Enabling the Global Response Force

Access Strategies for the 82nd Airborne Division

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Preface

The U.S. Army's 82nd Airborne Division (hereafter, the 82nd) plays a significant strategic role as part of the Global Response Force (GRF), whose mandate is contained in a Joint Chiefs of Staff executive order that codifies generalized global missions for which the GRF needs to be prepared, forces that could be called upon as part of the GRF (from across the Joint community), and time lines for providing them. The time lines, among other factors, make the GRF an important national asset for rapid responses to unforeseen or, more specifically, unplanned operations. One part of ensuring the GRF works is having working concepts and a generalized and specific understanding of what global access means to the GRF's mandate. RAND Arroyo Center was asked to consider access strategies from the standpoint of airlift constraints, intermediate staging bases (ISBs), and the various concepts for how they might access each of the five combatant commands (CCMDs) to help shed light on an important question: *How is the GRF going to get where it needs to go?*

The findings from this document should be of interest to planners from the services, Joint Staff, and Geographic Combatant Commands. This research was sponsored by the Army's 82nd Airborne Division and conducted within RAND Arroyo Center's Force Development and Technology Program. RAND Arroyo Center, part of the RAND Corporation, is a federally funded research and development center sponsored by the United States Army.

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Introduction

The U.S. Army's 82nd Airborne Division (hereafter, the 82nd) plays a significant strategic role as part of the Global Response Force (GRF), whose mandate is contained in a Joint Chiefs of Staff executive order that codifies generalized global missions for which the GRF needs to be prepared, forces that could be called upon as part of the GRF (from across the Joint community), and time lines for providing them. The time lines, among other factors, make the GRF an important national asset for rapid responses to unforeseen or, more specifically, unplanned operations. One part of ensuring the GRF works is having working concepts and a generalized and specific understanding of what global access means to the GRF's mandate. For rapid time lines, the GRF may not have considerable advanced planning for access, meaning there is a need to develop a strategic view of what access means. From the standpoint of the 82nd, global access means defining what potential or likely operations might look like. This includes having soldiers trained and equipped for the specific missions and a vision of how they will work with the United States Air Force (USAF) for lift and support and within the constraints and demands of specific combatant commands (CCMDs) and Joint Staff. This requires a common understanding of GRF operations from a Joint perspective.

RAND Arroyo Center was asked to consider access strategies from the standpoint of airlift constraints, intermediate staging bases (ISBs), and the various concepts for how they might access each of the five CCMDs to help shed light on an important question: *How is the GRF going to get where it needs to go?* This core question is at the heart of the study's analysis and highlights a complex and multifaceted problem. Most missions the GRF will likely be tasked with are not within direct access range of either C-130s or C-17s, the two most dominant airlifters that USAF possesses. Thus, for the GRF to access most mission sites, aircraft will stage for varying durations. Identifying these stopover points will require careful assessment and consideration of the location and the ability to support operations at that location.

This analysis identified appropriate missions and scenarios to assess the operational ability of the GRF to access and effectively operate in different regions, which entailed a deep look at possible lodgments and ISBs associated with various missions and how those relate to overarching accessibility parameters. Also, the GRF requires that the USAF provide considerable capabilities for Joint mission success; this study determined what USAF capability and capacity might be used to meet their overarching accessibility needs. The study helps the 82nd better understand expected demands being placed on the USAF and the USAF's abilities to meet those demands under various missions and scenarios.

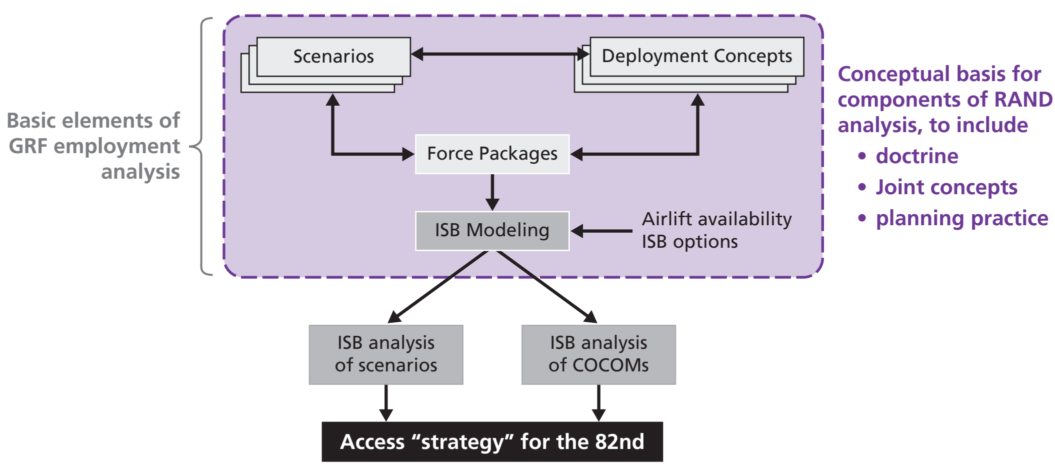
What Approach Did We Use, and What Did We Learn from Using It?

Figure S.1 shows the elements of the RAND study—scenarios and deployment concepts, leading to force packages used in doing the ISB modeling to yield findings for the scenarios and for the CCMDs and, ultimately, to an access strategy for the 82nd. We discuss these elements in this section and what we learned from doing the analyses for each.

Developing Scenarios and Force Packages

As shown in Figure S.1, the analysis developed a variety of plausible, illustrative scenarios that varied: (1) the mission, (2) the type and size of the threat, (3) terrain, (4) the distance from Fort Bragg to the objective, (5) whether an ISB is available, and (6) the size of the U.S. force (i.e., a complete GRF brigade, or a smaller Battalion Task Force, [BN TF]). The end result was seven scenarios (and vignettes within those scenarios)—Nigeria (four vignettes), Korea, Philippines, Thailand, Iran (two vignettes), Sudan, and Colombia (two vignettes)—that illustrated the range of missions the 82nd could perform. The analysis found that force packages will drive how the 82nd operates across

Figure S.1
Elements of the RAND Study



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mission but will also govern aspects of how and how quickly they will be able to reach a given mission. The Army will need to define minimal force packages under different conditions, given constraints in aircraft, maximum on ground (MOG) and other items, to help CCMDs and Joint Staff to plan for potential GRF use. These packages are already under development within the 82nd staff. Determining and describing how those force packages trade risk for speed should be part of those descriptions. The Army also needs to define the minimal footprints and infrastructure for staging to inform planning purposes and for conveying to CCMDs the requirements for using rapid response forces with intermediate staging.

Developing Deployment Concepts

In terms of developing deployment concepts (Figure S.1), two basic deployment concepts were considered—*direct access*, meaning a direct mission from the continental United States (CONUS) to the contingency location (CL), that is, the drop zone or airport that is the final destination of the airborne mission, either with one or no stops along the way; and *staging* by means of an ISB. Each has slight variants.

The study found that the direct access options will tend to be the fastest from wheels up but will suffer from not being able to reach deep into far CCMDs. Staging provides for more early-leg options for aircraft (e.g., using typical strategic lift options either by sea, air, or land) but entails more built and mobile infrastructure at those ISBs and coordination along the way. ISBs used as a more deliberate stop on the way to a CL provide a flexible delivery option for CCMDs to consider using the GRF and to build forces up in advance of a conflict. Using general strategic lift through air and sea to an ISB and then transloading to airdrop or other military aircraft for the final leg offers a higher probability that aircraft and other assets will be available to conduct the operation. From a GRF perspective, both direct access and staging are part of their concepts for access; they will need appropriate planning and practice to ensure they are available means for operations.

Assessing Lift and Airfield Considerations for Access Timing

As shown in Figure S.1, the scenarios and deployment concepts lead to force packages that in turn are used in modeling ISBs, the first part of which involves assessing lift and airfield considerations for access timing. The speed with which the 82nd will be able to deliver assets and personnel to a CL depends on the location and characteristics of the CL, the concept of operation (CONOP) used to access this location, lift availability, and characteristics of the airfields used for access. Timing calculations were presented in three portions: (1) travel time for gaining access to the ISB, (2) time spent at the ISB, and (3) mission timing for the final leg(s) from the ISB to the CL.

The study found that a typical GRF deployment of a single brigade may require about 25 C-17s for delivery of the alpha echelon and 65 C-17–equivalent sorties (with far fewer aircraft) to deliver the bravo echelon. Closure time is determined by initial warning and readiness, flight times, refueling and staging times at ISBs, and speed of the final delivery into the CL(s). Our analysis showed that with refueling locations that provide a MOG of at least three, refueling and even onload/offload operations for a fairly large alpha or bravo echelon could be completed in a couple of days. Timing issues are critical during the final leg of GRF delivery, from the final ISB to the CL. The analysis shows that efficient delivery of the bravo echelon is often possible with a relatively small number of C-17 aircraft—often even fewer than the 25 C-17s commonly required for alpha airdrop operations. After 25 C-17s deliver the alpha echelon onto a CL, a subset of these aircraft could be used to efficiently deliver follow-on forces over the course of the next few days. Since CLs usually have limited airfield capacity, the ability to land and unload aircraft at the CL generally becomes a limiting factor on closure time before the number of aircraft available does, especially when flight times are short. An implication of this finding is that the Army's portion of the GRF needs to plan the size (equipment and people) and timing of the bravo echelon under constraints related to airfield throughput/MOG, flight times, and aircraft availability.

Determining CL and ISB Selection

The ISB modeling itself (Figure S.1) classified ISBs hierarchically and then selected ISBs for use by the GRF. It captured both current planning documents and recent flight data to present a holistic picture of USAF operations, giving operational planners an evaluated set of locations in the five CCMDs. While it is hard to tell where the GRF will be called in the future, having the most staging options available will be instrumental in obtaining strategic surprise and in helping to enable mission success. Critical to this will be the use of primary ISBs, which are under U.S. military control and which provide the ability to use intra- to intertheater lift, fulfill command and control and reach-back capabilities, and provide logistics and sustainment functions. But access to primary ISBs is limited, with the majority in European Command (USEUCOM), Central Command (USCENTCOM), and Pacific Command (USPACOM), and only one ISB (Diego Garcia) located below the equator. Additional access will require the use of secondary and additional ISBs to fulfill GRF mission requirements throughout most of the world.

What Did We Learn from Applying the Approach to the Five CCMDs?

In applying the preceding approach, we derived findings relative to the five CCMDSs in terms of access, staging, and direct access, as well as some more general findings and conclusions.

CCMD-Related Findings and Recommendations

In all cases other than "direct, nonstop" access to small portions of Southern Command (USSOUTHCOM), some use of ISBs will be needed. The use of primary ISBs will certainly be desirable, as they have well-established capabilities and ample resources to support GRF operations in multiple places. However, some CCMDs do not have such well-established sites and will rely on more austere bases, which may not have the pedigree to warrant high confidence for future operations. Table S.1 summarizes what kind of coverage each CCMD might have with each access concept.

The table broadly illustrates a few things. First, direct access is largely limited to USSOUTHCOM, USEUCOM, and small portions of Africa Command (USAFRICOM). In each of those cases, ISBs are used for refueling, at least. Second, for staging, the primary ISBs provide very good coverage only in USEUCOM and USCENTCOM; the other geographic combat commands (GCCs) have to use secondary and additional bases to get close to complete access. Third, the table shows that USPACOM and USSOUTHCOM, in particular, have only three-fourths or less coverage, even if we use all the ISBs identified in this study.

The access strategies for each CCMD are a vision for how rapid access is accomplished, with appropriate constraints applied:

Table S.1
Coverage for Deployment Concepts

Access options	USSOUTHCOM (%)	USAFRICOM (%)	USEUCOM (%)	USCENTCOM (%)	USPACOM (%)
Direct, nonstop	44	0	0	0	0
Direct, off-site refueling	65	8	21	0	0
Direct, one-stop (airdrop)	83	36	83	0	0
Direct, one-stop (air land)	97	56	96	36	5
Direct, one-stop, off-site refueling (airdrop)	83	61	93	57	6
Staging, primary ISBs	8	23	86	98	21
Staging, primary and secondary ISBs	46	38	87	98	56
Staging using primary, secondary, and additional ISBs	63	81	92	99	76

NOTE: Staging shows percentage of CL double covered at 1,000 nautical miles. Direct shows single coverage.

- USAFRICOM: combinations of direct access and staging through Europe in the North, limited direct access through sites in USAFRICOM in the west, and staging at austere basing throughout
- USCENTCOM: limited direct access through developed basing in USEUCOM and staging at robust basing in both USEUCOM and USCENTCOM
- USPACOM: staging at both robust and austere bases
- USSOUTHCOM: direct access in the northern portions for airland and airdrop, direct, offsite refueling and staging for intermediate portions, and staging for airdrop at more austere bases farther south
- USEUCOM: mostly direct access from CONUS with robust options for staging.

Plans and Planning for GRF Operations Are Necessary

Rapid deployment of the airborne GRF and support forces requires effective Joint execution and synchronization of numerous complex multi-service functions and components, such as aircrew generation, assembly of enablers, out load, and ISB operations. To validate the airborne GRF's capability and assess potential risks to its timely deployment, Department of Defense (DoD) components should develop more explicit consideration of key GRF enabling functions and their associated requirements, such as host-nation coordination, staging of deployment support capabilities, and availability of personnel.

Joint Staff and CCMD should, in concert with the Joint GRF members, provide applicable plans for executing GRF operations in each area of operation. While these plans cannot cover the broad mandate for a GRF force, they should help ensure that key variables for access are deliberately considered in advance of possible operations.

Implementing this finding entails a series of recommendations detailed in the main document, such as having the Joint GRF community conduct habitual, collaborative planning to address the requirements for a broader range of missions than have historically been reviewed through the planning process (e.g., Weapons of Mass Destruction–Elimination [WMD-E], flexible deterrent options).

Exercises Should Begin with More-Developed CCMDs

Exercises that test key aspects of GRF employment and access should start with more-developed CCMDs like USEUCOM and USCENTCOM, with readily available and large ISBs, but can then expand to include more austere ISBs. By choosing exercises in one of the more well-developed commands (from an ISB standpoint), CCMDs will help to define key missing parameters for GRF employment, such as throughput for refueling operations, beddown of GRF elements in terms of staging, and possible sustainment and mission command requirements, among others. Eventual exercises might then move to different CCMDs to test other aspects of operations. Absent recent experience, these exercises should be both a training event and an input to defining key tactics, techniques, and procedures (TTPs) and doctrine.

Limited Site Preparation Should Ensue Pending Plans and Other Factors

Site preparation in USEUCOM and USCENTCOM is more about selecting ISBs for possible use and ensuring that the requirements provided by the Army in terms of sustainment and other factors, and requirements for how air operations would be run supplied by the Air Force, are agreed to among stakeholders. Austere bases in USAFRICOM, USPACOM, and USSOUTHCOM are foundational to GRF employment. Preparing ISBs in advance of possible operations will remain a challenge because of the changing nature of relationships and because of rather austere conditions present at some locations in terms of access to basic infrastructure, fuel, etc. The most austere of those locations will entail relationships and agreements to be worked out, and limited infrastructure built to ensure GRF operations, including runway improvements and sustainment capabilities.

The GRF capabilities are still seen, at times, as a replacement for assigned forces. Therefore, development of the more-austere basing in USPACOM to support GRF operations may be warranted, pending balancing of assigned and GRF force mission sets.

The key recommendation here is to work with the Defense Logistics Agency (DLA) to ensure that a minimum amount of fuel is on contract at top-tiered sites.

General Findings and Recommendations

A number of more-general findings and recommendations follow from the study analysis.

Beyond Its Use in Rapid Response Time Lines, the GRF Has a Role on Longer Time Lines

The scenario work illustrated cases where the 96-hour time line (for a full brigade) was appropriate to a deteriorating situation or with no strategic warning, and cases where the 82nd deployed in advance of actual operations, either as a flexible deterrent or because a strategic pause was exercised. The key recommendation here is that multiple concepts for access should be developed to get full use out of the GRF, and those concepts should be codified in doctrine, TTPs, and plans appropriately to enable additional force development.

Tailoring of Forces Is Necessary and of Great Value

Tactical planning ultimately drives force packages, and determining which capabilities to bring and what risk a force takes is both an art and a science. The division, corps, and echelons-above-corps enablers required for a GRF operation can vary significantly based on operational requirements and threats. The work done here illustrated the flexibility in defining force packages (including Joint enablers required) to meet mission needs, but more work in this area will help to define ultimate limits of just how small (or big) the GRF forces can be to get the job done.

Key recommendations here include (1) having GRF planners explicitly identify and routinely assess the factors that will influence the additional capabilities required and their method of employment, and (2) having the 82nd provide information and guidance that reflects current and evolving mission-specific conditions, concepts, and constraints for GRF employment.

Multiple Deployment Concepts Enable Global Operations

The GRF will use multiple deployment concepts to ensure access. From the standpoint of response time, the direct options will tend to be the fastest from wheels up but will suffer from not being able to reach deep into distant CCMDs. Staging provides for more early-leg options for aircraft but entails more built and mobile infrastructure at those ISBs and coordination along the way. Facilities, such as the Rota complex, which have the ability to receive, temporarily store, and transfer equipment and supplies among intertheater, intratheater lift, and maritime shipping are useful for employing the GRF. These sites, as multimodal transportation hubs, should be managed as key components of the GRF deployment network.

Key recommendations here include (1) carrying deployment concepts in service and Joint doctrine and plans and codifying them to further define requirements and gaps; (2) drafting a Multiservice Tactics, Techniques, and Procedures (MTTP) document to codify a shared vision of GRF deployments; (3) developing alternate methods for deploying all or elements of the GRF and supporting force, specific to each GCC and associated conditions; and (4) conducting a detailed assessment to identify the specific capabilities and capacities required to support GRF deployment.

GRF Deployment Functions Are Complex and Require Routine Validation

Rapid deployment of the airborne GRF and support forces requires effective Joint execution and synchronization of numerous complex multi-service functions and components—such as air crew generation, assembly of enablers, out load, and ISB operations—to validate the airborne GRF's capability and assess potential risks to its timely deployment.

The key recommendation here is for DoD components—Army, USAF, and Joint Staff—to define explicit requirements for key GRF-enabling functions, such as host-nation coordination, staging of deployment support capabilities, and availability of personnel.

Staging Opens More Options for the GRF

ISBs used as a more deliberate stop on the way to a CL are an integral part of how the GRF operates, providing a flexible delivery option for CCMDs to consider in using the GRF and in building forces up in advance of a conflict and allowing a larger and more abundant set of lift assets to be used to support missions. Thus, using general strategic lift through air and sea to an ISB and then transloading to airdrop or other military aircraft for the final leg offers a higher probability that aircraft and other assets will be available to conduct the operation. The key recommendation here is for the 82nd to maintain direct access capabilities in select CCMDs but ensure that staging plays a more prominent role in planning and in capabilities development in general for the GRF.

Demands on Aircraft Can Be Reasonable

Historically, several dozen to over 100 aircraft have been used for airborne operations for rapid deployments. Our work on C-17 availability showed that current estimates on alpha echelon aircraft demands seem reasonable given the total expected available. However, the tactical situation and determining what other demands are being placed on the C-17 fleet will certainly influence that calculus. Thus, it behooves the Army planners to remain realistic in force packages for various contingencies given constraints in airlift. The key recommendation here is for the Army to implement constraint-driven planning, build force packages and flow rates appropriately, and convey risks associated with those packages for decisionmakers; this includes working with USAF to define a shared vision of what the Army needs and the USAF would expect to provide so CCMDs requesting support are not surprised.

Follow-on Force Flows Need to Be Better Defined

The work on MOG, airlift, and timing showed how optimal movement from ISB to CL could result in a small number of airframes compared to the number of sorties. Better defining how forces will flow can help both the Army in operational and tactical planning and USAF in meeting expectations. The distinction between reinforcing entry (REF) and follow-on forces (FoF) creates different expectations over time lines for the arrival of different capabilities. During force package development exercises conducted with planners, some indicated preferences for capabilities to be included in REF that would clearly require significant reception, staging, onward movement, and integration (RSOI) activities (e.g., theater air defense artillery [ADA] assets) that in practice would likely be deferred to the FoF. The key recommendation here is for the Army to better define follow-on force flows with more attention to rate of closure and necessary capabilities to help the USAF and Joint planners meet those demands while minimizing demands on air assets.

Mustering Airdrop-Qualified Crews Does Not Seem to Be a Problem

Our discussions with Air Force planners seemed to indicate that gathering an appropriate number of airdrop-qualified crews for performing GRF-type missions is not a problem. During this study, the USAF checked this contention with a planning exercise that showed its ability to garner an appropriate number. However, a perception of this constraint still enters discussions of GRF planning and should be put to rest. The key recommendation here is for the Army and the USAF to develop a joint letter to do this.

There Is a Need for Plans, Planning, Exercises, and Site Preparation

The GRF's broad mandate is codified in an executive order from the Joint Chiefs of Staff, but plans for its use are largely resident in the services. The lack of well-established plans for using the GRF at the CCMDs means that the planning is not habitually performed and that many of the nuances of calling up the GRF are not the result of a shared vision of all stakeholders. This leads to some limitations in perceptions of GRF utility and confidence in employment. How these issues are resolved has to do with the importance of the GRF missions to a CCMD, balance of forces against assigned forces, and expectations for use.

The key recommendation here is for the appropriate stakeholders to exercise that knowledge by developing planning scenarios in support of the foundational orders setting up the GRF; planning conferences (virtual or other) to work out details of employment; and conducting exercises for key portions to ensure mechanisms work appropriately and readiness is known.

Realistic Exercises Are Key to Ensuring and Validating the GRF's Readiness

While some current exercises include deployment of airborne GRF components, these exercises rarely include a full and realistic force package (all enabler and support assets or expected threat and access conditions). For example, few exercises are conducted to assess planning factors for mass aircraft refueling and equipment cross-loading at ISBs. Historically, rapid deployment of the GRF has faced unanticipated challenges and operational "friction" that posed risks to mission success. The key recommendation here is for Joint airborne exercises to be designed explicitly to identify and assess implications of possible challenges and validate accepted planning assumptions. While composing the entire GRF deployment process could require extensive time and resources, DoD and the services can seek to design exercises that stress and assess each of the components separately.

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Abbreviations

A2/AD	anti-access/area denial
AAFIF	Automated Air Facility Information File
AB	air base
ABD	airborne division
ADA	air defense artillery
AFB	air force base
AFPAM	Air Force Pamphlet
AMC	Air Mobility Command
AMC/A8XPE	Air Mobility Command, A8XPE
AO	Area of Operations
AOR	Area of Responsibility
APS	Army Prepositioned Stocks
AVN	aviation
BCT	brigade combat team
BN TF	battalion task force
C2	command and control
C4ISR	command, control, communications, computers, intelligence, surveillance, and reconnaissance
CASF	Composite Air Strike Force
CBRN	chemical, biological, radiological, and nuclear
CBRNE	chemical, biological, radiological, nuclear, and enhanced conventional weapons
CF	conventional forces
CIA	Central Intelligence Agency
CL	contingency location
CCMD	combatant command

CONARC	Continental Army Command
CONOP	concept of operations
CONUS	continental United States
CRAF	Civilian Reserve Air Fleet
C-RAM	counter-rocket, artillery, and mortar
CRG	Contingency Response Group
CSG	carrier strike group
DLA	Defense Logistics Agency
DoD	Department of Defense
DTS	Defense Transportation System
DZs	drop zones
ER	extended range
FA BN	field artillery battalion
FA SECT	field artillery section
FIH	Flight Information Handbook
FoF	follow-on forces
GCCs	geographic combatant commands
GDSS	Global Decision Support System
GERS	Global En Route Strategy
GRF	Global Response Force
HADR	humanitarian assistance and disaster relief
HIMARS	High-Mobility Artillery Rocket System
IADs	integrated air defense systems
IBCT	infantry brigade combat team
IEF	initial entry forces
INF BN	infantry battalion
ISB	intermediate staging base
ISR	intelligence, surveillance, and reconnaissance
JCEO	Joint Concept for Entry Operations
JCS	Joint Chiefs of Staff
JFEO	Joint Forcible Entry Operations
JP	Joint Publication
LIMFACT	limiting factors
LIMS-EV	Logistics Installations Mission Support–Enterprise View

LMSR	Large, Medium-Speed Roll-on/Roll-off
MAF	Mobility Air Forces
MCAS	Marine Corps Air Station
MEDEVAC	medical evacuation
MHE	materials handling equipment
MOG	maximum on ground
MTOE	Modified Table of Organization and Equipment
MTTP	Multiservice Tactics, Techniques, and Procedures
NATO	North Atlantic Treaty Organization
NEO	noncombatant evacuation operations
NGA	National Geospatial-Intelligence Agency
OA	operating agency
OEF	Operation Enduring Freedom
OIF	Operation Iraqi Freedom
PAX	personnel
RDJTF	Rapid Deployment Joint Task Force
REF	reinforcing entry forces
REMAB	remote marshaling base
RSOI	reception, staging, onward movement, and integration
SAMs	surface-to-air missiles
SF	special forces
SOF	Special Operations Forces
SOFA	Status of Force Agreements
STRAC	Strategic Army Corps
TBA	Tri-Border Area
TF	task force
TRADOC (ARCIC)	Training and Doctrine Command (Army Capabilities Integration Center)
TTPs	tactics, techniques, and procedures
TWG	Threat Working Group
USAF	United States Air Force
USAFRICOM	U.S. Africa Command
USCENTCOM	U.S. Central Command
USEUCOM	U.S. European Command

USMC	United States Marine Corps
USPACOM	U.S. Pacific Command
USREDCOM	U.S. Readiness Command
USSOCOM	U.S. Special Operations Command
USSOUTHCOM	U.S. Southern Command
USSTRICOM	U.S. STRIKE Command
USTRANSCOM	U.S. Transportation Command
WMD	weapons of mass destruction
WMD-E	WMD elimination

CHAPTER ONE

Background

The 82nd Airborne Division (hereafter referred to as the 82nd) plays a significant strategic role as part of the Global Response Force (GRF). The mandate for the GRF is contained in a Joint Chiefs of Staff executive order that codifies generalized global missions for which the GRF needs to be prepared, forces that could be called upon as part of the GRF (from across the Joint community), and time lines for providing them. The time lines, among other factors, make the GRF an important national asset for rapid responses to unforeseen or, more specifically, unplanned operations.

The time lines also mean that appropriate planning mechanisms are needed to assure appropriate knowledge of the constraints and gaps. One part of ensuring the GRF works is having working concepts and a generalized and specific understanding of what global access means to the GRF's mandate. For rapid time lines, the GRF may not have the luxury of considerable advanced planning for access, and thus a strategic view of what access means is necessary.

From the standpoint of the 82nd, global access means it needs to define what potential or likely operations might look like. This includes having the soldiers trained and equipped for the specific missions, but also having a vision of how they will work with the United States Air Force (USAF) for lift and support and within the constraints and demands of specific combatant commands (CCMDs) and Joint Staff. A common understanding of GRF operations from a joint perspective is needed.

In 2013, RAND Arroyo Center was asked to consider access strategies from the standpoint of airlift constraints, intermediate staging bases, and the various concepts for how they might access each CCMD to help shed light on an important question: How is the GRF going to get where it needs to go? This core question is at the heart of this study's analysis and highlights a complex and multifaceted problem. The majority of the missions that the GRF will likely be tasked with are not within direct access range of either C-130s or C-17s, the two most dominant airlifters that the USAF possesses. Therefore, for the GRF to access most contingency locations (CLs), aircraft will stage for short and potentially long durations. Identifying these stopover points will require careful assessment and consideration of location, the ability to land and refuel, available space, and procurement of sustainment and lodging.

While large commercial airports would provide easy access and the most capability, this isn't a feasible solution in many parts of the world; some countries limit U.S. military aircraft access to their airspace, or do not allow them to land or conduct military operation on their soil. In addition, disrupting commercial traffic at large international airports in one country for operations in a second may not be feasible. Conversely, there are locations that the U.S. military typically won't travel to for health, safety, or political concerns. Therefore, when considering GRF accessibility, route planning and potential access points are incredibly important.

This study has therefore taken a nuanced approach—incorporating GRF requirements—to identify optimal locations to provide access to a host of mission sites. The analysis is based on a multitiered approach that utilizes USAF doctrine and historic precedent. Providing a realistic set of bases that the GRF could use is helpful to Army and USAF planners, as well as Joint and CCMD planners as they think about how they might use the GRF in the future. While there will always be unforeseen factors that influence nations' decisions to either grant (civil unrest, disaster assistance) or deny (military coup) access, highlighting the most likely points that could be used for basing will be more valuable than identifying every airfield capable of accommodating large military aircraft.

A Little History

A general-purpose force with the ability to quickly respond to contingencies has been a long-sought goal for American defense policymakers. For a short time after World War II, U.S. strategists believed that the doctrine of massive retaliation using nuclear weapons could serve as an economical and effective deterrent.[1] In the late 1950s, however, strategists moved away from that binary concept and attempted to design forces to address a "half war" contingency, separate from the one or two main conflicts (against the Soviet Union and, at times, China) that the United States was expected to fight.[2] At the same time, the Army began to develop service-level forces to meet that half war contingency. The Army devoted three divisions from Continental Army Command (CONARC) to a Strategic Army Corps (STRAC), which included the 82nd Airborne Division. The U.S. Air Force also dedicated air assets from its Tactical Air Command to form the Composite Air Strike Force (CASF).[3]

1 John Lewis Gaddis, "Implementing Flexible Response: Vietnam as a Test Case," in Robert J. Art and Kenneth Neal Waltz, eds., *The Use of Force: Military Power and International Politics*, 7th ed., Lanham, Md.: Rowman and Littlefield, 2009, pp. 235–260.

2 Alain C. Enthoven and K. V. Smith, *How Much Is Enough? Shaping the Defense Program, 1961–1969*, Santa Monica, Calif.: RAND Corporation, CB-403, 2005.

3 Robert P. Haffa, *The Half War: Planning U.S. Rapid Deployment Forces to Meet a Limited Contingency, 1960–1983*, Boulder, Colo.: Westview, 1984.

In 1961, U.S. STRIKE Command (USSTRICOM) was formed as a unified functional command that would put contingency response forces from the Army and Air Force under a single command structure.[4] USSTRICOM would not have any forces assigned to it but would serve as a headquarters for allocated forces during crises.[5] USSTRICOM was also responsible for conducting joint training and developing accompanying doctrine. Notably, though, the Navy and Marine Corps resisted the idea of unified contingency response and never devoted any identified significant assets to be allocated to USSTRICOM.

Although it was originally intended to have global responsibilities as a functional command, USSTRICOM eventually gained a geographic mission, focusing on the sub-Saharan Africa and Caribbean regions. These regions were seams between which existing geographic unified commands were not able to focus time and attention.[6] USSTRICOM essentially straddled the line between being a functional and geographic combatant command.

By 1969, though, the lack of participation by naval forces, problems in maintaining readiness, and shrinking budgets as the Vietnam War drew to a close spelled the end of USSTRICOM.[7] USSTRICOM's regional responsibilities devolved to European Command, and its functional responsibilities were given to the newly formed U.S. Readiness Command (USREDCOM).

In 1972, USSTRICOM was stripped of its regional focus and redesignated as U.S. Readiness Command (USREDCOM). USREDCOM's mission was limited to training continental United States (CONUS)-based contingency forces and conducting joint training and planning, which was a much more modest charge than USSTRICOM's global (and later regional) responsibilities. The services' commitment to USREDCOM did not change with the redesignation. The U.S. Army and Air Force continued to provide general purpose forces to USREDCOM, as they had with USSTRICOM. Although there were formal methods for the Joint Chiefs of Staff (JCS) to assign Navy and Marine Corps assets to USREDCOM, this was not expected.[8]

In the wake of the 1979 Iranian hostage crisis and the Soviet invasion of Afghanistan, however, defense policymakers reconsidered that modest mission and formed the Rapid Deployment Joint Task Force (RDJTF) in 1980 as a deployable contingency response force within USREDCOM. The RDJTF was intended to have a regional focus from the outset, unlike USSTRICOM. The RDJTF was never meant to have global responsibilities but would focus on the Middle East, with a secondary responsi-

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4 STRIKE stood for Swift Tactical Response in Every Known Environment. See "The Big Picture—United States Strike Command," WDTVLIVE42, uploaded August 12, 2011.

5 "The Big Picture," 2011.

6 "The Big Picture," 2011.

7 "The Big Picture," 2011.

8 "The Big Picture," 2011.

bility in Europe, if needed by the North Atlantic Treaty Organization (NATO). These two well-defined missions, as well as changing perspectives with Navy and Marine Corps leadership, resulted in greater participation in the new RDJTF. In addition to the three and one-third Army divisions earmarked for duty with the RDJTF, one and one-third Marine Corps divisions were also committed to the RDJTF, as was a carrier strike group (CSG) and sealift assets.

As instability in Southeast Asia grew, however, policymakers quickly realized that a more permanent and robust presence was needed in the region. The RDJTF quickly transitioned into a unified geographic command in the form of U.S. Central Command (USCENTCOM) by 1983. USREDCOM continued to pursue its original mission until the 1986 Goldwater-Nichols Act fundamentally altered the relationships between the services, combatant commands, and the Joint Chiefs of Staff in ways that made USREDCOM's mission less relevant and necessary. USREDCOM's personnel and assets were reflagged as U.S. Special Operations Command (USSOCOM) in 1987 as a result.

