largest airborne operation undertaken by U.S. military forces since World War II. On the first night of the operation, nineteen C-130s, seventy-seven C-141s, and two C-5s airdropped 4,000 paratroopers and their equipment to seize important objectives in Panama. Military planners studied the lessons learned during Operation Urgent Fury and planned Operation Just Cause to avoid some of the problems airborne and airlift forces faced in Grenada. After a brief summary of events that led up to the invasion, this section will look at the invasion plan to seize the Rio Hato and Torrijos/Tocumen Airports, examine the tactics used by airborne and airlift forces during the operation, and review the results of the airborne effort.

The events that led to U.S. intervention in Panama in 1989 were characterized by a gradual increase in tensions between the U.S. and Panamanian governments over a period of several years. A key source of conflict was the relationship of the Panama Canal Treaty to Panamanian sovereignty. Rhetoric by Panamanian politicians eager to gain public support often attacked the U.S. presence in the country and control of the Panama Canal. This rise in Panamanian nationalism resulted in numerous acts of violence by members of the Panamanian Defense Force (PDF) against U.S. citizens. General Manuel Noriega came to power in 1983 following the death of General Omar Torrijos which had left a power vacuum Noriega was able to fill. The U.S. government began putting pressure on Noriega immediately after he seized power to hold democratic elections. Noriega ignored the demands for elections and consolidated his hold on the country through use of the PDF.

U.S. policy toward Panama after 1987 became one of unreserved opposition to Noriega. The U.S. cut off all military assistance to Panama in July 1987 to pressure Noriega into holding democratic elections. In February 1988 two Florida grand juries returned criminal indictments against Noriega. The formal charges included: "protecting cocaine shipments, laundering drug money, and providing safe haven to Medellin Cartel drug traffickers in exchange for a bribe of \$4.6 million."⁴⁴

In response to pressure from the U.S., Noriega allowed elections to be held in Panama on 7 May 1989.

Notwithstanding extensive pre-election day fraud, Noriega's candidate, Carlos Duque, was easily defeated by Guillermo Endara. Nevertheless, Duque claimed victory and the following day government troops fired on thousands of opposition demonstrators and raided ballot counting centers.⁴⁵

President George Bush and other international observers denounced the elections immediately. Noriega charged foreign interference and annulled the vote. His Dignity Battalions then attacked and injured Endara and the vice presidential candidate, Guillermo Ford.⁴⁶

On Saturday, 16 December 1989, events occurred in Panama that prompted the U.S. invasion. First Lieutenant Robert Paz, U.S. Marine Corps, was shot by PDF soldiers manning a check point and died shortly after arriving at Gorgas Hospital. The same PDF soldiers who shot Paz also held a Navy Lieutenant and his wife that night. The PDF soldiers beat the Navy Lieutenant and sexually threatened his wife. President Bush, after learning of these incidents the next day, ordered the assault on Panama. H-hour was set for 1:00 A.M. on 20 December 1989.⁴⁷

During the increased tensions between Panama and the U.S., military planners at the unified command responsible for Panama, U.S. Southern Command (SOUTHCOM), were monitoring the situation and developing military courses of action should the PDF endanger U.S. citizens and facilities in Panama. Initial planning began in November 1987 and considered scenarios where the PDF was a threat to Americans. Planners developed a wide series of options while the Commander-in-Chief of SOUTHCOM was General Frederick F. Woerner, Jr. The plans were code named Elaborate Maze, then changed to Prayer Book, and covered a wide range of combat and post-combat operations. The combat portion of the plan was called Blue Spoon, and included several different force lists. SOUTHCOM planners continually updated the Blue Spoon and Prayer Book plans through December 1989.⁴⁸

On 30 September 1989 General Maxwell Thurman became SOUTHCOM's Commander-in-Chief. General Thurman immediately studied the situation in Panama and tasked the XVIII Airborne Corps under Lieutenant General Carl Stiner to take the planning lead for a contingency operation. Thurman recognized that SOUTHCOM lacked the assets to adequately control the forces involved in the Blue Spoon plan, so he tasked Stiner to be the deployed Joint Task Force (JTF) commander if the plan was executed.⁴⁹ Planners from the XVIII Airborne Corps continued to work on the invasion plan. The final version was a "coup de main" designed to shock the PDF with overwhelming combat power, simultaneously seize several key objectives in Panama, and rapidly defeat the PDF. "The use of overwhelming numbers was a departure from previous thinking concerning economy of force. Soldiers, not bureaucrats, planned this operation"⁵⁰

The overall invasion force was named Task Force South, which included approximately 13,000 military personnel stationed in Panama or deployed in advance, and approximately 9,500 additional troops flown from the United States during the operation. To ease command and control, the forces assigned to the initial invasion were divided into six task forces according to units, geographic area of operation, mission, and whether initially based in Panama. Task Force Red was made up of three battalions of the 75th Ranger Regiment and was to seize the Rio Hato and Torrijos/Tocumen Airports, then move on to other objectives. Task Force Pacific included one brigade of the 82nd Airborne Division whose mission was to airdrop at Torrijos/Tocumen Airport one hour after H-hour and relieve Task Force Red.⁵¹ Although other units were involved

in the invasion, this thesis only analyzed Task Force Red and Task Force Pacific airborne operations at Rio Hato and Torrijos/Tocumen Airports.

Unlike the Grenada operation, airlift planners from Military Airlift Command (MAC) were involved early in the airdrop plan for Operation Just Cause. The airborne assault at both Rio Hato and Torrijos/Tocumen Airports were planned at 500 feet above ground level (AGL) at night to reduce the vulnerability of airlift aircraft and paratroopers to enemy ground fire. To avoid the confusion of airdrop verses airland that occurred at Grenada, planners ensured all Rangers from Task Force Red in the initial assault were rigged for airdrop from the start of the operation and would jump no matter what the state of the airfields. Paratroopers from the 82nd Airborne Division that would relieve the Rangers at Torrijos/Tocumen Airport were also rigged for airdrop because it was unclear whether the Rangers could have the runway clear within the allotted time. There would be no delay before H-hour caused by improper aircraft rigging.⁵²

Twenty-seven MAC units, both active duty and reserve, provided twenty-two C-130s, seventy-one C-141s, and twelve C-5s to move the invasion troops from the U.S. to Panama on the first night of the operation. Of these aircraft, nineteen C-130s, sixty-three C-141s, and two C-5s flew airdrop missions while others landed at bases in Panama. Some C-141s and C-5s would land at Howard Air Force Base in Panama to evacuate any U.S. casualties back to the United States, but most would return immediately to the U.S. after unloading their cargo or paratroopers and air refuel on the return flight. Most C-130s, however, are not air

refuelable, so plans called for the C-130s to land and refuel at Howard Air Force Base or Torrijos/Tocumen Airport after the airdrops.⁵³

For the assault on the airfield at Rio Hato, twenty C-130s loaded with 837 Rangers and their equipment from the 2/75th Rangers and A and B Companies of the 3/75th Rangers were to depart Hunter Army Airfield, Georgia, and airdrop the Rangers onto the runway at Rio Hato. The aircraft would be escorted by Air Force F-15 and Navy fighter aircraft while flying near Cuban airspace over the Caribbean. Thirteen of the C-130s were loaded with the Rangers and would make an air drop. The other aircraft carried the Rangers' equipment, which would be airdropped after the paratroopers if the runway was obstructed or airlanded if the runway was clear.⁵⁴

Planners were concerned about the possibility of antiaircraft artillery and Soviet-made SA-7 Grail surface-to-air missiles near the drop zone, so AC-130 Specter gunships and AH-64 Apache helicopters were tasked to attack PDF antiaircraft defenses at Rio Hato just before H-hour to protect the transports. Once on the ground, the Rangers were to seize the airfield, attack the sixth and seventh PDF infantry companies to prevent them from reinforcing the Commandancia, and seize Noriega's beach house just south of the runway.⁵⁵

The assault plan for Torrijos/Tocumen Airport also included a force of Rangers assigned the mission of initial airfield seizure, but, unlike Rio Hato, included a reinforcing force from the 82nd Airborne Division that would jump onto the airfield after the Rangers. AC-130 Spectre gunships and MH-6 Little Bird helicopters would launch pre-assault fires at specific targets to destroy Panamanian air defense guns

for two and one-half minutes beginning at H-hour. Twelve C-141s and four C-130s were to airdrop 731 Rangers and their equipment from the 1/75th Rangers and C Company from 3/75th Rangers on the airfield thirty seconds after the gunship attack. Seven C-141s and the four C-130s were to airdrop the Rangers, and five C-141s were to airdrop their equipment. The primary task of the Rangers was to secure the airfield.⁵⁶

One hour after the Rangers from Task Force Red jumped onto the airfield, 2,176 paratroopers from the 82nd Airborne Division and their equipment would be airdropped to reinforce and relieve the Rangers. The plan for the 82nd Airborne Division airdrop at Torrijos/Tocumen Airport included a heavy equipment airdrop of M551 Sheridan light tanks, other vehicles, and supplies by twenty-eight C-141s, followed by twenty C-141s carrying 2,176 paratroopers.⁵⁷ The 82nd Airborne troopers were to link up with the Rangers, then move by helicopters to assault three other objectives in Panama City.

An airdrop was chosen over an airland option for the 82nd Airborne because parachuting a brigade of troops builds up forces much more rapidly than airlanding forces. "Military planners estimated it would take at least twenty-four hours to land a brigade of the 7th Infantry Division into one of the Panama airfields."⁵⁸ In contrast, a brigade from the 82nd Airborne could be on the ground in Panama six hours after its aircraft had left the U.S.

Airlift planners were faced with the challenging task of developing an airlift plan to introduce more than 6,000 troops into Panama within a period of twelve hours. An important element of the plan was deconflicting the approximately twenty-by-twenty mile air space over

Panama on the night of 20 December when 111 transports, seven AC-130 gunships, 173 helicopters, twenty-one OA-37s, six A-7s, and six F-117As would simultaneously move toward their targets.⁵⁹ Planners relied on air corridors, altitude separation, and timing to keep the many aircraft from running into each other. Altitude, time, and distance separation were especially important because many aircraft would be flying without lights over Panama and pilots would have to rely on night vision goggles to see other aircraft.

To reduce the vulnerability of the transports to ground fire, the airdrops were scheduled at night. Dropping at night made locating the exact drop point more difficult for aircrews, but increased surprise and protection of the aircraft and paratroopers from ground fire because they were more difficult to identify and target. Many of the transport aircrews trained with night vision goggles to aid drop zone acquisition, so planners had confidence in the ability of the airlifters to locate the drop zones at night.⁶⁰ To lower the amount of time the aircraft and their paratroopers would be in ground weapons range, airlifters planned to airdrop the troopers at 500 feet above ground level. Although this lower drop altitude gave the paratrooper less time to react if he had a parachute malfunction, this risk was offset by the shorter exposure time to ground fire the trooper faced while under canopy.

Preparatory fires by AC-130 gunships, AH-64 Apache and MH-6 Little Bird helicopters, and F-117A Stealth Fighters were also planned to suppress enemy air defenses over the drop zones to increase protection for transport aircraft and their paratroopers. At both Rio Hato and Torrijos/Tocumen Airports attack helicopters and AC-130s were to

attack Panamanian antiaircraft gun positions and provide shock through firepower to disorient PDF troops on the ground so they would not be able to fire effectively at vulnerable paratroopers under canopy.⁶¹

Planners were also aware of the lessons learned during Operation Urgent Fury in Grenada, and took steps to ensure the same problems would not occur again. The assaults on Rio Hato and Torrijos/Tocumen Airports would be airdrops from the start. There would be no confusion or rerigging in the air minutes before H-hour. Airlifters also planned tight formations of aircraft ten seconds behind each other to enable the paratroopers to mass on the drop zone.⁶² Attaining mass on the ground would increase the danger of aircraft being hit by ground fire because all aircraft in formation had to follow the same flight path. The first two aircraft would achieve surprise, but enemy gunners could have easily found numbers three through twelve. However, planners correctly saw that the risk to the overall force was lowered by achieving mass instead of piecemeal insertion that would put insufficient combat power on the objective area during the key initial minutes of the assault.

Perhaps the greatest advantage airlift planners had was the opportunity to rehearse portions of the operation with the ground forces they would actually airdrop during its execution. C-130, C-141, and C-5 aircrews rehearsed the airdrops at Rio Hato and Torrijos/Tocumen Airports with the Rangers on 14 December 1989 during a joint readiness training exercise at mock-ups of the airfields constructed on U.S. bases in Florida.⁶³ This gave the airlifters and Rangers an opportunity to sit down and talk face-to-face about possible tactics to use during the

operation. Detailed rehearsals gave the Rangers and airlifters confidence during the execution of Operation Just Cause six days later.

The detailed planning paid dividends when U.S. forces executed Operation Just Cause on 20 December 1989. The Rangers had secured the Rio Hato and Torrijos/Tocumen Airports by daylight on the morning of 20 December. All transport aircraft carrying the Rangers made their airdrop at the precise time planned--no small accomplishment after flying seven hours from the U.S. Figure 5 in appendix B illustrates how the Rangers seized the Rio Hato Airport and figure 6 in appendix B shows the Rangers' airdrop on Torrijos/Tocumen Airport.

The airdrop of the 82nd Airborne Division troopers at Torrijos/Tocumen Airport, although successful, encountered some problems. Bad weather in the U.S. delayed the departure of most transports carrying personnel, so although the heavy equipment airdrop was made on schedule the personnel jumped up to three hours late. Accuracy of the heavy equipment drop of M551 Sheridan tanks and other equipment was also mixed. Nearly 60 percent of the eighty-six tanks, trucks, and artillery cannons landed in ten-foot high elephant grass, delaying their recovery for up to four hours. Figure 7 in appendix B illustrates the 82nd Airborne Division's airdrop at Torrijos/Tocumen Airport.⁶⁴

Transport aircraft that dropped the Rangers over Rio Hato received particularly heavy ground fire from PDF defenders. Unlike Grenada, when two C-130s turned away from the drop zone after receiving similar fire, all transport aircraft held their course and made the drop as planned. Eleven C-130s and two C-141s were damaged by ground fire during the operation, mostly at Rio Hato.⁶⁵ Damage from ground fire

might have been greater except AC-130 Spectre gunships, AH-64 Apaches, and MH-6 Little Bird helicopters had provided excellent fire support before the airdrops and destroyed several PDF anti-aircraft positions.

Operation Just Cause was successful in that it achieved all stated U.S. military objectives. The success of the airborne operations during Just Cause was mostly due to detailed joint planning and cooperation between airlifters and paratroopers. Years of training to improve airborne operations after problems arose during the Grenada invasion were put to use in Panama. General Colin Powell, Chairman of the Joint Chiefs of Staff, summed up the performance of airlifters in Operation Just Cause when he said, "MAC did an absolutely outstanding job supporting the joint cause in Panama."⁶⁶

Historical Lessons Learned

After reviewing airborne operations in World War II, Operation Urgent Fury in Grenada, and Operation Just Cause in Panama, some lessons emerged that provided insight into how future airborne forcible entry operations should be planned. Of course, every situation is different. In FM 100-5, Operations, the U.S. Army introduced a framework to describe each combat situation called "METT-T" that stands for mission, enemy, terrain and weather, troops, and time available.⁶⁷ Each of these different factors can influence an individual situation in manners that dictate different tactics and courses of action. There will probably never again be a scenario like Operation Just Cause where the U.S. could rely upon a sizable military force and bases already in country to support the invading troops. Future scenarios will be different;

therefore, planners must examine METT-T factors and adjust airlift and airborne tactics to fit the situation.

The historical development of airborne forcible entry doctrine through trial and error does, however, illuminate several common characteristics that future operations will probably exhibit. First, the objective area of the assault will involve an airfield. Second, the paratroop assault force package will probably contain Rangers and troops from the 82nd Airborne Division. Third, the assault will be made at night. Fourth, airdrop will be the primary mode of insertion for the assault paratroopers. Fifth, airlift forces must use formation tactics to airdrop the paratroopers. Sixth, the airdrop will require local air superiority and extensive support from other air assets. Seventh, and most importantly, successful airborne forcible entry operations will be characterized by joint planning and close cooperation between air and ground forces.

Objective Area

According to FM 90-26, Airborne Operations, "A planned linkup with follow-on forces" is one characteristic of airborne operations.⁶⁸ The main objective in a forcible entry operation is to seize and secure a lodgment to allow for the introduction of sufficient combat power to achieve U.S. objectives in the area. Because of the necessity to introduce follow-on forces by way of airlift in an airborne forcible entry scenario, the objective area must be an airfield. Only by seizing an airfield can U.S. mobility assets transport enough combat forces into an objective area that does not have access to seaborne entry. Heavier

forces with the necessary combat power to destroy even light armored forces cannot be airdropped but must be airlanded after an airfield is secure. Thus, an airfield is necessary to land follow-on forces in order to linkup with initial airborne assault forces.

The obvious need for an airfield to support the insertion of follow-on forces presents a problem for airborne planners because it makes the defender's task much easier. If an aggressor obtains an intelligence warning that U.S. armed forces might intervene, he can mass his defenses near airfields to make their seizure more difficult and potentially too costly for U.S. forces. A choice must be made to drop on the airfield, or drop a safe distance away from the airfield and move over land to attack the objective area. The first choice puts aircraft and paratroopers in more danger over the drop zone, but makes the ground attack plan easier. Dropping some distance away from the airfield keeps aircraft and paratroopers safer during the airdrop itself, but makes the ground mission more difficult because airborne troops have limited tactical mobility on the ground. The paratroopers would be limited by their light weapons and slow rate of advance to the target. An offset drop could also cost the paratroopers the element of surprise that is fundamental to airborne operations because defenders on the airfield would have more time to prepare their defenses before the paratroopers reached their objective area. The airborne force commander will, of course, analyze METT-T factors to determine where to land his force, but airborne forcible entry operations historically have used airfields as a primary drop zone for the initial assault.⁶⁹

Assault Force Package

The types and number of forces assigned to make the initial lodgment in a forcible entry operation will vary from situation to situation according to METT-T factors. On the basis of historical operations, however, one can get a sense of what a "typical" assault force package might look like. A force package similar to the one used at Torrijos/Tocumen Airport during Operation Just Cause would probably be required to secure an airfield with the capacity to accommodate large cargo aircraft, such as C-141s and C-5s, that would lift reinforcing forces and sustainment supplies into the objective area.

Rangers from the 75th Ranger Regiment would probably make the initial jump onto the airfield. The Rangers would seize key objectives on the airfield, clear the runway if possible, destroy any ground-to-air defense systems remaining, and suppress any defending forces to lower the risk follow-on forces would face. One or two battalions of Rangers would be used to secure the airfield, depending on the size of the airfield and expected enemy resistance. C-141 or C-130 aircrews specially trained to operate at night using night vision goggles would airdrop the Rangers onto the airfield. As Operation Just Cause illustrated, the joint readiness training that the Rangers accomplished with selected Air Force aircrews built a strong, cooperative, joint team ready to accomplish these types of airfield seizure operations.⁷⁰

After the Rangers had secured initial objectives on the airfield, 82nd Airborne Division paratroopers would then jump onto the objective area to reinforce the initial Ranger success. 82nd Airborne Division paratroopers, more heavily armed than the Rangers, possessing

more anti-armor capability, and having the capability to airdrop light tanks, trucks, and artillery onto an objective area, would provide the additional combat power needed to hold the lodgment airfield against a determined enemy counterattack. C-141 or C-130 aircraft would make an airdrop of the 82nd Airborne's heavy equipment thirty minutes to one hour after the Rangers landed, followed by one medium airfield seizure package. The medium airfield seizure force package put together by the 82nd Airborne Division was composed of approximately 1,848 troops in two airborne infantry battalions, an anti-armor company (-), and two artillery batteries (-) with eight 105mm howitzers.⁷¹

After reinforcing the Rangers in defense of the airfield, 82nd Airborne Division paratroopers would seize other key objectives, expand the defensive ring around the airfield, and clear the runway of any obstacles to enable the landing of follow-on forces. Due to airlift constraints and the time required to clear the airfield to support landing aircraft, this force would probably be required to hold the airfield from six to twenty-four hours until the next lift of reinforcing troops and equipment could be landed. During Operation Just Cause, the first reinforcing troops airdropped at Torrijos/Tocumen Airport seven hours after the Rangers jumped.⁷²

Night Operations

Airborne operations during World War II began with night airdrops because flying at night offered greater protection to aircraft and the paratroopers inside. Planners eventually had to change tactics and airdrop paratroopers in daylight because the training of the troop car-

rier force and the equipment available made night airdrops so inaccurate the paratroopers could not attain sufficient mass on the ground to accomplish their tactical objectives. The trade offs between protection for airlift aircraft during the night and the difficulties of navigating to the correct objective area and making an accurate airdrop remain relevant to today's airborne planners.

Flying at night offers greater protection for airlift aircraft because the aircraft are more difficult to acquire and target by air defense assets. Much of the damage that C-130 and C-141 aircraft sustained during Operation Just Cause was caused by small arms fire--individual weapons that enemy soldiers simply fired at the aircraft from their fighting positions on the ground after visually acquiring the aircraft.⁷³ Most antiaircraft artillery today is still optically guided. Additionally, most shoulder-launched surface-to-air missiles guide off the heat signature of an aircraft and require visual acquisition before the missile can be locked-on the target and fired. Historically, these are the types of surface-to-air weapons most threatening to airlift aircraft. Night operations enhance the security of aircraft and paratroopers enroute to the objective area because optically guided weapons are less effective at night. Most ground to air weapon systems throughout the world are optically guided.

According to FM 90-26, Airborne Operations, "Airborne operations must capitalize on surprise."⁷⁴ Night operations enhance surprise by attacking an enemy when he is least prepared to react. Airborne troops are most vulnerable during the initial landings on the drop zone. Making the airdrop at night allows airborne troops time to gather momen-

turn to overcome their initial vulnerability while under canopy and assembling on the drop zone. Night obscures visibility for the defender, slows his reactions, and reduces the effectiveness of his fires.⁷⁵

Night airborne operations have disadvantages as well. Navigating to and finding the drop zone is more difficult for airlift crews at night. Also, night operations make land navigation, assembly operations after the drop, and assaulting defending positions more difficult for airborne troopers.⁷⁶ The adaptation of better navigation and night vision technology by U.S. armed forces have made these disadvantages of night operations less of a factor.

Current airlift aircraft are being fitted with more accurate navigation equipment that has made locating the drop zone at night much easier for aircrews. For example, the C-130 aircraft fleet has been fitted with a Self-Contained Navigation System containing an inertial navigation system that is accurate to within one-half mile after four hours of flight time. Airlift aircrews, Rangers, and 82nd Airborne paratroopers are all taking advantage of night vision technology offered by night vision goggles, thermal sights, and other equipment. Better navigation equipment for airlift aircraft and night vision technology offer U.S. military forces advantages that outweigh most of the difficulties associated with night airborne operations.

Airdrop Instead of Airland Operations

Airlanding rather than airdropping personnel and equipment is the most economical use of airlift.⁷⁷ Rigging equipment and personnel for airdrop requires parachutes, platforms, and other specialized equip-

ment that takes up more space in the aircraft and adds weight that would not be necessary for airland operations. This increases the number of aircraft required to deliver the same number of troops and equipment. Airland operations are not suitable for forcible entry operations, however, because the airborne force cannot be certain if the airfield can accept landing aircraft until the first assault elements are on the ground. Airborne forces should normally use airdrop insertion to successfully accomplish forcible entry operations.

Another option might be to plan for an airdrop insertion but also have an airland option if the tactical situation allows. Operation Urgent Fury at Grenada showed the risks involved in this type of plan, however. The Rangers who made the initial assault on Point Salines Airport were delayed and distracted when they had to switch from an airdrop to an airland then back to an airdrop delivery mode enroute to Grenada. They were unable to achieve mass on the drop zone because different aircraft received the message that the runway was not clear at different times. The confusion over the airland/airdrop decision caused the insertion of Rangers at Point Salines to take more than ninety minutes to airdrop from twelve C-130 aircraft.⁷⁸ Planners for Operation Just Cause recognized the problems in an airland/airdrop decision so close to an objective area and chose the airdrop option for the Rangers and the 82nd Airborne Division to avoid the confusion that surrounded the Grenada airdrop.⁷⁹ This will likely be the tactic for future airborne forcible entry operations as well.

Formation Operations

Colonel Paul L. Wilke, USAF, in his Air University Review article "Tactical Airlift Tactics and Doctrine: More Carts, More Horses," described a trend in the development of airlift tactics that emphasized single-ship over formation operations. Airlift aircrews and tactics officers recognized the vulnerability their aircraft faced when flying against modern air defense weapon systems and fighter aircraft during exercises like Red Flag, and worked to develop more aggressive tactics to survive on the battlefield. Unfortunately, those single-ship tactics, nap of the earth flying, and constant control inputs to avoid ground-to-air and air-to-air threats conflict with the airborne paratroopers' requirement for mass and concentration on the objective area. Single-ship tactics may make airlift aircraft more survivable in a medium to high-threat environment, but those tactics also make airborne troops more vulnerable once they are on the ground.⁸⁰

Formation airdrops will be the preferable mode of delivery during airborne forcible entry operations because paratroopers need mass and concentration on the drop zone to succeed. Single-ship tactics by airlifters cannot give paratroopers the necessary mass to be successful. The airdrop at Point Salines airfield during Operation Urgent Fury illustrated the danger a light airborne force can face when dropped on an objective area in a piecemeal fashion. That operation took ninety minutes to airdrop twelve C-130 loads of Rangers. During that ninety minutes the Rangers were in much more danger than they would have faced if dropped en-mass as planned.⁸¹ By contrast, airborne operations at Rio Hato and Torrijos/Tocumen Airports in Panama during Operation Just

Cause illustrated how formation airdrops can deliver paratroopers in sufficient mass to quickly overpower defenders and seize assigned objectives. Formation airdrop tactics, unlike single-ship tactics, allowed aggressive, rapid seizure of assault objectives in Panama--a characteristic of airborne operations.⁸²

A Coordinated Air Effort

Airborne operations require local air superiority to succeed.⁸³ Gaining air superiority enroute to and over the objective area is a task that requires a large effort by all air forces involved in the operation. Transport aircraft, such as the C-130, C-141, and C-5, lack self-protection measures and rely on thorough ingress and egress route planning to avoid enemy air defense assets for survival. Tactical aircraft, either land-based USAF or carrier-based Navy/Marine fighters, must provide protection for unarmed transport aircraft if the enemy has an air-to-air capability. Tactical fighter or bomber aircraft may also be required to suppress enemy air defenses enroute to the objective area.

If assaulting a heavily-defended airfield, airborne forcible entry operations would require tactical air assets to neutralize enemy ground-to-air threats near the airfield before the airdrop could take place. Operations in Grenada and Panama both illustrated how effective AC-130 Spectre gunships were to ensuring that Grenadian and Panamanian ground-to-air artillery did not inflict massive damage on vulnerable transport aircraft. At Rio Hato during Operation Just Cause, AC-130 gunships destroyed several ZPU-4 antiaircraft guns and most likely prevented many casualties among the Rangers that airdropped onto the

airfield.⁸⁴ Attack helicopters, tactical fighters, and carrier aircraft are also excellent platforms to perform this target preparation mission.

Another function that would illustrate the total air effort nature of airborne forcible entry operations is aerial refueling. C-141 transports the ability to deliver paratroopers anywhere in the world because they have an aerial refueling capability and do not have to stop at intermediate staging bases enroute to the target area. During Operation Just Cause, C-141 aircraft flew from the U.S. to Panama, then back to the U.S. without landing in Panama because KC-135 and KC-10 tanker aircraft provided aerial refueling support to the transport aircraft.⁸⁵

Airlift aircraft cannot perform airborne forcible entry operations without support from other air assets. The need to provide escort and suppression of enemy air defenses to, over, and from the target area, the need for thorough target preparation with aerial firepower, and the need for aerial refueling support illustrate that airborne forcible entry operations require a large, joint, coordinated air effort by all air forces available to succeed.

Joint Planning, Coordination, and Training

No one military service has all the resources necessary to accomplish airborne forcible entry operations. Army paratroopers jump to seize objectives on the ground and Air Force airlift aircraft transport the paratroopers to the objective area. Navy, Marine, or Air Force fixed-wing aircraft provide escort, aerial refueling, and fire support for transport aircraft and paratroopers. Army attack helicopters may also provide fire support and enemy threat suppression. Airborne

forcible entry operations are joint operations that require the cooperation of all military services to succeed.

Airborne forcible entry operations are also complex. They require detailed, joint planning with representatives from transport aircrews, paratroopers, and other support forces present. During planning for Operation Urgent Fury the airlift and airborne planners were not able to get together and review the airdrop plan for Point Salines airfield before takeoff time. As a result, the airdrop was characterized by confusion and was nearly a disaster. In contrast, airlift and airborne planners discussed the invasion plan for Panama at least one month before Operation Just Cause. The joint planning and training before Operation Just Cause contributed to the success of the airborne operations at Rio Hato and Torrijos/Tocumen Airport. Planning for any airborne forcible entry operation must include representatives from all forces and services involved to be successful.⁸⁶

Airborne and airlift planners studying airborne forcible entry operations can benefit from an analysis of past airborne operations. This chapter examined airlift aspects of airborne operations in World War II, Grenada, and Panama to extract lessons still relevant to airborne operations today. Chapter 4 will look at possible world trouble spots to determine what will be required of USAF airlift forces to successfully support future airborne forcible entry operations.

CHAPTER 4

POTENTIAL AIRBORNE FORCIBLE ENTRY SCENARIOS

The previous chapter reviewed past airborne forcible entry operations U.S. armed forces have accomplished and extracted historical lessons for airlift and airborne planners from those operations. This chapter turned to the future and examined areas around the world where U.S. armed forces could be tasked to accomplish an airborne forcible entry to determine what is required of USAF airlift forces to successfully support these operations.