The Global Response Force

With the transition of RDJTF into USCENTCOM and USREDCOM into USSOCOM, defense policymakers refrained from new iterations of Joint contingency response forces for the next two decades, although the services continued to organize, train, and equip forces for contingency response missions on their own. It was not until the early 2000s that defense policymakers again took up the issue of Joint contingency response forces, this time in the form of the Global Response Force. The rationale was that the sustained focus to provide forces to USCENTCOM in support of Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF) came at the cost of ensuring that a pool of unallocated general-purpose forces remained as a strategic reserve.[9]

The GRF's mission—more modest than the RDJTF's—was in essence to serve as a strategic reserve of Joint forces that could be quickly allocated to a geographic combatant command in the event of an unforeseen contingency.[10] The services, however, retain the mandate to develop training to meet the assigned missions. The GRF, as an entity created through the Joint Chiefs, does not have specific resources to provide joint training or develop doctrine to integrate forces assigned to the GRF.

With the drawdown from Iraq complete and Afghanistan's nearing completion, contingency response has received increased attention from the services, particularly the Army and Marine Corps. The United States is entering a strategic period similar to the 1990s, in which there are few adversaries or clearly defined threats to organize mili-

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9 In-person interview with Joint Staff J35 GRF action officer on March 4, 2014, regarding GRF policies and procedures.

10 RAND Corporation, "Joint Staff J31 GRF," briefing slides, Santa Monica, Calif., March 5, 2014.

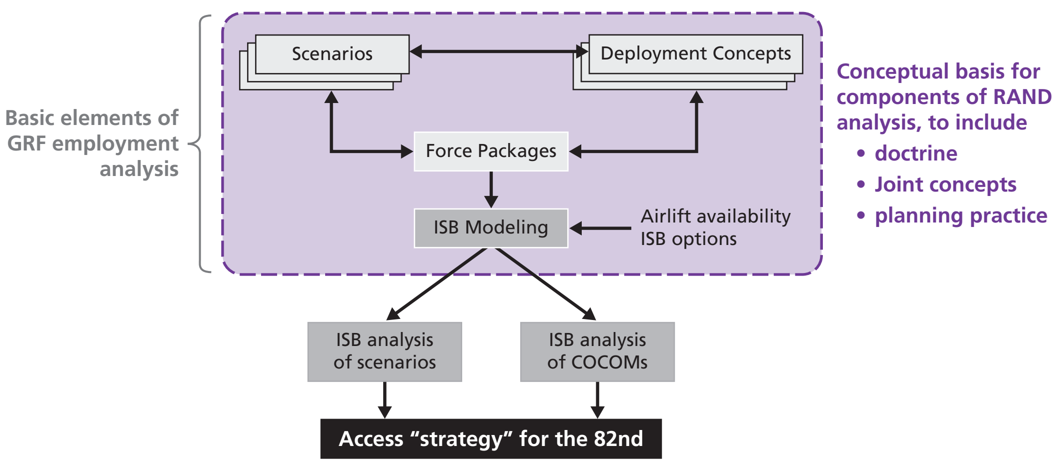
tary forces against, but where the possibility of needing to deploy to address smaller contingencies remains high. U.S. STRIKE Command, Readiness Command, and the RDJTF were able to have regional foci because the majority of U.S. forces were organized to face the Soviet threat in Europe. The last decade of war has been a period of intense focus and activity, particularly to the Army, with large numbers of forces regularly allocated to USCENTCOM. The presence of a clear adversary or strategic goal meant that contingency response forces could divert attention away from large swaths of areas (and their geopolitical struggles) toward which they had previously devoted time, resources, and attention.

The current period of ill-defined threats forces the Global Response Force (and other contingency response forces) to consider a wider range of scenarios and threats. With the exception of U.S. Pacific Command (USPACOM), there are few Army forces assigned to the geographic combatant commands (GCCs). There is also less certainty about the allocation and apportionment to any GCC. This means that the GRF may become a very attractive option for a wider group of CCMDs.

About This Study

This analysis first identifies appropriate missions and scenarios to assess the operational ability of the GRF to access and effectively operate in different regions. This entails a deep look at possible lodgments and intermediate staging bases (ISBs) associated with various missions and how those relate to overarching accessibility parameters (Figure 1.1). In addition, the GRF necessitates the Air Force provide considerable capabilities for Joint mission success, and this study will determine what USAF capability and

Figure 1.1
Elements of the RAND Study



RAND *RR1161-1.1*

capacity might be used to meet its overarching accessibility needs. This study will help the 82nd to better understand expected demands on the Air Force and the Air Force's abilities to meet those demands under various missions and scenarios.

Limitations of This Study

This study is about setting broad visions for access and therefore is not detailed, tactical planning. We make certain simplifications, including distances aircraft can travel, time lines involved, and others. We don't model details of where each element of GRF is for classification reasons. We use simplifying assumptions of locations at Fort Bragg. We use fuel and access concepts that change over time. We calculate distances for aircraft using USAF pamphlets and our own analysis. We provide coverage estimates of CCMDs without judging national or strategic interests in countries or regions within that CCMD but rather ones illustrative of how the GRF could access and be employed in each GCC. The GRF mandate is rather agnostic to specific threats, and therefore this operational-level analysis should be so as well.

CHAPTER TWO

Scenarios and Force Packages

Scenarios

For this analysis, a variety of plausible, illustrative scenarios was developed. Important aspects of the scenarios were varied, including (1) the mission, (2) the type and size of the threat, (3) terrain, (4) the distance from Fort Bragg to the objective, (5) whether an ISB is available, and (6) the size of the U.S. force (i.e., a complete GRF brigade, or a smaller battalion task force). By varying these factors, different issues can be explored and important insights provided. It should be noted that the seven scenarios (with a total of 12 vignettes) included in this analysis certainly do not include all the possible situations where the GRF could be employed. Rather, these scenarios are intended to be illustrative of the range of missions the 82nd could perform.

A number of assumptions were made in the vignettes, particularly regarding the availability of Joint enablers. For example, it was assumed that in all cases the Air Force would have sufficient C-17 or other transports available to fly the GRF to its objectives. Similarly, in those vignettes where an ISB was utilized, it was assumed that the Air Force would be able to assemble appropriate assets at the ISB in a timely manner to support GRF operations from that location.

Another important joint assumption was that some combination of Navy and Air Force assets would be able to suppress enemy air defenses to the point where airborne operations are feasible. Conducting a detailed assessment of what level of suppression is required in order for an airborne operation to be a viable option is beyond the scope of this study. That said, readers will see that each scenario includes a short discussion of the most important threats that would be encountered, and in some of the scenarios there would be a clear need to suppress enemy air defenses prior to an airborne operation taking place. Other recent RAND analysis conducted for XVIII Airborne Corps provides information on the threats that could be encountered. Suffice to note here that the Air Force and Navy generally devote much more effort and attention to locating and suppressing the radar-guided, long-range, medium-to-high–altitude surface-to-air missile threat (e.g., the Russian S-300/400 series surface-to-air missiles (SAMs) compared to nonemitting low-altitude, short-range antiaircraft guns and shoulder-fired missiles.

For each scenario, RAND developed illustrative *force packages*, essentially the list of units to perform that mission. As mentioned above, there was a desire to examine various GRF sizes, ranging from a large battalion task force (TF) to a reinforced airborne infantry brigade combat team (IBCT). Together, the scenarios and vignettes provide a set of 12 unique combinations of the following aspects:

- **employment concept:** organization/mission command of forces employed
- **deployment scale:** echelon of mission command for forces
- **tailored modifications:** specific capabilities added to or omitted from a force package based on mission-specific needs and/or constraints
- **fires concept:** primary capability or capabilities for fire support to the force package
- **total personnel:** total personnel in depicted force package based on the employment concept and tailored modifications
- **enabler support:** portion of the overall force package dedicated to enablers (rather than combat personnel).

Important aspects of the scenarios were varied, including (1) the mission; (2) the type and size of the threat; (3) terrain; (4) the distance from Fort Bragg to the objective; (5) sufficiency, proximity, and accessibility of ISBs (e.g., diplomatic constraints on access); and (6) the size and composition of the U.S. force (e.g., brigade or battalion task force, light infantry, or motorized forces). By varying these factors, different issues can be explored and important insights highlighted. These RAND scenarios capture specific contextual factors that can heavily influence the conditions, resources, and time required for GRF employment. The RAND scenarios primarily focus on the execution of

- **forcible entry:** seizing and holding of a military lodgment in the face of armed opposition.[1]
- **noncombatant evacuation operations (NEO):** operations directed by the Department of State or other appropriate authority, in conjunction with the Department of Defense, whereby noncombatants are evacuated from foreign countries when their lives are endangered by war, civil unrest, or natural disaster to safe havens as designated by the Department of State.[2]
- **raid/direct action:** short-duration strikes and other small-scale offensive actions conducted as a special operation in hostile, denied, or diplomatically sensitive

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[1] U.S. Joint Chiefs of Staff, *Joint Forcible Entry Operations*, Joint Publication 3-18, Washington, D.C., 2012.

[2] U.S. Joint Chiefs of Staff, *Noncombatant Evacuation Operations*, Joint Publication 3-68, Washington, D.C., 2007.

environments and which employ specialized military capabilities to seize, destroy, capture, exploit, recover, or damage designated targets.[3]

Other missions addressed include WMD elimination (WMD-E), deterrence, and humanitarian assistance and disaster relief (HADR).

It should be noted that the scenarios included in this analysis do not include all the possible situations where the GRF could be employed. Rather, these scenarios are intended to illustrate the range of missions the 82nd could perform, in keeping with DoD's general employment of scenario-based analysis.[4] These scenarios were useful in examining concepts for access and highlighting some of the constraints put on ISB use and other factors. The scenarios will also be useful outside this analysis for understanding roles and missions for the GRF in general. The RAND scenarios include the mission profiles in Table 2.1.

Insights that emerged from the scenario development:

- The range of missions, threats, and terrain types where the GRF could be employed requires the ability to quickly tailor force packages.
- Enhancing capabilities, perhaps by pulling units from outside the 82nd Airborne Division (ABD) that are still part of the broader GRF definition, is critical to some missions but can greatly increase the airlift requirement for both deployment and sustainment.
- Though C-17s can access virtually anywhere in the world, employing C-130s from ISBs to the objective can reduce the strain on this strategic asset.
- Exploiting strategic warning to forward deploy joint assets that require greater predeployment time lines, or naval transport, can greatly increase the capabilities available to the Joint task force. However, depending on strategic warning, early deployment exposes plans to both intelligence and political risk.
- Expanding the range of missions and conditions under which the 82nd can be most effectively employed will, in some important cases, require the integration of joint assets (e.g., counter–rocket, artillery, and mortar [C-RAM], ISR, fire support, and medical evacuation [MEDEVAC] capabilities).
- The Joint GRF community should conduct collaborative planning to address the requirements for a broader range of missions than have historically been reviewed through the planning process (e.g., WMD-E, flexible deterrent options).

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3 U.S. Joint Chiefs of Staff, *Special Operations*, Joint Publication 3-05, Washington, D.C., July 16, 2014.

4 U.S. Department of Defense, DoD Directive 8260.05, *Support for Strategic Analysis (SSA)*, 2011. This policy defines a scenario as "an account or synopsis of a projected course of action or events, with a focus on the strategic level of warfare. Scenarios include information such as threat and friendly politico-military contexts and backgrounds, assumptions, constraints, limitations, strategic objectives, and other planning considerations. A scenario is intended to represent a plausible challenge and may not reflect the most likely events."

Table 2.1
Scenario and Force Package Summary

Scenario	Mission	Employment Concept	Scale	Tailored Modifications	Fires Concept
Nigeria 1	Opposed NEO	2 BN TFs Separate DZs	INF BN (2x)	Omit artillery	MTRs
Nigeria 2		2 BN TFs Separate DZs	IBCT	Reduce artillery	FA SECT (x2) (mix) Joint fires
Nigeria 3		2 BN TFs Separate DZs	IBCT(-)	Reduce artillery; add AVN	FA SECT (x2) (105mm) Joint fires
Nigeria 4		Unified BN TF	INF BN	Reduce artillery; add AVN	FA SECT (105mm) Joint fires
Korea	WMD	Distributed BN/ CO TMs	IBCT(-)	Add C2, CRTs	FA BTRY (155mm)
Philippines	Defense	Distributed BN/ CO TMs	IBCT	Add C2	FA BN
Thailand	Distributed NEO	Unified BN TF	INF BN	Reduce artillery; add AVN	FA SECT (105mm) Joint fires
Iran 1	JFEO	Unified BCT	IBCT	Minor	FA BN HIMARS Joint fires
Iran 2		Unified BCT	IBCT	Add Avenger	FA BN HIMARS Joint fires
Sudan	CT	Unified BN TF	INF BN(+)	Add mobility and Stryker	FA BTRY (mix) Joint fires
Colombia 1	FDO	Unified BN TF	INF BN	Reduce artillery; add AVN	FA SECT (105mm) Joint fires
Colombia 2	HADR	Unified BN TF	INF BN	Omit artillery and AT	MTRs

SOURCE: RAND analysis.

NOTES: AVN = aviation; BN = battalion; BTRY = battery; CO TMs = company teams; CRTs = combat repair teams; FA SECT = field artillery section; FDO = flexible deterrent option; INF = infantry; MTRs = mortars.

The data associated with the scenarios, including the number of aircraft required, the illustrative force packages, and the time required to deploy the leading elements of the GRF to the various locations in this study, should provide planners useful information on the types of future missions that U.S. Army airborne units could be called upon to perform. While the scenarios are not necessarily predictive of specific future missions, they do highlight the types of operations that the Army portion of the GRF could perform. Some key insights that emerged from the scenario development:

In addition to being used on rapid time lines, the 82nd has a role on longer time lines. The scenarios illustrated examples of both rapid deployments and more deliberate deployments. In a few scenarios, the 96-hour time line (which we assume includes other time lines for smaller units) was appropriate for a deteriorating situation or one with no strategic warning, thus relying on the high state of readiness of the 82nd Airborne Division's ready brigade. In other scenarios, the 82nd deployed well in advance of actual operations, either as a flexible deterrent or because a strategic pause was exercised. This opened some options for different strategic lift (CRAF [Civilian Reserve Air Fleet] or even sealift) to deploy the GRF to an ISB close to a contingency, at the cost of having to support that early entry force for some time at that ISB.

The range of missions, threats, and terrain types where the GRF could be employed requires the ability to quickly tailor force packages. The seven scenarios used in this analysis included a significant range of situations. The level of threat, the availability of ISBs (or not), the mission, and the type of terrain encountered means that the GRF must have the ability to quickly tailor an appropriate force package, including in less-than-brigade strength. It was noted that in some vignettes there was no need to deploy heavy weapons such as field artillery or antiarmor weapons. In those situations, the total amount of airlift needed to deploy the Army force could be reduced, or the aircraft not needed to deploy heavy weapons could be repurposed for delivery of other capabilities.

Using nonorganic capabilities in support of the 82nd ABD is critical to some missions but greatly enhances the airlift requirement for both deployment and sustainment. The desire to increase the level of capability available at the tactical level (e.g., armor, MEDEVAC helicopters) consistently increased the number of airlifters required. More robust capability requirements increased the demand for airlift assets, directly through the need to deploy the capability, but also indirectly through the increased sustainment requirements for the force. Due to its size and associated support requirements, the size and composition of the aviation task force most dramatically impacts the overall airlift requirement associated with an airborne GRF task force. Balancing these competing logics will be a key challenge for planners. For nonairlift missions (e.g., the GRF being employed through CRAF, sealift, using prepositioned stocks), this burden becomes less of an issue.

Local ISBs enable operations with C-130s. While refueling C-17s can access essentially anywhere in the world, given the relatively modest number of C-17s and their crucial role in the deployment planning for many contingencies, the ability to deploy by C-130 from an ISB appears very attractive and could reduce the number of C-17s required. However, time will be required to move C-130s from within the CCMD or elsewhere, as will at least minimal logistics and maintenance support to regional ISBs.

Joint GRF Employment

The GRF brigade will likely be reinforced by units not organic to the Airborne IBCT and from outside the 82nd Airborne Division for most possible future operations. In scenarios that include a rocket or missile threat to regional ISBs, or to arrival airfields in the objective area that were just seized by the leading assault echelon, the GRF will need to be reinforced with a C-RAM capability. In some scenarios, the GRF may need to be reinforced by armored vehicles, vehicles not organic to today's 82nd Airborne Division. In some cases, it was determined that helicopters were needed in the objective area soon after arrival of the leading elements to provide troop mobility, assault fires, and rapid MEDEVAC capabilities. These are important factors for GRF planners to consider and plan for in real-world missions about to occur.

Assumptions were made regarding the availability of joint enablers. In all scenarios, the GRF was dependent on the Air Force for transport. In the scenarios that include combat operations, the GRF would benefit greatly from USAF and/or Navy intelligence, surveillance, and reconnaissance (ISR) and fires. Additionally, for an airborne assault to be feasible at all, enemy air defenses would have to be sufficiently suppressed. These joint issues are highlighted in the scenarios, but the details of how joint support would be provided are not included in this analysis; nonetheless, Army GRF planners should consider these.

Method for Generating Tailored Force Packages

Generating force packages for possible contingencies is a highly uncertain business. Tactical (e.g., very specific) planning for which units, which equipment, and on what time lines those things need to be delivered to accomplish a mission are highly sensitive to the conditions on the ground and various planning assumptions throughout the process. Typically, tactical planning can take considerable time and should be updated continuously as intelligence comes in. Small changes in the threat, for instance, can have very radical changes in what is brought to a fight.

We view our scenarios and force packages more broadly. We do not generate these packages as a tactical solution to a specific problem, which we will defend against criticism. Rather, we generated these as plausible, representative force packages that span the types of operations the 82nd Airborne might be called upon to join and thus test important parameters for access.

The packages are highly tailored in that we start with the initial set of equipment and people a unit is designed to have (the Modified Table of Organization and Equipment, or MTOE) and add and subtract subunits, equipment, and people throughout the planning process. MTOEs are treated as a baseline from which units adjust to best prepare for the particularities of the mission.

We used multiple sources to generate these representative force packages. We used the literature on Joint GRF force package options, deployment potential, and historical employment. This included an investigation of rapid entry employment concepts and force packages from other U.S. forces (e.g., 75th Ranger Regiment, 173rd and 4/25 Infantry, USMC Marine Expeditionary Unit) as well as foreign forces (French, British, and Russian airborne). We used past planning documents that contained 82nd ABD force packages, including work currently being done in the 82nd and operational concept documents from Training and Doctrine Command (Army Capabilities Integration Center) (TRADOC [ARCIC]) and the XVIII Airborne Corps. We also collected prioritized vehicle lists from the Brigades. These are lists that include the major pieces of equipment (vehicles, for example) that would be loaded and brought to a specific contingency.

Using these materials, we conducted an internal RAND workshop, incorporating staff expertise in airborne operations, operations research, landpower strategy, and logistical support. This group included former members of the 82nd Airborne and 75th Ranger Regiment, as well as several of Arroyo's active-duty Army fellows. This workshop investigated each scenario and vignette with regard to the mission, threat, geography, deployment options, time line, and readiness shaping the available force package options. Within each scenario and vignette, we discussed the extent and character of the warfighting function requirement, and what 82nd and Joint GRF elements could fulfill this requirement. This included a discussion of alternative operational concepts (e.g., multiple drop zones (DZs) versus consolidated; land or air movement within theater; the 82nd as a supporting or supported element) as well as different deployment concepts of operations (CONOPs) (straight from CONUS; employing ISBs; basing rotary wing assets at ISBs or on the objective).

We conducted two staff discussions with the 82nd, looking at the merits of each force package and CONOP as a means of answering the scenario and mission. This included meetings at the battalion, brigade, and division levels, as well as specialized discussions with 82nd aviation; loadmaster; logistics; chemical, biological, radiological, nuclear, and enhanced conventional weapon (CBRNE); and cavalry squadron leaders and planners. The culmination of this collaboration was a meeting with Division G-5 where we presented the force packages to a group of 82nd officers and solicited input. This resulted in several additions.

There is a natural tendency to second-guess a given force package for being too large, or too small, too heavy, or too light. Military judgment typically rules the day, and that day is governed by the information on hand. However, the sequential, iterative process we used to develop these packages gives us a launching point for the analysis and provides fodder for future planning.

Constraints-Driven Planning

Airlift constraints help establish reasonable expectations regarding how many people, how much equipment, and on what time lines a force package can be delivered for a given contingency. Dialogues between the Army and Air Force on how much lift is necessary for a contingency versus how much lift is available have historically led to perceptions that some 82nd Division GRF concepts would be unexecutable in practice. Theater requirements for C-17s are very high during the early phases of a conflict. However, continued discussions have helped the 82nd develop a clearer understanding of what's feasible under what conditions, helping it to focus planning efforts on constructing realistic force packages.

Force Package Risk

The highly tailored packages thus have an inherent risk associated with them. Having no constraints on lift, or time, or access to equipment, planning should naturally gravitate to the low-risk force package—that package able to overcome foreseeable challenges to accomplish the mission. As more constraints are placed on the planners, the force packages can be updated to take on more operational risk yet still remain viable options for leaders considering employment of expeditionary forces like the GRF.

To develop a well-integrated assessment of risk, planners and commanders will have to balance broader theater requirements (e.g., in support of establishing early air dominance) and the mission requirements for the ground component of the GRF. Planners from the 82nd can help the Joint task force commander assess risk and make informed decisions by specifying low- and high-risk force packages during "course of action" development. The "high-risk" force package would be stripped down to the bare requirements of the mission, while the "low-risk" force package might hedge against risk in a variety of ways by increasing the capabilities available to the ground component of the GRF. Intermediate options could be developed to reflect the commander's preferences.

To help the commander understand the nature of the risk under consideration, risk could be decomposed into elements that the commander considers important (e.g., mission accomplishment, force protection, time), and assumptions that the risk assessment depends on specified (e.g., threat air defense capabilities, threat quick-reaction force time lines, ISB maximum on ground [MOG]).

Massing Force Versus Just-in-Time Delivery

Time lines are very important for force package delivery. The initial echelon of the force package ("alpha echelon," or "initial entry forces" [IEF]), particularly when airdropped, tends to be massed in time and space to deliver the maximum amount of capability to the objective. The subsequent echelon ("bravo," or "reinforcing entry forces" [REF]) is airlanded, and though chiefly focused on augmenting combat power, it also includes immediate sustainment requirements. "Follow-on forces" (FoF, also called "Charlie" echelon) enable a sustained campaign beyond the immediate seizure of a lodgment but typically require more intensive reception, staging, onward movement, and integration (RSOI) activities. Follow-on forces fall outside the scope of our analysis.

The IEF tends to be a reasonably well-defined set of capabilities focused on securing the initial lodgment during forcible entry operations. Capabilities for a broader set of missions tend to fall within the REF (where FoF are not required). The REF echelon varies much more than IEF in composition and size for different missions. The required time line for the arrival of REF-associated capabilities can vary just as much as the capabilities themselves. Some sustainment elements of the REF may not be required for more than a day, depending on the intensity and tempo of operations. At other times, nontraditional capabilities like C-RAM may have to arrive with the IEF at the ISB, to secure it from threat extended-range indirect fire assets.

Exploring the time lines for the delivery of different capabilities can have a dramatic impact on the feasibility of a given concept of operations from an airlift constraint perspective. Though a given force package will require a fixed amount of airlift to move it, the timing of when those capabilities need to be delivered to the objective can greatly reduce the number of airframes required (e.g., ten C-17s conducting one sortie versus one C-17 conducting ten sorties).

Range of Force Packages

Tables 2.2 and 2.3 specify the number of airlift sorties required for the high-risk force package for the Colombia 1 vignette discussed earlier. The Iran forcible entry operation vignettes employ much larger force packages (including armor) for much-higher-end threats. The Sudan scenario constitutes an in-between force package, where the GRF is providing support to a direct action mission targeting terrorist cells.

The C-17 sortie estimates here are based on tailored mission packages built from the unit's authorized levels (i.e., MTOE), to the more specific needs of a particular mission. In some cases, this can be done because the demands of the mission are less than the demands of the mission the unit was designed to address. In other cases, this may be done by accepting additional operational risk, in order to preserve additional lift capacity for higher-priority capabilities needed in theater.

Conclusions

Force packages will drive how the 82nd operates across missions but will also govern aspects of how and how quickly they will be able to reach a given mission. The Army will need to define minimal force packages under different conditions, given constraints in aircraft, MOG, and other items, to help CCMDs and Joint Staff to plan for potential GRF use. These packages are already under development within the 82nd staff. Determining and describing how those force packages trade risk for speed should be part of those descriptions.

The Army also needs to define the minimal footprints and infrastructure for staging in order to inform planning purposes, and for conveying to CCMDs the requirements for using rapid response forces with intermediate staging.

Table 2.2
C-17 Sortie Equivalents by Scenario

Scenario	A-PAX	A-Heavy	A-Supply	A Total	B-PAX	B-Heavy	B-Supply	B Total
Colombia 1 (airland)	6	10	2	18	0	15	7	22
Colombia 2 (airland)	6	5	2	13	0	12	7	19
Iran 1	16	9	2	27	0	85	20	105
Iran 2	16	9	2	27	0	87	20	107
Korea	9	3	9	21	16	20	0	36
Nigeria 1	15	5	2	22	0	22	7	29
Nigeria 2	15	5	3	23	0	39	13	52
Nigeria 3	15	5	3	23	0	32	13	45
Nigeria 4	10	5	2	17	0	16	7	23
Philippines (airland)	10	9	2	21	0	85	20	105
Sudan	10	6	2	18	0	29	13	42
Thailand (airland)	6	5	2	13	0	16	7	23

Table 2.3
C-17 Sortie Equivalents by Scenario—82nd Only

Scenario	A-PAX	A-Heavy	A-Light	A-Supply	A Total	B-PAX	B-Heavy	B-Light	B-Supply	B Total
Colombia 1 (airland)	0.2	3.4	4.1	0.0	8	0.0	5.1	7.5	0.3	13.0
Columbia 2 (airland)	0.0	9.8	5.2	0.0	16	0.0	4.7	6.8	0.3	12.0
Iran 1	27.6	11.3	13.1	0.0	52	0.0	24.9	24.8	0.3	50.0
Iran 2	27.6	11.3	13.1	0.0	52	0.0	24.0	24.8	0.3	50.0
Korea	28.6	9.3	13.1	0.0	52	0.0	28.6	25.0	0.4	54.0
Nigeria 1	23.2	9.7	11.4	0.0	45	0.0	39.7	23.6	0.7	64.0
Nigeria 2	27.2	11.3	13.1	0.0	52	0.0	46.7	27.3	0.9	75.0
Nigeria 3	27.4	11.3	13.1	0.0	52	0.0	46.1	27.3	0.9	75.0
Nigeria 4	5.3	5.3	3.6	0.0	15	0.0	16.2	5.2	0.3	22.0
Philippines (airland)	13.0	11.3	13.1	0.0	38	0.0	33.0	24.5	0.1	58.0
Sudan	7.6	9.9	6.4	0.0	24	0.0	29.1	13.9	1.0	45.0
Thailand (airland)	0.0	5.3	3.6	0.0	9	0.0	16.2	5.2	0.3	22.0

CHAPTER THREE

Deployment Concepts

Although there is a strong tendency to think of airborne operations in terms of deploying directly from home station at Fort Bragg to the airdrop or airland location, historically speaking, alternative approaches have been more common and are likely to be on the table for future contingencies. There are two basic deployment concepts that we discuss in detail below, using past examples. These are *direct access*, meaning a direct mission from CONUS to the CL,[1] either with one or no stops along the way, and *staging* by means of an ISB. Each has slight variants, which will be explained in sequence.

Staging represents the most common type of mission. A few historical examples below illustrate how staging was used when contingencies were not so urgent as to require scrambling units to the CL as fast as possible. Moreover, given adequate time, staging translates into flexibility with regard to all aspects of the mission. Staging creates options and can place fewer demands on planners, not to mention the Air Force, which is responsible for providing and organizing the required lift. However, staging may also introduce additional support requirements.

Aerial Refueling and Hopping Across the Globe

Throughout the rest of this report, we will detail both direct access metrics and staging metrics. There are a few other access concepts, which we will decline to cover in detail. First, we will not go into detail on aerial refueling coverage. The fleet of C-17s is capable of aerial refueling to extend its range to almost anywhere on the planet. This is done through a fleet of tankers that perform that duty regularly for other Air Force assets. The GRF could ostensibly reach any point on the globe given enough support from those tankers. The trade-offs on how many tankers it would take and what those tankers might be doing otherwise during a contingency is beyond the scope of this analysis. However, we acknowledge that aerial refueling over large distances is a deployment concept available for employing the GRF.

[1] Contingency location is the official DoD terminology for the drop zone or airport that is the final destination of the airborne mission.

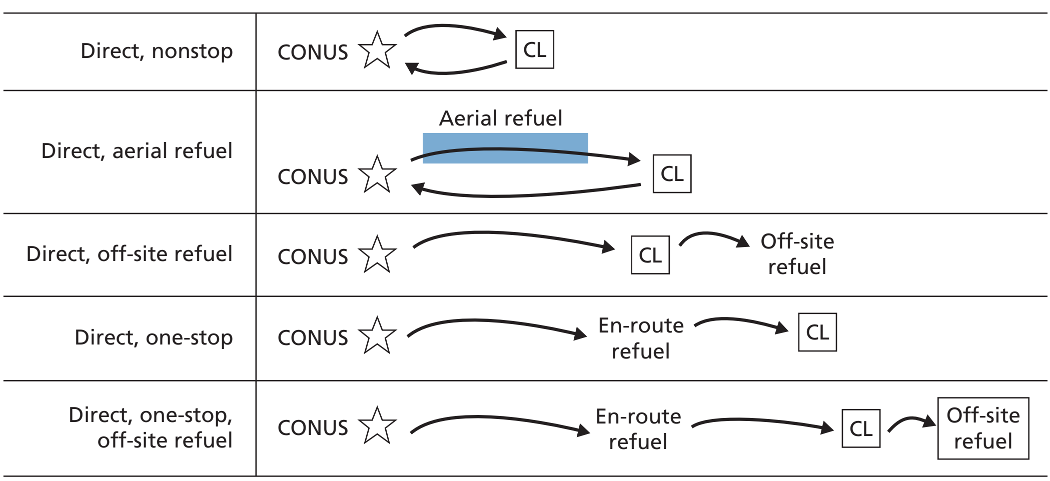
Secondly, we will limit discussions of direct access to one stop on the way to a CL. It is not uncommon to imagine making multiple stops across the globe to refuel, swap crews, and replan. The Air Force's en-route strategy is purposely set up to enable such operations, and indeed long-legged aircraft routinely hop around the globe performing their missions. We stipulate that the GRF could access almost any place on the globe by hopping from one ISB to another until reaching one suitably close to perform its duty, but we do not analyze this.

Direct Access

Direct access from CONUS to a CL is a fundamental capability for the 82nd Airborne and represents the quickest means to deliver significant ground combat forces to much of the globe on short notice. The chief advantage of direct access is speed. For this reason, actual examples are rare, as it turns out that contingencies necessitating such haste are rare. They tend to bespeak policymakers' sense of urgency rather than actual strategic surprise. Moreover, until the advent of the C-141, direct access was impractical outside the Caribbean and Central America, and nearly all airborne missions were conducted within theater.

Direct access can take a few different forms, as illustrated in Figure 3.1. The first and simplest is direct, nonstop. CONUS-based forces would get into aircraft and fly directly to the CL without landing or aerial refueling. Aerial refueling is shown next, where forces are loaded into planes, and tankers pull those aircraft longer distances to the CL. The third entails increasing the first leg of the journey from CONUS, and

Figure 3.1
Five Archetypal Variants of Direct Access



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then, shortly after airdrop or airlanding at the CL, the aircraft find an alternative airfield at which to refuel. Fourth, forces leave from CONUS, performing a short stop en route to fuel and perhaps perform some minimal planning before they continue to the CL and then return to the en-route refueling point. In this variant, we assume the refueling time is minimal compared to examples following, where units have officially staged at those bases. Lastly, we include direct access with one stop, but with an off-site refuel near to the CL. This allows for maximizing the first and second legs of the aircraft subject to finding a near-by refueling point to the CL different from the en-route refueling point (as shown in the figure).

These variants are archetypes, and, indeed, history has examples of each. The variants of direct access can be mixed and matched for a given contingency, and the deployment concept may be decided as the situation unfolds based on aircraft availability, timing, and other factors. We constrain direct access to no more than one stop on the way to the CL. With a maximum distance of a few thousand miles for long-legged aircraft, two flights would easily max out the time soldiers can spend on a plane and still be mission capable upon arrival at the CL. With more than one stop along the way, or with considerable aerial refueling, the soldiers performing the mission would have to recover and replan prior to engaging in an operation. Thus, those deployment concepts begin to look more like staging than direct access, so we cover those cases in the discussions on staging.

Historical Examples

Below, we illustrate direct access with three U.S. examples of direct nonstop missions: Operations Power Pack 1 and 2 (Dominican Republic, 1965), Operation Just Cause (Panama, 1989), and Operation Desert Shield (Saudi Arabia, 1990).

Power Pack 1 came as a result of a burgeoning political crisis in the Dominican Republic. Policymakers had planned to send the entire 82nd, but at the last minute a force only a quarter of the size was in fact sent.[2] The Air Force at Pope scrambled to gather together sufficient numbers of aircraft and crews, revise parking plans, etc., and the congestion at Pope impeded the refueling, loading, and launching of aircraft.[3] Still, within 18 hours, USAF managed to put 1,754 paratroopers and their equipment and supplies aboard 144 C-130s for the first phase, Power Pack 1.