First, a list of countries where U.S. forces might conduct future airborne forcible entry operations was developed. Using this list, the ground-to-air threat environment that airborne forces might face operating in those countries was analyzed to determine what self-defense capabilities airlift forces might require to successfully reach a target drop zone. After analyzing the potential threat to airborne forces, this chapter examined the distance from the U.S. to potential crisis areas to determine the range capabilities required of an airlift force. This list of possible forcible entry locations with threat and distance information was then used in chapter 5 to draw conclusions on the requirements airlift forces must meet to successfully support airborne forcible entry operations.

Potential Airborne Forcible Entry Target Areas

One methodology an analyst could use to determine what type of environment airborne forces will need to operate in during the next ten years would be to examine the singularly most challenging target area in the world and justify a force based on that worst case scenario. In a time of declining resources, however, the U.S. may not be able to afford this type of airborne force or the airlift assets required to transport the paratroopers to a crisis area. The methodology in this chapter was designed to survey the current world situation using unclassified information to determine likely scenarios where airborne forces might be used in a forcible entry operation. Requirements developed from potential real-world situations instead of worst-case scenarios make good sense in a time of declining military resources. The list of potential target areas developed below includes countries that had armed conflicts ongoing within their borders in 1992, countries that sponsored terrorism, and countries that were combating illegal drug traffic in 1992.

These three criteria for choosing which countries around the world could be potential forcible entry targets were based on U.S. national interests and military objectives outlined in the January 1992 version of the National Military Strategy of the United States. The reader could argue that the list is incomplete or other countries should be added or deleted. This is valid, but debating whether each country in the world should or should not be on the list is not the point of this thesis. The deletion or addition of this or that specific country from or to the list is unlikely to change the overall requirements. In any case, the world situation will change over time and this list will

need to be updated at least annually. The methodology used to derive the requirements was the important point of this thesis.

One of the U.S. national interests listed in the 1993 version of the National Security Strategy of the United States was "Global and regional stability which encourages peaceful change and progress." The document then went further to list an objective of "working to avoid conflict by reducing sources of regional instability and violence."¹ On the basis of this guidance, U.S. military forces could be tasked to conduct combat or other operations short of war in countries involved in armed conflict. The source of conflict in these countries could be from either internal or external actors.

This thesis used a Journal of Peace Research article written by Peter Wallensteen and Karin Axell from the Department of Peace and Conflict Research, Uppsala University, titled "Armed Conflict at the End of the Cold War, 1989-1992," to develop a list of countries involved in armed conflict. Wallensteen and Axell defined armed conflicts as:

Contested incompatibilities which concern government and/or territory where the use of armed force by two parties, of which at least one is the government of a state, results in at least twenty-five battle-related deaths.²

They further divided armed conflicts into three subcategories: minor armed conflicts, intermediate conflicts, and wars. Minor armed conflicts have resulted in less than 1,000 battle-related deaths during the course of the conflict. Intermediate conflicts have involved more than 1,000 battle-related deaths during the course of the conflict and at least twenty-five deaths but not more than 1,000 during the particular year. Wars have resulted in more than 1,000 battle-related deaths

during one particular year.³ The fifty-four armed conflicts Wallensteen and Axell identified in 1992 are listed by region, country and level of activity in table 1.

Table 1.--List of Armed Conflicts in the World, 1992

Location	Intensity	Location	Intensity
Europe		Africa	
Azerbaijan	War	Algeria	Minor
Croatia	Intermediate	Angola	War
Georgia	Minor	Burundi	Minor
Moldova	Minor	Chad	Intermediate
Spain	Minor	Comoros	Minor
U.K. (N. Ireland)	Intermediate	Djibouti	Minor
Bosnia-Herzegovina	War	Liberia	War
		Mozambique	War
Middle East		Niger	Minor
Egypt	Minor	Rwanda	War
Iran	Intermediate	Senegal	Minor
Iraq	Intermediate	Sierra Leone	Minor
Israel/Palestine	Intermediate	Somalia	War
Turkey	War	South Africa	War
		Sudan	War
Asia		Latin America	
Afghanistan	War	Colombia	War
Bangladesh	Intermediate	Guatemala	War
Cambodia	Intermediate	Haiti	Minor
India	War	Peru	War
India-Pakistan	Intermediate	Venezuela	Minor
Indonesia	Intermediate		
Myanmar (Burma)	War		
Papua New Guinea	Minor		
Philippines	War		
Sri Lanka	War		
Tadzhikistan	War		

Note: Data on armed conflicts compiled from Peter Wallensteen and Karin Axell, "Armed Conflict at the End of the Cold War, 1989-1992," Journal of Peace Research vol. 30, no. 3, (1993): 336. Wallensteen and Axell identified 54 armed conflicts in 1992. Some countries listed above had more than one armed conflict within their borders at one time.

After investigating locations with armed conflict, this thesis reviewed countries that sponsored terrorism. A U.S. military objective stated in the 1992 National Military Strategy was to "effectively counter threats to the security of the United States and its citizens and interests short of armed conflict, including the threat of international terrorism."⁴ Laurence Pope, the Acting Coordinator for Counter-Terrorism with the U.S. State Department, listed six nations that sponsor terrorism during testimony before the Senate Judiciary Committee on 21 April 1993: Cuba, Iran, Iraq, Libya, North Korea, and Syria.⁵

Another military objective of the U.S. stated in the 1992 National Military Strategy was to "reduce the flow of illegal drugs into the United States by encouraging reduction in foreign production, combating international traffickers, and reducing demand at home."⁶ U.S. military forces are currently being used in cooperation with U.S. Drug Enforcement Agency personnel to combat the transportation of illegal drugs into the United States. One of the justifications for the U.S. intervention in Panama was General Manuel Noriega's involvement in drug trafficking. The United States could not tolerate a drug dealing dictator who would become responsible for the defense and operation of the Panama Canal, so Operation Just Cause was launched in 1989. U.S. military forces could be used again to directly combat drug trafficking in one of the countries where international drug trafficking is a major problem. Table 2 summarizes the U.S. State Department's list of cocaine, opium, and heroin producing states.

Table 2.--U.S. International Narcotics Control Targets, 1991

Location	Narcotics	Location	Narcotics
Latin America		East Asia	
Bolivia	Cocaine	Laos	Heroin/Opium
Brazil	Cocaine	Myanmar	Heroin/Opium
Colombia	Cocaine/Heroin	Thailand	Heroin/Opium
Ecuador	Cocaine		
Guatemala	Cocaine/Heroin	Southwest Asia	
Mexico	Cocaine/Heroin	Afghanistan	Heroin/Opium
Peru	Cocaine	Iran	Heroin/Opium
		Lebanon	Heroin/Opium
		Pakistan	Heroin/Opium
		Turkey	Heroin/Opium

Source: U.S. Department of State, "Fact Sheet: International Narcotics Control--1990," U.S. Department of State Dispatch (June 10, 1991): 417; and Melvyn Levitsky, Assistant Secretary for International Narcotics Matters, "Assessing the Current Trends in Opium Production and Heroin Trafficking," U.S. Department of State Dispatch (June 15, 1992): 468.

A comprehensive list of possible forcible entry targets was developed by combining the list of countries experiencing armed conflicts in table 1, the six countries that sponsored terrorism, and the countries listed in table 2 involved with international cocaine, heroin, and opium production. These three categories of world hot spots were combined to form a list containing fifty-four countries. This list of potential airborne forcible entry target areas was narrowed by deleting the countries that were littoral, or had access to their territory from the sea. Amphibious operations are normally a much more efficient method to conduct a forcible entry operation in a littoral location because heavy equipment is easier to transport by sea. For the purpose of this study, it was assumed the U.S. Marine Corps (USMC) would conduct amphibious forcible entry operations in littoral locations.

During World War II, airborne forcible entry operations were conducted in Sicily and Normandy in conjunction with amphibious operations. In the future, airborne operations might be used to support or leverage amphibious forcible entry operations. With limited defense resources, however, the workload must be divided among the military services according to their unique capabilities. Basing airlift or airborne requirements on target locations with littoral access does not make fiscal sense when USMC units train specifically to prevail in those situations. The time it takes an amphibious group to respond to a situation may take longer than an airborne force, but in most plausible forcible entry scenarios there will be ample time to plan and position amphibious forces near the objective area.

Combining the countries from table 1 and table 2 with the countries that sponsor terrorism, then removing littoral areas, yielded the results in table 3. One airfield in each of the countries capable of supporting C-141 aircraft and its location in latitude and longitude were also added to this table. One of the lessons derived from the historical analysis in chapter 3 was that the target area for airborne forcible entry operations should be an airfield because of the need to keep the airborne force resupplied and reinforced by airlift. It is also worth noting that the number of potential airborne forcible entry targets drops from fifty-four to twelve after littoral locations are removed from the list. This listing of airfields will be used later to determine the distances airlift forces must conquer to successfully deliver airborne forces to potential forcible entry locations.

Table 3.--Potential Airborne Forcible Entry Locations

Location	Major Airfield	Latitude	Longitude
Azerbaijan	Baku	N 40-28.25°	E 050-03.10°
Georgia	Tbilisi	N 41-40.00°	E 044-57.00°
Moldova	Kishinev	N 46-55.70°	E 028-56.00°
Bosnia-Herzegovina	Sarajevo	N 42-53.00°	E 018-25.00°
Afghanistan	Kabul Intl.	N 34-33.88°	E 069-12.80°
Laos	Vientiane	N 17-59.28°	E 102-33.73°
Tadzhikistan	Dushanbe	N 38-32.62°	E 068-49.48°
Burundi	Bujumbura Intl.	S 03-19.38°	E 029-19.35°
Chad	N'djamena	N 12-08.00°	E 015-02.03°
Niger	Niamey	N 13-28.90°	E 002-10.93°
Rwanda	Kigali	S 01-58.07°	E 030-08.40°
Bolivia	La Paz	S 16-30.80°	W 068-11.55°

Note: Major airfields in the countries above were first located in The Easton Press, World Atlas (Norwalk, Conn.: The Easton Press, 1991). Latitude and longitude of airfield locations came from airfield data files in FPlan Version 9.1, 28th Test Squadron, Eglin AFB, FL--an aircraft flight planning computer program.

Distance Requirement

Future airborne forcible entry operations will require the airlift of specialized forces from the CONUS to the target area. The analysis of historical lessons learned in chapter 3 led to the conclusion that the typical ground force required to successfully create a lodgment through airborne operations was a Ranger battalion and a medium airfield seizure force package from the 82nd Airborne Division. Due to the expense involved in training for this demanding mission, these will probably remain the only U.S. Army units available to accomplish airborne forcible entry missions in the future. These units are stationed in the CONUS and require airlift to reach a potential target area.

Table 4 listed the USAF airlift force available to transport paratroopers and their equipment from CONUS to a potential airborne

forcible entry target area. The number of aircraft in the force structure does not include aircrew qualification limitations. Although there were 250 C-141 Starlifter aircraft in the USAF inventory at the end of 1993, there were not 250 airdrop-trained aircrews available to perform the mission, so the actual number of aircraft available to planners would be less. The C-5 aircraft is not listed because only two USAF C-5 aircrews were trained to accomplish the airdrop mission -- too small a number to be relative to this study. The four C-17 aircraft in the USAF inventory at the end of FY 93 were also not listed because the aircraft was not airdrop certified and aircrews were not trained for airdrop. The C-17 will probably not be used as an airdrop platform on a mass scale until at least one squadron is operational at Charleston AFB. As of December 1993, this was scheduled to occur in late 1995.⁷

Table 4.--Capabilities of FY 93 Airlift Force

Aircraft	Number Available	Maximum Ferry Range	Maximum No Wind Radius	No Wind Radius Wartime Payload
C-130E/H	235	3,686 NM	1,500 NM	16,200 lbs
C-141B	230	4,531 NM	1,750 NM	45,800 lbs

Notes: Number of aircraft in active USAF inventory from International Institute for Strategic Studies, The Military Balance 1992-1993 (London: Brassey's, 1992), 25. Maximum ferry range data found in AFP 76-2, Airlift Planning Factors (Washington, D.C.: Department of the Air Force, May 1987), 32-33. Maximum no wind radius without air refueling and maximum payloads based on airdrop data for greatest cargo weight using wartime limitations in AFP 76-2, 10.

The range capabilities of the aircraft listed in table 4 were based on data found in AF Pamphlet 76-2, Airlift Planning Factors. The

first range number is the maximum ferry range of the aircraft, which is the maximum distance an empty aircraft can fly from one location to another. As the cargo load increases, the range decreases because an aircraft can only be loaded to a certain maximum weight that includes fuel plus cargo. Also, as aircraft weight increases, fuel consumption increases. As a result, the actual range capabilities of aircraft carrying airborne troops and equipment will be lower than the maximum ferry ranges listed in table 4.

A more realistic measure of range capability for airlift aircraft is the maximum no wind radius. This figure was estimated by using an aircraft that took off at maximum wartime allowable weight, flew to an objective area carrying an airdrop load that weighed a specified amount, dropped the load over the target, and flew empty back to the takeoff location. The distance from the takeoff location to the objective area is the maximum radius. The figures in table 4 were based on a cargo weight of 16,200 pounds for the C-130 and 45,800 pounds for the C-141. The USAF places peacetime restrictions on airlift aircraft maximum takeoff weights to prolong the service life of the aircraft. Cargo weights listed above were based on wartime payloads that are greater than peacetime restrictions.

Table 5 listed the distance an aircraft would need to fly from Pope Air Force Base (AFB), North Carolina, to the potential airborne forcible entry target areas listed in table 3. Pope AFB was chosen because it was used by the 82nd Airborne Division as the primary airport of embarkation for most operations. The distances in table 5 were computed using FPlan version 9.1 flight planning computer software and are

the straight line distances from Pope AFB to the target location. These distances represent a best case scenario because they do not take into account overflight coordination and established air routes. Some countries might deny overflight rights to U.S. aircraft, as France did during the U.S. strike on Libya in 1986, so the distances might increase. The distances demonstrate the challenges airlift aircraft would face delivering an airborne contingent to current world hot spots.

Table 5.--Distance To Potential Airborne Forcible Entry Locations

Location	Major Airfield	Distance From Pope AFB
Azerbaijan	Baku	5,462 NM
Georgia	Tbilisi	5,256 NM
Moldova	Kishinev	4,536 NM
Bosnia-Herzegovina	Sarajevo	4,300 NM
Afghanistan	Kabul Intl.	6,253 NM
Laos	Vientiane	7,609 NM
Tadzhikistan	Dushanbe	6,030 NM
Burundi	Bujumbura Intl.	6,412 NM
Chad	N'djamena	5,178 NM
Niger	Niamay	4,510 NM
Rwanda	Kigali	6,404 NM
Bolivia	La Paz	3,162 NM

Note: NM - Nautical Miles. Distance from Pope AFB to target airfields computed using FPlan Version 9.1, 28th Test Squadron, Eglin AFB, FL.