Another striking thing about Power Pack 1 was that it was not supposed to be a direct access mission. On the contrary, the plan called for airdropping on Ramey AFB in Puerto Rico, and then using Ramey as an ISB to stage an invasion of the Dominican Republic. It is not clear why the plan was to airdrop on Ramey rather than simply land and disembark. Midflight, the Embassy informed the military that friendly forces

[2] A. Timothy Warnock, ed., *Short of War: Major USAF Contingency Operations*, Air Force History and Museums Program, 2000, p. 65.

[3] Warnock, 2000, p. 65.

controlled San Isidro Airport just east of Santo Domingo, so the planes changed their route and landed there instead.[4] Seventy-nine C-130s made up the first wave; unloading the equipment took longer than planned because the equipment had been packed for airdropping, and because there was little in the way of cargo-handling equipment and ground crews. Cargo clogged taxiways and impeded landing operations, forcing 65 C-130s to divert to Ramey to refuel and rerig. Finally, five and a half hours later, San Isidro began receiving groups of nine aircraft arriving at 15-minute intervals. Eighteen hours after the first elements arrived, an Aerial Port Detachment and a Consolidated Airlift Support Unit with equipment and people to handle cargo and passenger loading and unloading arrived.[5] Meanwhile, there were so many planes returning to Pope that Pope was overwhelmed, causing lengthy delays to turn-around times and forcing USAF to divert aircraft to Charleston AFB for maintenance prior to flying to Pope for loading.

Power Pack 2 was a follow-on mission conducted the next day, involving 2,000 troopers and the aircraft assigned to Power Pack 1, as they became available. The delays to Power Pack 1 having to do with congestion at Pope and San Isidro and the rigging had cascading effects on Power Pack 2.

Operation Just Cause involved just over 2,000 troopers, who jumped onto two airfields after Rangers had secured them. All told, it represented the largest USAF operation since the end of hostilities in Southeast Asia, with over 250 aircraft employed. Of course, there was already a large U.S. presence in Panama, and the 82nd itself had deployed Sheridan tanks to Panama a month earlier. The scale of the operation presented problems similar to Power Pack 1 in that the number of troops, equipment, and planes involved swamped Pope AFB and forced the Air Force to send loaded planes to Charleston AFB to sit out of the way and wait.[6] One unexpected boost came from Reservists and retired servicemen from the area who had heard that something big was going on at Pope and Bragg and volunteered to help load aircraft.[7] The planes—at least 45 C-141s—refueled midair. The Rangers traveled from Georgia to Panama via C-130s, C-141s, and C-5s carrying special forward area refueling equipment.

Desert Shield was not an airborne operation but rather a bid to demonstrate intent by placing U.S. forces on the ground in Saudi Arabia just days after Iraq invaded Kuwait. The soldiers appear to have reached Saudi Arabia via a nonstop flight on C-5s. Significantly more men, as well as equipment and vehicles, arrived in subsequent days and weeks to reinforce what was in effect a token and symbolic presence.

Examples of one-stop direct missions are even less common. Few missions are so urgent that one cannot stage somewhere within range of the destination and so

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[4] Warnock, 2000, p. 66.

[5] Warnock, 2000, p. 67.

[6] William J. Allen, "Intervention in Panama: Operation JUST CAUSE," in Warnock, 2000, p. 173.

[7] Allen, in Warnock, 2000, p. 174.

distant that one would have to refuel. Moreover, the Air Force's C-17s and C-5s can refuel midair. Basically, one is talking about cases in which C-130s or smaller aircraft are obliged to travel, quickly, to a distant location. Most cases, historically, of this being done are commando-type operations such as the Israeli raid on Entebbe (Israel's C-130s refueled in Kenya), which involved 100 soldiers.

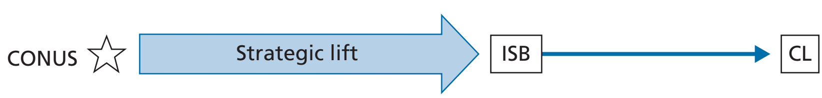
The one example involving the 82nd—and modern airlift (C-141s)—was the emergency deployment in 1968 of 3,600 men from the 3rd Brigade to Vietnam in response to the Tet Offensive. The unit was alerted on February 12, 1968, and an advance party departed on the 13th. The bulk of the unit, divided into five "task forces," began leaving on the 14th.[8] The troops and their equipment began departing from Pope Air Force Base on the 13th, although it departed in five waves, or "task forces." They made two stops on their way to Chu Lai Air Base to refuel, first at Elmendorf AFB, Alaska, and then at Yokota, Japan. The total length of the trip was 30 hours, and it required 155 C-141s and "a number of C-130s."[9] (It is possible the 82nd flew the final leg from Yokota to Chu Lai via C-130s; the sources are not clear.)

Theater Staging

Theater staging, broadly, entails using an airfield closer to the CL for a period of days or longer. If we include in this category troops stationed in forward locations, this is the most common type of operation, as it arguably includes intratheater operations from the forward bases. A majority of airborne operations have been intratheater operations, as they include most if not all the combat jumps conducted over the course of World War II, Korea, Vietnam, and Afghanistan and Iraq, not to mention the large operations conducted in the 1950s by the British and French militaries in the Indochina and Suez wars.

The staging concept (Figure 3.2) entails moving from CONUS to an ISB via any means—either military or commercial; by air, land, or sea—and then moving

Figure 3.2
Staging Concept Archetype



NOTE: Strategic lift can include military or civilian platforms over land, sea, or air.
RAND *RR1161-3.2*

8 Golden Brigade Chapter of the 82nd Airborne Division Association, "82nd Airborne Division (Vietnam) Golden Brigade: History of the Golden Brigade," 2012.

9 U.S. Congress, *Congressional Record,* V. 149, PT. 14, July 17, 2003, to July 25, 2003, Washington, D.C.: Government Printing Office, 2007.

from that location to the CL by military aircraft (which can use the same deployment concepts as direct access). This is distinguished from the direct, one-stop option preceding in that we assume the ISBs used for staging provide more on-ground presence and entail more on-ground infrastructure to support the additional troops and time involved.

Historical Examples

Two recent American examples of staging are the assault on Objective Rhino, Afghanistan, in 2001 by 200 members of the 75th Ranger Regiment, who jumped out of MC-130s, which presumably staged locally; and the landing two years later of members of the 173rd and other units forming Task Force Viking in northern Iraq. The 173rd flew out of Vicenza, Italy, where it is forward deployed, while the other units staged out of Romania.

Several foreign airborne operations that involved the U.S. military deserve mention. The first is Operation Dragon Rouge, a U.S.-Belgian operation conducted in Congo in 1964 in response to a large-scale hostage situation in the context of a major rebellion by Marxist-aligned rebels. The U.S. military offered two options, a large-scale deployment involving a brigade of the 101st Airborne Division (one battalion would provide the first wave, another the second, and the rest of the brigade was intended to remain in CONUS "until directed to move") and a small-scale insertion of a few "A-teams" that would land up river from the target and paddle to it on inflatable boats.[10] The Johnson Administration rejected the first, largely because it was unwilling to be seen dragging the country into another war just weeks before the 1964 election (the United States was in fact covertly engaged in the Congo war by means of a CIA-run air force flying close air support missions using T-28s and B-26s). It rejected the special forces (SF) option apparently on the grounds that it was unlikely to succeed. The crisis on the ground continued to mount, however, until finally the Belgians offered up an alternative that represented something of a happy medium between the two: a joint U.S.-Belgian operation in which U.S. aircraft would drop a battalion of Belgian paratroopers and have the CIA combat air fleet provide cover. The United States agreed.

USAF C-130s based in France picked up 545 Belgians and their vehicles (armored jeeps and AS-24 motorized tricycles) and flew them to two separate staging areas, Ascension Island (with a stop en route at Moron AFB, Spain, to refuel) and Kamina, Congo, before conducting the combat drop on the target, a golf course in Stanleyville (now Kisangani), Congo, situated next to an airfield. The distance from Belgium to Ascension is 4,134 nautical miles; from Ascension to Kamina, 2,405 nautical miles;

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[10] Fred E. Wagoner, *Dragon Rouge: The Rescue of Hostages in the Congo,* Washington, D.C.: National Defense University Research Directorate, 1980, pp. 55, 68.

from Kamina to Stanleyville, 550 miles.[11] A total of 14 C-130s took part in the operation, one of which was a communications plane.[12]

Besides the need to refuel, the operation's planners wanted to use ISBs for two reasons. One was to help hide the purpose of the Belgian deployment. The other was to furnish policymakers in Washington and Brussels with ample opportunity to reassess, revise, and abort the operation. Indeed, at each stage, U.S. and Belgian commanders and policymakers discussed modifying the plans in light of newly emerging information about what was going on in Stanleyvillle.

Two similar operations worth noting are the 1978 French Operation Leopard and the Belgian Operation Red Bean, both conducted at the same time to rescue Western hostages taken by rebels in Kolwezi, Zaire—essentially a replay of Dragon Rouge. Initially, President Carter put the 82nd Airborne on alert to intervene, but he ordered the division to stand down when almost all of the American hostages made it to safety. The French and Belgians continued with their own planning to rescue the remaining hostages in cooperation with the United States, which they asked to provide airlift. Complicating matters was the fact that the French and Belgians planned and acted separately in pursuit of different, though overlapping, objectives: The French were going in intending to kill rebels and thus help the Zairian government while saving hostages, whereas the Belgians focused on the hostage rescue and persisted with negotiations up until the end. The Belgian paratroopers only learned of the French plans when they arrived at their ISB in Kamina, and they were forbidden to coordinate directly with the French. In at least one instance, once both were on the ground, they even exchanged fire.

The French flew 700 members of the 2nd Foreign Legion Parachute Regiment (2e REP) from their base in Corsica to Kinshasa aboard four civilian DC-8s. They could fly directly because they had established "semi-permanent" overflight clearance in most of Africa.[13] The next day, they boarded two French C-160s and four Zairian C-130s to mount their assault on Kolwezi. USAF C-141s arrived soon after with the French troops' vehicles. The French use of Kinshasa to stage the operation, as well as their dependence on USAF C-141s, reflected their lack of strategic lift; presumably, they might have done the equivalent of a "straight from Bragg" operation had they possessed C-141s or their equivalent. There were two waves, the first consisting of 450 legionnaires; the second, conducted early the next day, consisted of 250 legionnaires.

In contrast to the French and unlike in 1964, Belgium relied on its own transportation, specifically C-130s and 727s (some borrowed from the civilian airline Sabena)

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11 Wagoner, 1980, p. 134.

12 Wagoner, 1980, p. 139.

13 Thomas P. Odom, *Shaba II: The French and Belgian Intervention in Zaire in 1978*, Fort Leavenworth, Kan.: U.S. Army Forces Command and General Staff College, 1992.

to transport roughly 1,000 paratroopers.[14] The planes made several stops to refuel before staging in Kamina, and they relied on USAF to fly fuel to Kamina for the use of the C-130s making the Kamina-Kolwezi run. The Belgians did not have overflight rights like the French and had to work their way slowly by way of Morocco, Côte d'Ivoire, and Gabon. The Belgians acted openly, departing from a civilian airport with families waving goodbye, forcing the French to move up their timetable. In turn, the Belgians had to revise their plan at the last minute once they learned that the French were already in Kolwezi. One important change involved the decision to airland the paratroopers rather than airdrop them.

U.S. support to Leopard and Red Bean was extensive, consisting of C-5, C-130, and C-141 flights from Europe and Delaware to provide fuel and other forms of support as well as to help evacuate hostages.[15] Most of the U.S. aircraft staged in Liberia and Senegal to swap crews and refuel.[16] USAF aircraft also helped the Belgians and French withdraw from Zaire and flew various African military contingents into Zaire to replace them.[17]

The last and most recent operation of note is also named Operation Leopard and also involved the Corsica-based 2nd Foreign Legion Parachute Regiment—the French combat jump on Timbuktu in late January 2013 as part of the larger Operation Serval. The 2e REP deployed to Côte d'Ivoire roughly a week before the jump to form a theater reserve force with other airborne elements. Plans evolved apace with the tactical situation, and commanders determined to drop 256 Legionnaires to form a blocking position on the outskirts of Timbuktu. They traveled there using two C-130s and three C-160s. The C-160s had to stop to refuel in Ouagadougou, Burkina Faso.

The previous examples indicate that although the long-range and midair refueling capabilities of modern U.S. strategic lift enables the 82nd to conduct "straight from Fort Bragg" operations, staging and using ISBs remain important. Time and distance sometimes require it, particularly in the vast expanse of the African continent. Staging also enables the use of a wide range of large military and Civilian Reserve Aviation Fleet (CRAF) aircraft, such as the C-5, 747, and C-17, to deliver cargo more efficiently than with airdrop-rigged and/or tactically cross-loaded aircraft loads. The use of an ISB eliminates the need to move and deliver the whole force package simultaneously and can help link units up with coalition partners to conduct combined planning.

Moreover, as the African examples demonstrate, staging provides a measure of flexibility that suits policymakers and military commanders alike: In both Dragon Rouge and Serval, commanders and policymakers found it desirable to go step by step. Serval's commanders were able to order Leopard because they already had airborne

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14 Odom, 1992.

15 Daniel L. Haulman, "Crisis in Tropical Africa: Operations Zaire I and II," in Warnock, 2000, p. 118.

16 Haulman, in Warnock, 2000, pp. 119–120.

17 Haulman, in Warnock, 2000, p. 120.

forces at hand in the form of the theater reserve force that had formed up in Abidjan. Staging in Abidjan had created options.

Dragon Rouge also points to an important factor often overlooked in discussions of airborne operations, which tend to focus on “objective” and tactical requirements: Policymakers value having options that meet their political requirements in addition to purely military considerations. Thus, in 1964, Washington was pleased with neither of the options that the military put on the table. It was the roughly “medium”-scale Belgian proposal that policymakers decided was “just right.”

The comparison between the Belgian and French operations on one side and the American operations on the other suggests that the Belgians and the French appear to have greater tolerance for risk, as reflected by the relatively small size of their deployments and their willingness to drop troops into areas where they have had poor ground intelligence and are likely to be outnumbered and outgunned. In 1964, for example, the Belgian paratroopers found when they attacked their first objective, an airfield, that the Congolese rebels had set up fixed machine gun emplacements—but fled from them when the assault began. In other words, casualties among the lightly armed Belgians could easily have been much higher. The same could be said of Kolwezi, where hostile forces fired at French paratroopers as they landed. In comparison, most of the named U.S. airborne operations are of a much larger scale and draw on far greater support resources.

The preceding discussion also hints at an important truth regarding airborne operations: True airborne forcible entry—defined as operations that “seize and hold lodgments against armed opposition” or that otherwise establish the conditions for a primary mission such as a blocking maneuver, a NEO, or a raid—are rare, especially at the battalion or above scale. Excluding special forces operations, the few U.S. examples (TF Rhino, Grenada) involved Ranger companies, and one has to go back to the Korean War to find examples for 1,000-man-plus jumps (the 187th ARCT in 1951). The 82nd has not done an airborne forcible entry operation since Operation Market Garden (1944). No one else has done it at scale since the Sinai war (1956).

Distances Used for Coverage

As the examples illustrate, distance matters, and the reach of aircraft—whether from CONUS or from an ISB—can dictate concepts for access. Based on the modeling and analyses outlined in Appendix B, we implement a set of range guidelines for each set of CONOPs, which then are used in our modeling to produce access metrics, such as number of accessible ISBs, CLs reached, and CCMD population accessible, among others.

The postairdrop range on a C-17 is slightly longer than 1,000 nautical miles, as are the ranges for the C-130. In addition, as Table 3.1 notes, the preairdrop range of a

Table 3.1
Range Assumptions for C-17 and C-130 Aircraft for CCMD Access Calculations

Equipment and CONOP	Maximum Range (nm) (one way)	Maximum Radius (nm) (round trip)
C-17 airland	4,300	2,000
C-17 airdrop**	2,500 (pre) + 1,000 (post)	1,000
C-130 airland	2,000	1,000
C-130 airdrop	2,000	1,000

** Only personnel aircraft are limited in range for airdrop; equipment will not have the limitations above the drop zone. Thus, we use these numbers as conservative distances.

C-17 is significantly longer than its postairdrop range. While these longer preairdrop ranges are utilized in certain scenarios where the specific basing and contingencies are well defined for staging and postairdrop refueling, for general CCMD access metrics, we limit our analysis to these more conservative, general planning values.

Conclusions and Observations

This chapter described several concepts for access under the general distinction of "direct" and "staging." From the standpoint of response time, the direct options will tend to be the fastest from wheels up but will suffer from not being able to reach deep into far CCMDs. Staging provides for more early-leg options for aircraft (e.g., using typical strategic lift options by sea, air, or land) but entails more built and mobile infrastructure at those ISBs and coordination along the way.

Intermediate staging bases, used as a more deliberate stop on the way to a contingency, are an important part of how the GRF operates. They provide a flexible delivery option for combatant commands to consider when using the GRF and to build forces up in advance of a conflict. They also allow a larger and more abundant set of planes to be used to support missions. Airdrop-capable planes and crews are limited in supply—much more so than commercial or other military transport. Thus, using general strategic lift via air and sea to an ISB, then transloading to airdrop or other military aircraft for the final leg, offers a higher probability that aircraft and other assets will be available to conduct the operation.

From a GRF perspective, both direct access and staging are part of their concepts for access, and options which will need appropriate planning and practice to ensure they are available means for operations. The next chapter provides more detail on how ISBs are chosen, a framework for choosing them that we applied here, and some statistics on what those ISBs provide in terms of coverage in each CCMD.

CHAPTER FOUR

Lift and Airfield Considerations for Access Timing

The speed with which the 82nd Airborne Division will be able to deliver assets and personnel to a CL depends on a variety of factors, as discussed throughout this analysis. Key drivers of closure time include the location and characteristics of the CL, the CONOP used to access this location, lift availability, and characteristics of the airfields used for access. This section looks broadly at the effect of lift and airfield capacity on mission timing to provide a context for timing discussions in specific scenarios or for access to a specific CCMD. While alpha echelons generally require more aircraft than a large bravo echelon, closure time overall is driven by the large number of sorties required to deliver the bravo echelon. Closure time for a large bravo echelon is in turn driven by airfield capacity at the CL and lift availability. Since airfield capacity at a CL is often limited, it is generally possible to achieve a close-to-optimal aircraft cycling schedule even when a relatively small number of aircraft are available.

Timing calculations are presented in three portions:

- travel time for gaining access to the ISB
- time spent at the ISB
- mission timing for the final leg(s) from the ISB to the CL.

Getting to a Staging Base

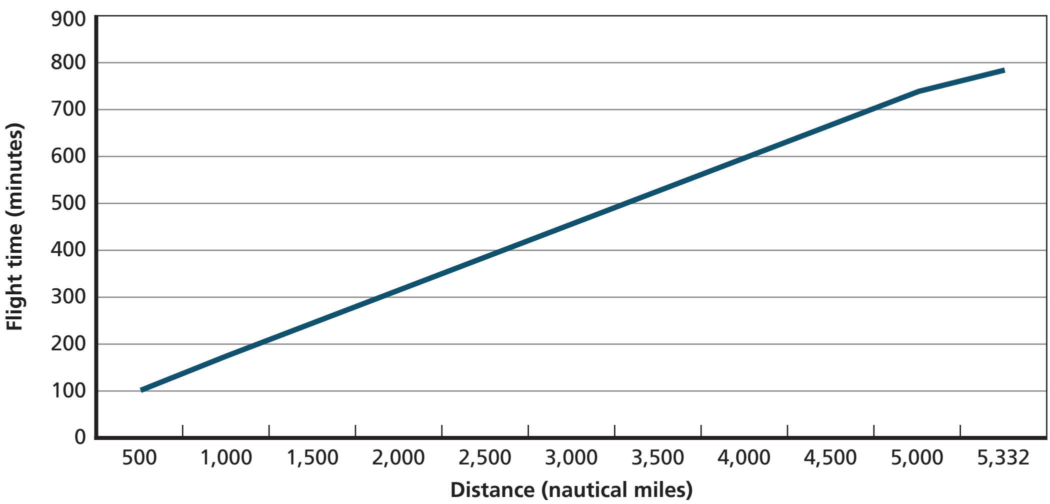
In many cases, staging at an ISB is preferable to direct missions from Fort Bragg, as demonstrated throughout this analysis. In cases where an ISB is used, personnel and equipment must be moved to this ISB before deploying to the CL. The time required to preposition this personnel and equipment may or may not be critical to overall mission timing, depending on how much warning is available. Prepositioning time consists of the flight or flights to the ISB as well as any refueling that occurs en route.

Assuming a planning payload of 54,000 lbs, the flying time for maximum range for a C-17 is about 13 hours, as shown in Figure 4.1.[1] If the trip to an ISB is short, flight time is likely to be negligible with regard to overall closure time. If a very long flight is necessary, the majority of additional time required is likely to come from refueling stops. Refueling times are determined by the number of sorties required, the number of aircraft available, and the MOG capability of refueling airfields.

Figure 4.2 estimates the total time required to refuel an alpha echelon of varying sizes. We assume that the number of aircraft used is equal to the number of sorties required, as is generally the case for the alpha echelon. In cases where a large number of sorties are required, aircraft could cycle between Fort Bragg and the ISB location(s), or aircraft could be switched into and out of service for this mission. Because long flight times are likely for this part of the trip, the effects of multiple smaller cycles of sorties will be generally additive, with a 200-sortie mission consisting of several smaller missions back-to-back. The effect of cycling on timing is discussed further in the section on travel to the CL.

Refueling time depends on the limiting MOG at the refueling airfield. Limiting MOG is the most restrictive of a set of MOG metrics that determine how many aircraft an airfield can service simultaneously. Examples of types of MOG include park-

Figure 4.1
C-17 Flight Times, Assuming 54,000 Pounds Payload



SOURCE: Based on fuel-burn rates, weight restrictions, and reserve requirements from Air Force Pamphlet 10-1403.
RAND *RR1161-4.1*

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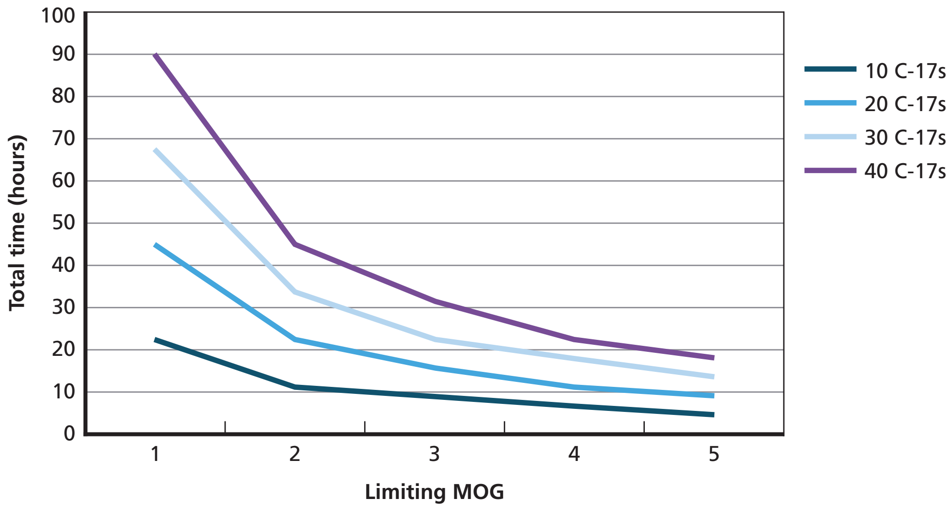
[1] Based on fuel-burn rates, weight restrictions, and reserve requirements from Air Force Pamphlet 10-1403, *Air Mobility Planning Factors*, December 12, 2011.

Figure 4.2
Refueling for Entire Echelon (number of aircraft = number of sorties) at a Refueling Base (ISB)



RAND *RR1161-4.2*

ing MOG (number of aircraft that can be parked), Aerial Port MOG (number that can be supported for cargo or passenger service by available manpower and facilities), and working MOG (number that can be serviced/maintained). Working MOG is generally the limiting factor for airfield throughput. MOG can be further restricted by the Threat Working Group (TWG) based on an assessment of threat to ground operations. ISBs identified in this analysis have been selected to provide sufficient MOG (MOG = 3 or greater) whenever possible, and multiple locations could be combined to provide additional MOG when time is critical. This type of clustering approach is especially beneficial in parts of the world with fewer high-capacity airfields, such as USAFRICOM.

As shown in Figure 4.2, even a large alpha echelon can be refueled in a day and a half at a MOG of 3, which is equivalent to a throughput of one aircraft every 45 minutes. When multiple stops are required en route, timing would again be additive, taking one to two days of time at each refueling stop. Timing estimates provided here are based on on-ground and refueling numbers from Air Force Pamphlet 10-1403 and are in many cases conservative. These planning factors are used throughout this section, though increased throughput may be achievable in reality.

We assume C-17s are used for this portion of the trip, since long distances likely need to be covered from Fort Bragg when an ISB is used. C-130s would not provide the necessary range for completing this mission. Alternate lift options are available, however. C-5 or other military aircraft could be used, or the military fleet could be supplemented with CRAF capacity. Based on analysis of a common CRAF airframe, the Boeing 747-400, we find that CRAF flight times should be comparable to or faster than a military fleet. While fuel-burn per plane is increased, overall fuel consumption could be reduced when CRAF is used for PAX transport, since the 747's large passenger capacity could reduce overall fleet size. The main concern with relying on CRAF supplementation would be limitations on usable airfields. About 60 percent of ISB locations identified in this report are believed to be capable of supporting at least some 747 operations, but CRAF providers may be unwilling to fly to airfields that cannot provide adequate maintenance and support.[2]

Operations at the Staging Base

Upon arrival at an ISB, onload/offload and refueling operations begin to ready the force for deployment to the CL. Onloading/offloading generally does not occur at the same time as refueling, so these times would be additive. However, depending on advance warning, the time spent at the ISB may not be critical for overall operations. Even without sufficient warning, it is likely that aircraft onloading/offloading and refueling will not be the overall bottleneck for ISB operations. Matters such as personnel rest and rigging of equipment may be limiting factors. Crew rest for aircraft crews is not discussed here.

The key difference between ISB operations and refueling en route to the ISB is that a mixed fleet of C-17 and C-130 aircraft is likely for the final leg(s) of the mission, en route to the CL. Figures 4.3 through 4.5 provide estimates of refueling time, onload or offload time, and expedited ground times for the three C-17-only scenarios used earlier, as well as an approximately equivalent mixed fleet.[3] Expedited ground time estimates are used by Air Force planners for time-sensitive onload and offload operations and are included here to provide an example of less conservative throughput estimates.[4] In general, use of a mixed fleet will increase time required for service at the same MOG, as more aircraft are required. Although refueling and loading times for C-130s are generally shorter than for C-17s, this does not offset the increase in fleet size, especially at very low MOG. The exact effect of C-130 use will depend on the specific ISB(s) selected. Parking availability at an airfield is sometimes the limiting factor for MOG and is generally calculated using C-17-equivalent parking spaces. If increased parking is possible for C-130s, this may decrease time required.

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2 Statistics gathered from the Air Force's Automated Air Facility Information File.

3 Mixed fleets are approximated by preserving 20 percent of original C-17 sorties, reserved for large equipment. Remaining C-17 sorties are converted to C-130 equivalents using 2.5 C-130s per C-17.

4 Air Force Pamphlet 10-1403, 2011.

Figure 4.3
Refueling Time for Entire Echelon (number of aircraft = number of sorties) by MOG at ISB

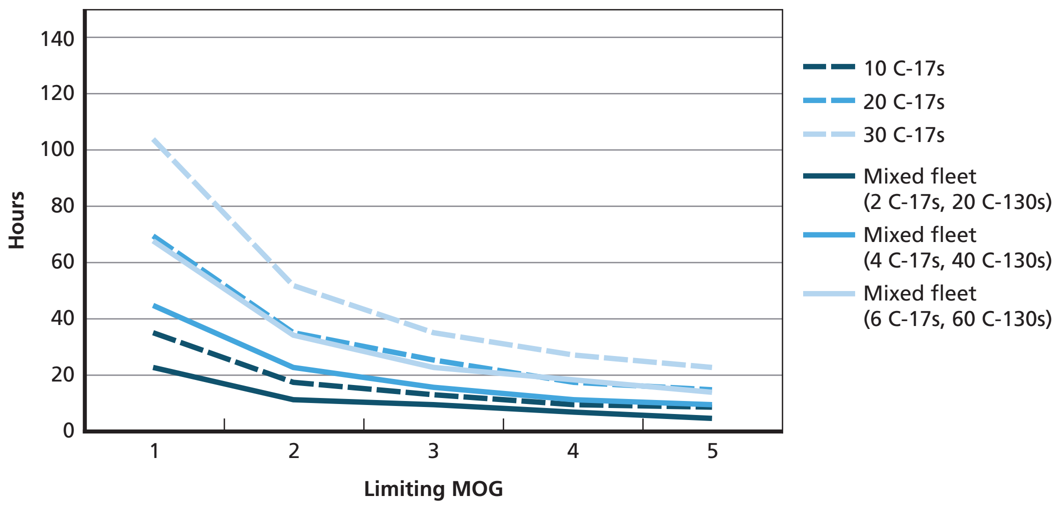

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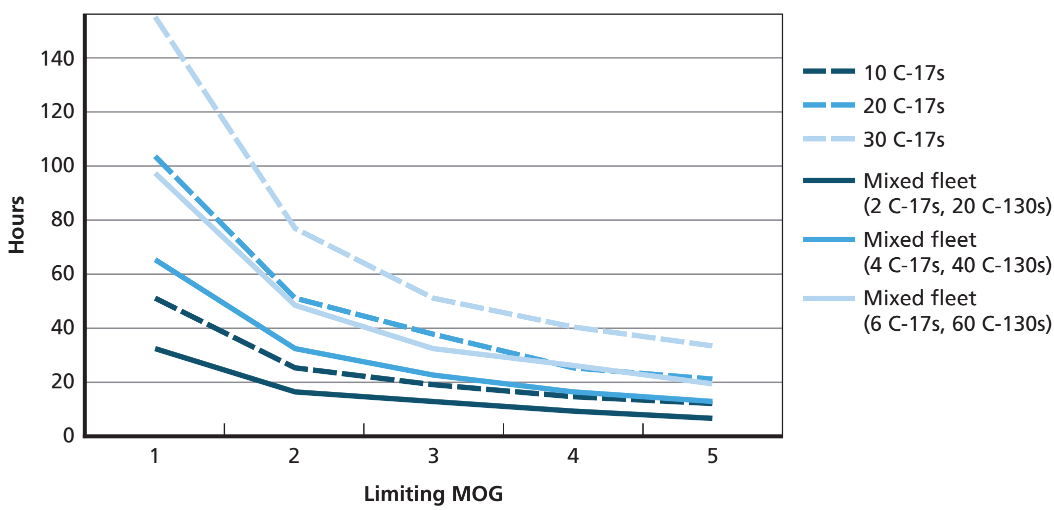
Figure 4.4
Onload or Offload Time for Entire Echelon (number of aircraft = number of sorties) by MOG at ISB



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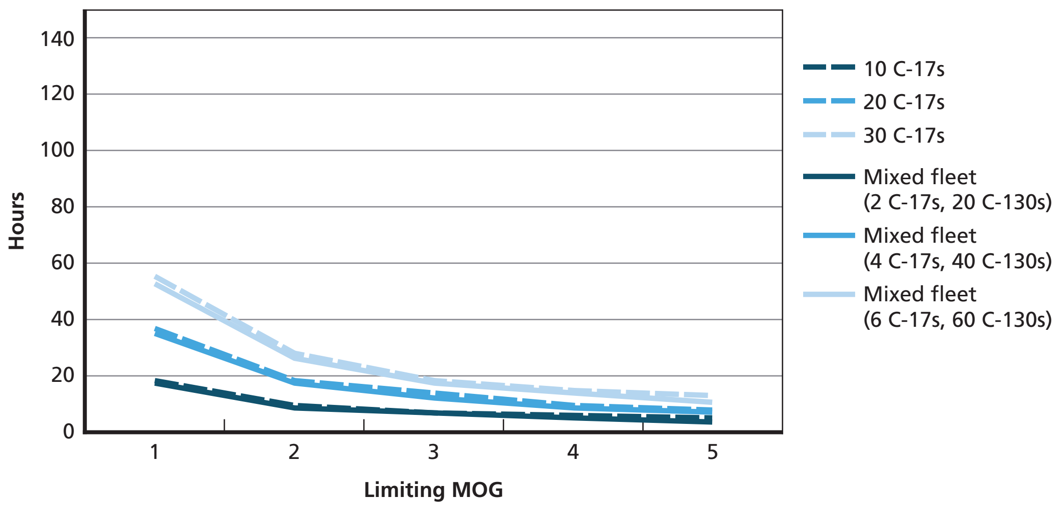
Accessing the Contingency Location

Timing analysis becomes somewhat more complex when examining the shorter range, highly time-sensitive last legs of the operation. Arrival at the CL must be carefully

Figure 4.5
Expedited Ground Time for Entire Echelon (number of aircraft = number of sorties) by MOG at ISB



RAND *RR1161-4.5*

timed, and limited resources must be used effectively to ensure correct spacing and a sufficiently short closure time.

For the smaller alpha echelon, a number of aircraft equal to the total number of sorties is generally required. All components of the alpha echelon are generally needed on the ground within a short time window, especially in airdrop situations.

The larger bravo echelon is unlikely to be delivered to the CL all at once. This is not only due to lift concerns, but also because many CLs around the world have limited capacity. Closure time from the final staging or refueling location to the CL for a large bravo echelon is driven by

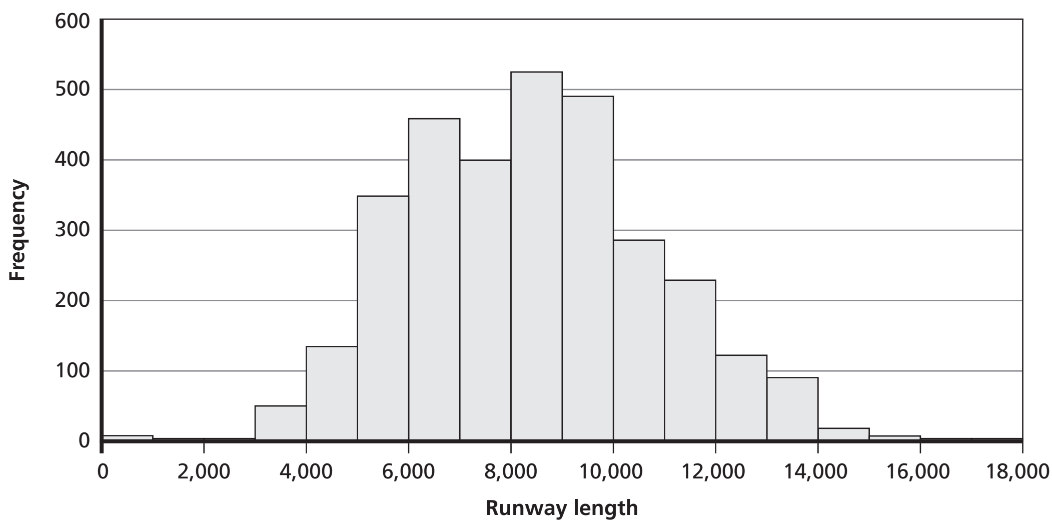
- number of sorties required
- number of aircraft available
- cycling pattern of aircraft
- MOG at ISB (or refueling stop)
- MOG at the CL (assuming airland for bravo echelon)
- distance from ISB (or last refueling stop) to CL.

The number of sorties required clearly increases closure time when all other parameters are held constant. In this section, we develop a formula for determining an optimal aircraft cycling strategy given hard constraints on MOG and distance from the ISB or refueling location to the CL. As the number of sorties increases, this will simply increase the number of optimal cycles that must be performed, causing a linear increase in overall closure time. We assume throughout this section that MOG at the

ISB is less restrictive than MOG at the CL. ISBs presented in this report have been selected for their ability to support the 82nd's operations and should thus be expected to have a throughput at least as high as the CL being accessed. The closure time bottleneck will likely be the ability to land and take off from the CL. Data on MOG for smaller airfields is generally unavailable and cannot be reliably extrapolated based on available parking data. Figure 4.6, which shows a distribution of CL runway lengths, demonstrates that there is high variance among the facilities available at CLs. Low MOG at either the ISB or CL (or both) can also be mitigated by use of several staging/refueling locations and/or CL airfields.

We assume cycling of the same aircraft from the refueling locations to the CL and back again, especially since trip distances for this final leg are often short. Discussion of more-complex aircraft usage patterns or substitution of different aircraft throughout the mission is outside of the scope of this analysis. All calculations are based on use of C-17s. For tactical reasons, C-130s could be used when ranges are short. C-130s are controlled by individual CCMDs to provide intratheater lift, providing flexibility and freeing up strategic lift for intertheater operations. Use of C-130s results in very similar timing requirements. Flight times are again based on a payload of 54,000 pounds but are fairly insensitive to payload. We use expedited ground times from Air Force Pamphlet 10-1403, which again provide conservative overall time estimates. Expedited ground times can be used at the CL, since no refueling is taking place, and we assume expedited ground times to be sufficient at the refueling locations,[5] since air-

Figure 4.6
Distribution of Longest Runway Lengths at CLs



SOURCE: Automated Air Facility Information File (AAFIF).
RAND *RR1161-4.6*

5 "Expedited ground times" are defined in AF Pamphlet 10-1403.

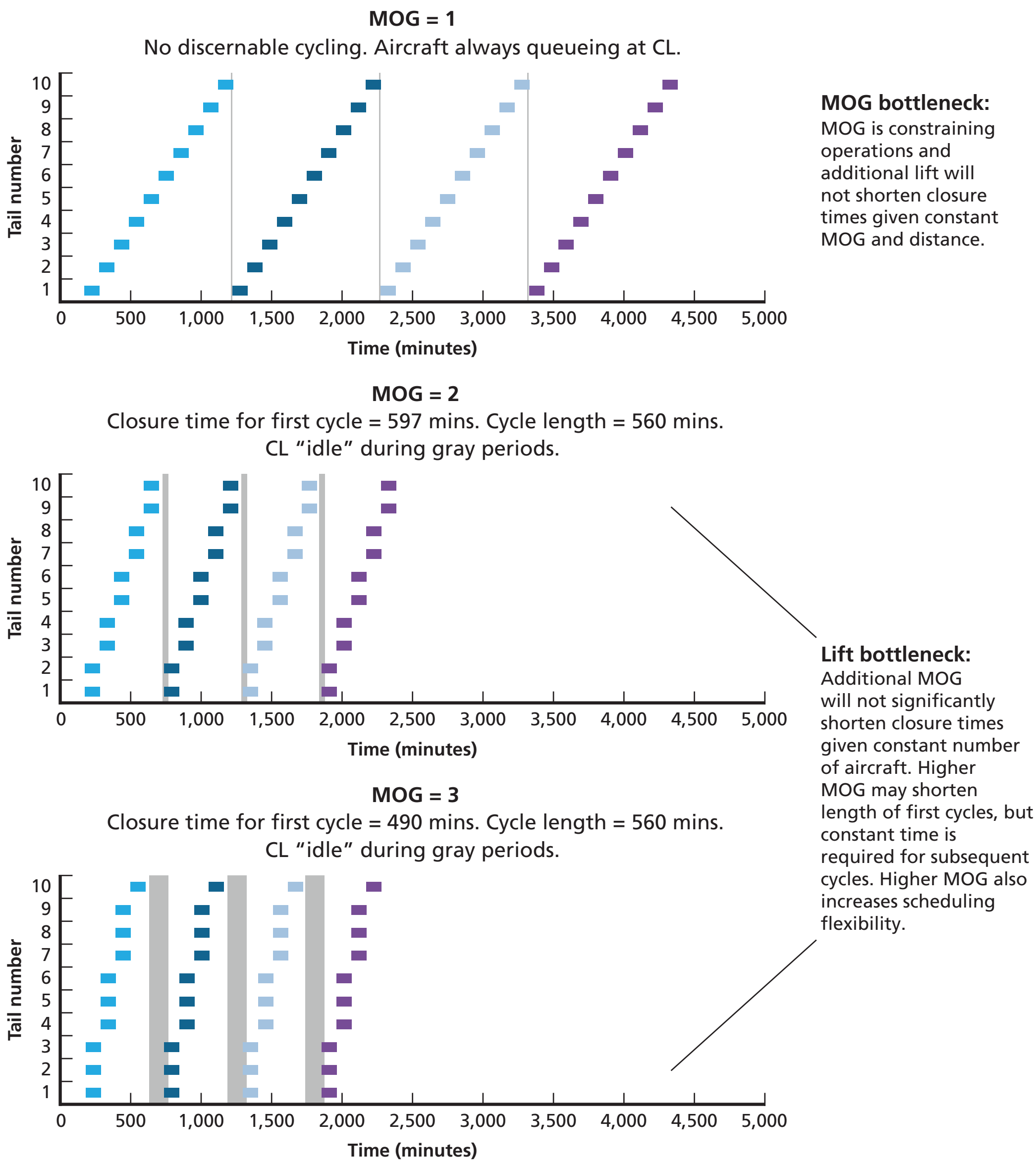
craft are refueled only to the level required for the generally short last leg of operations. Expedited ground times are based on Air Force estimates of onload/offload capabilities in time-constrained situations. Onloading and fueling may take place simultaneously during extremely time-sensitive contingency operations. For modeling purposes, we use a two-minute buffer between initial takeoffs. Required buffers between future takeoffs/landings are then calculated based on flight times and ground capabilities.

Optimal Cycling

When the number of aircraft available becomes less than the total number of sorties, cycling must occur. Aircraft must make multiple trips in order to complete all sorties. In a cycling situation, MOG and the number of aircraft available must increase *together* to provide a significant decrease in closure time. If MOG is low, a large fleet of aircraft will be unable to land and offload cargo at the CL efficiently, leading to queueing at the CL. Aircraft must wait to take off from the ISB until space becomes available for offloading at the CL, meaning that not all aircraft can be used to shuttle cargo and passengers simultaneously. Figure 4.7 provides an example of the effect of MOG on cycling for a 1,000–nautical mile trip when ten aircraft are available. This graph shows the number of aircraft on the ground (offloading) at the CL over time. When MOG = 1, the single-capacity CL is operating at maximum capacity 100 percent of the time. This means that the majority of the ten available aircraft are waiting to be used, meaning they are not helping to reduce closure time. No true cycling occurs. When MOG is increased to 2, however, we see that the CL airfield briefly "resets," meaning no aircraft are offloading, between cycles. This indicates that airfield MOG is high enough to support this operation without causing a delay in total closure time; when the first aircraft arrives at the airfield on its second pass, the last aircraft has completed its first offload and cleared the airfield. The "reset" period is indicated by the gray bar highlighting times when no aircraft are on the ground at the CL. All aircraft contribute to a faster closure time. When MOG is increased to 3, spacing between cycles increases. All aircraft are contributing to a faster closure time, but there is only a marginal reduction in total closure time of the MOG = 2 case. While the first cycle of ten aircraft completes slightly faster in the MOG = 3 case than the MOG = 2 case, subsequent cycles will take 560 minutes each. Five hundred sixty minutes represents the time it takes for a single aircraft to complete a round trip (560 = 2 x 175-minute flights + 105-minute expedited ground time at CL + 105-minute expedited ground time at refueling location). Once MOG is no longer limiting throughput by forcing aircraft to queue, this trip time dictates cycle length and therefore closure time.

The ability to use aircraft efficiently depends on the elimination of unnecessary queuing. Whether queuing occurs is in turn determined by the relationship between total trip time (2 flights + 2 ground times) and the bottleneck ground time at the CL.

Figure 4.7
Aircraft On-Ground Times at CL for Ten Aircraft and a 1,000–Nautical Mile Trip



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Ground time is the average on-ground time required for a single aircraft. If the total trip time is long, a lower CL MOG will be able to support more planes. In general, for efficient aircraft usage, the amount of time required for all N aircraft in the fleet to unload equipment must be less than the amount of time it takes a single aircraft to complete its trip:

$$N\left(\frac{\text{Bottleneck ground time}}{\text{MOG at CL}}\right) \leq (\text{Total trip time})$$

$$N\left(\frac{\text{CL ground time}}{\text{MOG at CL}}\right) \leq 2(\text{Flight time}) + (\text{ISB ground time}) + (\text{CL ground time})$$

This limitation ensures that the cycle resets. Given this assumption, we can calculate the maximum number of aircraft that can be efficiently used given MOG at a CL and flight times. The notation below assumes that MOG at the CL is limiting; if MOG at the ISB is considered to be limiting, "ISB ground time" replaces "CL ground time" throughout.

$$\leq \left(\frac{\text{Cycle time}}{\text{CL ground time}}\right)(\text{MOG at CL})$$

$$= \left\lfloor \frac{\text{Cycle time}}{\text{CL ground time}}(\text{MOG at CL}) \right\rfloor$$

Figure 4.8 shows the maximum number of aircraft *N* that can be efficiently used for a variety of different trip distances and CL MOGs. MOG has a significant effect on closure time, as increased MOG increases landing frequency at the CL. For a given MOG, cycle time is fixed, given the optimal number of aircraft is used. This means that closure time for multiple cycles of *N* aircraft to complete a large number of sorties is additive. A MOG of 3 at a CL would be a reasonable assumption in, for example, USEUCOM, and an optimistic one in other parts of the world such as USAFRICOM. Given a MOG of 3 and a 1,000–nautical mile one-way trip from ISB/refueling location to the CL, the maximum number of C-17s that can be efficiently employed is 16. Figure 4.9 translates the information from Figure 4.8 into a rate of aircraft arrivals; using 16 aircraft would lead to a plane arriving at the CL approximately once every 35 minutes. Increasing MOG beyond 3 would have a significant favorable impact on closure time if more aircraft are also made available; at a MOG of 4, 22 aircraft can be cycled efficiently, yielding one arrival at the CL approximately every 26 minutes.

Conclusions

A typical GRF deployment of a single brigade may require about 25 C-17s for delivery of the alpha and 65 C-17–equivalent sorties (with far fewer aircraft) to deliver the

Figure 4.8
Maximum Aircraft for Efficient Cycling and Arrival Spacing by Distance and CL MOG

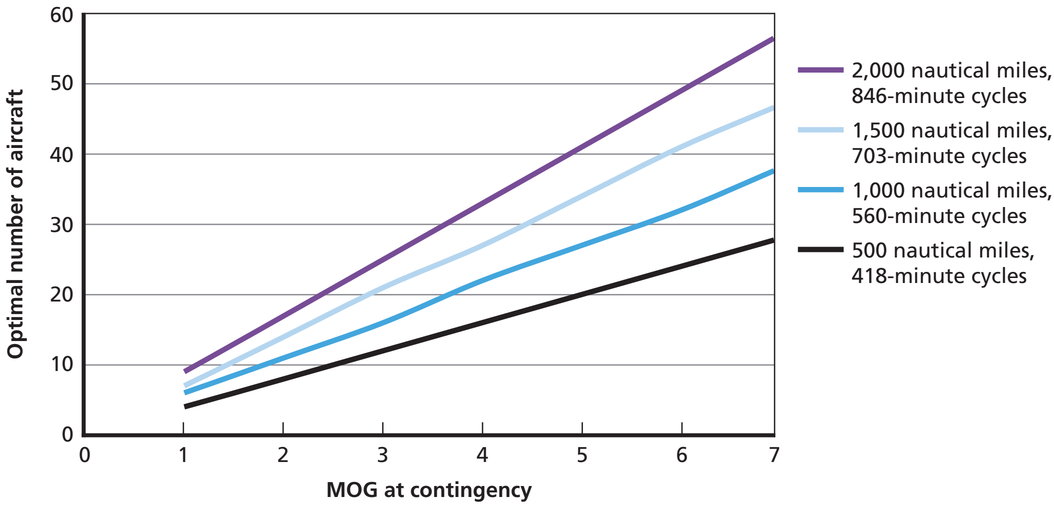

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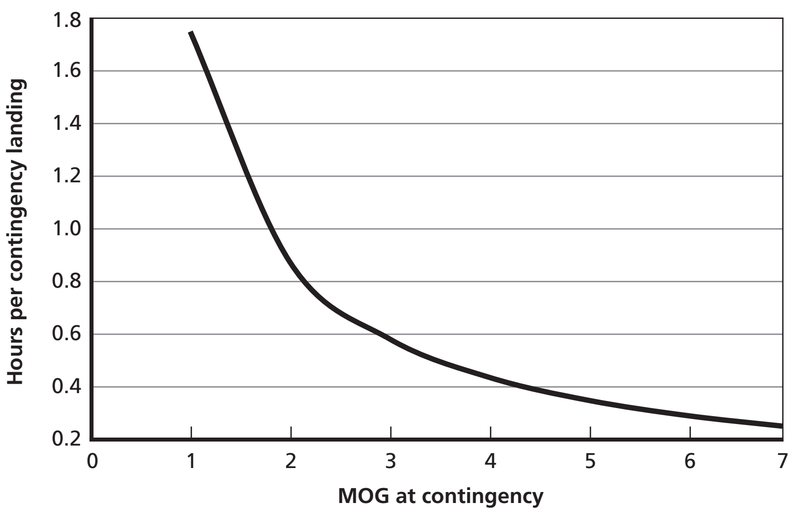
Figure 4.9
Arrival Spacing by Distance and CL MOG When Using Maximum Aircraft for Efficient Cycling



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bravo echelon. Initial warning and readiness, flight times, refueling and staging times at ISBs, and speed of the final delivery into the CL(s) determines closure time. Flight time is generally fixed given distances and aircraft type, but overall closure time on the way to the final ISB depends on number of refueling stops required, throughput at the refueling locations, and aircraft cycling policies. This analysis shows that with refueling locations that provide a MOG of at least 3, refueling and even onload/offload operations for a fairly large alpha or bravo echelon could be completed in a couple of days. Since there is some flexibility in choosing refueling stops and staging locations, including the ability to use different locations for different portions of the force, we expect an efficient refueling policy can be developed en route to most locations around the world.

Timing issues are critical during the final leg of GRF delivery, from the final ISB to the CL. Delivery of the alpha echelon typically involves one aircraft per sortie, while a smaller number of aircraft may cycle to provide the large number of sorties required for the bravo echelon. This analysis shows that efficient delivery of the bravo echelon is often possible with a relatively small number of C-17 aircraft—often even fewer than the 25 C-17s commonly required for alpha airdrop operations. After 25 C-17s deliver the alpha onto a CL, a subset of these aircraft could be used to efficiently deliver follow-on forces over the course of the next few days. Since CLs usually have limited airfield capacity, the ability to land and unload aircraft at the CL generally becomes a limiting factor on closure time before the number of aircraft available does, especially when flight times are short.

An implication of this work is that the Army's portion of the GRF and the Air Force need to plan the size (equipment and people) and timing of the bravo echelon under constraints related to airfield throughput/MOG, flight times, and aircraft availability. In austere places, the GRF may need to plan for slow build-ups of the bravo echelon over the course of several days. In such places, the main limitation on improving closure time may not be aircraft availability but rather the rate at which airfields and ground forces can receive delivery of equipment and personnel. For instance, the case above showed aircraft arriving every 35 minutes, something perhaps faster than could be received at a CL.

CHAPTER FIVE

Contingency Location and ISB Selection

Role of ISB

ISBs are integral for the projection of U.S. force outside of the continental United States. Joint Publication 1-02 defines an ISB as a "Tailorable temporary location used for staging forces, sustainment and/or extraction into and out of an operational area."[1] These bases can serve as principal staging bases to secure a lodgment, project the force for the rapid delivery of combat power, and perform select operational-level tasks. The ISB serves a logistic function for GRF deployment.[2] Often an ISB will be colocated with an airfield and will be used to transition from intertheater airlift (C-17 or C-5) to intratheater airlift (C-130) to increase the number of points of entry available to the force to mitigate antiaccess measures.[3] Capabilities at these airfields vary, with a minimum of servicing, supply, and shelter required for the temporary occupancy of military aircraft and personnel during operations.

The role of the ISB is to provide access into an Area of Operations (AO). The most capable will have robust infrastructure allowing for a full complement of support services, command and control (C2) facilities, and accommodations for an enduring presence. The least capable will allow access to an airfield with no services, C2 support, or accommodations.

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1 U.S. Joint Chiefs of Staff, *Department of Defense Dictionary of Military and Associated Terms*, Joint Publication 1-02, Washington, D.C., November 2010, p. 134.

2 A remote marshaling base (REMAB) is a type of intermediate stop that serves a broader operational purpose as a secure base to which the entire airborne force (to include organic and attached support elements) deploys and continues mission planning. This analysis focuses on ISB composition and location as key determinants for GRF deployment and operational access, heavily influencing the time and lift assets required for terminal delivery. Since the REMAB's operational role does not directly influence operational access, this base type is not explicitly included in this analysis.

3 U.S. Joint Chiefs of Staff, *Deployment and Redeployment Operations*, Joint Publication 3-35, Washington, D.C., January 31, 2013, p. VI-20.

Determining Criteria/Methodology

The approach used to determine ISB selection in support of the 82nd Airborne's analysis of the GRF analyzed both quantitative and qualitative methods and was built on current Air Force and Joint products and doctrine. This study utilized the Automated Air Facility Information File (AAFIF); Air Mobility Command (AMC) *Global En Route Strategy*; AMC *GERISC 2013 Brief, Overseas Basing of U.S. Military Forces, A Global Access Strategy for the U.S. Air Force*; C-17 flight data compiled from the Logistics Installations Mission Support–Enterprise View (LIMS-EV) tool; and consultations with USAF experts.

ISB characteristics influence airfield throughput capability for rapid reception, staging, and onward deployment of the airborne GRF.[4,5] Aircraft Parking Capacity (Parking MOG: the number of aircraft that can fit, or be parked, on the ground) and Aircraft Loading/Unloading Capacity (Working MOG: maximum number of parked aircraft that can be worked simultaneously, based on available personnel, materials handling equipment [MHE], and ramp space) play a large role in tactical planning. For forward-looking studies or detailed planning, real-time information on exact situations on the ground is necessary. This study attempted to identify appropriately detailed, stable data for MOG and local sustainment options and apron durability and size in an effort to make a comprehensive suitability determination for each airfield.[6] Most of these data were either unavailable, not credible, or changed too often to be useful for operational-level planning.

In light of these challenges, Figure 5.1 outlines the steps used to determine individual airport suitability while balancing GRF requirements for staging.

The initial list of airfields was compiled from the AAFIF,[7] which contained the vast majority of airfields worldwide that potentially could be used to support a GRF access strategy (over 2,000 airfields). To define a large set of potential airfields, we first selected all those airfields that could support C-130 and C-17 operations based on their physical characteristics. We used data fields in the initial list aiding this classification. For the rest of this report, we will use this super-set of locations as "contingency loca-

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4 Air Force Pamphlet 10-1403, 2011. Airfield throughput capability is defined as the amount of passengers or cargo which can be moved through the airfield per day via strategic airlift based on the limitations of the airfield (such as parking spots).

5 Air Force Pamphlet 10-1403, 2011.

6 The Global Decision Support System (GDSS) is the primary USTRANSCOM system that provides combatant commanders Mobility Air Forces (MAF) C2 information for the Defense Transportation System (DTS). It draws data from over 20 other USAF systems and provides aircraft schedules and arrival and/or departure status in near–real time for aircraft and aircrews.

7 The AAFIF is a DoD program for the collection of worldwide aviation facility data, designed to meet the needs of the services, combatant commanders, and their subordinate component commands for air facility data in contingency planning and for military operations. The National Geospatial-Intelligence Agency (NGA) is responsible for maintaining the AAFIF.

tions" or "contingencies." These locations span the globe and generally follow population patterns. In addition, since much of the planning for the 82nd entails airfield seizure for follow-on forces, they are a good set of possible locations upon which the 82nd might deploy. We make no adjustments to this list for political or threat periodization, instead using these as a proxy for global access.

To pick possible ISBs from that longer list, we had to determine where sufficient criteria are met to make them plausible places aircraft might transit or stage to deliver the GRF. This list was analyzed through the use of the Air Mobility Command's *Global En Route Strategy*[8] and *Global En Route Strategy 2013 Brief*,[9] which depict airfields the USAF has traditionally utilized, preferred airfields, and types of assessment criteria used by the USAF in determining airfield suitability. Selected airfields were identified and compared against subsequent levels of analysis.

RAND analysis previously conducted in support of overseas basing and scenario development—*Overseas Basing of U.S. Military Forces*[10] and *A Global Access Strategy for the U.S. Air Force*[11]—was then referenced to ensure accuracy and independent verification of the selected ISBs. This work built upon already conducted analysis and allowed the addition of airfields that haven't traditionally been used by USAF planners. Select large commercial airports were included when they provided unique geographic access and had a demonstrated capability to handle a large influx of aircraft.

The next level of analysis utilized C-17 flight data compiled from the LIMS-EV tool.[12] The tool listed all C-17 sorties flown during FY 2013. All airfields to which more than 20 sorties were flown were selected and cross-referenced with the AAFIF list. *DoD Flight Information Publication (Enroute) Supplements*[13] were then utilized to determine the operating agency (OA) for each remaining ISB to categorize airfields

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8 Air Mobility Command, *Global En-Route Strategy,* White Paper, July 14, 2010.

9 Steve McAllister, *AMC En Route Strategy 2013 GERS Brief*, Headquarters Air Mobility Command, 2013.

10 Michael Lostumbo, Michael J. McNerney, Eric Peltz, Derek Eaton, Dave Frelinger, Victoria A. Greenfield, John M. Halliday, Patrick H. Mills, Bruce R. Nardulli, Stacie Pettyjohn, Jerry M. Sollinger, and Stephen M. Worman, *Overseas Basing of U.S. Military Forces: An Assessment of Relative Costs and Strategic Benefit*, Santa Monica, Calif.: RAND Corporation, RR-201-OSD, 2013.

11 David A. Shlapak, John Stillion, Olga Oliker, and Tanya Charlick-Paley, *A Global Access Strategy for the U.S. Air Force,* Santa Monica, Calif.: RAND Corporation, MR-1216-AF, 2002.

12 LIMS-EV serves as the system of record for USAF logistics and maintenance for reporting and analytics. It comprises a host of capabilities, spanning the executive, logistics readiness, requirements, maintenance repair and overhaul, and installation and mission support functions for the USAF.

13 *DoD Flight Information Publication (Enroute) Supplements* are regionally produced products updated every 16 weeks by the NGA and are designed to be used in combination with the DoD Enroute Charts and Flight Information Handbook (FIH). They provide general information, airport/facility directories, theater flight data and procedures, and related aeronautical information that applies to specific geographic regions for U.S. military air operations.

as military, civilian, or civilian/military. Preference was given to military and civilian/military airports over civilian-only airports.

USAF expertise from USTRANSCOM and Air Mobility Command/A8XPE were then consulted to ensure that all potential ISBs remaining on the list were valid, consistent with the current operating environment, and sufficiently robust for the purpose of this study.

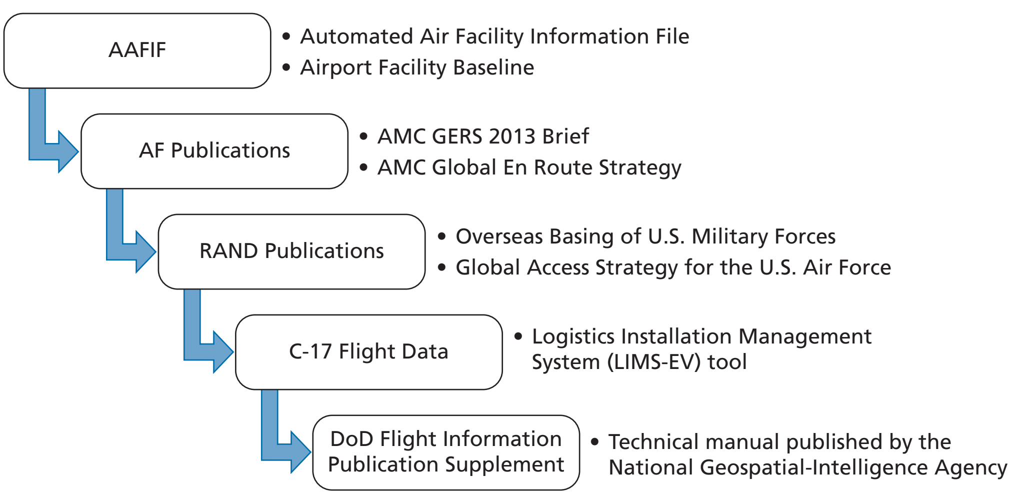
Caveats for Choosing ISBs in This Study

The intent of listing ISBs in the manner preceding is to provide a broad look at what access might mean now and in the near term for executing GRF missions, to highlight where gaps might exist. As this is an operational view of the situation, as detailed tactical planning ensues, some ISBs might change their status or additional ISBs may be included.

In addition, there are other large airfields with significant infrastructure not on our list. A major commercial airport could be used for GRF missions. However, without past examples of USAF using it, or without good reason to believe the Air Force could get access to a large swath of those airfields on short notice, we discounted the probability that it would and left them off the list. So, we are taking a conservative view and trying to use those ISBs that have evidence of previous use to ground our determination of ISBs. The sources used in our analysis are presented in Figure 5.1.

There are areas within the CCMDS—several examples include South America's Tri-Border Area (TBA) of Argentina, Brazil, and Paraguay, multiple countries in southern Africa, and the Indian subcontinent—that would benefit greatly from the inclusion of additional ISBs. However, recent USAF flight data and USAF planning

Figure 5.1
ISB Selection Analysis



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documents either do not highlight the need for basing in these regions or they don't show frequent flights there by USAF aircraft. Reasons for this can vary from the political relationships with those countries and Status of Force Agreements (SOFA) to internal conflict or a lack of strategic interest by the United States in those regions. This study acknowledges that there are areas of the world that have relatively few options for ISB selection, and an effort was made to ensure that, to the maximum extent possible, options were available to support GRF operations globally.

Fuel Issues

Airplane fuel has been identified as one of the most limiting factors in many access strategies for two reasons. First, even small force packages of 12 C-17s can overwhelm many smaller, less capable airfields with the amount of fuel required. Many airfields will not have the amount of fuel needed or the ability to rapidly replace fuel stores once depleted. Secondly, even if fuel is available, the ability to rapidly distribute the fuel may be limited by infrastructure available to move fuel into planes.

One of the primary indicators this study used to address fuel concerns was the Defense Logistics Agency's (DLA) "into plane" fuel contract established at selected airfields. These data are readily available, up-to-date, and identify locations of appreciable activity. If a contract is in place, it indicates that the U.S. government has the standing ability to arrive at the airfield and procure fuel immediately. Contract size varies by location and has the ability to be augmented given lead-time. DLA will not initiate contracts for less than 50,000 gallons of fuel; therefore, it is a good indicator of the level of importance and expected use of a given airfield.

This indicator is used primarily for additional ISBs to show frequent use by the U.S. government. DLA contracts are primarily established at large international airports frequented by U.S. aircraft, but they will be established at smaller fields if unique access is gained from the location.

At airports owned and operated by the U.S. government, a fuel contract with DLA is not required because the U.S. military either partially or wholly controls the airfield. In these cases, there are other military or government methods to procure, store, and distribute fuel. Therefore, primary ISBs are assumed to have the required amount of fuel necessary for all missions.[14] In cases of a secondary ISB where the United States is colocated with a commercial airport, a DLA contract might be possible for additional fuel augmentation.

[14] A conservative estimate for the amount of fuel required for 27 C-17s that constitute the alpha echelon, or initial phase of forces, coming from Fort Bragg is 962,900 gallons of fuel. This number was generated by taking an empty C-17 and filling it with 35,663 gallons of fuel, accounting for a 10-percent fuel reserve.

Additional Considerations

Attempts to identify other limiting factors (LIMFACT) for airfield usage in the access strategy have been restricted to the availability of comparable data. Political stability, the availability of overflight, the ability to obtain country clearance, and other host nation government concerns were not factored into ISB selection analysis. All airfields initially listed in the AAFIF were included for consideration regardless of country or level of political risk. These issues were not included based on data availability (there are no agreed-upon metrics for planning purposes, or there was a lack of specific information) and susceptibility to change (data would not be valid for long enough for this analysis to be useful into the future).

The ability exists within USAF to augment airfield capacity through the use of a Contingency Response Group (CRG). A CRG is composed of all the personnel and equipment needed to deploy to a remote site, open a runway, and establish airfield operations. Alternatively, a CRG can bring additional capability to an existing airfield, including the ability to augment the amount of fuel storage at a location, increase MOG, and augment Command and Control. These groups can operate at civilian airfields, ally air bases, or U.S.-controlled bases. This analysis assumes that sufficient capacity can be brought to airfields selected for GRF use. We provide analysis of time lines resulting from low-MOG (for instance) airfields to ensure that minimal airfields can still be used. Increasing the throughput capability for a selected ISB in some scenarios requires the GCC and/or Air Force to provide additional capabilities as appropriate to the risk being assumed and subject to access to equipment already there, such as[15]

- **lighting:** navigation beacons, working light sets, etc.
- **airfield command and control:** air control tower, airspace management, etc.
- **personnel handling equipment:** air stairs, etc.
- **cargo handling equipment:** 10K forklift, 25K forklift, K-Loader, belt-loader, 747 main deck loader, etc.
- **munitions handling**
- **fuel storage:** 10,000- and 50,000-gallon bladders
- **fuel handling:** pumping vehicles and servicing equipment
- **crash/fire response**.

We used parking estimates to help guide ISB selection; however, we also assume that certain parking allowances can be made during times of crisis. For instance, if an airfield has parking for four aircraft, additional aircraft could be placed on taxiways or elsewhere in times of crisis. It entails taking additional risk that a broken aircraft could stall on-ground operations but has been done historically and opens up certain

[15] Air Force Tactics, Techniques, and Procedures 3-4.1, *Expeditionary Combat Support Planning*, January 2012.

possibilities that current data on parking would limit. Once again, the data for such parking and satellite parking situations are suspect in the data sets we accessed, except for the most robust ISBs, and therefore something we do not hinge our selection of ISBs on. For example, according to GDSS data there are only four C-17 parking spots available for use at Tel Aviv International airport. The same data set claims that Camp Lemonnier, Djibouti, has one C-17 parking spot.[16] These low numbers could be for a variety of reasons, including political constraints on parking U.S. military aircraft or the length between site surveys to update the data.

However, knowing general limitations in parking has shown that multiple ISBs will likely be necessary to support two dozen (or more) aircraft when and if simultaneity is necessary. Planning for multiple ISBs, therefore, will be necessary except in rare cases of very small force packages being delivered or very large, robust airfields being used.

Requirements for sustainment of GRF forces during refueling or for longer periods are not currently known. Staging for an appreciable period of time—several days to several weeks depending on the scenario and use of the GRF—will require the provision of basic necessities. There is current work by the Army to detail those requirements, but they have not been integrated into this analysis.