The distances in table 5 are difficult for an airlift force to overcome in any situation. All countries except Bolivia are outside even the maximum ferrying range of the C-130, and none are within its maximum no wind airdrop radius. Bosnia-Herzegovina and Bolivia are the only countries within the maximum ferrying range of the C-141. Like the C-130, none of the countries are within the C-141's maximum no wind

airdrop radius. To deliver airborne forces to these potential target locations airlift aircraft would need to air refuel, make enroute stops to refuel, or use an intermediate staging base.

One advantage that the C-141 aircraft had was an air refueling capability that could extend its range and payload capacity. This air refueling capability made the C-141 the aircraft of choice for conducting long range airborne forcible entry operations. Some models of the C-130 were air refuelable, such as the MC-130 Combat Talon, but these were available in small numbers and had a lower payload capacity than regular C-130s. The USAF has recognized the potential for air refuelable airlift aircraft and will continue to purchase aircraft with that capability, such as the C-17. This is a capability airlift aircraft require if they are to support airborne forcible entry operations.

A second means available for airlift aircraft to overcome the distances in table 5 would be to make enroute stops for fuel before and after the airdrop at the target location. This would create several problems that are not easily overcome. First, to provide the necessary mass on the objective area the enroute stop airfield would need enough parking space, fuel, and aircraft servicing personnel to quickly recover, refuel, and launch a large number of aircraft (the airdrop on Torrijos/Tocumen airport during Operation Just Cause used fifty-five C-141s and four C-130s). The U.S. in 1993 had overseas air bases that could support airlift operations of this size, but as the military force structure overseas decreases in the late 1990s air bases available for U.S. aircraft to use for enroute stops will decline.

Another problem a large airlift force conducting an airborne forcible entry operation would have regarding enroute stop airfields would be permission of the host country. If the host country did not agree with U.S. military intervention, it might not allow the U.S. to use the airfield for the operation. The reliance on enroute stop locations would make diplomatic coordination very difficult and could lower the chance of success.

A third concern with enroute stops was their impact on surprise. Historical analysis in chapter 3 found that airborne operations rely on surprise to improve the chances for success. Therefore, operational security is an overriding concern in any airborne operation. News services, such as Cable News Network (CNN), have learned to watch Pope AFB for signs of increased activity during any potential world crisis where U.S. military force might be applied.⁸ Assembling the aircraft and soldiers of an assault force at Pope AFB without compromising the operation is difficult. Without a coordinated media plan and cooperation of reporters some element of surprise for any potential airborne forcible entry operation will be lost when the first transports depart Pope AFB.

Chances for security compromises, however, increase with each enroute stop the airlift force is required to make before reaching the objective area. Each of the enroute stops would increase the time required to reach the target location after leaving the CONUS, thereby increasing the warning time available to defenders and decreasing the element of surprise. Each enroute stop also increases the chance of security compromises through press reports by reporters at locations

where media coordination and cooperation may be impossible to obtain because the local reporters do not support the U.S. action.

Using an intermediate staging base is another technique for overcoming the distance problem associated with airborne forcible entry operations. This concept involves moving a large number of airdrop capable aircraft and aircrews to a staging base within their combat radius from the target area, bringing paratroopers to the staging base using long range transports that are unable to airdrop troops, transloading the paratroopers onto the airdrop transports, and then making the airdrop insertion from the staging base. This system could overcome a shortage of airdrop-trained aircrews in aircraft such as the C-141 and C-5, and take advantage of C-130 airdrop capabilities. Another option is to have the same aircraft that carried the paratroopers to the intermediate staging base make the airdrop after delaying to change aircrews, refuel, conduct additional planning, or await an execution order. The delay time could vary from several hours to several days, depending on the situation.

Intermediate staging bases, however, have many of the same shortcomings enroute stops have. Surprise would be difficult to obtain because a large number of aircraft and soldiers would be concentrated at a location relatively close to the objective area for a substantial time while the airdrop force assembled and prepared to depart. Also, the use of an intermediate staging base would probably increase the warning time available to defenders, giving them more time to prepare defenses against an airborne assault. Airborne and airlift planners would need to weigh the risks of lost surprise and increased warning time before

using this method of overcoming large distances. Using an intermediate staging base or enroute stops may, however, be the only way airlift aircraft can possibly reach a target area given the distances involved.

Threat Survivability Requirement

One important requirement for airlift aircraft to successfully support airborne forcible entry operations is the ability to avoid enemy defensive actions and survive to deliver airborne paratroopers to the objective area. To analyze this requirement, this thesis first examined threat definitions airlift planners use when evaluating the potential success of an operation. After establishing accepted threat definitions, the threat capabilities of the potential airborne forcible entry target countries listed in table 5 were analyzed and categorized. This analysis yielded a list of potential threat scenarios airlift aircraft are required to overcome if they are to successfully support airborne forcible entry operations.

Airlift aircraft supporting an airborne forcible entry mission could face enemy threats during three separate phases of the operation. One phase would be the long deployment from CONUS bases to the borders of the target country. A second phase would be the employment of airlift forces in an airdrop mode within the borders of the target country. The third phase would be redeployment of aircraft to CONUS after departing the target country. Although some interception of airlift aircraft during the deployment and redeployment phases is possible, not many countries in the world have the long-range aircraft or forward deployed forces necessary to engage U.S. aircraft during these phases.

Therefore, this thesis limited its evaluation of potential threats to the target countries identified previously.

Airlift aircraft are particularly vulnerable to attack by surface- and air-to-air weapon systems. Cargo aircraft present large radar signatures, but most lack on-board defensive systems. They fly at relatively slow airspeeds, particularly near the drop zone where enemy defenses are likely to be most intense. Airlift aircraft also lack maneuverability, which limits their ability to defeat an engaged threat and survive.

Threat definitions often differ between various communities in the USAF or other services. During 1975, the Tactical Air Warfare Center at Eglin AFB conducted a study on the Tactical Deployment of the C-130 in a surface-to-air missile (SAM) environment and defined specific orders of battle of a low, moderate, and high threat environment. The USAF fighter community classified threats into two categories: non-radar and radar guided.⁹ FM 90-25/FMFRP 5-33/MACP 55-35, Airlift for Combat Operations defined three threat categories airlift forces might face. This thesis used the threat categories from FM 90-25 to analyze the threat capabilities of potential target countries. FM 90-25 suggested "the JCS [Joint Chiefs of Staff] and the services consider adopting these threat categories or some common criteria for all applicable doctrinal publications."¹⁰ Table 6 summarizes the threat categories used in this study.

Table 6.--Threat Categories for Airlift Aircraft

Category	Definition	Typical Weapon Systems
1	A threat in which the enemy has limited ability to effectively respond due to limited weapon systems and a poorly integrated air defense network. Weapon systems are usually few.	<ul style="list-style-type: none"> - Small arms. - Optically-aimed antiaircraft artillery up to 12.7-millimeters (.50 caliber equivalent). - A limited number of man-portable, surface-to-air missiles (SAMs).
2	A threat in which enemy weapon systems are in a moderately integrated air defense network, but they are few or poorly deployed.	<ul style="list-style-type: none"> - Category 1 systems. - Early-generation SAMs. - Radar-directed antiaircraft guns. - Aircraft lacking effective look down-shoot down and/or all-weather capability.
3	A threat in which the enemy has densely concentrated and/or very sophisticated weapon systems in a highly integrated air defense network.	<ul style="list-style-type: none"> - Category 1 and 2 systems. - Advanced generation SAMs. - Aircraft with look down-shoot down capability. - Helicopters with air-to-air capability. - Directed energy weapons.

Source: U.S. Army, U.S. Navy, Military Airlift Command, FM 90-25/FMFRP 5-33/MACP 55-35, Airlift for Combat Operations (Washington, D.C.: Department of the Army, Department of the Navy, Military Airlift Command, September 1990), 1-1 and 1-2.

For airlift aircraft to survive a category one threat, evasive action may be required by the pilot. Category two threats may require evasive action, electronic countermeasures, and/or defense suppression support for airlift aircraft to survive. To survive a category three threat scenario, airlift aircraft must employ evasive action, electronic countermeasures, and defense suppression operations. In his book Self-Protective Measures to Enhance Airlift Operations in Hostile Environments, Lieutenant Colonel John A. Skorupa used unclassified data from a Military Airlift Command study on C-17 defensive systems to examine what threat categories airlift aircraft could encounter. The C-17 study anticipated that transport aircraft would routinely operate in a category one threat environment, occasionally in a category two environment, and infrequently in a category three threat environment.¹¹

The second step to develop threat survival requirements for airlift aircraft after determining how to categorize different threats was to examine the individual target countries listed in table 5 to determine the threat category they fall into. To accomplish this, the author consulted The Military Balance 1992-1993 written by the International Institute for Strategic Studies. Categories of equipment listed in The Military Balance that represented threats to airlift aircraft during an airborne forcible entry mission included air defense guns and SAMs in army units; fighter aircraft, radar units, command and control capabilities, air defense guns, and SAMs in air force units; and air defense equipment in specialized air defense units. Table 7 listed the types of weapon systems fielded in potential airborne forcible entry target countries.

Table 7.--Threats to Airlift Aircraft by Country

Country	Anti-Aircraft Weapons	Air Force Capabilities
<p>Azerbaijan</p> <p>(Note: Includes Russian forces from Trans-Caucasus Military District)</p>	<ul style="list-style-type: none"> - Self-propelled anti-aircraft artillery, radar guided, organic to three Russian Motorized Rifle Divisions and one Russian Airborne Division. Includes up to 16 ZSU-23-4 or 2S6 systems per division. - SAMs of various types organic to Russian divisions, including up to 156 SA-6, SA-9, SA-7, SA-14, or SA-16 per division. - 135 Russian strategic SAMs (SA-2, SA-3, SA-5, or SA-10) positioned in country - Long-range radar associated with strategic and tactical SAMs. - Unknown number of radar-guided anti-aircraft artillery systems integrated with strategic SAMs. 	<ul style="list-style-type: none"> - One bomber regiment (30 Su-24) - One fighter, ground attack regiment (30 SU-25) - One fighter regiment (30 MiG-25) - Early warning radar and integrated command and control system. Ground control intercept radar.
<p>Bosnia-Herzegovina</p>	<ul style="list-style-type: none"> - Unknown number of 20mm, 30mm, and 57mm anti-aircraft guns taken over by Serb, Croat, and Muslim militias from Yugoslav Army. - Unknown number of SA-7 SAMs. 	<ul style="list-style-type: none"> - None.

Table 7--Continued.

Country	Anti-Aircraft Weapons	Air Force Capabilities
<p>Georgia</p> <p>(Note: Includes Russian forces from Trans-Caucasus Military District)</p>	<ul style="list-style-type: none"> - Self-propelled anti-aircraft artillery, radar guided, organic to four Russian Motorized Rifle Divisions and one Russian Airborne Division. Includes up to 16 ZSU-23-4 or 2S6 systems per division. - SAMs of various types organic to Russian divisions, including up to 156 SA-6, SA-9, SA-7, SA-14, or SA-16 per division. - 175 Russian strategic SAMs (SA-2, SA-3, SA-5, or SA-10) positioned in country - Long-range radar associated with strategic and tactical SAMs. - Unknown number of radar-guided anti-aircraft artillery systems integrated with strategic SAMs. 	<ul style="list-style-type: none"> - Two bomber regiments (60 Su-24) - Four fighter regiments (80 MiG 23, MiG 29, 40 Su-15, 30 Su-27) - Early warning radar and integrated command and control system. Ground control intercept radar.
<p>Bolivia</p>	<ul style="list-style-type: none"> - Small arms organic to two armored battalions, one mechanized cavalry regiment, and other military units. - Oerlikon twin 20mm air defense guns in one air defense regiment. 	<ul style="list-style-type: none"> - One fighter squadron with 12 AT-33N and 4 F-86F.

Table 7--Continued.

Country	Anti-Aircraft Weapons	Air Force Capabilities
<p>Moldova</p> <p>(Note: Includes Russian forces from 14th Army.)</p>	<ul style="list-style-type: none"> - Self-propelled anti-aircraft artillery, radar guided, organic to one Russian Motorized Rifle Division. Includes up to 16 ZSU-23-4 or 2S6 systems. - SAMs of various types organic to Russian divisions, including up to 156 SA-6, SA-9, SA-7, SA-14, or SA-16. - 80 strategic SAMs (SA-2, SA-3, SA-5, or SA-10). - Long-range radar associated with strategic and tactical SAMs. - Unknown number of radar-guided anti-aircraft artillery systems integrated with strategic SAMs. 	<ul style="list-style-type: none"> - One fighter regiment with 30 MiG 29. - Early warning radar and integrated command and control system. Ground control intercept radar.
<p>Burundi</p>	<ul style="list-style-type: none"> - Small arms associated with two infantry battalions, one airborne battalion, one commando battalion, and one armored car company. - 15 ZPU-4 14.5mm air defense guns. 	<ul style="list-style-type: none"> - Three combat aircraft for counter-insurgency.

Table 7--Continued.

Country	Anti-Aircraft Weapons	Air Force Capabilities
<p>Afghanistan</p> <p>(Note: Includes regular army and insurgent forces. Equipment listings reflect the organization of Afghan forces at the time of the fall of Najibullah regime in 1992.)</p>	<ul style="list-style-type: none"> - Anti-aircraft guns: 600+ 14.5mm; 23mm: ZU-23, 20 ZSU 23-4; 37mm: M-1939; 57mm: S-60; 85mm: KS-12; 100mm: KS-19. - SA-7, Blowpipe, and Stinger SAMs. - Two SAM brigades with 115 SA-2 and 110 SA-3 - Long-range radar associated with strategic and tactical SAMs. - Unknown number of radar-guided anti-aircraft artillery systems integrated with strategic SAMs 	<ul style="list-style-type: none"> - Nine fighter, ground attack squadrons (30 MiG-23, 80 Su-7/-17/-22). - Seven fighter squadrons (80 MiG-21F). - AA-2 air-to-air missiles. - Early warning radar and integrated command and control system. Ground control intercept radar.
<p>Chad</p>	<ul style="list-style-type: none"> - Small arms organic to army units in seven military regions. - 20mm and 30mm air defense guns. 	<ul style="list-style-type: none"> - Four combat aircraft for counter-insurgency.
<p>Laos</p>	<ul style="list-style-type: none"> - Anti-aircraft guns: 14.5mm: ZFU-1/-4; 23mm: ZU-23, ZSU 23-4; 37mm: M-1939; 57mm: S-60. - Unknown number of SA-3 and SA-7 SAMs. - Limited long-range radar to guide SAMs and anti-aircraft artillery. 	<ul style="list-style-type: none"> - One fighter regiment with 29 MiG-21. - AA-2 Atoll air-to-air missiles.

Table 7--Continued.

Country	Anti-Aircraft Weapons	Air Force Capabilities
<p>Tadzhikistan</p> <p>(Note: Includes Russian forces under joint control per CIS summit agreement in 1991.)</p>	<ul style="list-style-type: none"> - Self-propelled anti-aircraft artillery, radar guided, organic to one Russian Motorized Rifle Division. Includes up to 16 ZSU-23-4 or 2S6 systems. - SAMs of various types organic to Russian divisions, including up to 156 SA-6, SA-9, SA-7, SA-14, or SA-16. - 40 strategic SAMs (SA-2, SA-3, SA-5, or SA-10). - Long-range radar associated with strategic and tactical SAMs. - Unknown number of radar-guided anti-aircraft artillery systems integrated with strategic SAMs. 	<p>- None.</p>
<p>Niger</p>	<ul style="list-style-type: none"> - Small arms organic to two armed reconnaissance squadrons, six infantry companies, one airborne company. - 10 Vulcan 20mm air defense guns. 	<p>- None.</p>

Table 7--Continued.