ISB Typology

Based on the above criteria and logic, we categorized ISBs as follows:

enduring ISB—has durable or long-lasting presence that the USAF has used and will likely continue to use into the future to support global contingency operations. Enduring ISBs are further defined as primary or secondary.

primary enduring ISB—occupies the entire base and airfield either on U.S.-controlled territory (e.g., CONUS) or via a long-term lease and operation by U.S. forces (e.g., Germany's Ramstein AFB). U.S. forces control access to the base, the airfield, and all operations on the base. These are the preferred airfields—with robust infrastructure, C2 facilities, logistics and sustainment—fully capable of sustained military operations.

secondary enduring ISB—located on foreign soil where the U.S. military has access to the airfield but isn't in control of all airfield operations. Portions of the airfield are on either a short-term or long-term lease by the United States, or are controlled by a foreign partner nation. The U.S. military often controls operations on the leased portion of the airfield (e.g., Djibouti's Ambouli airport) and maintains a separate security posture from the unleased portion of the airfield. It can also be a dual civilian/military or strictly civilian airfield with demonstrated continuous use by the USAF.

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16 GDSS, as of April 7, 2014.

additional ISB—does not meet the stricter criteria to be called a primary enduring ISB or a secondary enduring ISB. These types of ISB can be a military, civilian/military, or civilian airfield, located in another country that provides increased access, capability to refuel, and ability to stage aircraft. Most of these are large, commercially owned and operated airports but can be colocated with foreign Air Force Bases (AFB). The largest distinguishing characteristic is that they do not meet the criterion of demonstrated continuous use by the USAF.

For planning purposes, primary enduring ISBs are those sites that the secondary and additional ISBs hinge upon. This is especially important when taking the GRF from intratheater lift onto intertheater airlift. Primary ISBs have the most capability, are operational 24 hours a day, are military controlled, and are able to handle the heaviest operational loads. Secondary ISBs are less capable, oftentimes due to partner nation constraints, but still continue to fulfill many operational needs and tend to be responsive to military requirements. Additional ISBs are necessary for operational access; they are the least dependable, are typically civilian controlled, and have a wide range of capabilities. AMC uses a tiered I–IV system when rank ordering airfields for potential use. For the purpose of this study a more nuanced approach was needed because of the inclusion of so many civilian airfields, which led to the creation of the preceding terms.

For this study, the order of precedence is (1) primary enduring ISB, (2) secondary ISB–U.S. controlled, (3) secondary ISB–ally military controlled, (4) secondary ISB–civilian controlled, (5) additional ISB. The USAF will use primary ISBs whenever possible, followed by secondary ISBs, and then additional ISBs. Whenever it is determined that bases need to be clustered to establish a minimum amount of parking, throughput, or fueling capability, a primary ISB will be included if possible. This will allow U.S. forces the ability to flex aircraft in order to maintain adequate aircraft throughput.

Cluster of ISBs

In geographic areas that do not contain a sufficient number of primary or secondary airfields, clustering of airfields will be necessary. “Clustering” refers to a geographic area where multiple suitable airfields must be used to support initial entry by the GRF. Many areas in the USAFRICOM and USPACOM Area of Responsibility (AOR) will be required to use clustering because of the large geographic distance and insufficient suitability of airfields. Later in this report, we provide some metrics on clustering but point out here that limitations in some factors that change regularly (like fuel or political access) could be addressed through the right amount of redundancy in the suite of ISBs available to the GRF.

Conclusions

The ISB modeling described in this chapter explains the methodology used to both tier ISBs and then select ISBs for use by the GRF. This methodology captures both current planning documents and recent flight data to present a holistic picture of USAF operations, giving operational planners an evaluated set of locations. Based on the analysis conducted, there are still access limitations that the GRF will face, specifically in more remote locations. Chapters Six to Ten will look in detail at access to specific CCMDs and provide the more detailed ISB recommendations.

While it is hard to tell where the GRF will be called in the future, having the most staging options available will be instrumental to obtaining strategic surprise and helping enable mission success. Critical to this will be the use of primary ISBs, which provide the ability to use intra- to intertheater lift, fulfill C2 and reach-back capabilities, provide logistics and sustainment functions, and are under U.S. military control. However, as we will see, access to primary ISBs is limited, with the majority in USEUCOM, USCENTCOM, and USPACOM, and only one ISB (Diego Garcia) located below the equator. Additional access will require the use of secondary and additional ISBs to fulfill GRF mission requirements throughout most of the world.

This study has attempted to identify what ISBs are "foundational" for GRF operations, and therefore necessitate actions now to ensure that should the GRF be used, those places can provide adequate support. Those CCMDs with primarily foundational ISBs are well positioned for success; those CCMDs with primarily secondary or additional ISBs will have to identify what it will take to operate and support GRF operations.

CHAPTER SIX

Toward a USAFRICOM Access Strategy

This chapter describes the CLs, intermediate staging bases, and coverage estimates from those ISBs of those CLs under different CONOPs. Figure 6.1 shows those locations. The coverage results show access at aggregated CCMD levels to help illustrate a strategy for access, which is provided at the end.

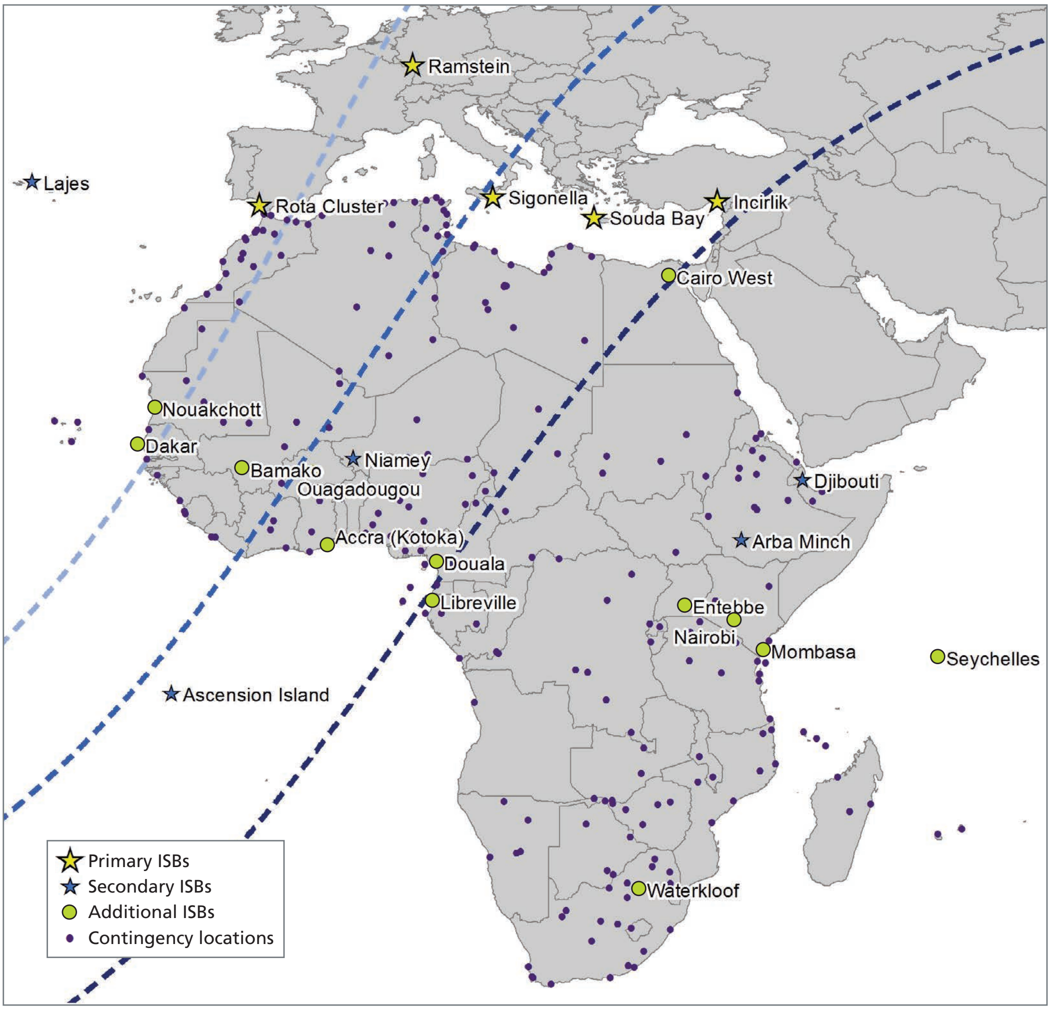
Description of USAFRICOM Contingency Locations

The number of CLs in each CCMD varies based on the number of airfields where landing by C-17 and C-130 aircraft would be possible, even if fuel and other logistical support are not. In USAFRICOM, there are 264 CLs. Among these contingencies are 16 ISBs physically located in USAFRICOM noted in Figure 6.1.[1] Figure 6.1 also shows the location of the 264 contingencies. ISBs located outside of USAFRICOM are not included among the 264 CLs.

There are relatively few airports within USAFRICOM given its relatively large area, and so the average distance between contingencies is farther than in most other CCMDs (with the exception of USPACOM). The average distance from any CL to the nearest other CL is approximately 86 nautical miles. These distances are useful descriptive statistics for on-ground operations or in cases where multiple CLs are being used. Roughly 50 percent of the CLs are within 70 nautical miles of another CL, and approximately 70 percent are within 100 nautical miles of one. Figure 6.2 shows the distribution of the distance to the nearest CL for each CL in USAFRICOM. As with all the other CCMDs, the distribution appears to follow a right-tailed, Poisson-like distribution, though with varying degrees of "noise" based on the geographical features of the CCMD.

1 To clarify, the ISBs are technically a subset of all CLs, which have attributes that make them plausible staging locations.

Figure 6.1
Intermediate Staging Bases in and Distances to USAFRICOM

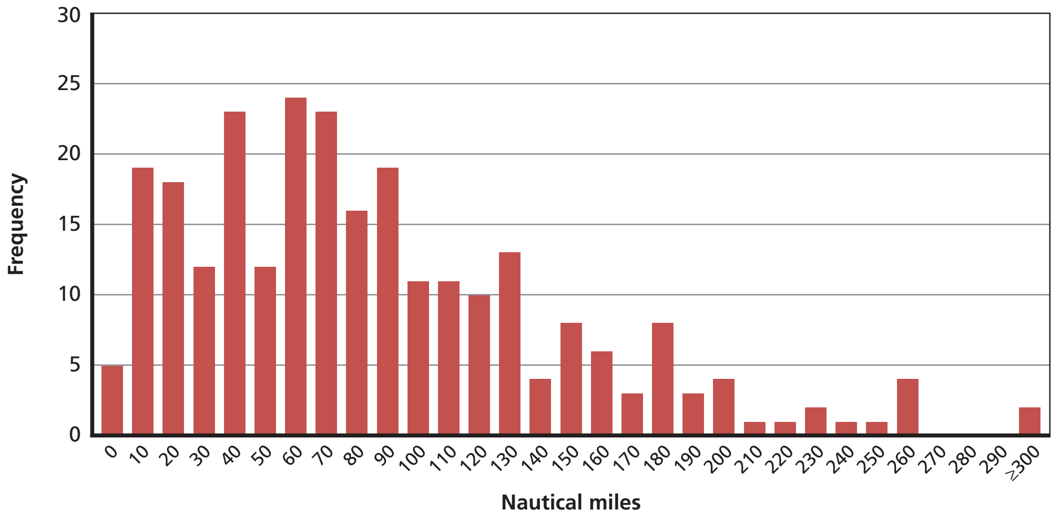


SOURCE: RAND analysis.
NOTE: Three dashed lines represent 3,600 nautical miles (light colored), 4,300 nautical miles, and 5,250 nautical miles (dark colored) from Fort Bragg.
RAND *RR1161-6.1*

ISB Selection for USAFRICOM

USAFRICOM requires the use of ISBs in both Europe and Africa; by using primary, secondary, and additional ISBs, the most coverage can be ensured. There are 24 total ISBs within 22 different countries, all of which are C-17 capable. Of these 24 ISBs, five are civilian, ten are military, and nine are dual civilian and military airfields. There are 12 DLA contracts, with Camp Lemonnier (Djibouti) having the largest contract

Figure 6.2
Histogram of Distances to Nearest CL for Each CL in USAFRICOM



SOURCE: RAND analysis of CLs.
RAND *RR1161-6.2*

at about 6 million gallons of fuel; Djibouti is also a dual-use facility, indicating the availability of additional fuel through military means. The smallest DLA contract is in Niamey, Niger, with 174,000 gallons of fuel on contract. Current flight data shows over 4,200 sorties into USAFRICOM, ranking it the fourth-most-flown-to CCMD as compared to the other CCMDs analyzed in this study. Seven of the selected ISBs are on the GERS, and 14 are on a list from USTRANSCOM experts.

Access into USAFRICOM will mainly be staged out of primary ISBs in Europe. The primary ISBs to stage into Africa are Ramstein AFB (Germany), Moron AB (Spain), Naval Station Rota (Spain), Souda Bay (Greece), Incirlik AFB (Turkey), and Naval Air Station Sigonella (Italy). Due to the limited availability of primary ISBs on the continent, secondary ISBs will become critical to operations, utilizing the islands of Ascension and Lajes offshore and Djibouti and Niamey on the continent. The lack of well-established U.S. military presence and infrastructure, coupled with a limited number of international airports that possess the ability to handle initial entry force requirements, further limit the number of airfields for ISB selection. Based on the fuel availability, the force package sizes included in the scenarios, and other requirements placed on the GRF for USAFRICOM, it is likely that between two and four ISBs will be needed to successfully support large-scale operations.

In northern Africa, basing options are limited, with zero options for ISBs in Morocco, Algeria, Tunisia, or Libya. Additionally, overflight of these countries can be limited, further reducing GRF access onto the continent. Options in central Africa fare little better because of severe fuel restrictions and the inability to meet minimum basing requirements. As a result, most ISB selections are in regions south of the Sahara Desert, predominantly along the coast. Most airfields selected are civilian operated; more than half selected as additional ISBs have a DLA fuel contract in place, indicating at least a moderate level of aircraft throughput.

The availability of airfields with the capacity to support initial entry forces and the vast geographic distances on the continent will necessitate clustering of airfields to obtain optimum coverage, reduce risk, and ensure the most flexibility to mission planners. Possible clusters have been identified across West, Central, and East Africa to help increase coverage area while still meeting the criteria to become an individual ISB. Because of the distance between the primary ISBs in Europe and the rest of the continent, secondary ISBs were included in each cluster. The clusters are

- West Africa—Niamey, Lajes, Dakar, Bamako, and Nouakchott
- Central Africa—Niamey, Douala, Accra, Libreville, and Ouagadougou
- East Africa—Djibouti, Nairobi, Arba Minch, Mombasa, and Entebbe.

At the broadest level, we modeled two types of CONOPs for access to USAFRICOM: with and without staging at an ISB. Without staging implies that we use ISBs only for refueling, and that the planning and preparation for the operation is performed at Fort Bragg. With staging, the ISB serves as a point for transferring of cargo and personnel among aircraft, along with some more planning functions. Staging enables shorter-range aircraft, such as the C-130, to be used in missions.

Staging for USAFRICOM

Staging Provides Good Coverage to USAFRICOM, But Only with More Austere ISBs

Staging at ISBs within or near USAFRICOM requires that the materiel, personnel, and aircraft have sufficient time and the means to reach the desired set of ISBs. With staging, the assumed range is that of a C-130 performing a radius mission, which is 1000 nautical miles. As shown previously, 1,000 nautical miles is also the assumed range for a C-17 postairdrop due to the 385,000-pound weight restriction on personnel aircraft (note this constraint applies to only personnel aircraft, and not to equipment-carrying aircraft).

Table 6.1 shows coverage at 1,000 nautical miles. We calculated the number of CLs accessible from the three tiers of ISBs (primary enduring, secondary enduring, additional). As Table 6.1 shows, staging from the primary ISBs in Europe provide modest coverage to the contingencies in USAFRICOM, though the accessible ones are almost all accessible by multiple primary ISBs. The contingencies in northern Africa are suitably close to multiple ISBs—such as Rota (LERT), Moron (LEMO), and Sigonella (LICZ)—that provide redundant coverage.

Table 6.1
Coverage Statistics for USAFRICOM

ISB Type	ISB Name	CL Coverage (1,000 nm) Single (%)	CL Coverage (1,000 nm) Double (%)	Population Access (%)	Additional CL coverage (1,000 nm) Single (%)
Primary enduring	Ramstein	24	23	5	
	Rota			9	
	Moron			9	
	Souda Bay			4	
	Incirlik			0.2	
	Sigonella			7	
Secondary enduring	Niamey	+43	+15	29	
	Djibouti			18	
	Arba Minch			25	
	Lajes			2	
	Ascension Island			1	
Additional	Waterkloof	+33	+43	11	22
	Douala			30	4
	Mombasa			28	3
	Seychelles			3	3
	Bamako			26	1
	Entebbe			30	0
	Dakar			7	0
	Cairo West			3	0
	Nouakchott			9	0
	Nairobi			28	0
	Accra (Kotoka)			29	0
	Ouagadougou			30	0
	Libreville			30	0
	Total	**100**	**81**		

SOURCE: RAND analysis.

NOTE: The population access represents the percentage of the USAFRICOM population within 100 nautical miles of any reachable CL from that ISB. The population access metric is nonadditive (i.e., multiple ISBs may have overlapping population coverage). "CL Coverage" is the percentage of CLs within 1,000 nautical miles of at least one ISB (for the "Single" column) or at least two ISBs (for the "Double" column) from the group noted. CL coverage is additive going down the column.

The secondary ISBs provide significant additional coverage due to the addition of ISBs physically located within USAFRICOM, particularly Djibouti (HDAM), Arba Minch (HAAM), and Niamey (DRRN). Between the primary and secondary ISBs, two-thirds of the USAFRICOM CLs are within 1,000 nautical miles of at least one ISB; most of those are within range of at least two ISBs.

Adding the additional ISBs' locations to the primary and secondary list provides access to all USAFRICOM CLs within the 1,000–nautical mile range metric.

In addition to the aggregate level of marginal coverage, we measure at an individual level the ability of additional ISBs to provide coverage beyond primary and secondary ISBs in a rank ordering. Coverage is calculated according to a greedy algorithm, such that the ISB from the "additional" list with the greatest additional coverage is selected first, then the location with the greatest additional coverage once the first ISB is already included is added next, and so on.

Primary and secondary enduring ISBs in USAFRICOM fail to cover much of southern Africa. Waterkloof (FAWK) in particular is significant for providing access to the southern portion of USAFRICOM, as—to a lesser extent—are the ISBs in Kenya, such as Nairobi (HKJK) and Mombasa (HKMO). Waterkloof significantly increases single coverage of the CCMD, from 43 percent to 65 percent. Addition of further ISBs provides only marginal benefit, though the addition of Douala and Mombasa increases the number of CLs that can be accessed from multiple ISBs. Of course, other combinations of additional ISBs could be used to increase this secondary coverage.

The population access metric refers to the percentage of the USAFRICOM population within 100 nautical miles of any reachable CL. So while the CL coverage metric refers to the *number* of reachable contingencies, the population access metric provides a measure of how much each of those reachable contingencies reflects the overall population of USAFRICOM. The population access for each ISB is noncumulative. As a reminder, these metrics for coverage do not reflect the priorities of GCC commanders, which will be based on the perceived need for access to areas of the GCC.

Redundant Coverage in USAFRICOM

Redundant access to a particular CL is important, since a single ISB cannot necessarily handle the fuel, aircraft, and personnel requirements for a particular scenario. Having multiple ISBs that can provide access to that CL makes for a more viable strategy. ISBs can be teamed up to increase fuel availability, MOG, or parking. Figure 6.3 shows the amount of redundant coverage possible for airlanding at C-17 and C-130 ranges[2] from either the top two tiers or all three tiers of ISBs. This analysis shows some current limitations in USAFRICOM in terms of using multiple sites to access one CL.

Direct Access to USAFRICOM

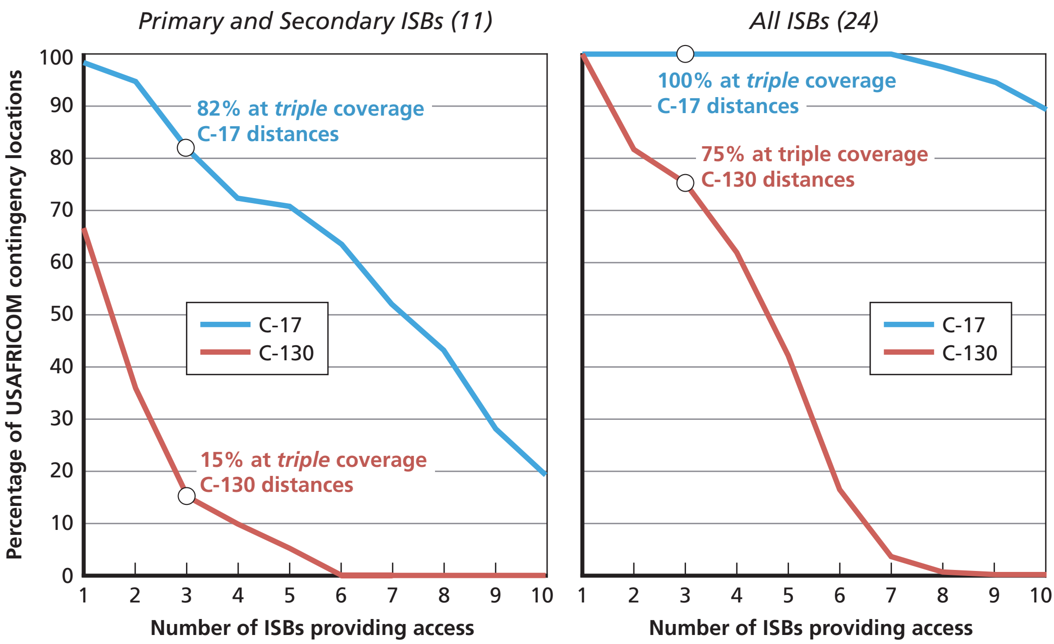
"Direct, Off-Site Refuel" Covers 8 Percent of USAFRICOM

Eight percent of USAFRICOM CLs are directly reachable from Fort Bragg with enough fuel left postdrop to reach a nearby ISB to refuel. There are four ISBs[3] from our list that can be reached for off-site refuel from those CLs. These CLs and ISBs are near the far reaches of western Africa. Only one or two ISBs are reachable from any

2 These correspond to roughly 1,000 nautical miles and 2,000 nautical miles, respectively. See Appendix B for more information on these calculations.

3 Two in Africa (Nouakchott and Dakar) plus Rota and Moron.

Figure 6.3
Redundant Coverage Metrics for USAFRICOM Contingencies



SOURCE: RAND analysis.
RAND *RR1161-6.3*

given CL—thus there is low redundancy for refueling for those few CLs. Five percent of the USAFRICOM population is within 100 nautical miles of any of these reachable CLs. The airland and airdrop coverage are identical, since the fuel expended to reach to any USAFRICOM CL is large enough that the C-17 aircraft would be under 385,000 pounds, and therefore the weight restriction is not the limiting constraint in this particular case.

"Direct, One-Stop for Airdrop" Covers 36 Percent of USAFRICOM

Direct, one-stop means that airdrop-ready troops and equipment leave Bragg, refuel and replan very briefly at an intermediate staging base, and then subsequently move on to the CL. As shown in Figure 6.1, there are multiple ISBs both in Europe and in USAFRICOM reachable from Fort Bragg given a 4,300–nautical miles limit. The postairdrop range of 1,000 nautical miles for a C-17 limits the accessible population to those within 1,000 nautical miles of those reachable ISBs. For the case in which primary, secondary, and the additional ISBs are included, in which Nouakchott (GQNN), Dakar (GOOY), and Bamako (GABS) are within 4,300 nautical miles of Fort Bragg, 36 percent of USAFRICOM population are within airdrop range (1,000 nautical miles) of any of these seven ISBs.

"Direct, One-Stop with Off-Site Refueling" for Airdrop Covers 61 Percent of USAFRICOM

Assuming we are using a fleet of C-17 aircraft, the CONOP involving airdrop followed by an off-site refuel can expand coverage into a COCOM. While there is a postairdrop distance restriction of 1,000 nautical miles, this restriction does not apply to the range preairdrop. As shown in Table 3.1, we assume a 2,500–nautical mile distance from the ISB where the air drop was planned to the contingency; the standard 385,000-pound weight restriction at drop still applies. The "direct, one-stop, off-site refueling for airdrop" CONOP is not one of the core cases shown in Figure 6.3. Nevertheless, the increase in range can provide significant greater access for certain COCOMs, such as USAFRICOM. Sixty-one percent of the USAFRICOM contingencies are reachable under this CONOP. This is significantly larger than the "direct, one-stop airdrop" CONOP, as this allows for greater outbound distances (2,500 nautical miles instead of 1,000 nautical miles) to contingency locations, though there still needs to be an ISB within 1,000 nautical miles of the CL, so refueling postairdrop could occur.

As in the "direct, one-stop" airland case, the population within ten nautical miles or even 100 nautical miles is less than the percentage of accessible contingencies. The percentage of the USAFRICOM population within ten nautical miles and 100 nautical miles of the reachable contingencies in this CONOP is 12 percent and 50 percent, respectively.

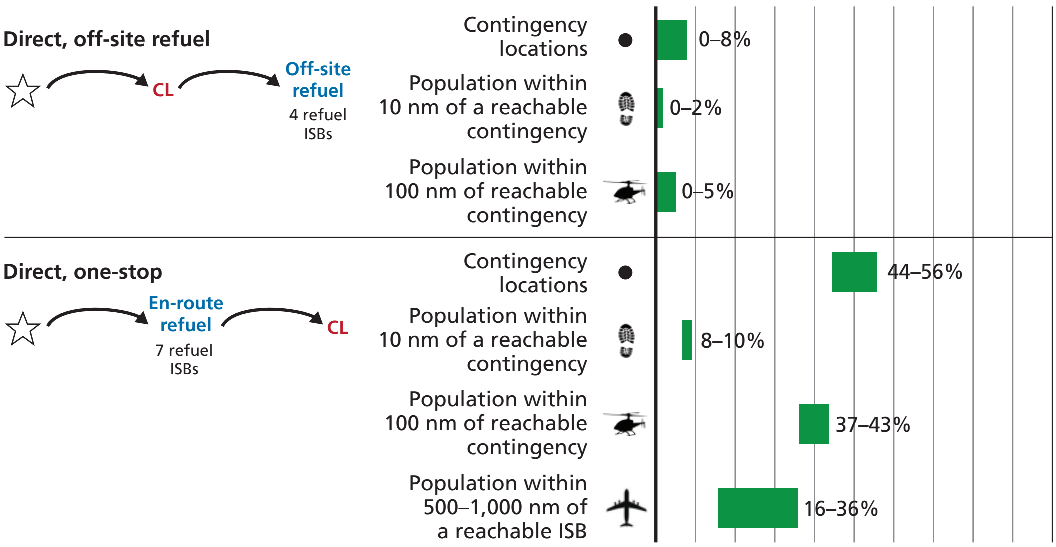
"Direct, One-Stop for Airland" Covers 56 Percent of USAFRICOM

In the case of airland at the CL, the coverage increases considerably for the case where the planes refuel briefly en route. The ability to land at the ISB removes the 385,000-pound weight restriction, and the maximum range under the same set of cargo weight assumptions that provides a 4,300–nautical mile range allows for a 2,007–nautical mile–radius range (assuming all cargo is removed at the CL and the flight returns empty). As Figure 6.4 shows, 56 percent of the CLs in USAFRICOM are reachable by at least one of the seven in-range ISBs (Rota cluster includes Rota and Moron), and 44 percent of them are reachable by at least five of them. As one might expect, the population within 100 nautical miles is less than this percentage, as not all of USAFRICOM's population is within 100 nautical miles of any CL. This effect is obviously more pronounced by the ten–nautical mile metric, assumed to be a reasonable "on-foot" access metric. This accessibility matters, in particular, for when airland is chosen in lieu of airdrop, as the actual forces may be needed significantly far from a given airfield.

"Direct, Nonstop" is Not Possible for USAFRICOM

As with most CCMDs, there is no "direct access" to any CL within USAFRICOM without off-site refuel or en-route refueling. All C-17 aircraft must refuel prior to returning to Fort Bragg and, in most cases, must do so prior to arriving at the CL or at an ISB, whether staging or simply for refueling purposes.

Figure 6.4
USAFRICOM Accessibility Metrics Under Airland



NOTE: Ranges for the first six rows indicate percentages of CLs covered redundantly by at least five ISBs (low number) to CLs covered by at least one ISB (high number). Light-colored, vertical lines are in increments of 10%.
RAND *RR1161-6.4*

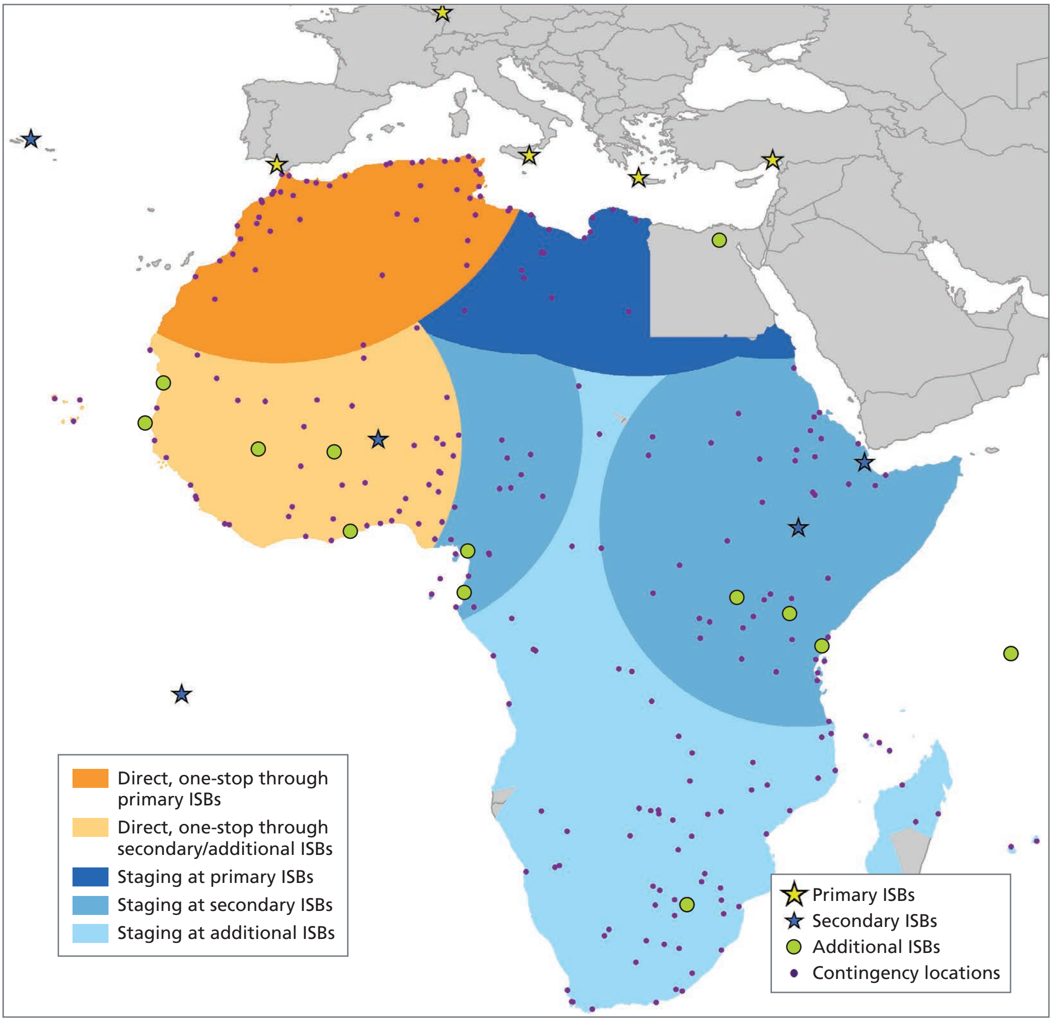
Toward an Access Strategy into USAFRICOM

This chapter provides an operational view of coverage and access for the GRF across USAFRICOM. This can be seen as input to planning to help ensure that the mandate for being able to employ GRF globally has been considered from the lens of ISBs. This study is not a replacement for tactical-level planning for a specific CL but can help set an access strategy for the GRF in the CCMD. To that end, we summarize access into USAFRICOM as follows:

> *GRF access into USAFRICOM entails combinations of direct access and staging through Europe in the north, limited direct access through sites in USAFRICOM in the west, and staging at austere basing throughout.*

Figure 6.5 summarizes the access portions for USAFRICOM. For northern Africa, staging in USEUCOM is expected. Robust basing allows for either staging there in advance of a final move into North Africa, or flying through there on the way to a rapid deployment. Some locations in Western Africa, perhaps from Morocco along the coast and down to the Gulf of Guinea, are directly accessible from CONUS on long-legged aircraft but suffer from less infrastructure and fewer defined relationships with the United States. Thus, direct, one-stop through secondary and additional

Figure 6.5
USAFRICOM Coverage Across Multiple Deployment Concepts



NOTE: This coverage assumes 1,000–nautical mile ranges from ISBs.
RAND *RR1161-6.5*

ISBs is possible while retaining 1,000–nautical mile radii from an ISB. Access to sites farther inland from those, and along the east coast of Africa and into the south entail some means of strategic lift and assume staging in advance of operations. The less-developed basing noted in this report covers the CLs noted, even if one assumes that the CLs are accessed from those bases at C-130 distances (e.g., ~1,000 nautical miles. See Figure 6.3). The austere basing in Africa noted in this report, therefore, is *foundational* to ensuring GRF operations in USAFRICOM, and therefore will entail activities to ensure that the appropriate infrastructure is available should a rapid response mission warrant its use. As Figure 6.5 shows, large portions of USAFRICOM are accessible only through the secondary and additional ISBs noted in this report. The redundancy is not high in most of USAFRICOM, and therefore additional potential sites for development may be warranted as well.