Country	Anti-Aircraft Weapons	Air Force Capabilities
Rwanda	- Small arms organic to one commando battalion, one reconnaissance company, and eight infantry companies.	- Two combat aircraft for counter-insurgency (R-234 Guerrier).

Sources: Weapon systems found in each country from International Institute for Strategic Studies, The Military Balance 1992-1993 (London: Brassey's, 1992). Specific information on number of anti-aircraft systems organic to Russian divisions found in U.S. Army, FM 100-2-3, The Soviet Army: Troops, Organization, and Equipment (Washington, D.C.: Department of the Army, 1991), 4-39.

The final step in analyzing the types of threats airlift aircraft might be required to survive against while supporting airborne forcible entry operations involved categorizing the threat for each country in table 7 according to the classification system in table 6. To accomplish this task, the weapons systems information on each country in table 7 was compared with the threat system characteristics described in tables 12-14 in appendix A. Table 8 combines the threat categories for each country with the distances from table 5 to illustrate the distance and threat survivability requirements for airlift aircraft.

Of the twelve potential target countries identified, five were categorized as having category one threat capabilities, five have category two threat capabilities, and two have category three threat capabilities. The category three threat countries, Georgia and Moldova, are both former states of the Soviet Union that still have much residual air defense capability from Soviet armed forces still deployed within their borders. The Military Balance, however, cautioned in its analysis that

the militaries in the former Soviet Union were undergoing uncertain changes due to the breakup of that country. The threat categories in table 8 reflected worse-case scenarios where the former Soviet Republics maintain the military equipment left behind by the Soviet military.

Table 8.--Distance and Threat Survivability Requirements

Location	Major Airfield	Distance From Pope AFB	Air Defense Threat Category
Azerbaijan	Baku	5,462 NM	2
Georgia	Tbilisi	5,256 NM	3
Moldova	Kishinev	4,536 NM	3
Bosnia-Herzegovina	Sarajevo	4,300 NM	1
Afghanistan	Kabul Intl.	6,253 NM	2
Laos	Vientiane	7,609 NM	2
Tadzhikistan	Dushanbe	6,030 NM	2
Burundi	Bujumbura Intl.	6,412 NM	1
Chad	N'djamena	5,178 NM	1
Niger	Niamey	4,510 NM	1
Rwanda	Kigali	6,404 NM	1
Bolivia	La Paz	3,162 NM	2

Note: NM - Nautical Miles. Distances from table 5. Threat categories determined by author's analysis of data in tables 6, 7, 12, 13, and 14.

Table 8 summarized the requirements airlift aircraft must meet to successfully support future airborne forcible entry operations. Additional target countries could be added to the list, but this would not significantly change the requirements. The average distance from Pope AFB to the target countries was 5,426 nautical miles, and ranged from 3,162 to 7,609 nautical miles. Airlift aircraft would face category one or two threats in ten, and category three threats in two of the potential target countries. On the basis of this analysis and the historical lessons learned in chapter 3, this thesis will now turn to conclusions.

CHAPTER 5

CONCLUSIONS

In the future, U.S. military strategy will rely less on military forces being forward deployed to areas where potential conflict may erupt and more on U.S. forces being able to deploy from the U.S. to the area where a regional contingency might exist. U.S. military strategy will place emphasis on the ability to respond quickly to major regional conflicts, as well as support peacekeeping, peace enforcement, peace engagement, preventive diplomacy, humanitarian relief, and disaster relief operations. Future U.S. defense strategy will focus on being able to project power anywhere in the world rapidly and not just a massive surge of force across the Atlantic.

Forcible entry operations to create a lodgment for U.S. military forces will be an important aspect of the new defense strategy of power projection from the United States. Objective areas far from ocean access and emergency operations without adequate time for amphibious forces to move into position will require forcible entry by airborne forces deployed by airlift. The U.S. military must organize, train, and equip military forces to accomplish this difficult mission if the new national military strategy is to be successful.

This thesis has investigated what the requirements are for airlift forces to successfully support airborne forcible entry operations. It reviewed past airborne operations in World War II, Grenada, and

Panama, then drew some historical lessons from these operations that can be applied to future airborne forcible entry scenarios. After the historical perspective, this thesis examined present areas of armed conflict throughout the world to determine possible future areas where the U.S. might have to conduct an airborne forcible entry operation.

On the basis of an analysis of historic airborne operations and present armed conflicts, the requirements for airlift forces to support airborne forcible entry operations can be divided into four distinct sets. The first three sets of requirements have direct implications for what type of airlift aircraft the USAF purchases in the future, and the fourth set has implications for airlift aircrew training now and in the future. The first requirement concerned the size of the Army force airlift forces must carry to the objective area. A second requirement addressed the distance airlift forces must travel to reach potential target areas. The third requirement investigated what types of ground-to-air threat environments airlift forces must operate in to successfully reach potential airborne forcible entry targets. A fourth and final requirement identified aircrew training issues related to the airborne forcible entry mission.

Lift Requirement

On the basis of an analysis of past airborne forcible entry operations, this thesis concluded that to assault an airfield with the capacity to accommodate larger cargo aircraft, such as the C-141 and C-5 that lift reinforcing forces into the objective area, would probably require an Army force package similar to the one used at Torrijos/

Tocumen Airport during Operation Just Cause. One reinforced battalion of Rangers from the 75th Ranger Regiment will likely make the initial jump onto the airfield to seize key objectives on the ground, clear the runway if possible, destroy any ground-to-air defense systems remaining, and suppress any defending forces to lower the risk follow-on forces would face. After the Rangers had secured initial objectives, one 82nd Airborne Division medium airfield seizure package would jump onto the objective area to reinforce the Rangers' initial success.

This thesis used the 82nd Airborne Division Readiness Standard Operating Procedures (RSOP) to determine how many aircraft were required to lift these force packages from the U.S. to a potential forcible entry target. Chapter 16 of the 82nd Airborne Division RSOP listed generic force packages and the airlift requirements for each package in C-130 and C-141 sorties.¹ Although commanders will shape the actual force package used in any scenario according to METT-T, based on history and current doctrine an airlift force must be able to lift one battalion from the 75th Ranger Regiment and one medium airfield seizure package from the 82nd Airborne Division from CONUS to an airborne forcible entry location. Figures for a light infantry battalion force package from the 82nd Airborne Division were used to plan for the Ranger lift requirements. No data was available for the actual Ranger force package, but the light infantry battalion equipment and personnel lists were very similar to the Ranger force packages used for Operations Urgent Fury and Just Cause.

The 82nd Airborne Division designed force packages to conduct forcible entry operations and to deploy in two echelons--an airdrop

(ALPHA) and an airland echelon (BRAVO). The division designed light force packages for force entry operations into environments where the threat is primarily light infantry with little armor or air capability. Medium packages are designed for force entry into environments where the threat has moderate armor and/or air capability. The force packages were also designed with adequate, but austere, combat support and combat service support assets "capable of sustaining operations for 72 hours."² Table 9 lists the total assets in an 82nd Airborne Division light infantry battalion force package that is similar to a Ranger battalion package. Table 10 lists the total assets in an 82nd Airborne Division medium airfield seizure force package.

Planners from the 82nd Airborne Division also developed airlift requirements to move force packages to a target area. The airlift requirements were based on the number of C-130 or C-141 aircraft required to carry the airdrop and airland echelons in a combat configured load. Load plans incorporated cross-loading procedures where personnel and equipment from the same unit are loaded onto different aircraft to avoid complete loss of a certain capability if one aircraft was to be shot down by the enemy. 82nd Airborne Division planners computed the airlift requirements using equipment and personnel rigged for airdrop or airland as required.³ Table 11 lists airlift requirements for the light infantry battalion, medium airfield seizure force packages, and total C-130 or C-141 sorties required to airlift an airborne forcible entry force package from CONUS to a target area.

Table 9.--82nd Airborne Division Light Infantry Battalion Force List

ITEM	ALPHA ECHELON	BRAVO ECHELON	TOTAL
Personnel	525	13	538
M998, Trk, Cgo, HMMWV	6	3	9
M996, Trk, Amb, HMMWV	2	2	4
M35A2, Trk, Cgo	0	1	1
M149, Trl Tank Wtr	0	1	1

Source: Headquarters 82nd Airborne Division, 82nd Airborne Division Readiness Standard Operating Procedures (FT Bragg, NC: ACoFS Operations, May 1992), p. 16-C-1.

Table 10.--82nd Airborne Division Airfield Seizure (Medium) Force List

ITEM	ALPHA ECHELON	BRAVO ECHELON	TOTAL
Personnel	1646	202	1848
M998, Trk, Cgo, HMMWV	33	31	64
M101 Trl Cgo 3/4T	2	2	4
M996, Trk, Amb, HMMWV	4	10	14
M966, Trk, TOW, HMMWV	8	1	9
M1008, Trk, Cgo (USAF)	1	0	1
M1025, Trk, Armt Carrier	3	3	6
M1026, Trk, Armt Carrier	1	0	1
M1035, Trk, Cgo	3	0	3
M1037, Trk, HMMWV w/Shelter	4	1	5
M1038, Trk, Cgo, HMMWV	2	0	2
M119 How Lt towed	8	0	8
M35A2, Trk, Cgo	0	10	10
M105 Trl, Cgo 1 1/2T	0	4	4
M149, Trl Tank Wtr	0	2	2
M923 Trk 5T/Tank & Pump Unit	0	1	1
M936 Trk, Wreck, 5T	0	1	1
M167 Gun, AA, Towed, 20mm	3	0	3
M551 Sheridan Armd Recon Veh	4	0	4
Forklift, RT, 4K	1	0	1
Forklift, RT, 6K	0	1	1
Forklift, RT, 10K	0	1	1
S250 Shelter	0	1	1
AN ASM 146 Shelter	0	1	1
8' Platform	2	0	2
CDS Bundles	24	0	24
950B Bucket Loader	4	0	4
463L Pallets	(1	1
350 GPM Pump	0	1	1

Source: Headquarters 82nd Airborne Division, 82nd Airborne Division Readiness Standard Operating Procedures (FT Bragg, NC: ACoFS Operations, May 1992), p. 16-B-7.

Table 11.--82nd Airborne Division Force Package Airlift Requirements

FORCE PACKAGE	PAX AIRDROP	HVY EQUIP AIRDROP	AIRLAND	TOTAL
Infantry Battalion (LT)				
C-130 Airlift Requirement	8	4	3	15
C-141 Airlift Requirement	4	2	2	3
Airfield Seizure (MED)				
C-130 Airlift Requirement	26	41	29	96
C-141 Airlift Requirement	14	27	19	60
Total Force Package				
C-130 Airlift Requirement	34	45	32	111
C-141 Airlift Requirement	18	29	21	68

Source: Headquarters 82nd Airborne Division, 82nd Airborne Division Readiness Standard Operating Procedures (FT Bragg, NC: ACoFS Operations, May 1992), p. 16-J-1.

Table 11 summarized the airlift requirements for a typical airborne forcible entry force package. The airborne force package required sixty-eight C-141 or 111 C-130 aircraft to carry it from CONUS to a potential target. This is the minimum number of aircraft and aircrews the USAF airlift force must acquire, train, and maintain, to support airborne operations if the U.S. military is to have a successful airborne forcible entry capability.

Distance Requirement

This thesis examined the distance airlift aircraft would need to travel to transport an airborne force package from Pope AFB to a potential target area in chapter 4. Target locations were selected from a list of countries that experienced armed conflicts, sponsored terrorism, or were involved in international narcotics production. The list was narrowed by removing countries that have sea access because

amphibious forces would most likely accomplish forcible entry operations in those scenarios. Table 8 in chapter 4 summarized the distance airlift aircraft were required to overcome if they were to successfully support an airborne forcible entry operation in that target location.

The average distance from Pope AFB to target locations was 5,426 nautical miles, and ranged from 3,162 to 7,609 nautical miles. Airlift aircraft would be required to lift an airborne force 7,609 nautical miles from CONUS to a target location to successfully support all the airborne forcible entry scenarios. This long distance can be overcome by using intermediate staging bases, enroute stops to refuel, or aerial refueling. Analysis in chapter four noted the advantages and disadvantages of using enroute stops or intermediate staging bases. Because of the increased risk to the force if enroute stops or intermediate staging bases are used, USAF airlift forces should be air refuelable. This will insure airlift aircraft can overcome the long distances they will be expected to travel--up to 7,609 nautical miles from CONUS to one potential target--to successfully support airborne forcible entry operations.

Threat Survivability Requirement

Chapter four also analyzed the types of ground-to-air threats airlift aircraft would be required to successfully defeat to deliver airborne forces safely to a forcible entry location. Of the twelve potential target countries identified, five have defense capabilities that correspond to category one threats, five have category two threat capabilities, and two have category three threats. The category three

threat countries--Georgia and Moldova--are both former states of the Soviet Union that still have much of the air defense capability the Soviet armed forces deployed within their borders. The average threat category was 1.75.

For airlift aircraft to survive a category one threat, evasive action may be required by the pilot. Category two threats may require evasive action, electronic countermeasures, and/or defense suppression support for airlift aircraft to survive. To survive a category three threat scenario, airlift aircraft must employ evasive action, electronic countermeasures, and defense suppression operations. On the basis of the potential airborne forcible entry target locations, airlift aircraft would be required to operate in threat environments ranging from category one to three, with an average threat level of 1.75. Airlift aircraft would be required to survive this threat level to successfully support airborne forcible entry operations.

A complete description of potential systems that would improve the probability of airlift aircraft surviving in a category two or three threat environment is beyond the scope of this thesis. However, there are several systems currently available for these aircraft that provide some self-protection. In early 1994, C-130 aircraft flying into Sarajevo Airport to deliver relief supplies were required to have threat defense systems installed to provide protection against ground launched surface-to-air missiles. The "Snowstorm" system included a radar warning receiver and chaff dispensers to protect the aircraft against radar-guided missiles. The system also included an infrared missile launch warning detector and flare dispensers to protect against infrared-guided

missiles. The Snowstorm system is a low cost self-protection device that was available for airlift aircraft in 1992. Enough of the systems should be procured to equip airlift aircraft tasked to support airborne forcible entry operations.

Equipment improvements alone will not make airlift aircraft survivable in a category three threat environment. Airlift aircrews must train with USAF, Navy, and Army tactical aircraft that will provide defense suppression and escort support to transport aircraft attempting to penetrate a heavily defended area. Procedures for the escort and protection of airlift aircraft must be improved and practiced.

Aircrew Training Issues

The ability of USAF airlift to successfully support airborne forcible entry operations does not depend solely on equipment. The most important factor is the aircrews that would fly such demanding missions. After analyzing past airborne operations and potential future threat areas, the author determined several training issues for airlift aircrews. These issues included the forcible entry objective area; night operations; airdrop insertion of assault forces; formation employment; integration with the overall air effort; and joint airborne planning, coordination, and training.

The main objective in a forcible entry operation is to seize and secure a lodgment to allow for the introduction of sufficient combat power to achieve U.S. objectives in the area. Because of the necessity to introduce follow-on forces by airlift in an airborne forcible entry scenario, the objective area must be an airfield. Only by seizing an

airfield can U.S. mobility assets transport enough combat forces into an objective area that does not have access by sea. The obvious need for an airfield to support the insertion of follow-on forces presents a problem for airborne planners because it makes the defender's task much easier. If an aggressor obtains intelligence warning that U.S. armed forces might intervene, he can mass his defenses near airfields to make their seizure more difficult and potentially too costly for U.S. forces. A choice must be made to drop on the airfield, or drop a safe distance away from the airfield and move over ground to attack the objective area. USAF airlift planners must work with Army, Navy, and Marine Corps representatives to fully develop airfield seizure doctrine and procedures to successfully support airborne forcible entry operations.

The trade-off between protection for airlift aircraft during the night and the difficulties of navigating to the correct objective area to make an accurate airdrop is still relevant to today's airborne planners. Flying at night offers greater protection for airlift aircraft because the aircraft are more difficult to acquire and target by air defense assets. Night operations enhance the security of aircraft and paratroopers enroute to the objective area because optically guided weapons are less effective at night. Night operations also enhance surprise by attacking an enemy when he is least prepared to react. This could give airborne troops additional time to gather mass and momentum on the ground to overcome their initial vulnerability while under canopy and assembling on the drop zone.

Night operations, however, make land navigation, assembly operations after the drop, and assaulting defending positions more dif-

difficult for airborne troopers. Airborne operations at night also make the task of navigating to the drop zone and making an accurate airdrop difficult for aircrews. The current airlift force must continue to be fitted with more accurate navigation equipment that makes locating a drop zone at night much easier for aircrews. Aircrews must continue to train in night airdrop procedures to maintain this perishable skill. Airlift tacticians should develop procedures to make better use of night vision goggles for airdrop-trained aircrews. To successfully support airborne forcible entry operations USAF airlift aircrews must operate effectively at night.

Airborne forcible entry operations will rely on airdrop procedures to insert paratroopers onto an airfield to secure an initial lodgment. Airland operations are not suitable for forcible entry operations because the assaulting force cannot be certain of the airfield condition until the first assault elements are on the ground. Airland insertion plans with airdrop backups, such as the Ranger airdrop during Operation Urgent Fury, risk confusion near the target area and should be avoided. USAF airlift aircrews and aircraft must maintain the capability to airdrop one battalion from the 75th Ranger Regiment and the airdrop echelon of a medium airfield seizure force package from the 82nd Airborne Division to successfully support airborne forcible entry operations. Based on data in table 12, this represents a minimum requirement of seventy-nine C-130 or forty-seven C-141 airdrop aircrews.

Because of the necessity for mass and concentration on the drop zone, formation tactics will be the preferable mode of delivery during airborne forcible entry operations. Single-ship tactics by airlifters

cannot give paratroopers the mass they need to be successful. Airlift single-ship tactics, nap of the earth flying, and constant control inputs to avoid ground-to-air and air-to-air threats conflict with the airborne paratroopers' requirement for mass and concentration on the objective area. Formation airdrop tactics, unlike single-ship tactics, allow for aggressive, rapid seizure of assault objectives by airborne forces. To successfully support airborne forcible entry operations, USAF airlift aircrews must continue to train using formation flight procedures. They must also strive to develop new formation delivery techniques that improve the survivability of airlift aircraft while satisfying paratroopers' requirements for mass and concentration on the objective area.

Airborne operations require local air superiority to be successful. Air superiority enroute to and over the objective area is a task that requires a large effort by all air forces involved in the operation. Tactical aircraft, either land-based USAF or carrier-based Navy/Marine fighters, must provide protection for unarmed transport aircraft and suppress enemy air defenses enroute to the objective area. If attacking a heavily-defended airfield, airborne forcible entry operations would require the airfield to be attacked by tactical air assets to neutralize enemy ground-to-air threats before the airdrop could take place. Another function that would illustrate the total air effort nature of airborne forcible entry operations is aerial refueling. C-141 transports have a capability to deliver paratroopers anywhere in the world because they have an aerial refueling capability and do not have to stop at intermediate staging bases enroute to the target area.

The need to provide escort and suppression of enemy air defenses enroute to and from the target area, the need for thorough target preparation with aerial firepower, and the need for aerial refueling support illustrate that airborne forcible entry operations require a large, joint, coordinated air effort by all air forces available to be successful. USAF airlift forces must continue to improve and exercise night formation airdrop doctrine with other air assets and ground forces to successfully support airborne forcible entry operations.

No one military service has all the resources necessary to accomplish airborne forcible entry operations. Army paratroopers jump to seize objectives on the ground and Air Force airlift aircraft transport the paratroopers to the objective area. Navy, Marine, or Air Force fixed-wing aircraft provide escort, aerial refueling, and fire support for transport aircraft and paratroopers. Army attack helicopters may also provide fire support and enemy threat suppression. Airborne forcible entry operations are joint operations that require the cooperation of all military services to succeed. They require joint planning with representatives from transport aircrews, paratroopers, and other support forces present. Planning for any airborne forcible entry operation must include representatives from all forces and services involved to be successful. To successfully support airborne forcible entry operations USAF airlift forces must develop liaisons and joint procedures with the other forces they will work with to conduct these challenging missions.

Areas for Further Research

Many areas for further research remain in the field of airborne forcible entry operations. Because of the recent change in U.S. military strategy from forward deployed armed forces to a force projection strategy, forcible entry operations became very significant for military planners. Airborne forcible entry operations are likely to remain a significant U.S. force projection capability in the near future.

This thesis addressed airlift requirements to successfully support airborne forcible entry operations. One logical area that merits further research is what type of airborne force package can best accomplish the airfield seizure or lodgment phase of an airborne forcible entry mission. A study could examine standard force packages developed for airfield seizure in the 82nd Airborne Division Readiness Standard Operating Procedures to determine if they can accomplish the airborne forcible entry mission given current world ground threats. Another study could develop requirements for airborne forces to successfully support these types of operations.

In the area of airlift tactics and procedures, one subject that merits further research is formation airdrop delivery techniques. Most literature written by airlifters has concentrated on identifying the dangers modern air defenses pose to airlift aircraft and the need for new equipment or single-ship tactics to overcome those defenses. A study to find more efficient and effective formation geometries to deliver massed airborne troops while increasing survivability in the face of modern air defenses would greatly benefit the airlift community.

Another area that would benefit from further research is the subject of armed escort for airlift aircraft. Using high speed fighter aircraft or helicopters to escort airlift aircraft is a difficult task that has not been given adequate attention in the past. A fresh look at tactics and methods to escort large, slow moving airlift aircraft to an objective could improve airborne forcible entry capabilities and make a positive impact on USAF fighter and airlift doctrine.

A final subject for further research involves other aspects of airlift force structure. This thesis investigated what was required of airlift forces to successfully support airborne forcible entry operations. Another study could examine present airlift force structure, aircrew training, and airlift doctrine using the requirements developed in this study to determine if the current or projected airlift force can successfully support these types of operations.

In summary, this thesis determined airlift requirements of airborne forcible entry operations. Many areas remain that could benefit from further research. The U.S. military will continue to rely on airborne forces to project power into regions where the U.S. has vital interests at stake. Airborne forcible entry operations require joint doctrine, training, planning, and execution to be successful. Airlift forces will undoubtedly continue to play a major role in maintaining this vital capability.

ENDNOTES

Chapter 1

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⁶U.S. Army, FM 100-5, Operations (Washington, D.C.: Department of the Army, June 1993), 3-11.

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⁸U.S. Army, FM 90-26, Airborne Operations (Washington, D.C.: Department of the Army, December 1990), 1-6.

⁹Jeffrey R. Cooper, "U.S. Post-Cold War Policy Must Heed Many Threats," Aviation Week and Space Technology (14 September 1992): 59.

¹⁰Colin L. Powell, "U.S. Forces: Challenges Ahead," Foreign Affairs (Winter 1992/93): 34.

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¹²Powell, 35.

¹³National Military Strategy, 7.

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¹⁷National Military Strategy, 23.

¹⁸U.S. Army, FM 100-15, Corps Operations (Washington, D.C.: Department of the Army, September 1989), 8-2.

¹⁹FM 90-26, Airborne Operations, 1-6.

Chapter 2

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Chapter 3

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¹¹Tugwell, 166.

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¹³Ibid., 87.

¹⁴Tugwell, 207.

¹⁵Boston, 68; Tugwell, 202, 210.

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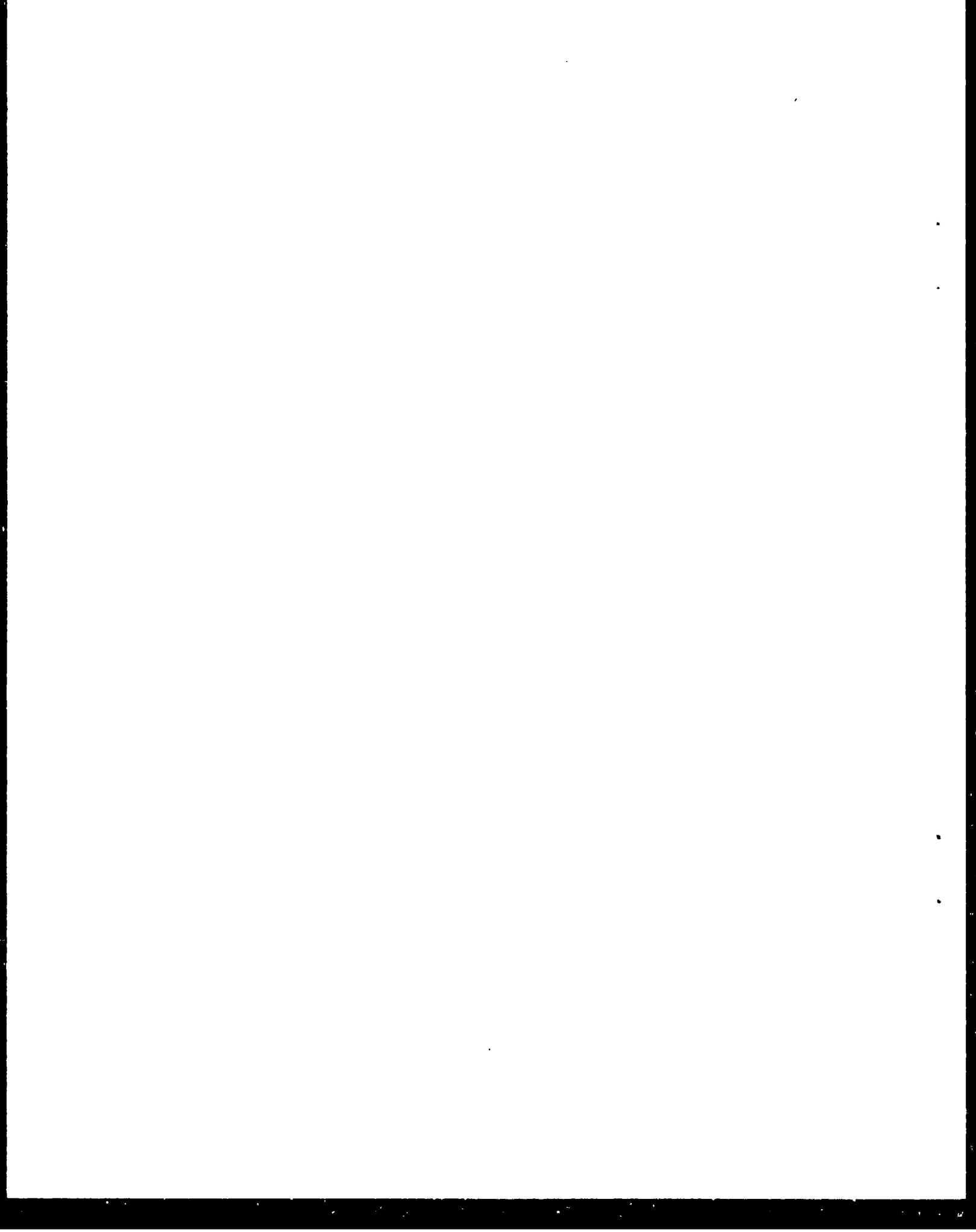
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APPENDIX A

THREAT SYSTEM CHARACTERISTICS

Table 12.--Airborne Interceptor Threats

Fighters	NATO Code	Remarks
MiG-23	Flogger-G/K	(2xAA-7, 4xAA-8, AA-11)
MiG-25	Foxbat-A	700-NM range, 4 AAMs (AA-6, AA-7, AA-8)
MiG-29	Fulcrum	350-NM range, 6 AAMs (AA-8, AA-9, AA-10, AA-11), LD/SD, track-while-scan, 60-NM search, 45-NM track.
MiG-31	Foxhound-A	LD/SD, track-while-scan (AA-6, AA-7, AA-8, AA-9)
Su-27	Flanker	400-NM radius, LD/SD, 130-NM search, 100-NM track, 8 AAMs (AA-8, AA-10, AA-11)
Tu-28	Fiddler	Works with Tu-126 Mainstay, 4 AAMs (AA-5)
F-4	Phantom II	8 AAMs (Sidewinder and Sparrow)
F-14A	Tomcat	8 AAMs (Sidewinder, Sparrow, and Phoenix)
Mirage III		Magic 530/550

Legend

AA - Air-to-Air

AAM - Air-to-Air Missile

LD/SD - Look-Down/Shoot-Down

NM - Nautical Mile

Source: Lieutenant Colonel John A. Skorupa, USAF, Self-Protective Measures to Enhance Airlift Operations in Hostile Environments, (Maxwell AFB, AL: Air University Press, 1989), 30.

Table 13.--Air-to-Air Missile Threats

AAMs	NATO Code	Remarks
AA-2	Atoll	AIM 9B equivalent, IR guided, 3- to 4-NM range
AA-5	Ash	Semiactive radar guided (I/J band), 16-NM range
AA-6	Acrid	Semiactive radar homing, 25-NM range, 220-lb warhead
AA-7	Apex	IR or semiactive radar homing, 17-NM range
AA-8	Aphid	IR or semiactive radar homing, 3- to 4-NM range, all-aspect
AA-9	Amos	Radar guided, LD/SD missile, 25-NM range, high altitude
AA-10	Alamo	Radar guided, LD/SD missile, 19-NM range
AA-11	Archer	38-NM range, active terminal radar
Magic R-530		18-km range, semiactive homing or IR seeker
Magic R-550		6-NM range, IR seeker

Legend

AA - Air-to-Air
 AAM - Air-to-Air Missile
 LD/SD - Look-Down/Shoot-Down
 NM - Nautical Mile
 IR - Infrared

Source: Lieutenant Colonel John A. Skorupa, USAF, Self-Protective Measures to Enhance Airlift Operations in Hostile Environments, (Maxwell AFB, AL: Air University Press, 1989), 30.