This general strategy for USAFRICOM entails a few actions.

Plans: Joint Staff and CCMD should, in concert with the Joint GRF members, provide applicable plans for executing GRF operations in AOR. While these plans cannot cover the broad mandate for a GRF force, they should help ensure that key variables for access are deliberately considered in advance of possible operations.

Planning: Table top planning among key stakeholders (CCMDs and Joint Force) should be made habitual to update ISB choices in a changing environment and help seed investments in infrastructure for developing the most austere basing.

Exercises: Limited exercises in USAFRICOM should follow exercises in the more robust CCMDs.

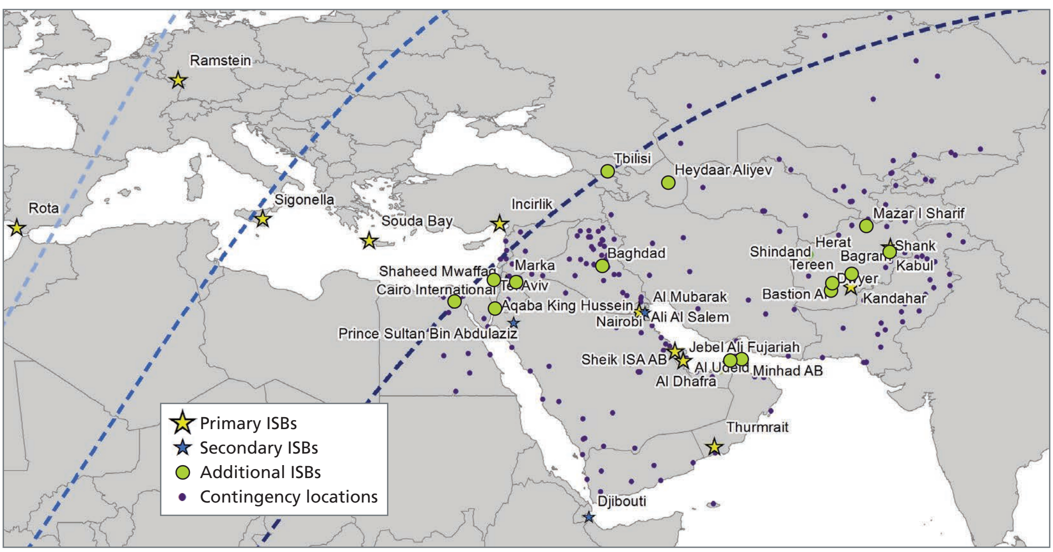
Site Preparation: Preparing ISBs in advance of possible operations will remain a challenge in USAFRICOM because of the changing nature of relationships, and rather austere conditions present at some locations in terms of access to basic infrastructure, fuel, etc. Therefore, preparing some key ISBs in regions important to the GCC should be done in concert with plans drawn up above to help prioritize locations for investment. The most austere of those locations noted in this study will entail relationships and agreements to be worked out and limited infrastructure built to ensure GRF operations, including runway improvements and sustainment capabilities.

CHAPTER SEVEN

Toward a USCENTCOM Access Strategy

USCENTCOM has robust basing at key points, and redundant coverage for a smaller CCMD. Access to USCENTCOM is primarily through USEUCOM, with eventual basing occurring both in USEUCOM and USCENTCOM. The edge of USCENTCOM is approximately 5,200 miles from Fort Bragg, and therefore even a single hop is a long distance for direct access. Nonetheless, with staging in both USEUCOM and USCENTCOM, good coverage of USCENTCOM exists. ISBs and CLs are shown in Figure 7.1 and described more completely below.

Figure 7.1
USCENTCOM ISBs and Distances



SOURCE: RAND analysis.
NOTE: Three dashed lines represent 3,600 nautical miles (light colored), 4,300 nautical miles, and 5,250 nautical miles (dark colored) from Fort Bragg. Note that Diego Garcia has been cropped.
RAND *RR1161-7.1*

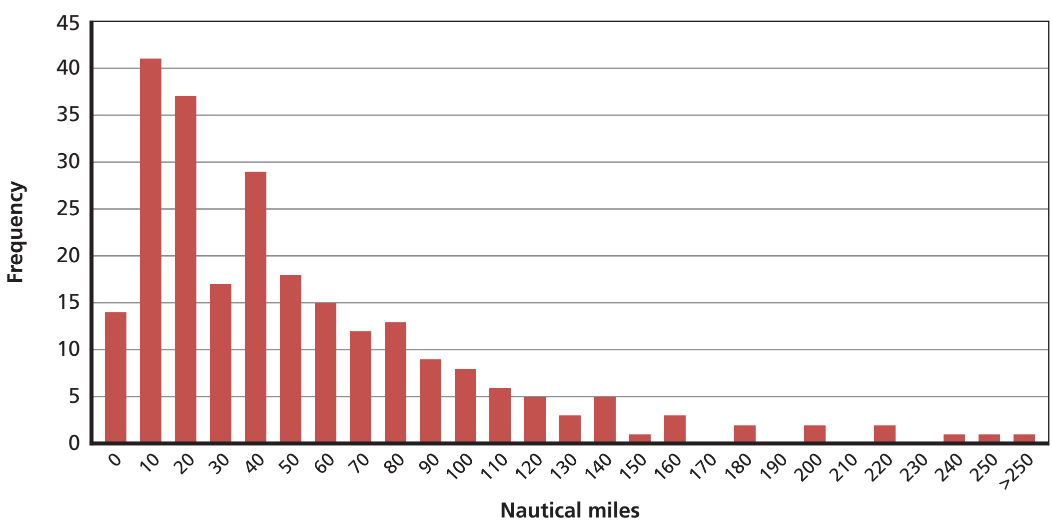
USCENTCOM Contingency Locations

In USCENTCOM, there are 245 CLs. Among these contingencies are 25 ISBs physically located in USCENTCOM noted in Figure 7.1. Figure 7.1 also shows the location of the 245 contingencies. While there are slightly fewer CLs in USCENTCOM than in USAFRICOM, they are contained within a much smaller geographical area. As a result, the average distance to the closest CL from each CL is less: approximately 53 nautical miles. Approximately 86 percent are within 100 nautical miles of another. Figure 7.2 shows the distribution of the distance to the nearest CL for each CL in USCENTCOM. While the average distance is smaller than in USAFRICOM, the distribution appears to follow a similar Poisson-like distribution.

ISB Selection for USCENTCOM

Access into USCENTCOM relies primarily on ISBs located in Europe and on the northern and central routes in the GERS. This section details the ISB selection and shows that a high level of access requires the use of multiple ISBs in both USEUCOM and USCENTCOM, relying on all three types of ISB for maximum coverage. We identify 35 ISBs from 15 different countries, all of which are C-17 capable. Of these 35 ISBs, six are civilian, 22 are military, and seven are dual civilian and military airfields. There are 11 DLA contracts in place, with Al Mubarak, Kuwait, having the largest contract, with over 21 million gallons of fuel, and King Hussein, Jordan, having the

Figure 7.2
Histogram of Distances to Nearest CL for Each CL in USCENTCOM



RAND *RR1161-7.2*

smallest contract, with 100 thousand gallons of fuel. Six of the selected ISBs are on the GERS, and 15 are on a list from USTRANSCOM experts. Additionally, USCENTCOM is ranked first among CCMDs in flights flown there, with over 16,000 flown in FY 2013.

Incirlik AB (Turkey), Naval Support Activity Souda Bay (Greece), and Ramstein AFB (Germany) are important hubs along the route to USCENTCOM. Once into the USCENTCOM AOR, there are options for both primary and secondary ISBs because of the persistent U.S. presence in the Middle East and the relatively smaller geographic area covered. Consequently, there are more robust basing possibilities in this region than in other GCCs.

Primary ISBs are located in and around the Gulf States of Qatar, Bahrain, and Oman, with multiple secondary and additional ISBs located in Kuwait, Saudi Arabia, and the United Arab Emirates. Because of the various types of operations that the GRF could be called on to perform and the potential for a high threat level in this region, a diverse set of ISBs was selected to minimize risk. Bases selected in Israel, western Saudi Arabia, Jordan, and Djibouti were considered at this point.

On the other side of the USCENTCOM AOR, bases in Afghanistan are included based on current C-17 flight data and operational demands. Access may be limited in the future as U.S. forces continue to withdraw, but it is likely that some level of U.S. involvement will continue, thereby providing access to Bagram AFB (Afghanistan).

We describe two types of CONOPs for access to USCENTCOM: with and without staging at an ISB. Without staging implies that we use ISBs only for refueling and that the planning and preparation for the operation is performed at Fort Bragg. With staging, the ISB serves as a point for transferring of cargo and personnel among aircraft, along with some more planning functions. Staging enables the use of shorter-range aircraft, such as the C-130, in missions.

Staging Provides Very Good Coverage of USCENTCOM

Staging at ISBs within or near USCENTCOM assumes that the materiel, personnel, and aircraft have sufficient time and the means to reach the desired set of ISBs. From those ISBs, we look at coverage of the CCMD at 1,000 nautical miles. That number represents the radius distance for C-130s and provides a conservative estimate of the postairdrop distance limitations of a C-17 carrying personnel.

Staging at Primary ISBs Only Still Provides Very Good Access

As Table 7.1 shows, 99 percent of the CLs in USCENTCOM are reachable from at least one primary ISB, and 98 percent are reachable from at least two ISBs. Because the primary ISBs provide such access, the addition of secondary or additional ISBs provides “reinforcing” coverage, with the exception of a few remote contingencies in

Table 7.1
Access Statistics for USCENTCOM

ISB Type	ISB/Cluster Name	CL Coverage (1,000 nm) Single (%)	CL Coverage (1,000 nm) Double (%)	Population Access (%)	Additional CL Coverage (1,000 nm) Single (%)
Primary enduring	Incirlik			38	
	Al Udeid			44	
	ISA AB			46	
	Bagram			57	
	Kandahar			61	
	Ramstein			0	
	Rota	**99**	**98**	0	
	Moron			0	
	Souda Bay			25	
	Ali Al Salem			51	
	Thurmrait			26	
	Sigonella			12	
	Diego Garcia			0	
Secondary enduring	Marka			29	
	Al Mubarak			18	
	Bin Abdulaziz	**+0**	**+0**	25	
	Jebel Ali			2	
	Djibouti			1	
Additional	Heydaar Aliyev			40	0.4
	Kabul			57	0
	Aqaba King Hussein			42	0
	Fujariah			67	0
	Minhad AB			62	0
	Dwyer			66	0
	Tbilisi			41	0
	Tereen			61	0
	Cairo Intl			34	0
	Shaheed Mwaffaq	**+0.4**	**+1.2**	40	0
	Bastion AF			66	0
	Herat			68	0
	Tel Aviv			40	0
	Mazar I Sharif			59	0
	Shindand			67	0
	Al Dhafra			50	0
	Shank			57	0
	Baghdad			45	0
	Total	**99**	**99**		

SOURCE: RAND analysis.

NOTE: The population access represents the percentage of the USCENTCOM population within 100 nautical miles of any reachable CL from that ISB. The population access metric is nonadditive (i.e., multiple ISBs may have overlapping population coverage). "CL coverage" is the percentage of CLs within 1,000 nautical miles of at least one ISB (for the "Single" column) or at least two ISBs (for the "Double" column) from the group noted. CL coverage is additive going down the column.

Table 7.2
USCENTCOM Coverage by ISB Location

ISB Type	ISB/Cluster Name	Cumulative CCMD Coverage (1,000 nm)	
		Single (%)	Double (%)
Primary enduring—USEUCOM	Incirlik Souda Bay Sigonella	49	28
Primary enduring—USCENTCOM	Al Udeid ISA AB Bagram Kandahar Ali Al Salem Thurmrait	+49	+69
	Total	**99**	**98**

northern Kazakhstan (airports UASK and UACP). As noted previously, the population access metric refers to the percentage of the USCENTCOM population within 100 nautical miles of any reachable CL. The population access is noncumulative (i.e., considered for that ISB in isolation of all others).

In addition to a highly redundant level of coverage even with the use of only primary ISBs, several of the ISBs provide access to a large percentage of the USCENTCOM population (e.g., Bagram, Incirlik, Kandahar) compared with those ISBs providing access to USAFRICOM.

Both USCENTCOM ISBs and USEUCOM ISBs Play a Role in Access to USCENTCOM

The primary ISBs in Table 7.1 include both USCENTCOM and USEUCOM locations. Coverage by CCMD ISB is shown in Table 7.2. This shows that USEUCOM ISBs cover 49 percent of USCENTCOM, and to get the other half of coverage, ISBs in USCENTCOM are necessary. However, if calculated cumulatively in the other direction, then the ISBs in USCENTCOM alone provide 98 percent single coverage for USCENTCOM. The utility of USEUCOM ISBs in covering USCENTCOM indicates options for planners considering how to position GRF forces in advance of their use and how to position them in relation to possible threats to ground forces.

Direct Access to USCENTCOM Limited to Airland

"Direct, One-Stop" for Airdrop Not Possible Without Off-Site Refuel

No ISBs located within USCENTCOM are reachable with C-17s under the 4,300–nautical mile range assumption. USEUCOM ISBs within 4,300 nautical miles of Fort Bragg are Rota (LERT), Moron (LEMO), and Ramstein (ETAR). With these three, the airdrop access to USCENTCOM is effectively none. Due to the weight restriction of 385,000 pounds at airdrop, a C-17 aircraft must land within 1,000 nautical miles postairdrop. No USCENTCOM CL is within 1,000 nautical miles of Rota, Moron, or Ramstein. It is possible to stage an airdrop from Rota, Moron, and Ramstein to many USCENTCOM locations, but nearby off-site refueling would be necessary. Given the robust basing in USCENTCOM, that makes this a robust CONOP.

"Direct, One-Stop with Off-Site Refueling" for Airdrop Covers 57 Percent of USCENTCOM

The ability to do direct, one-stop, off-site refueling with airdrop significantly adds to the accessibility of the contingencies in USCENTCOM. With the addition off-site refueling to "direct, one-stop" CONOP, the ability to come from a Fort Bragg–reachable ISB up to 2,500 nautical miles from a USCENTCOM contingency location provides considerable access to the western portion of USCENTCOM, though there must be ISBs in and around USCENTCOM that are viable options for refueling post airdrop. Fifty-seven percent of the USCENTCOM CLs are reachable under this CONOP. This percentage is significantly larger than the "direct, one-stop airland" CONOP as well (36 percent), as this allows for greater outbound distances (2,500 nautical miles vs. 2,000 nautical miles) to contingency locations—again, so long as there is an ISB within 1,000 nautical miles of the contingency in which to refuel. The percentage of the USCENTCOM population within ten nautical miles and 100 nautical miles of the reachable contingencies in this CONOP is 14 percent and 43 percent, respectively.

"Direct, One-Stop" for Airland Covers 36 Percent of USCENTCOM

For airland operations, the radius range of the C-17 is approximately 2,000 nautical miles, which is sufficiently large to provide access to some of the CLs in USCENTCOM from Rota, Moron, and Ramstein. As shown in Figure 7.3, 36 percent of the USCENTCOM CLs are reachable by airlanding from one these three ISBs, and 28 percent of the USCENTCOM population is within 100 nautical miles of one or more of these reachable contingencies.

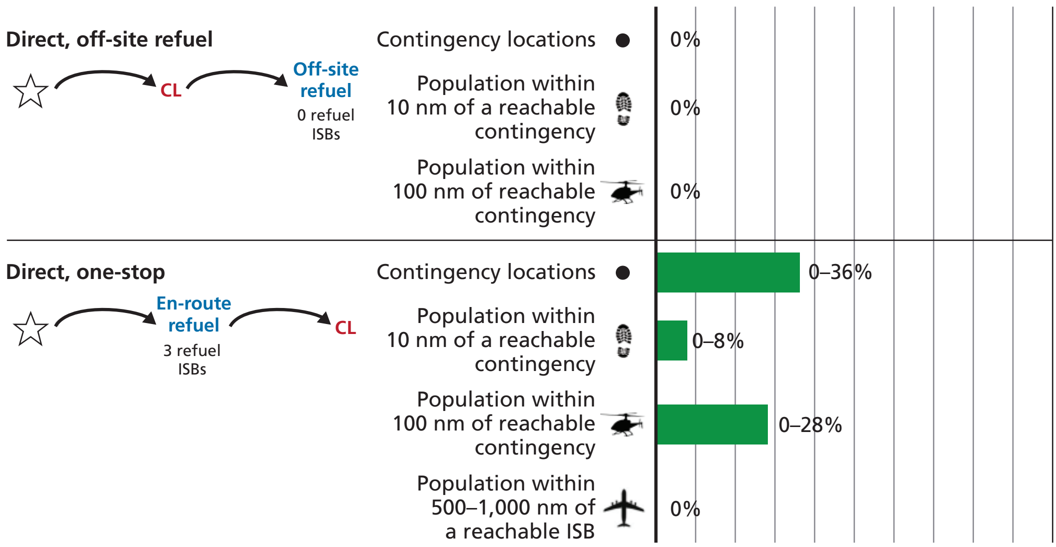
"Direct, Off-Site Refuel" Provides No Coverage of USCENTCOM

No direct access from Bragg is possible even with off-site refueling. The contingencies in USCENTCOM are beyond the maximum 4,300–nautical mile range of the C-17, so an en route refuel is necessary for even the closest CL.

Toward an Access Strategy into USCENTCOM

This chapter provides an operational view of coverage and access for the GRF across USCENTCOM. This can be seen as input to planning to help ensure that the man-

Figure 7.3
USCENTCOM Accessibility Metrics Under Airland



NOTE: Light-colored, vertical lines are in increments of 10%.
RAND *RR1161-7.3*

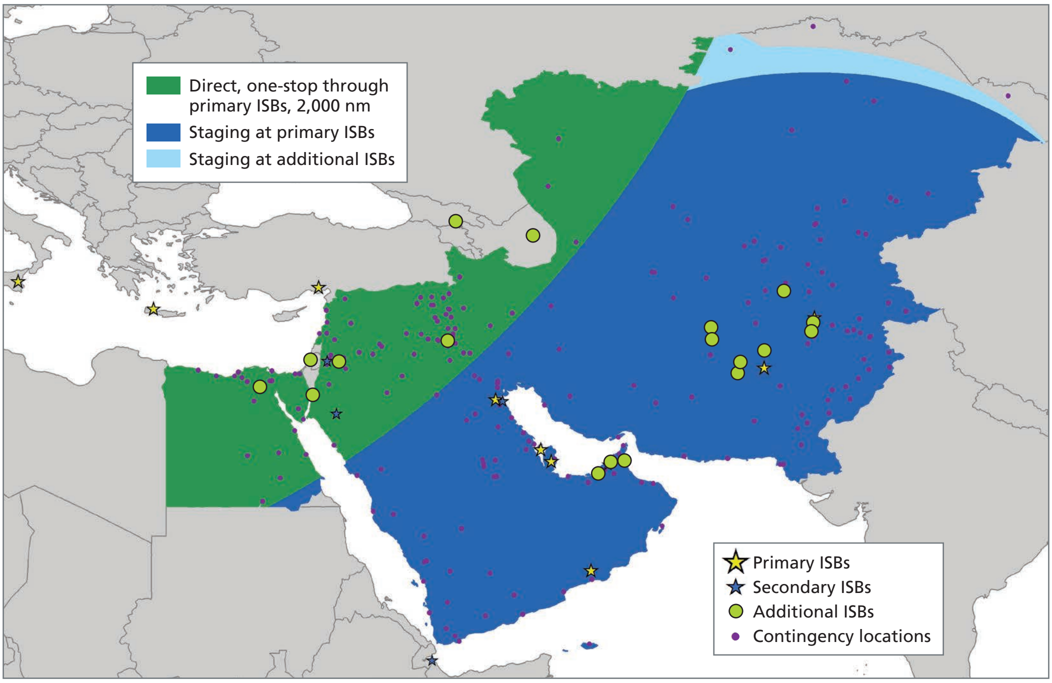
date for being able to employ GRF globally has been considered from the lens of ISBs. This study is not a replacement for tactical-level planning on specific contingencies but can help set an access strategy for the GRF in the CCMD. To that end, we summarize access into USCENTCOM as follows:

> *GRF access into USCENTCOM entails limited direct access through developed basing in USEUCOM and staging at robust basing in both USEUCOM and USCENTCOM.*

Figure 7.4 shows a summary of coverage through multiple deployment concepts. Strategic lift like C-17s can directly reach Western Europe ISBs, and with airlanding (e.g., assuming a second leg of 2,000 nautical miles), it is possible to then reach portions (up to 36 percent of CLs) of USCENTCOM as denoted by the green in the map. Distances are too great to reach USCENTCOM for airdrop with one hop. Therefore, direct access will be limited to some airlanding scenarios, with long legs.

Staging into USCENTCOM, however, provides very robust geographic coverage based on well-established ISBs analyzed in this study. Using only the primary enduring ISBs in this study, double coverage is available to 98 percent of USCENTCOM, thus providing the *foundational* coverage. The remaining ISBs therefore provide *reinforcing* coverage. Part of this strategy will therefore entail shoring up detailed knowledge of how GRF employments would be used in these known areas and coming to a shared vision among services and Joint Staff. This general strategy entails a few actions:

Figure 7.4
USCENTCOM Coverage Across Multiple Deployment Concepts



NOTE: As opposed to the other CCMDs, we show 2,000–nautical mile range from primary ISBs in USEUCOM to show a long-reach, one-stop operation for direct access (shown in green). Those areas in green are generally within range of primary USCENTCOM ISBs at 1,000 nautical miles.
RAND *RR1161-7.4*

Plans: Joint Staff and CCMD should, in concert with the Joint GRF members, provide applicable plans for executing GRF operations in AOR. While these plans cannot cover the broad mandate for a GRF force, they should help ensure that key variables for access are deliberately considered in advance of possible operations.

Planning: Limited table top exercises among key stakeholders (CCMDs and Joint force) should be done to codify how GRF operations might be run in USCENTCOM. Included in here should be a shared understanding of which ISBs GRF operations would be run through, specific planning expectations for site use, and a list of any applicable infrastructure improvements necessary to enable operations. The planning might identify a robust set of possible ISBs for future use, with the expectation that a select few would actually be used in a given operation. This strategy might be termed a "Five use Two" strategy, where five sites are identified from current robust basing that provide redundant coverage of the AOR, with the expectation that one or two of those might be actually used in some future operation.

Exercises: Exercises for GRF operations in USCENTCOM should be done to exercise key planning considerations highlighted in this report. Choosing exercises in one of the more well-developed (from an ISB standpoint) CCMDs like USCENTCOM or USEUCOM will help to define key missing parameters for GRF employment like throughput for refueling operations, beddown of GRF elements in terms of staging, and possible sustainment and mission command requirements, among others. Eventual exercises might then move to different CCMDs to test other aspects of operations.

Site Preparation: The primary ISBs mentioned in this report are known to be rather robust in terms of sustaining GRF operations, and some minimal preparation might be necessary as more details of exact requirements are determined as per the preceding.

CHAPTER EIGHT

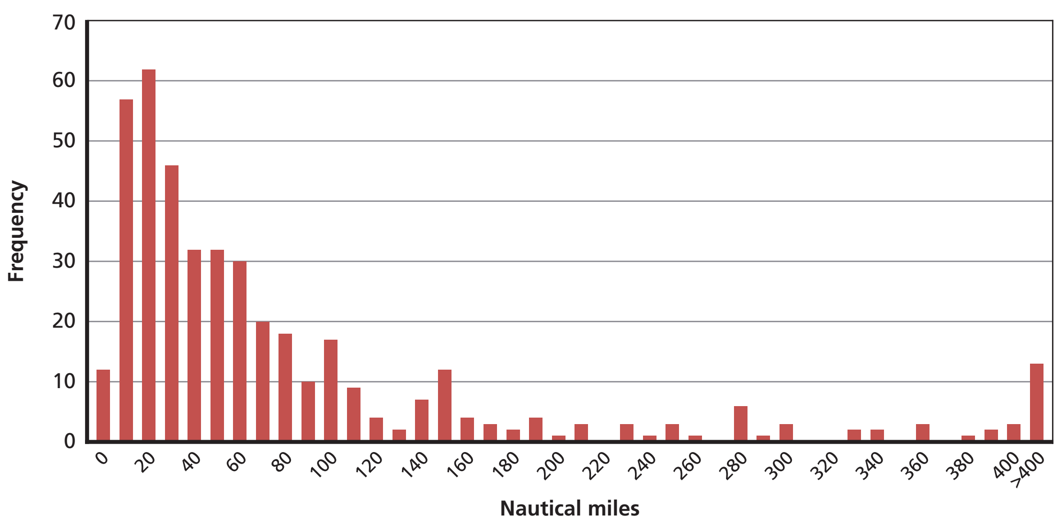
Toward a USPACOM Access Strategy

This section details the ISB selection for USPACOM. To ensure the most access, multiple ISBs throughout the AOR must be utilized. This requires the use of primary, secondary, and additional ISBs on U.S. territory and throughout the USPACOM AOR.

Description of Contingency Locations

There are 431 CLs within USPACOM. Due to the vastness of the USPACOM area, which includes large swaths of the Pacific Ocean, many of these contingencies are quite remote. On the other hand, the dense population in parts of Asia makes some contingencies very close to one another (Figure 8.1). Among these contingencies are 47 ISBs

Figure 8.1
Histogram of Distances to Nearest CL for Each CL in USPACOM

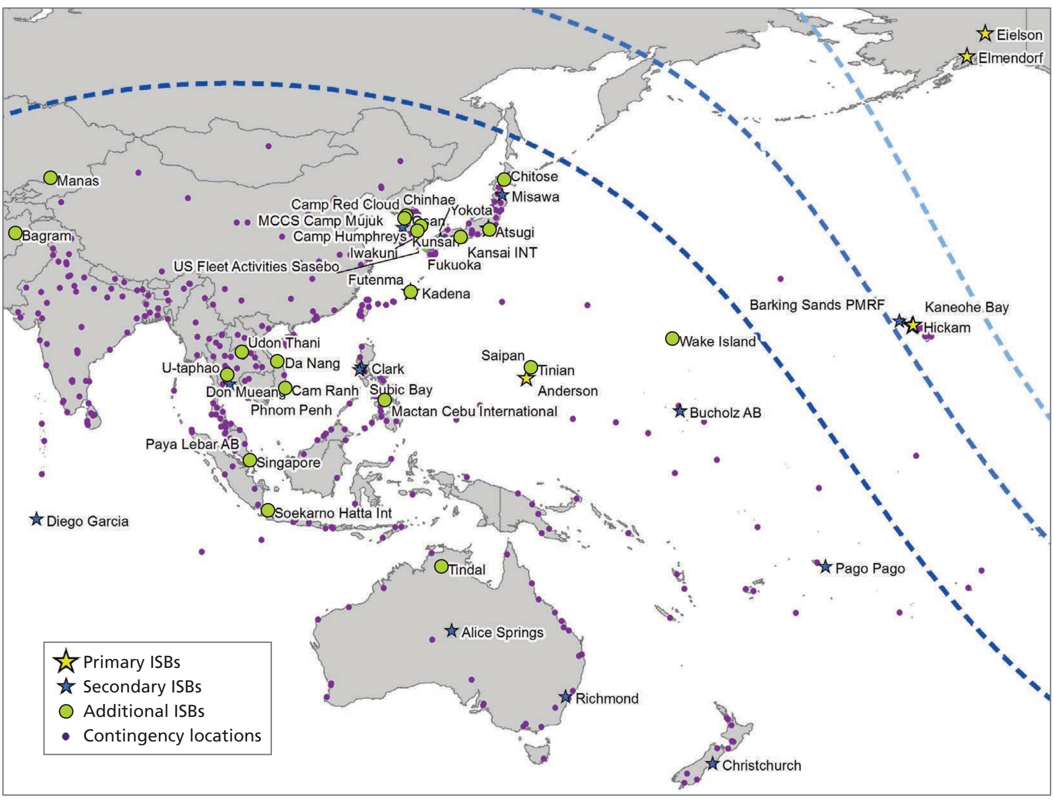


SOURCE: RAND analysis of CLs.
RAND *RR1161-8.1*

physically located in USPACOM, noted in Figure 8.2. Figure 8.2 also shows the location of the 245 contingencies.

Due to the large number of contingencies in relatively remote portions of the Pacific Ocean or Australia, the average distance to the closest CL is greater than in any other CCMD: approximately 90 nautical miles. However, since many of the contingencies are in densely populated areas of eastern Asia (e.g., Japan, Philippines), most of the contingencies are much closer to another CL than that. Figure 8.1 shows the distribution of distances to the closest CL from each CL. While roughly half the locations are within 40 nautical miles of another CL (and roughly 75 percent within the average 90 nautical miles), roughly 10 percent of locations are more than 200 nautical miles from their nearest CL. The distribution follows a similar Poisson-like shape, but with an extremely long right tail.

Figure 8.2
USPACOM ISBs and Distances



SOURCE: RAND analysis.
NOTE: Three dashed lines represent 3,600 nautical miles (light colored), 4,300 nautical miles, and 5,250 nautical miles (dark colored) from Fort Bragg.
RAND *RR1161-8.2*

ISB Selection for USPACOM

There are 47 total ISBs in 18 different countries (Figure 8.1), of which 98 percent are C-17 capable; the sole exception is Chinhea AFB in South Korea. Of the 47 ISBs, ten are civilian, 25 are military, and 12 are dual civilian and military airfields. There are nine DLA contracts in place, with U-Taphao, Thailand, having the largest contract, with over 16.2 million gallons of fuel, and Don Mueang, Thailand, the smallest contract with 306 thousand gallons on contract. Eight of the selected ISBs are on the GERS, and 29 are on a list from USTRANSCOM experts. Additionally, USPACOM is ranked second in flights flown there with over 6,500 flown in FY 2013.

There are two primary routes into the USPACOM AOR—a northern route and southern route—with both routes requiring multiple refueling stages because of the large geographic area. Primary and secondary ISBs are located on each route, providing options in the event of bad weather or increased threat risks. A continual U.S. presence in the region and the high level of importance have ensured a large number of ISB possibilities. Some rigging facilities are also available in USPACOM, at Elmendorf Joint Mission Complex, which makes it even more useful for possible staging for long-distance airdrop. Based on the fuel availability, the force package sizes included in the scenarios, and the vast geographic distances covered in USPACOM, it is likely that between two and four ISBs will be needed to successfully support operations.

The primary ISBs to stage into the USPACOM AOR are Eielson AFB (Alaska), Elmendorf AFB (Alaska), Hickam AFB (Hawaii), Kaneohe Bay Marine Corps Air Station (MCAS) (Hawaii), Yokota AFB (Japan), Kadena AFB (Japan), and Anderson AFB (Guam). Secondary ISBs are critical to access because of the huge geography, with key ISB locations throughout the Marshall Islands, American Samoa, the Philippines, and multiple options in Australia. Two of the most important are Paya Lebar AFB (Singapore) and U-Taphao Navy Airfield (Thailand) because of their capabilities and their location.

Additional ISBs provide more than supplemental coverage throughout the region; some are critical for GRF access. ISBs in Vietnam, Cambodia, and the Northern Mariana Islands are necessary as staging options in those regions. Additional ISBs in Japan and South Korea help to mitigate risk and allow for aircraft dispersion and clustering options.

We generate results for USPACOM with and without staging. Technically, one can reach some CLs via direct access with one en-route refueling stop, but the percent of the USPACOM population to which access is provided is insignificant. Staging is required for any meaningful access to USPACOM.

Staging Provides Good Access to USPACOM

Staging at ISBs within or near USPACOM assumes that the materiel, personnel, and aircraft have sufficient time and the means to reach the desired set of ISBs through various lift mechanisms (sea, air, land, etc.). Due to the distances involved in reaching USPACOM CLs, this movement will likely require multiple stops for refueling of C-17 aircraft. As with the other CCMD analyses, the coverage is based on the range of a C-130 performing a radius mission or that of a post-airdrop C-17, both of which are approximately 1,000 nautical miles.

Staging Necessitates More Austere Bases

As Table 8.1 shows, the coverage provided by the primary ISBs provides access to only about a third of the contingency locations, and only about one-fifth of the contingencies has redundant ISB coverage. Redundant coverage is provided by the two primary ISBs in Japan. The vast majority of the contingency and population coverage comes from Yokota (RJTY) and Kadena (RODN). The remainder of the primary ISBs are on the periphery of USPACOM (e.g., Hawaii) or, in the case of Eielson and Elmendorf, in USNORTHCOM.