Table 14.--Surface-to-Air Missile Threats

SAMs	NATO Code	Remarks
SA-4A/B	Ganef	1,000 to 80,000 ft, 5- to 45-mile range, command guidance and semiactive radar homing, salvo and guide 2 missiles per target, E-band surveillance, H-band acquisition.
SA-6A/B	Gainful	50 to 30,000 ft, 2- to 12-mile range, command guidance and semiactive radar homing, E-band acquisition.
SA-7	Grail	50 to 10,000 ft, 0.5- to 3-mile range, IR homing.
SA-8	Gecko	150 to 30,000 ft, 7.4-mile range, command guidance, semiactive radar and IR homing.
SA-9	Gaskin	50 to 15,000 ft, 0.4- to 4-mile range, passive radar and IR homing.
SA-10B	Grumble	Low to high altitude, 50-NM range, Mach 6, 200-lb warhead.
SA-11	Gadfly	100 to 45,000 ft, 1.6- to 15-NM range, command guidance, semiactive monopulse radar and IR homing, SA-6 replacement.
SA-12A	Gladiator	Low to high altitude, 80-km range, 330-lb warhead, Mach 3, SA-4 replacement.
SA-13	Gopher	30 to 32,000 ft, 5-mile range, passive radar and IR homing, SA-9 replacement.
SA-14	Gremlin	SA-7 replacement.
SA-16		SA-7 replacement.
SA-17		SA-4/SA-11 replacement.
SA-18		SA-7/SA-14 replacement.
SA-19		(256 SP) 8 SAM plus twin 35mm.

Table 14.--Continued.

SAMs	NATO Code	Remarks
Crotale		Low to medium altitude, 5-NM range, monopulse radar guidance.
Hawk		Low to medium altitude, 22-NM range, semiactive radar homing.
Rapier		Low to medium altitude, 4-NM range, command to line-of-sight guidance.
Roland		Low to medium altitude, 3.4-NM range, command guidance and IR homing.

Legend

SAM - Surface-to-Air Missile

NM - Nautical Mile

IR - Infrared

Source: Lieutenant Colonel John A. Skorupa, USAF, Self-Protective Measures to Enhance Airlift Operations in Hostile Environments, (Maxwell AFB, AL: Air University Press, 1989), 32-33; International Institute for Strategic Studies, The Military Balance 1992-1993 (London: Brassey's, 1992), 98.

APPENDIX B

FIGURES

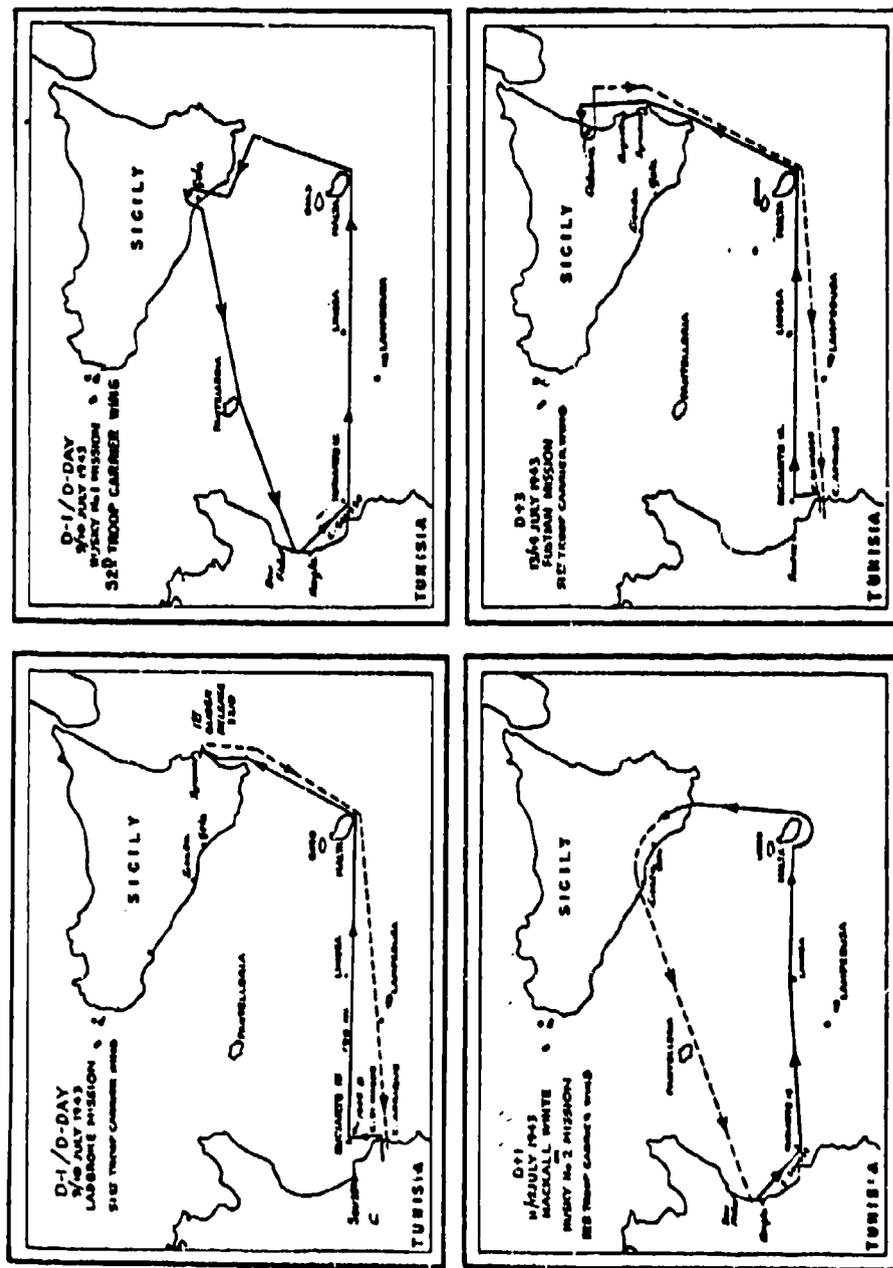


Fig. 1. Operation Husky Airborne Missions. From U.S. Air Force Historical Division, USAF Airborne Operations: World War II and Korean War (Washington, D.C.: Department of the Air Force, March 1962), 9.

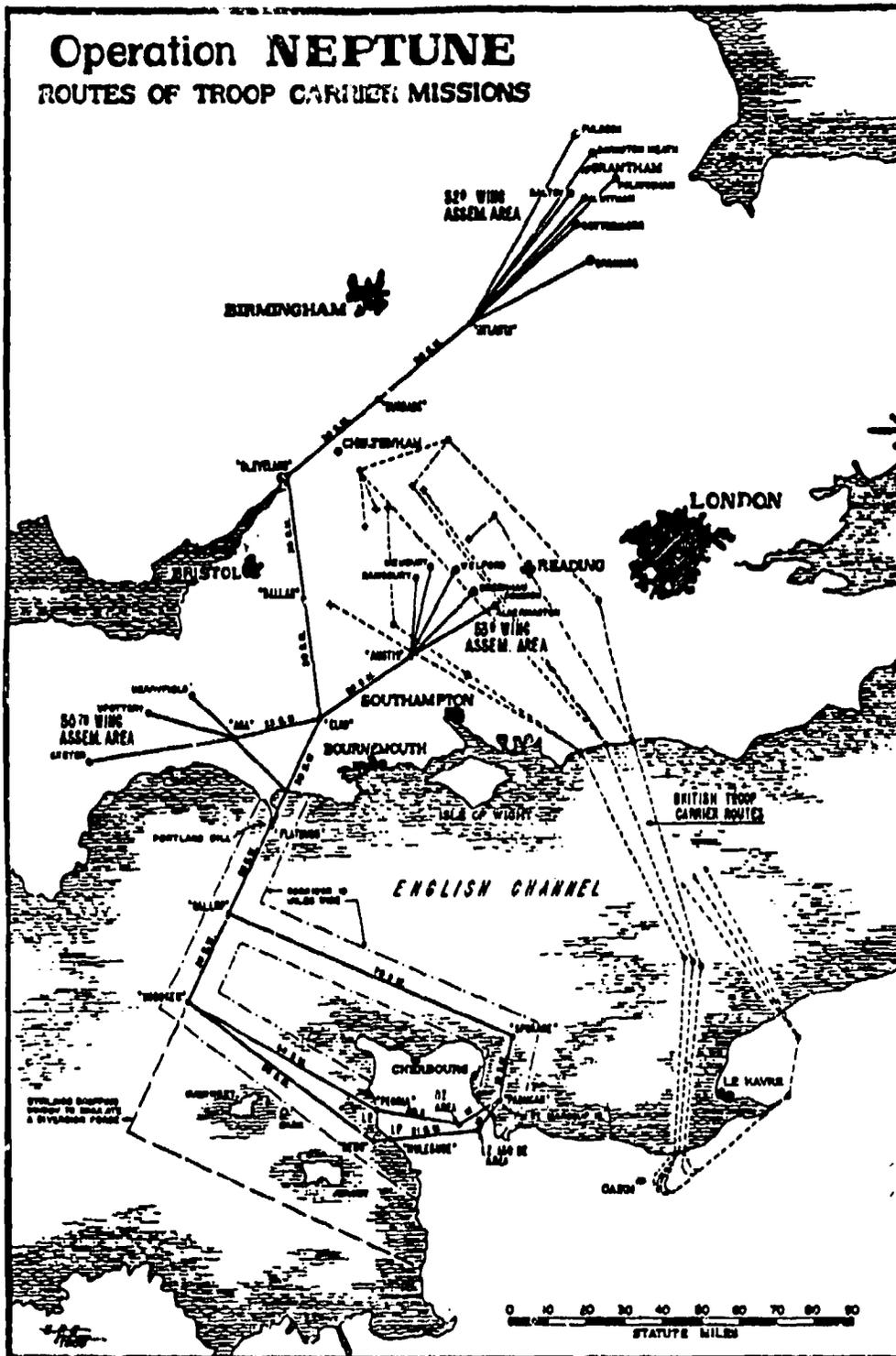


Fig. 2. Operation Neptune: Routes of Troop Carrier Missions. From U.S. Air Force Historical Division, USAF Airborne Operations: World War II and Korean War (Washington, D.C.: Department of the Air Force, March 1962), 41.

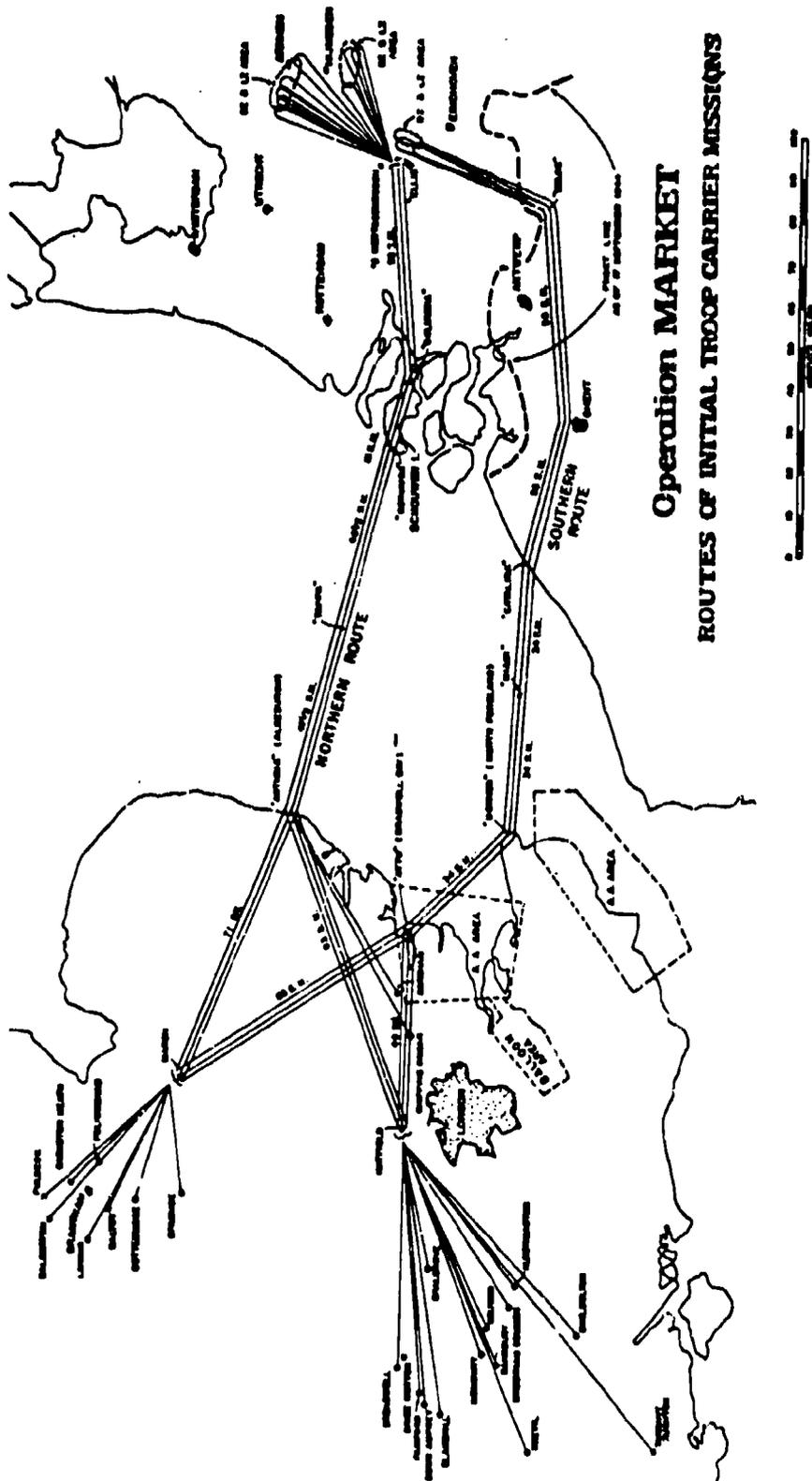


Fig. 3. Operation Market Garden: Routes of Troop Carrier Missions. From U.S. Air Force Historical Division, USAF Airborne Operations: World War II and Korean War (Washington, D.C.: Department of the Air Force, March 1967), 55.