The secondary ISBs provide a significant increase in both single and multi-ISB coverage to the USPACOM CLs. The additional ISBs provide incremental increases

Table 8.1
Access Statistics for USPACOM

		CL Coverage (1,000 nm)			
ISB Type	**ISB/Cluster Name**	**Single (%)**	**Double (%)**	**Population Access (%)**	**Additional CL Coverage (1,000 nm) Single (%)**
Primary enduring	Eielson			0	
	Elmendorf			0	
	Hickam			0	
	Yokota	**37**	**21**	9.8	
	Kadena			25	
	Kaneohe Bay			0	
	Anderson			0	
Secondary enduring	Misawa			7.5	
	Iwakuni			20.4	
	Kunsan			23.8	
	Diego Garcia			1.2	
	Alice Springs			0.1	
	Richmond			0.5	
	Barking Sands PMRF			0.0	
	Bucholz AB	**+45**	**+35**	0.0	
	Pago Pago			0.0	
	Clark			16.0	
	Subic Bay			13.8	
	Paya Lebar AB			9.7	
	U-taphao			20.2	
	Christchurch			0.1	

Table 8.1—Continued

ISB Type	ISB/Cluster Name	CL Coverage (1,000 nm) Single (%)	CL Coverage (1,000 nm) Double (%)	Population Access (%)	Additional CL Coverage (1,000 nm) Single (%)
Additional	Bagram	+11	+20	16.8	7.2
	Tindal			0.4	2.6
	Udon Thani			26.0	1.2
	Manas			6.6	0.2
	Soekarno Hatta Intl			6.5	0
	Chinhae			23.1	0
	Mactan Cebu Intl			7.6	0
	Saipan			0.0	0
	Wake Island			0.0	0
	Futenma			25.0	0
	Camp Humphreys			23.1	0
	Atsugi			9.8	0
	Camp Red Cloud			23.1	0
	Singapore			9.7	0
	Osan			23.1	0
	Fukuoka			22.3	0
	Phnom Penh			14.1	0
	Chitose			7.1	0
	Cam Ranh			15.9	0
	US Fleet Activities Sasebo			22.3	0
	Tinian			0.0	0
	MCCS Camp Mujuk			21.5	0
	Kansai INT			14.9	0
	Da Nang			20.7	0
	Don Mueang			20.5	0
	Total	**92**	**76**		

SOURCE: RAND analysis.

NOTE: The population access represents the percentage of the USPACOM population within 100 nautical miles of any reachable CL from that ISB. The population access metric is nonadditive (i.e., multiple ISBs may have overlapping population coverage). "CL Coverage" is the percentage of CLs within 1000 nautical miles of at least one ISB (for the "Single" column) or at least two ISBs (for the "Double" column) from the group noted. CL coverage is additive going down the column.

in coverage but do not obtain complete population coverage: 92 percent of the USPACOM CLs are reachable from at least one ISB, while 76 percent are reachable from two or more. Bagram provides important additional CL coverage and is a good candidate for future improvement given the heavy U.S. presence. Given the vast geography of USPACOM, full coverage of all CLs is difficult even with a large set of ISBs. The nonaccessible CLs are in various parts of USPACOM: many in India, a few in Australia and Papua New Guinea, along with several in French Polynesia and other Pacific Island chains. As seen in Figure 8.2, these locations are typically remote island locations (French Polynesia, Midway), relatively large and less populated areas (Australia, Papua New Guinea), or simply larger countries without an ISB (India).

As with the other CCMD analyses, the population access metric refers to the percentage of the USPACOM population within 100 nautical miles of any reachable CL for that ISB. The population metrics are noncumulative, and thus many of the ISBs overlap. Many of the ISBs on islands in the Pacific Ocean (e.g., Hickam, Anderson, Pago Pago) cover a population less than 0.05 percent of the USPACOM population, due the relatively few contingencies within 1000 nautical miles and the very large overall population of USPACOM (more than all the other CCMD populations combined). That said, among the primary ISBs, Kadena (RODN) on Okinawa, in particular, provides access to fully a quarter of USPACOM's population.

"Direct Access" Provides Almost No Coverage in USPACOM

Accessing USPACOM without staging provides almost no access to any significant portion of the USPACOM population, though there are a handful of contingencies that can be reached. The only USPACOM ISBs within 4,300 nautical miles (C-17 distance) of Fort Bragg are in Alaska or Hawaii: Eielson (PAEI), Elmendorf (PAED), Hickam (PHIK), Kaneohe Bay (PHNG), and Barking Sands PMRF (PHBK). Thus, access to any significant portion of USPACOM requires staging.

"Direct, One-Stop" for Airdrop Provides Negligible Coverage

With only four ISBs within 4,300 nautical miles of Fort Bragg, the airdrop access to USPACOM is effectively none. As noted, due to the weight restriction of 385,000 pounds at airdrop, a C-17 aircraft must land within 1,000 nautical miles postairdrop. No USPACOM CL is within 1,000 nautical miles of Eielson or Elmendorf. The percentage of population within 1,000 nautical miles of Hickam and Barking Sands PMRF is very small as a percentage of the USPACOM population (0.03 percent), as it is only the population of Hawaii itself.

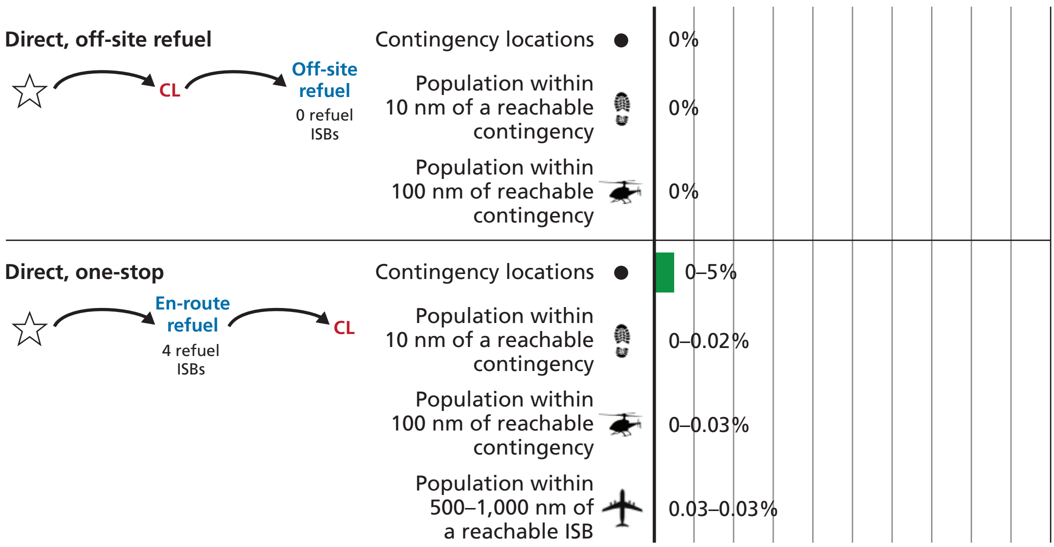
"Direct, One-Stop" for Airland Provides Negligible Coverage

For airland operations (Figure 8.3), the radius range of the C-17 is approximately 2,000 nautical miles, which is sufficiently large to provide access to 5 percent of the CLs in USPACOM from these five ISBs; however, the population in the area around these reachable CLs is quite small, as the covered population is almost exclusively limited to the Hawaiian Islands.

"Direct, One-Stop with Off-Site Refueling" for Airdrop Provides Negligible Coverage in USPACOM

Despite the increased accessibility that off-site refueling provides to the "direct, one-stop" airdrop CONOP in USAFRICOM and USCENTCOM, the major contingency locations in USPACOM are simply too far for this CONOP to provide significant coverage. Six percent of the contingency locations are accessible under this CONOP, but all of the locations are in Hawaii or islands in the South Pacific. The portion of the

Figure 8.3
USPACOM Accessibility Metrics under Airland



NOTE: Light-colored, vertical lines are in increments of 10%.
RAND *RR1161-8.3*

population within 100 nautical miles of any contingency represents only 0.06 percent of the entire USPACOM population.

"Direct, Off-Site Refuel" Provides No Coverage

No direct access is possible either returning to Fort Bragg or even with off-site refueling. It is possible to reach the CLs in Hawaii directly from Fort Bragg, but refueling at that CL would then be required.

Toward an Access Strategy into USPACOM

This chapter provides an operational view of coverage and access for the GRF across USPACOM. This can be seen as input to planning to help ensure that the mandate for being able to employ GRF globally has been considered from the lens of ISBs. This study is not a replacement for tactical-level planning on a specific CL but can help set an access strategy for the GRF in the CCMD. To that end, we summarize access into USPACOM as follows:

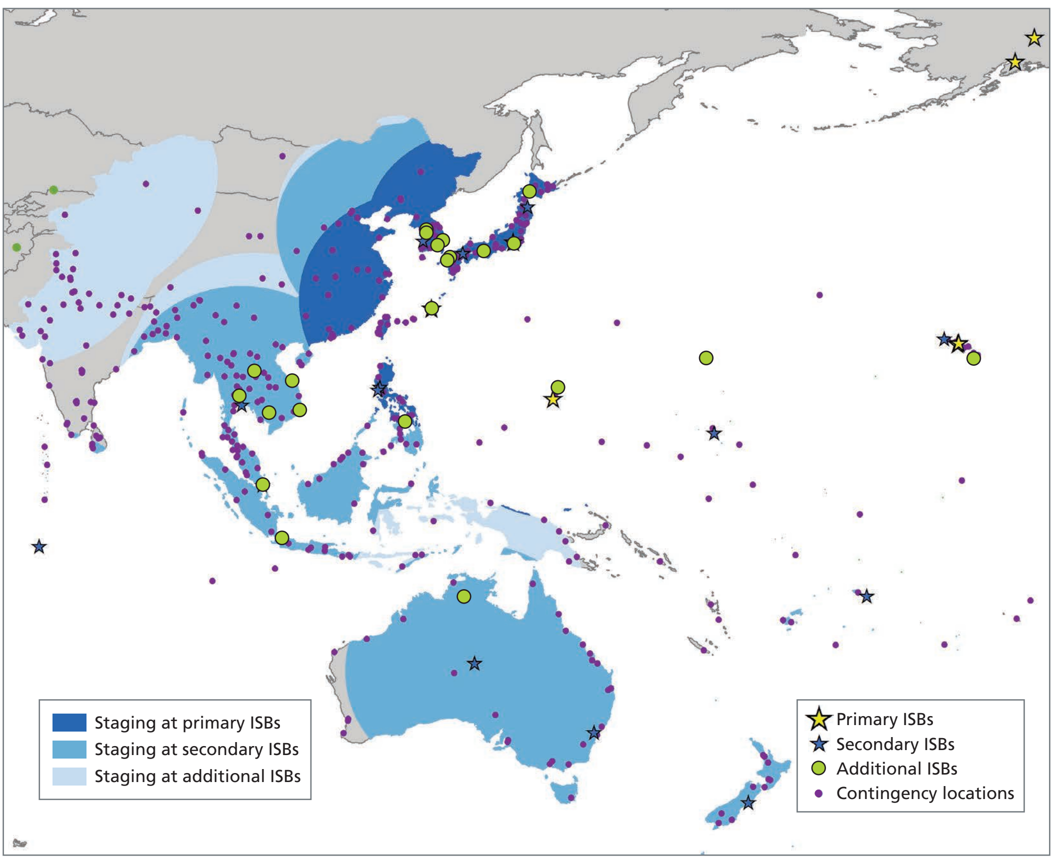
GRF access into USPACOM entails staging at both robust and austere bases.

Figure 8.4 summarizes the coverage of USPACOM through staging dependent on ISB type.

Strategic lift can move the GRF into proximity of operations in USPACOM but will entail potentially multistop flights from CONUS via strategic air. Arriving in theater, they will be staged at both developed and austere bases. From those bases, access to the vast majority (over 90 percent) of USPACOM is possible even at C-130 ranges, and redundancy, by and large, is satisfactory (about 80 percent of CLs are doubly covered by ISBs used in this analysis). The second- and third-tier bases noted in this study are therefore *foundational* to GRF employment in USPACOM, and part of this strategy will be to ensure infrastructure at those more austere bases is adequate and available. This general strategy entails a few actions:

Plans: Joint Staff and CCMD should, in concert with the Joint GRF members, provide applicable plans for executing GRF operations in AOR. These plans should

Figure 8.4
USPACOM Coverage Through Multiple Deployment Concepts



RAND *RR1161-8.4*

discernably show when GRF forces might be called vice the assigned forces already in theater to help define those roles applicable to the GRF. While these plans cannot cover the broad mandate for a GRF force, they should help ensure that key variables for access are deliberately considered in advance of possible operations.

Planning: USPACOM has the most forces assigned to it from the Army out of all CCMDs, and those forces include some airborne units. Limited planning with the GRF should therefore highlight which plans are appropriate for the GRF missions and ensure that key access variables are covered.

Exercises: Limited exercises may be warranted in the future pending balancing possible missions against assigned forces.

Site Preparation: Development of the more austere basing to support GRF operations may be warranted, pending balancing of assigned and GRF mission sets.

CHAPTER NINE

Toward a USSOUTHCOM Access Strategy

There is good coverage of USSOUTHCOM closer to the continental United States and relatively poor continual access elsewhere via C-17 airlift. Unlike many of the other CCMDs (particularly USCENTCOM and USPACOM) analyzed in this study, direct access is possible for many of the CLs within USSOUTHCOM due to its relative proximity to Fort Bragg. Coverage under a variety of direct access CONOPs is quite good. On the other hand, even with staging, there are a handful of southern USSOUTHCOM contingencies that are inaccessible from the ISBs used in this study. ISBs and CLs are shown in Figure 9.1 and described more completely below.

Description of USSOUTHCOM Contingency Locations

There are 301 CLs within USSOUTHCOM. Included among these CLs are 18 ISBs noted in Figure 9.1. While some CLs are extremely remote (especially Easter Island), most of the locations are relatively close to at least one other CL. The average distance to the nearest CL is 71 nautical miles, and over 50 percent of the locations are within 50 nautical miles of their nearest CL. On the other hand, approximately 8 percent of the locations are more than 150 nautical miles from their nearest CL. Figure 9.2 shows the distribution of distances to the closest CL from each CL. As with other CCMDs, it follows a similar Poisson-like shape, but with a very long right tail.

ISB Selection for USSOUTHCOM

In USSOUTHCOM, there are 22 total ISBs in 16 different countries (not including the continental United States), all of which are C-17 capable. Of these 22 ISBs, seven are civilian, six are military, and 13 are dual civilian and military airfields. There are 13 DLA contracts in place, with El Salvador having the largest contract, with over 13 million gallons of fuel; Toussaint Louverture, Haiti, has the smallest contract, with 178 thousand gallons of fuel. Two of the selected ISBs are on the GERS, and ten are on a

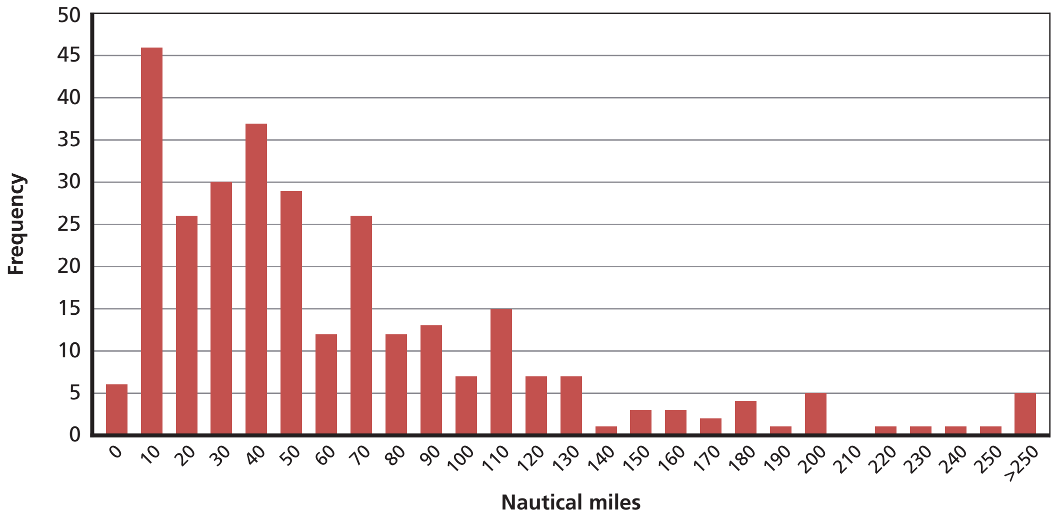
Figure 9.1
USSOUTHCOM ISBs and CLs

SOURCE: RAND analysis.
NOTE: Three dashed lines represent 3,600 nautical miles (light colored), 4,300 nautical miles, and 5,250 nautical miles (dark colored) from Fort Bragg.
RAND *RR1161-9.1*

list from USTRANSCOM experts. USSOUTHCOM is ranked fifth among CCMDs in flights flown there, with just under 300 flown in FY 2013.

Primary ISBs are located in the continental United States—Fort Bragg, North Carolina or Charleston, South Carolina—or on U.S. territories such as Puerto Rico, where a National Guard AFB at San Juan provides capabilities. Secondary ISBs are limited to Honduras, Saint Helena, the Virgin Islands, and Panama. The inclusion of St. Helena is of note because of its dual use to support both USSOUTHCOM operations and access into USAFRICOM. Operations out of the secondary ISBs will allow access to more than half of the South American continent. Based on the fuel availabil-

Figure 9.2
Histogram of Distances to Nearest CL for Each CL in USSOUTHCOM



SOURCE: RAND analysis.
RAND *RR1161-9.2*

ity, the force package sizes included in the scenarios, and the relatively short distances to CONUS, it is likely that one or two ISBs would be needed to successfully support operations in USSOUTHCOM.

Additional ISB selections in Columbia, several Caribbean islands, Brazil, Peru, and French Guiana complete the list of ISBs. Olano AFB in Columbia is of particular note because of its selection as a cooperative security location and the viable options for GRF employment into USSOUTHCOM.

We generate results for USSOUTHCOM with and without staging. With staging, most contingencies are accessible by multiple ISBs, due to the large number of ISBs in Central America, northern South America, and the Caribbean. However, much of southern South America remains outside of the 1,000–nautical mile range of an ISB, due to a lack of ISBs on the bottom half of the continent.

Staging Provides Good Access to USSOUTHCOM If Austere Bases Are Included

Staging at ISBs within or near USSOUTHCOM assumes that the materiel, personnel, and aircraft have sufficient time and the means to reach the desired set of ISBs. The distances involved in reaching USSOUTHCOM CLs are such that many scenarios could likely skip staging, especially if airland is an option, as the access from Fort Bragg, especially with en-route refuel, makes much of the CCMD accessible.

As with the other CCMD analyses, the assumed range with staging is that of a C-130 performing a radius mission or that of a postairdrop C-17, which is 1,000 nautical miles. As Table 9.1 shows, the coverage provided by the primary ISBs is limited, due to their locations being either in CONUS or Puerto Rico; those only cover 33 percent of the CLs. The ISBs within USSOUTHCOM provide much better coverage, though even the additional ISBs fail to provide access to contingencies in the far southern parts of USSOUTHCOM (84 percent of the contingencies are within 1,000 nautical miles of any ISB). A few key additional ISBs, such as Galeao Antonio Carlos in Brazil and Jorge Chavez in Chile, provide access to large portions of South America.

Direct Access to USSOUTHCOM Provides Good Coverage

Access to USSOUTHCOM without staging generally requires the use of C-17s to reach South America, unless the mission is in the extreme northern sections of USSOUTHCOM (e.g., the Caribbean). Given the relative short distance to much of USSOUTHCOM, there are multiple nonstaging options that provide access to at least some of the CLs.

"Direct, One-Stop" for Airdrop Covers 89 Percent of USSOUTHCOM

Under a direct, en-route refuel CONOP, the access to USSOUTHCOM is quite substantial, even under an airdrop scenario. Every ISB in Table 9.1 is reachable (i.e., under 4,300 nautical miles) from Fort Bragg except Ascension Island. Therefore, assuming a postairdrop range of 1,000 nautical miles means that 84 percent of the contingencies are reachable (similar to the staging numbers, since all but one ISB is accessible directly from Fort Bragg). As Figure 9.2 shows, under the en-route refueling case, the percentage of USSOUTHCOM population within 1,000 nautical miles of any reachable ISB is 89 percent, and 73 percent of the population is within 500 nautical miles of those reachable ISBs.

"Direct, One-Stop" for Airland Covers 97 Percent of USSOUTHCOM

The ability to airland (as opposed to an airdrop) allows for a 2007–nautical mile radius range (assuming all cargo is removed at the CL and the flight returns empty). In the case of airland at the CL, the coverage approaches 100 percent of the CLs. Moreover, there is a lot of redundant ISB coverage for those contingencies, providing multiple ISBs from which to refuel and stage for a given contingency. As Figure 9.3 shows, 97 percent of the CLs are accessible from at least one reachable ISB, and 79 percent of the contingencies are reachable from at least five ISBs. These reachable CLs also provide good access to the overall population of USSOUTHCOM: 86 percent of the population of USSOUTHCOM is within 100 nautical miles of a reachable CL.

Table 9.1
Access Statistics for USSOUTHCOM

ISB Type	ISB/Cluster Name	CL Coverage (1,000 nm) Single (%)	CL Coverage (1,000 nm) Double (%)	Population Access (%)	Additional CL Coverage (1,000 nm) Single (%)
Primary enduring	Fort Bragg			2.4	
	Charleston	**33**	**8**	6.3	
	San Juan			21.2	
Secondary enduring	Ascension Island			0.0	
	Enrique Soto Cano AFB	**+22**	**+38**	0.5	
	Rohlsen			19.9	
	Tocumen Int			35.4	
Additional	Galeao Antonio Carlos			26.6	13.6
	Jorge Chavez			17.1	10.9
	Cayenne			7.9	3.6
	Augusto Severo			10.5	1.0
	Bogota			32.5	0
	Aruba			27.8	0
	Rafael Nunez			35.1	0
	GTMO	**+29**	**+18**	30.6	0
	Curacao			26.4	0
	Toussaint Louverture Int			27.4	0
	Juan Santamaria Int			33.1	0
	Olano Air Field			33.3	0
	El Salvador			23.0	0
	Recife			14.1	0
	Antigua Int			17.0	0
	Total	**84**	**63**		

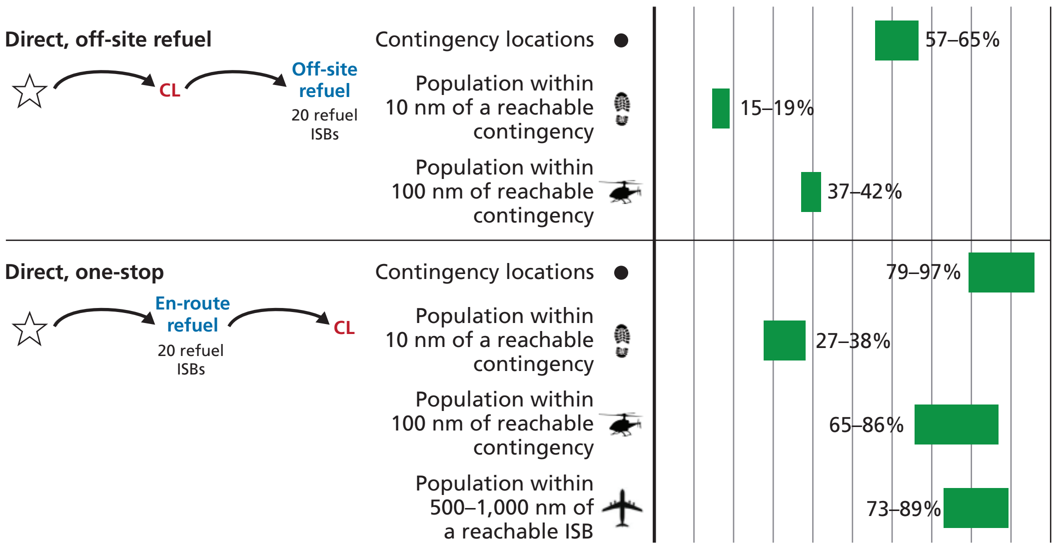
SOURCE: RAND analysis.

NOTE: The population access represents the percent of the USSOUTHCOM population within 100 nautical miles of any reachable CL from that ISB. The population access metric is nonadditive (i.e., multiple ISBs may have overlapping population coverage). "CL Coverage" is the percentage of CLs within 1,000 nautical miles of at least one ISB (for the "Single" column) or at least two ISBs (for the "Double" column) from the group noted. CL coverage is additive going down the column.

"Direct, One-Stop with Off-Site Refueling" for Airdrop Provides No Additional Coverage in USSOUTHCOM

Since all ISBs in USSOUTHCOM are directly accessible by C-17 from Fort Bragg, any contingency location within 1,000 nautical miles of a USSOUTHCOM ISB would already be accessible under a "direct one-stop" airdrop CONOP. As a result, the coverage under this scenario is identical to the "direct, one-stop airdrop" case. For the "direct, one-stop airdrop" case, the accessibility metric is calculated in terms of percentage of population within 1,000 nautical miles of an ISB (89 percent for USSOUTHCOM). Under the addition of off-site refueling to this CONOP, the metric must be contingency-centric, as the departing and arriving ISB may not be the same location. For USSOUTHCOM, 83 percent of the *contingency locations* are reachable; and the

Figure 9.3
USSOUTHCOM Accessibility Metrics Under Airland



NOTE: Light-colored, vertical lines are in increments of 10%.
RAND *RR1161-9.3*

percentage of the USSOUTHCOM population within ten nautical miles and 100 nautical miles of the reachable contingencies in this CONOP is 32 percent and 76 percent, respectively.

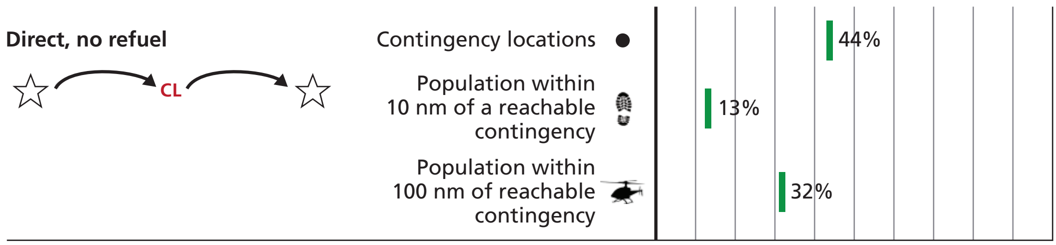
"Direct, Off-Site Refuel" Provides Coverage of 65 Percent of USSOUTHCOM

Unlike most other CCMDs, accessing the CL directly from Fort Bragg via airland and then afterwards flying to an off-site ISB to refuel is a viable CONOP for many USSOUTHCOM CLs. Almost two-thirds (65 percent) of the CLs are accessible under this CONOP, and the vast majority of those reachable contingencies have multiple off-site ISBs reachable after leaving the CL. In fact, as Figure 9.3 shows, 57 percent of the CLs can access five or more off-site refuel ISBs after arriving at the CL directly from Fort Bragg. Moreover, over a third of the USSOUTHCOM population is within 100 nautical miles of these reachable contingencies under this CONOP. Having direct access from Bragg with refueling only after leaving the CL allows for very rapid access to much of USSOUTHCOM.

"Direct, Nonstop" (without Refueling) Covers 44 Percent of USSOUTHCOM

Portions of USSOUTHCOM are accessible via "direct, nonstop" with no refueling required. In other words, under this CONOP, C-17s fly directly from Fort Bragg to the CL (landing) and return to Bragg without refueling. As Figure 9.4 shows, 44 percent of the contingencies in USSOUTHCOM are reachable under this CONOP, and

Figure 9.4
USSOUTHCOM Accessibility Metrics, Direct Access with Airland



RAND *RR1161-9.4*

32 percent of the USSOUTHCOM population is within 100 nautical miles of these reachable contingencies. In addition to providing immediate access from Bragg to the CL, this CONOP also reduces the need to identify and logistically support refueling ISBs within USSOUTHCOM. Since there would be no ISBs serving the CLs under this CONOP, the amount of redundant coverage is not an applicable metric (i.e., all access is provided from Fort Bragg only).

It is important to reiterate that these access metrics are for airland only, where the C-17 radius range is assumed to be 2,007 nautical miles. Only a few CLs are within airdrop range (1,000 nautical miles) of Fort Bragg. As Table 9.1 shows, only 2.4 percent of the USSOUTHCOM population is accessible under an airdrop scenario directly from Fort Bragg.

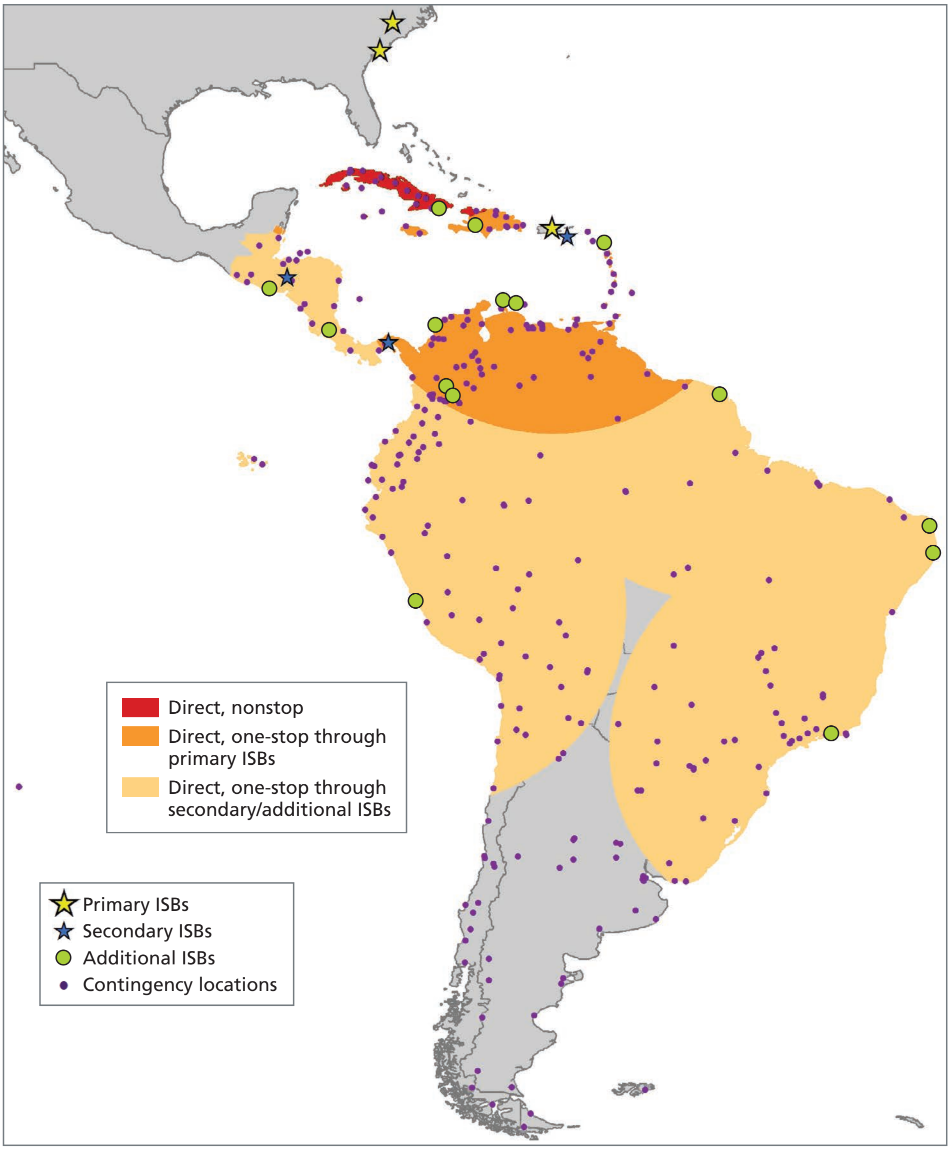
Toward an Access Strategy into USSOUTHCOM

This chapter provides an operational view of coverage and access for the GRF across USSOUTHCOM. This can be seen as input to planning to help ensure that the mandate for being able to employ GRF globally has been considered from the lens of ISBs. This study is not a replacement for tactical-level planning on specific contingencies but can help set an access strategy for the GRF in the CCMD. To that end, we summarize access into USSOUTHCOM as follows:

> *GRF access into USSOUTHCOM entails direct access in the northern portions for airland and airdrop; direct, off-site refueling and staging for intermediate portions; and staging for airdrop at more austere bases farther south.*

Figure 9.5 shows a summary of the access strategy for USSOUTHCOM. Three deployment concepts are shown: direct nonstop (darkest colors, relegated to only a few areas off the Florida coast); direct, one-stop; and direct, off-site refueling. All locations shown are reached by direct access, and those areas uncovered (in the far south) do not have ISBs within reach. Strategic lift like C-17s can directly reach Central America,

Figure 9.5
USSOUTHCOM Coverage Across Multiple Deployment Concepts



NOTE: 1,000–nautical mile legs from ISB to CL are used to generate coverage.
RAND *RR1161-9.5*

the Caribbean, and portions of northern South America without stopping for fuel and (potentially) without refueling before returning to CONUS. Nearly 85 percent of USSOUTHCOM can be reached directly, assuming refueling at some off-site location (which may be a less-developed site). This provides for some of the fastest response times for the GRF but entails additional investments to ensure that those ISBs can support refueling.

Staging into USSOUTHCOM with the ISBs used in this study provides for up to 85 percent double coverage; however, it also entails the use of more austere basing. The far south of South America remains less covered with the current list of ISBs used here. The austere bases mentioned in this study are *foundational* for GRF access into USSOUTHCOM, and part of this strategy will entail shoring up knowledge and relationships with those ISBs in South America to increase probability they have the infrastructure necessary and could be used in a contingency. This general strategy entails a few actions:

Plans: Joint Staff and CCMD should, in concert with the Joint GRF members, provide applicable plans for executing GRF operations in AOR. While these plans cannot cover the broad mandate for a GRF force, they should help ensure that key variables for access are deliberately considered in advance of possible operations.

Planning: USSOUTHCOM staff has worked recently in concert with Joint Staff and 82nd Airborne Division to exercise staff planning functions for GRF-type missions. This planning needs to be habitual in order to keep abreast of a changing environment. Additional detailed planning on ISB use across aforementioned plans should then highlight access constraints.