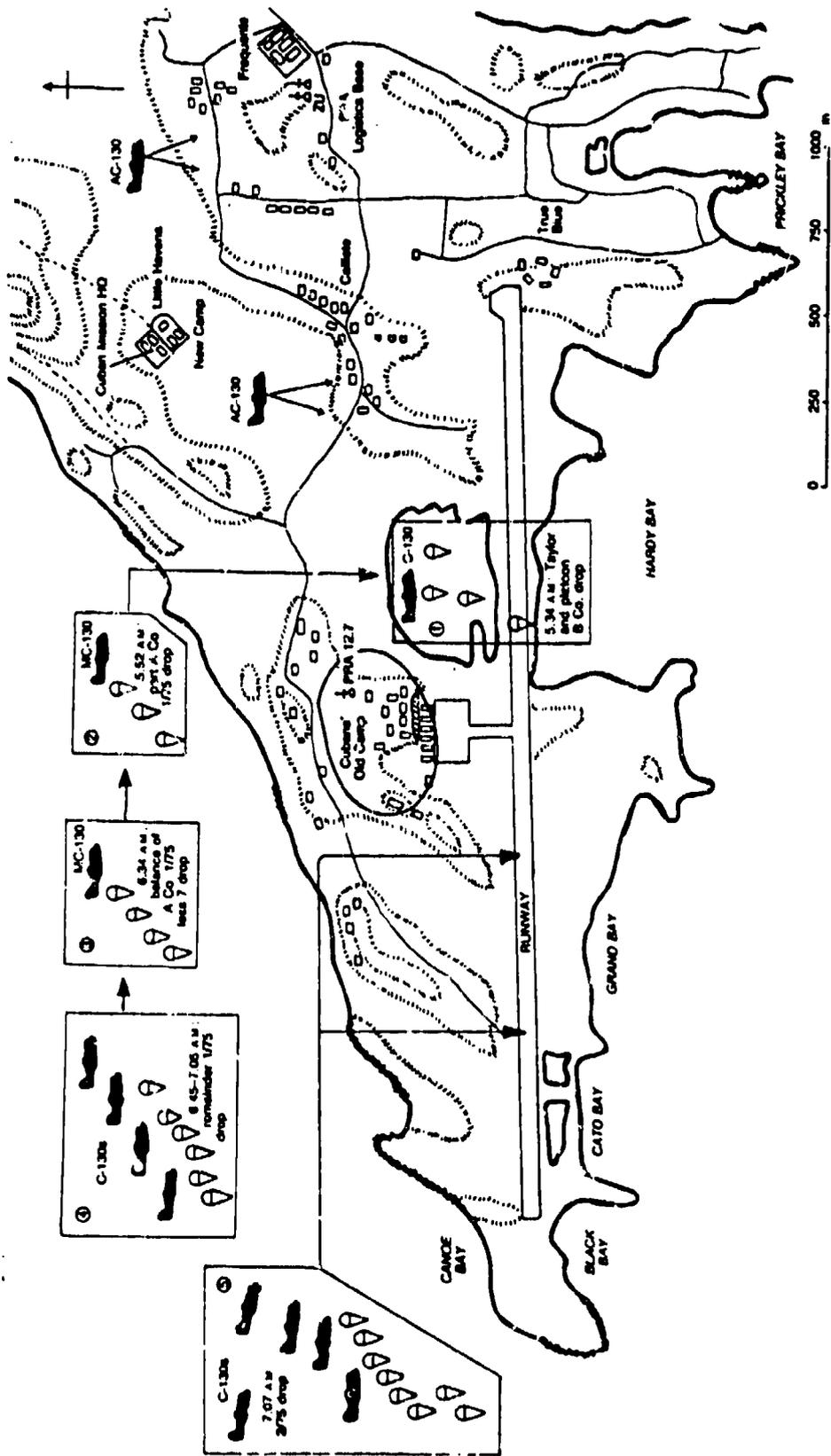


Fig. 4. Operation Urgent Fury: Airdrop at Point Salines Airport. From Mark Adkin, *Urgent Fury: The Battle for Grenada* (Lexington, Massachusetts: Lexington Books, 1989), 200.

The Rangers Seize Rio Hato

The Panamanian military base at Rio Hato consists of a 1.5-mile runway and military camp on the Pacific Coast 75 miles west of Panama City. The assault was conducted by the better part of two battalions of the 75th Ranger Regiment.

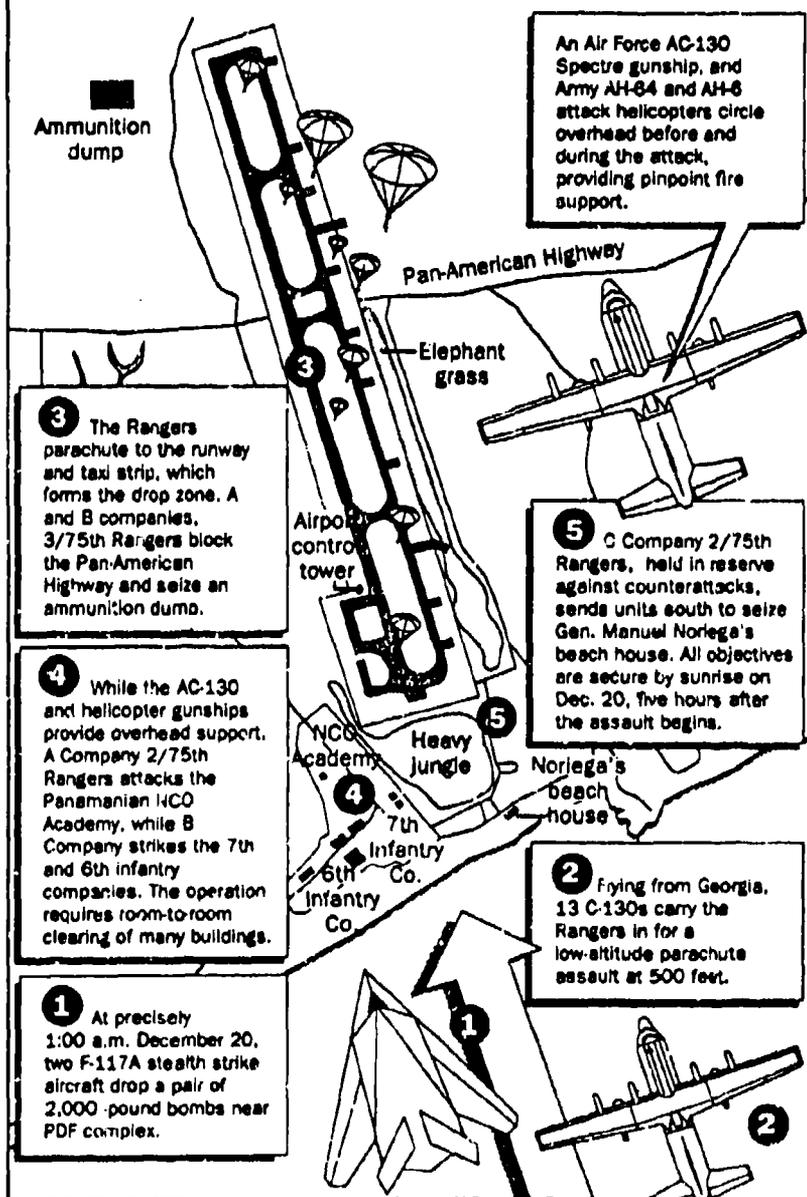


Fig. 5. Operation Just Cause: The Rangers Seize Rio Hato. From Thomas M. Donnelly, Margaret C. Roth, and Caleb Baker, *Operation Just Cause: The Storming of Panama* (New York: Lexington Books, 1991), 337.

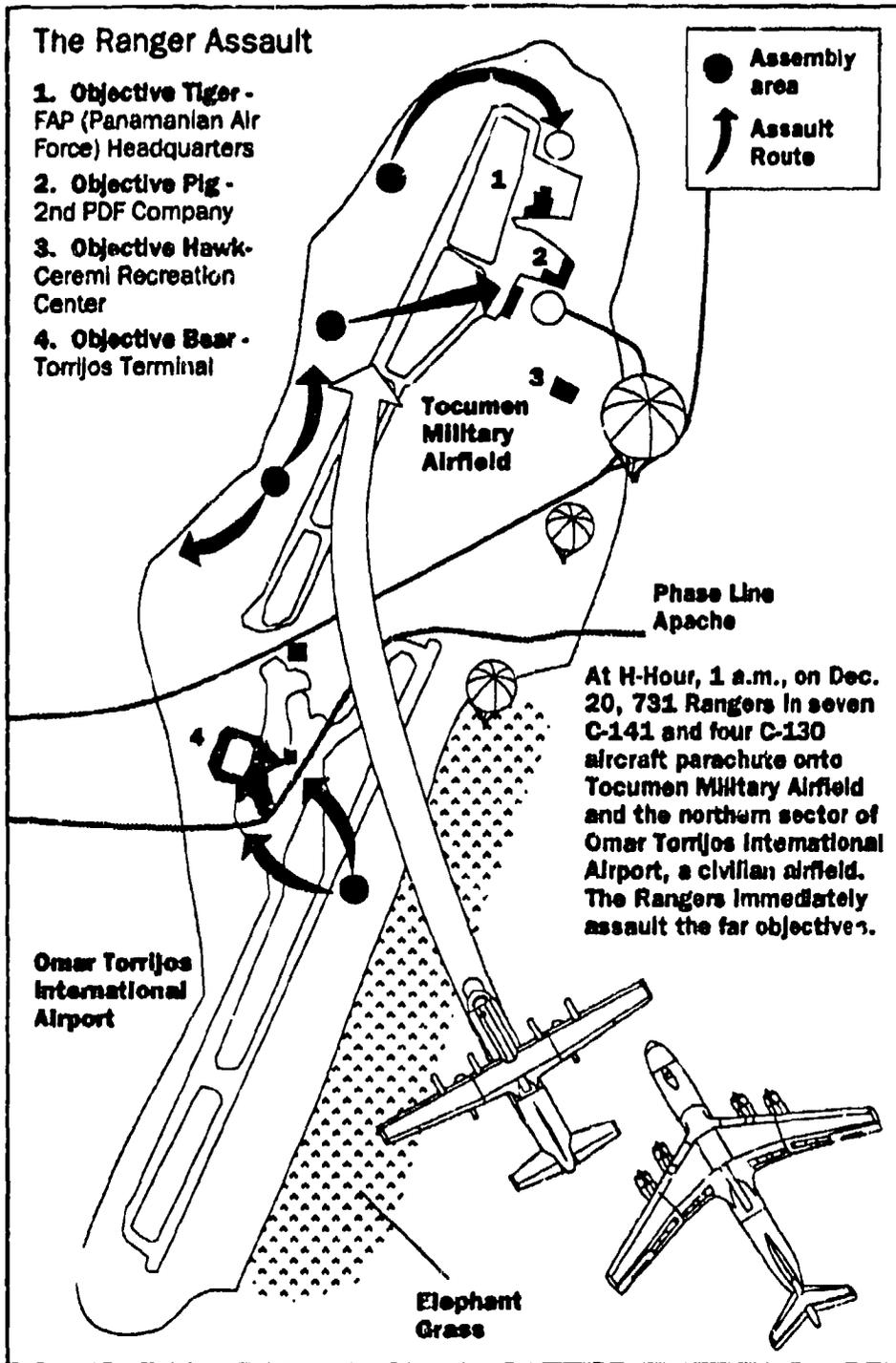


Fig. 5. Operation Just Cause: Ranger Assault at Torrijos/Tocumen. From Thomas M. Donnelly, Margaret C. Roth, and Caleb Baker, Operation Just Cause: The Storming of Panama (New York: Lexington Books, 1991), 195.

Torrijos/Tocumen: 82nd Arrives

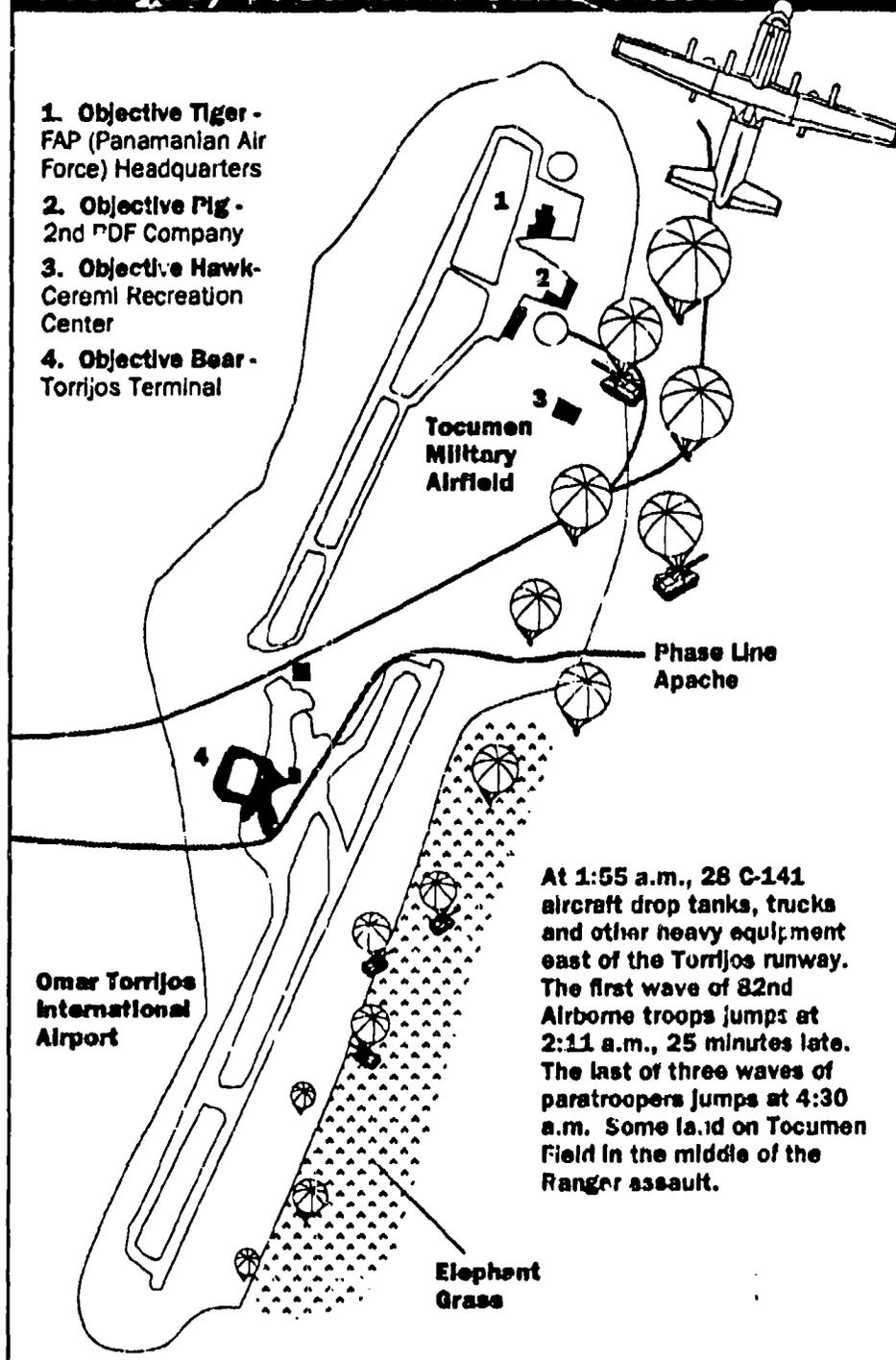


Fig. 6. Operation Just Cause: 82nd Arrives at Torrijos/Tocumen. From Thomas M. Donnelly, Margaret C. Roth, and Caleb Baker, Operation Just Cause: The Storming of Panama (New York: Lexington Books, 1991), 204.

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