Exercises: USSOUTHCOM is essentially the only CCMD where direct, nonstop access can be performed. This provides very rapid access to portions of the north and should be considered in terms of how exercises of that capability fit into the broader prioritization of demands.

Site preparations: Preparing ISBs for possible use will entail identifying possible sites in mid- and southern South America and building the agreements over time to assure access.

CHAPTER TEN

Toward a USEUCOM Access Strategy

USEUCOM has robust infrastructure in terms of well-known and large basing facilities and airfields in multiple countries. The CCMD is relatively small, if one is considering only the main parts of Europe and excluding Siberia and Greenland, and thus is relatively easily accessed from CONUS either directly or through staging. The implications for the GRF are that USEUCOM can be accessed in part by directly flying to locations in Europe, which can allow for either follow-on operations quickly or staging in the event of additional time. Below, we describe the CLs, choice of ISBs used in the analysis, and coverage statistics of USEUCOM given those items.

Description of USEUCOM Contingency Locations

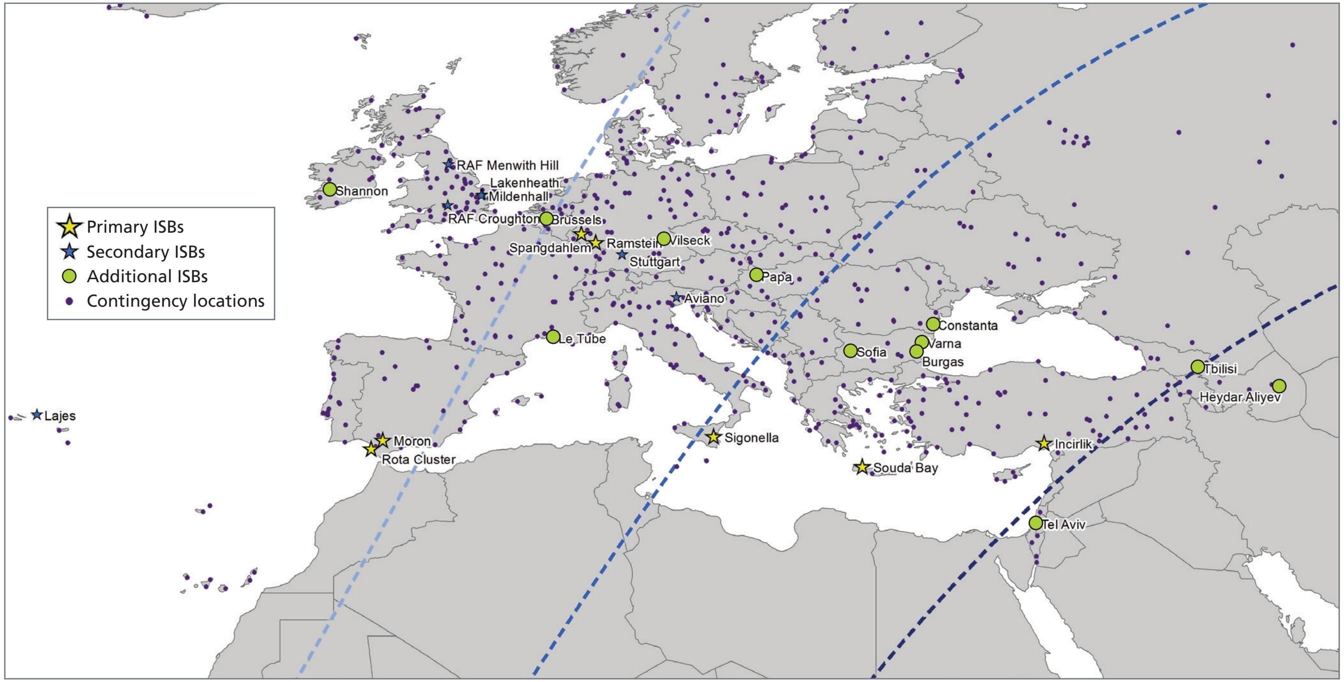
USEUCOM has the largest number of CL locations of any CCMD in this analysis: 743. Included among these contingencies are 26 ISBs, as noted in Figure 10.1. The contingencies in eastern Russia and Siberia are excluded from this map to show greater detail in Europe proper. Figure 10.2 shows all contingencies within USEUCOM.

While some CLs are remote in locations such as Greenland and Siberia, the average distance to closest CL is 44 nautical miles. Eighty percent of the contingencies in USEUCOM are within 50 nautical miles of another location, and almost 95 percent are within 100 nautical miles of one. Figure 10.3 shows the distribution of distances to the closest CL from each CL. The distribution follows a Poisson-like distribution more suitably than most of the other CCMDs, likely at least partially due to the larger number of CLs from which the empirical distribution can be generated.

ISB Selection for USEUCOM

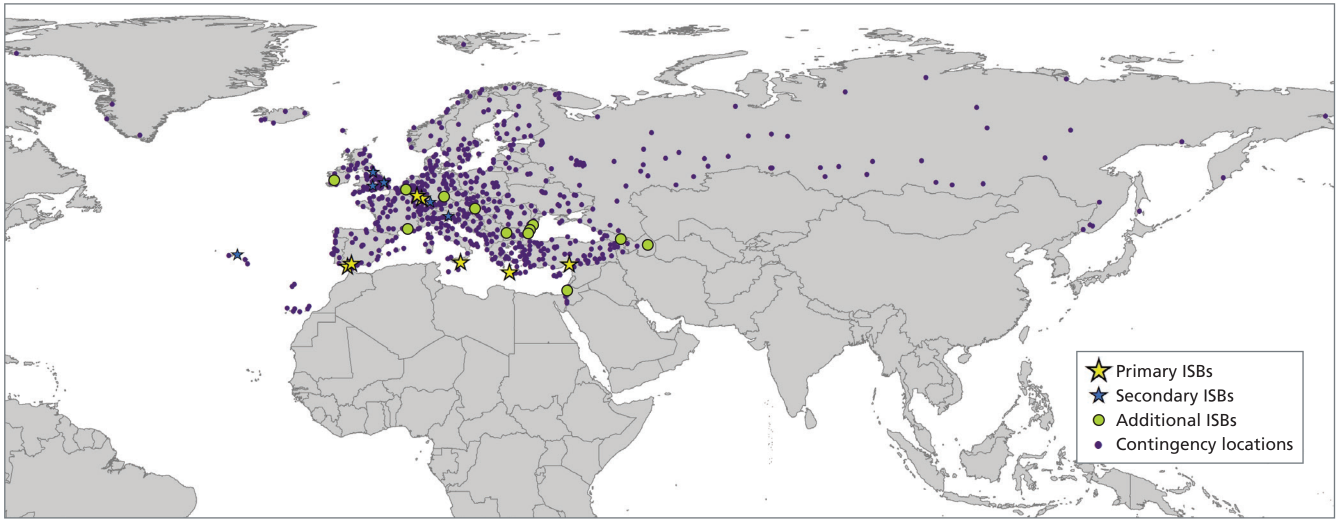
In USEUCOM, there are a total of 26 ISBs in 16 different countries; all but Vilseck, Germany, are C-17 capable. Of these 26 ISBs, seven are civilian, 16 are military, and three are dual civilian and military airfields. There are nine DLA contracts in place; the largest is Constanta, Romania, with over 4.6 million gallons of fuel on contract, and

Figure 10.1
Intermediate Staging Bases in and Distances to USEUCOM, Focused on Europe



SOURCE: RAND analysis.
NOTE: Three dashed lines represent 3,600 nautical miles (light colored), 4,300 nautical miles, and 5,250 nautical miles (dark colored) from Fort Bragg.
RAND *RR1161-10.1*

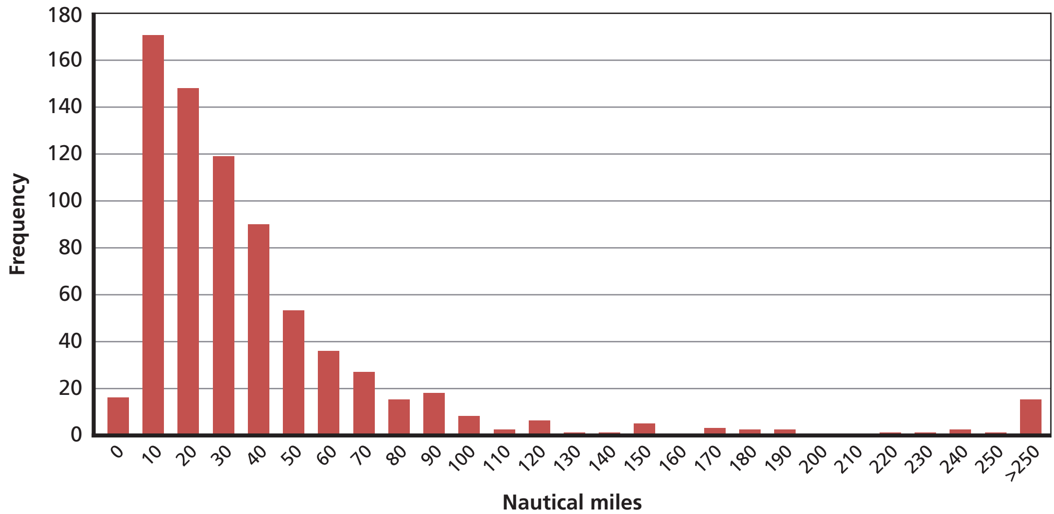
Figure 10.2
All USEUCOM CLs



SOURCE: RAND analysis.

RAND *RR1161-10.2*

Figure 10.3
Histogram of Distances to Nearest CL for Each CL in USEUCOM



SOURCE: RAND analysis.
RAND *RR1161-10.3*

the smallest DLA contract is Sofia, Bulgaria, with 174,000 gallons of fuel on contract. Seven of the selected ISBs are on the GERS, and 14 are on a list from USTRANSCOM experts. Additionally, USEUCOM is ranked third in flights flown there, with approximately 4,700 flown in FY 2013.

Direct access to USEUCOM is not possible without refueling; direct access with either en-route or off-site refueling is possible for many of the CLs within USEUCOM due to the robust set of ISBs that cover a relatively small geographical area. Coverage under a variety of CONOPs is quite good. Based on the fuel availability and number of primary ISBs located in USEUCOM, perhaps just one ISB will be needed to successfully support operations.

On the other hand, even with staging, there are a handful of contingencies in the extreme eastern portion of the CCMD that are inaccessible from any ISB in Europe. While not modeled in this analysis, those locations would likely be accessed via a western route using ISBs in Alaska, such as Eielson (PAEI) and Elmendorf (PAED).

We generate results for USEUCOM with and without staging. Without staging, direct access with en-route refueling provides coverage to almost all contingencies within USEUCOM (assuming an airdrop). A portion of the contingencies are accessible directly from Fort Bragg with off-site refueling. With staging, the vast majority of the CLs are within the 1,000–nautical mile range of a primary ISB.

Staging for USEUCOM

Staging Provides Very Good Coverage of USEUCOM

Staging at ISBs within or near USEUCOM assumes that the materiel, personnel, and aircraft have sufficient time and the means to reach the desired set of ISBs. The number of relatively nearby ISBs within USEUCOM makes redundant coverage possible, especially for locations in or near western and central Europe. As with the other CCMD analyses, the assumed range with staging is that of a C-130 performing a radius mission or that of a postairdrop C-17, which is approximately 1,000 nautical miles. As Table 10.1 shows, 89 percent of the CLs are accessible via the primary ISBs. On the other

Table 10.1
Coverage Statistics for USEUCOM

ISB Type	ISB Name	CL Coverage (1,000 nm) Single (%)	CL Coverage (1,000 nm) Double (%)	Population Access (%)	Additional CL Coverage (1,000 nm) Single (%)
Primary enduring	Ramstein			70.8	
	Rota			36.2	
	Moron			38.5	
	Souda Bay	89	86	47.4	
	Incirlik			35.8	
	Spangdahlem			68.9	
	Sigonella			60.8	
Secondary enduring	Stuttgart			73.0	
	Lajes			2.3	
	Aviano			74.4	
	Lakenheath	+2	+1	60.7	
	RAF Croughton			58.7	
	RAF Menwith Hill			57.0	
	Mildenhall			60.7	
Additional	Tbilisi			32.6	2.0
	Vilseck			76.7	0.1
	Shannon			47.8	0
	Brussels			67.4	0
	Heydar Aliyev			22.6	0
	Constanta			71.4	0
	Papa	+2	+4	79.1	0
	Tel Aviv			24.4	0
	Le Tube			63.8	0
	Varna			69.6	0
	Burgas			67.9	0
	Sofia			73.6	0
	Total	**93**	**92**		

SOURCE: RAND analysis.

NOTE: The population access represents the percentage of the USEUCOM population within 100 nautical miles of any reachable CL from that ISB. The population access metric is nonadditive (i.e., multiple ISBs may have overlapping population coverage). “CL Coverage” is the percentage of CLs within 1,000 nautical miles of at least one ISB (for the “Single” column) or at least two ISBs (for the “Double” column) from the group noted. CL coverage is additive going down the column.

hand, even with all ISBs considered, only 93 percent of the CLs are within 1,000 nautical miles of an ISB. Additional ISBs provided little additional coverage beyond Tbilisi in Georgia (or Heydar Aliyev in Azerbaijan), which improves some single and double coverage in the southeastern portion of the CCMD. The primary regions uncovered in this CONOP are non-European portions of Russia, Greenland, and extreme northern areas of Scandinavia.

Direct Access to USEUCOM

Access to USEUCOM without staging requires the use of C-17 or other strategic lift (i.e., it is not possible with C-130) due to the need to reach any ISB or CL within USEUCOM itself. Given the large number of ISBs in western and central Europe, there are multiple nonstaging options that provide access to most of the USEUCOM CLs.

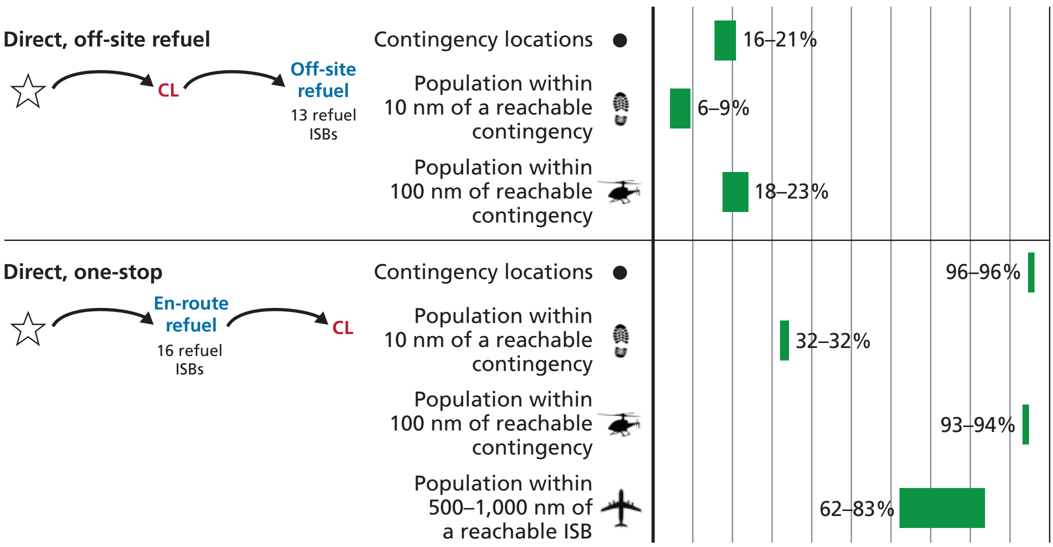
"Direct, One-Stop" for Airdrop Covers Over 80 Percent of USEUCOM

Under a direct, en-route refuel CONOP, access to the majority of the CLs is possible. Sixteen of the 26 ISBs in Table 10.1 are reachable (i.e., under 4,300 nautical miles) from Fort Bragg, 83 percent of the population is within 1,000 nautical miles of those reachable ISBs, and 62 percent of the population is within 500 nautical miles of those reachable ISBs.

"Direct, One-Stop" for Airland Covers 96 Percent of USEUCOM with Significant Redundancy

If we assume airland from those reachable ISBs, and thus assume a 2,007–nautical mile radius for a C-17 instead of the 1,000–nautical mile radius for airdrop, the access approaches full coverage of the CLs. Also, there is significant redundant ISB coverage for those contingencies. As Figure 10.4 shows, 96 percent (715 out of 743) of the CLs are accessible from at least one reachable ISB; 711 out of those 715 reachable contingencies are reachable from at least five ISBs (95.7 percent of the total USEUCOM contingencies). These reachable CLs also provide almost complete access to the overall population of USEUCOM: 94 percent of the population of USEUCOM is within 100 nautical miles of a reachable CL. The 4 percent of contingencies not reachable via the ISBs are located primarily in far northern and eastern Russia. While this analysis did not consider using ISBs in USNORTHCOM to access USEUCOM, ISBs in Alaska could potentially serve many of these CLs.

Figure 10.4
USEUCOM Accessibility Metrics Under Airland



NOTE: Light-colored, vertical lines are in increments of 10%.
RAND *RR1161-10.4*

"Direct, One-Stop with Off-Site Refueling" for Airdrop Covers 93 Percent of USEUCOM

Adding off-site refueling to the "direct, one-stop airdrop" case increases the coverage in USEUCOM. Unlike USCENTCOM and USAFRICOM, however, the percent of contingency locations accessible is slightly lower than under the "direct, one-stop airland" CONOP. In other words, the ability to access contingencies up to 2,007 nautical miles away from a Fort Bragg–reachable ISB provides slightly larger coverage than the capability to reach contingencies as far as 2,500 nautical miles away from a Fort Bragg–reachable ISB that requires refueling nearby (i.e., within 1,000 nautical miles) of some ISB. That said, the off-site refuel addition to the "direct, one-stop airdrop" CONOP provides additional access into eastern portions of USEUCOM. Given the large concentration of CLs in western and central Europe, the coverage under both a "direct, one-stop airland" and a "direct, one-stop airdrop with off-site refueling" is over 90 percent. The percentage of the USEUCOM population within 10 nautical miles and 100 nautical miles of the reachable contingencies under the "direct, one stop with off-site refueling" airdrop CONOP is 32 percent and 92 percent, respectively.

"Direct, Off-Site Refueling" Covers 21 Percent of USEUCOM

Accessing a CL directly from Fort Bragg and then flying to an off-site, nearby ISB for refueling is a viable CONOPs for certain locations in the western portion of USEUCOM. As Figure 10.4 shows, only about one-fifth (21 percent) of the CLs (located primarily in Western Europe) are accessible under this CONOP, but the vast majority of those reachable contingencies have multiple off-site ISBs reachable after leaving the CL: 16 percent of the CLs can reach five or more refueling ISBs. This redundant coverage is due to the high number of ISBs located relatively close to one another in Western Europe. Approximately one-quarter of the USEUCOM population is within 100 nautical miles of these reachable contingencies under this CONOP. While this CONOP is not viable for most CLs in USEUCOM, it does represent a viable planning option for portions of Western Europe.

"Direct, Nonstop" Without Refueling Is Not Possible in USEUCOM

Unlike USSOUTHCOM, USEUCOM does not have any direct access without refueling from Fort Bragg without either an en-route refueling or an off-site refueling after reaching the CL.

Toward an Access Strategy into USEUCOM

This chapter provides an operational view of coverage and access for the GRF across USEUCOM. This can be seen as input to planning to help ensure that the mandate for being able to employ GRF globally has been considered through the lens of ISBs. This study is not a replacement for tactical-level planning on a specific CL but can help set an access strategy for the GRF in the CCMD. To that end, we summarize access into USEUCOM as follows:

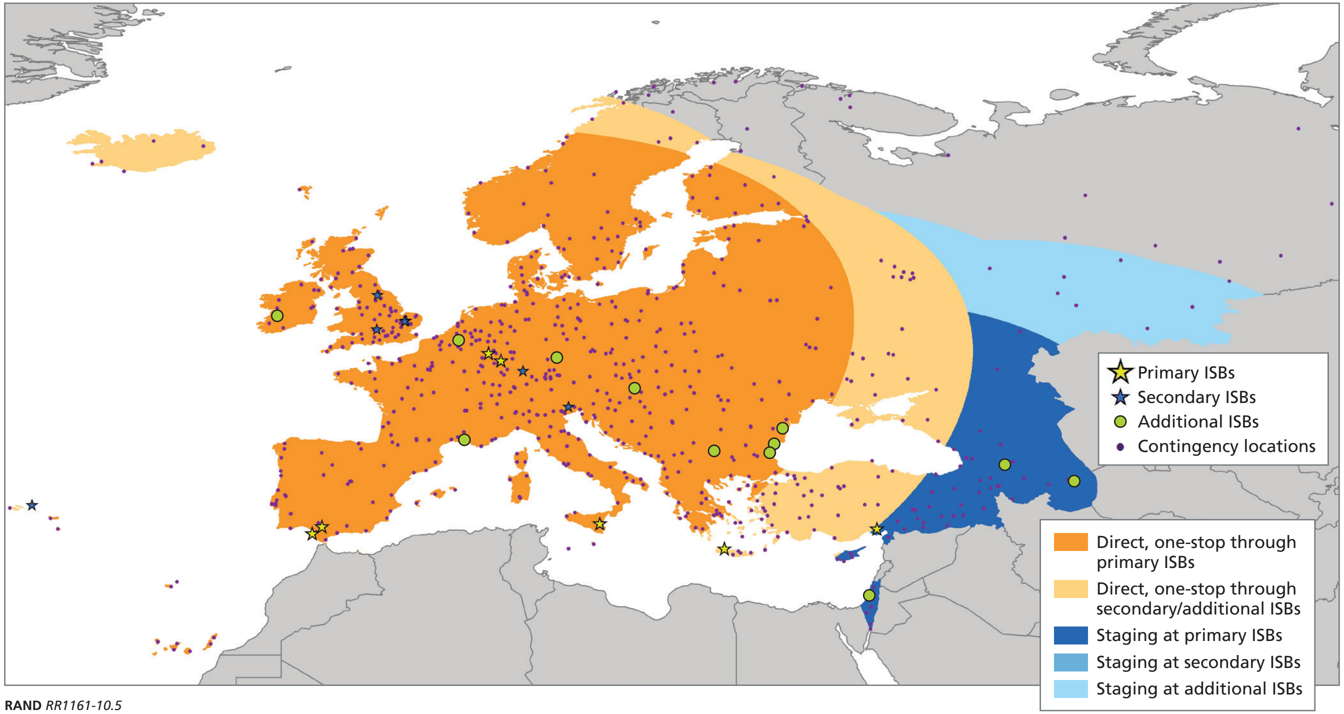
> *GRF access into USEUCOM entails mostly direct access from CONUS with robust options for staging.*

Figure 10.5 illustrates a summary of the deployment concepts and their coverage.

Modern strategic lift like C-17s can reach western portions of USEUCOM, which has robust basing and thus can then extend reach into eastern portions. Almost 90 percent of USEUCOM is covered by at least two major hubs at C-130 distances, so use of both C-17s and C-130s is possible for final approach to contingencies. Once in USEUCOM, either follow-on to a CL or longer-term staging can be made possible at multiple sites, pending additional tactical planning. The top-tier ISBs mentioned in this study provide the *foundational* infrastructure for GRF operations in USEUCOM, and the second and third tier provide further *reinforcing* support. Thus, the access strategy will first focus on those top-tier ISBs to ensure access. This general strategy entails a few actions:

Plans: Joint Staff and CCMD should, in concert with the Joint GRF members, provide applicable plans for executing GRF operations in AOR. While these plans cannot cover the broad mandate for a GRF force, they should help ensure that key variables for access are deliberately considered in advance of possible operations. Plans

Figure 10.5
USEUCOM Coverage Across Multiple Deployment Concepts



RAND *RR1161-10.5*

should include staging or en-route access for GRF forces at a select set of predetermined ISBs. Update those plans on a normal basis and when access to airfields changes.

Planning: Limited table top exercises among key stakeholders (CCMDs and Joint force) should be done to codify how GRF operations might be run in USEUCOM. Included in here should be a shared understanding of which ISBs GRF operations would be run through, specific planning expectations for site use, and a list of any applicable infrastructure improvements necessary to enable operations. Similar to USCENTCOM, the planning might identify a robust set of possible ISBs for future use, with the expectation that a select few would actually be used in a given operation. This strategy might be termed a "Five use Two" strategy, where five sites are identified from current robust basing that provide redundant coverage of the AOR, with the expectation that one or two of those might be actually used in some future operation.

Exercises: Exercises for GRF operations in USCENTCOM should be done to exercise key planning considerations highlighted in this report. Choosing exercise in one of the more well-developed (from an ISB standpoint) CCMDs like USCENTCOM or USEUCOM will help to define key missing parameters for GRF employment like throughput for refueling operations, beddown of GRF elements in terms of staging, and possible sustainment and mission command requirements, among others. Eventual exercises might then move to different CCMDs to test other aspects of operations.

Site Preparation: The primary ISBs mentioned in this report are known to be rather robust in terms of sustaining GRF operations, and some minimal preparation might be necessary as more details of exact requirements are determined as per above.

CHAPTER ELEVEN

Findings, Conclusions, and Recommendations

The current period of strategic uncertainty in how and when U.S. forces might be called upon to engage in operations abroad means that the Global Response Force (and other contingency response forces) needs to consider a wider range of scenarios and threats. With the exception of USPACOM, there are few Army forces assigned to the geographic combatant commands. There is also less certainty about the allocation and apportionment to any GCC. This means that the GRF has become a very attractive option for a wider group of CCMDs.

This study looked at the types of operations the GRF might be called upon to conduct, staging and direct access concepts for reaching CLs, what intermediate staging bases might be available for GRF operations, and what kind of coverage of those CLs might then be possible.

General Findings and Recommendations

In addition to being used on rapid response time lines, the GRF has a role on longer time lines. The scenario work illustrated cases where the 96-hour time line (for a full brigade) was appropriate to a deteriorating situation or with no strategic warning, and cases where the 82nd deployed in advance of actual operations, either as a flexible deterrent or because a strategic pause was exercised.

Recommendation: Multiple concepts for access are necessary to get full use out of the GRF, and those concepts need to be codified in doctrine, TTPs, and plans to appropriately enable additional force development.

Tailoring of forces is necessary and of great value. Tactical planning ultimately drives force packages, and determining which capabilities to bring and what risk a force takes is both an art and science. The division, corps, and echelons-above-corps enablers required for a GRF operation can vary significantly based on operational requirements and threats. The work done here illustrated the flexibility in defining force packages (including Joint enablers required) to meet mission needs, but more work in this area will help to define ultimate limits of just how small (or big) the GRF forces can be to get the job done.

Recommendations:

- The Army should continue to work to define various force packages and expectations for Joint enablers for prioritized missions to inform airlift, time lines, and ISB choice for the broader community. To better understand the likely composition and employment requirements of these tailorable and scalable GRF force packages, GRF planners should explicitly identify and routinely assess the factors that will influence the additional capabilities required and their method of employment. Capabilities for specific consideration can include aviation, air defense, missile defense, chemical detection, and engineer capabilities. Those packages should be codified in doctrine and TTPs inform internal and external planning.
- Due to consistent involvement in OIF/OEF combat operations since 2002, there is very limited institutional memory or in-depth understanding of GRF employment realities at BCT level and below. In coordination with the wider airborne community, the 82nd Airborne Division should provide information and guidance that reflect current and evolving mission-specific conditions, concepts, and constraints for GRF employment.

Multiple deployment concepts enable global operations. The GRF will use multiple deployment concepts to ensure access. We generalized these under "direct" access (including nonstop, one-stop, and offsite refueling) and "staging." From the standpoint of response time, the direct options will tend to be the fastest from wheels up but will suffer from not being able to reach deep into distant CCMDs. Staging provides for more early-leg options for aircraft (e.g., using typical strategic lift options either by sea, air, or land) but entails more built and mobile infrastructure at those ISBs and coordination along the way.

Facilities, such as the Rota complex, which have the ability to receive, temporarily store, and transfer equipment and supplies among intertheater and intratheater lift and maritime shipping are useful for employing the GRF. These sites, as multimodal transportation hubs, should be managed as key components of the GRF deployment network.

Recommendations:

- These deployment concepts should be carried in service and Joint doctrine and plans, and codified for further defining requirements and gaps.
- A Multiservice Tactics, Techniques, and Procedures (MTTP) document should be written on deploying the GRF to bring the various communities (Air Force, Army, CCMDs, etc.) toward a shared vision.
- Develop alternate methods for deploying all or elements of the GRF and supporting forces, such as using Large, Medium-Speed Roll-on/Roll-off (LMSR) ships

and other maritime deployment methods in conjunction with USAF. Developed concepts should be specific to each GCC and associated conditions.
- Conduct a detailed assessment to identify the specific capabilities and capacities required to support GRF deployment. Make recommendations to improve and refine the composition of multimodal hubs to better support deployment of GRF and supporting forces.

GRF deployment functions are complex and require routine validation. Rapid deployment of the airborne GRF and support forces requires effective Joint execution and synchronization of numerous complex multiservice functions and components, such as aircrew generation, assembly of enablers, outload, and ISB operations. In order to validate the airborne GRF's capability and assess potential risks to their timely deployment, DoD components should develop more explicit consideration of key GRF enabling functions and their associated requirements, such as host-nation coordination, staging of deployment support capabilities, and availability of personnel.

Recommendations:

- The Army should design and execute realistic planning and exercises that demand and assess performance of each key Army GRF deployment function, such as equipment and ammunition outload; ISB command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) and mission support functions; REMAB activities; and rapid airland delivery.
- The Air Force should design and execute realistic planning and exercises that demand and assess performance of key Air Force functions for GRF deployment, such as aircrew assembly, rapid en-route refuel of GRF force, rapid establishment and operation of one or more ISBs, and transfer of GRF from inter- to intratheater airlift.
- The Joint Staff should identify and assess key Joint and Interagency functions and requirements for rapid GRF deployment, such as country clearance, prioritization of GRF versus competing demands, assessing implications of varying A2AD postures, and identifying likely partner capabilities and interoperability demands.

Staging opens more options for the GRF. From a GRF perspective, both direct access and staging are part of its concepts for access and will need appropriate planning and practice to ensure they are available means for operations. Direct access is possible, but it is an attractive option in only a few areas because of the potential cost of aerial refueling. Intermediate staging bases used as a more deliberate stop on the way to a CL are therefore an integral part of how the GRF operates. They provide a flexible delivery option for combatant commands to consider using the GRF and to build forces up in advance of a conflict. They also allow a larger and more abundant set of lift assets to be used to support missions. Thus, using general strategic lift via air and sea to an ISB, then transloading to airdrop or other military aircraft for the final leg, offers a higher probability that aircraft and other assets will be available to conduct the operation.

Recommendation: While direct access capabilities should be maintained in select CCMDs, staging should play a more prominent role in planning and in capabilities development for the GRF.

Demands on aircraft can be reasonable. Historically, several dozen to over 100 aircraft have been used for airborne operations for rapid deployments. Our work on C-17 availability showed that current estimates on alpha echelon aircraft demands seem reasonable given total expected available. However, the tactical situation and determining what other demands are being placed on the C-17 fleet will certainly influence that calculus. It behooves the Army planners to remain realistic regarding force packages for various contingencies given constraints in airlift.

Recommendation: Army should implement constraint-driven planning, based on fitting within reasonable airlift constraints; build force packages and flow rates appropriately; and convey risks associated with those packages to decisionmakers. The Army and Air Force should work to define a shared vision of what the Army needs and Air Force would expect to provide so that CCMDs requesting support are not surprised.

Follow-on force flows need to be better defined. The work on MOG, airlift, and timing (Chapter Four) showed how optimal movement from ISB to CL could result in a small number of airframes compared to the number of sorties. Better defining how forces will flow can help both the Army in operational and tactical planning and the Air Force in meeting expectations. Army planners should create greater clarity regarding the boundary between REF and FoF.[1] The distinction between REF and FoF creates different expectations over time lines for the arrival of different capabilities. During force package development exercises conducted with planners, some indicated preferences for capabilities to be included in REF that would clearly require significant RSOI activities (e.g., theater air defense artillery [ADA] assets) that in practice would likely be deferred to the FoF.

Recommendation: Army should work to better define follow-on force flows with more attention to rate of closure and necessary capabilities to help Air Force and Joint planners meet those demands while minimizing demands on air assets.

Mustering airdrop-qualified crews does not seem to be a problem. Our discussions with Air Force planners indicated that gathering an appropriate number of airdrop-qualified crews for performing GRF-type missions is not a problem. During this study, the Air Force checked this contention with a planning exercise, which showed its ability to garner an appropriate number. However, a perception of this constraint still enters discussions of GRF planning and should be put to rest.

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[1] U.S. Joint Chiefs of Staff, *Joint Concept for Entry Operations*, Distribution Statement A, Washington, D.C., April 7, 2014.

Recommendation: A joint letter between Army and Air Force should lay to rest an ongoing perception of constraints in airdrop crews.

Plans, planning, exercises, and site preparation are needed. The GRF's broad mandate is codified in an executive order from the Joint Chiefs of Staff; however, plans for use are largely resident in the services at this point. The lack of well-established plans at the CCMDs for how the GRF might be used means that the planning is not habitually performed, and many of the nuances of calling up the GRF—like those issues highlighted in this report about access concepts, ISB use, and similar—are not from a shared vision from all stakeholders. This leads to some limitations in perceptions of GRF utility and confidence in employment. How these issues are resolved has to do with the importance of the GRF missions to a CCMD, balance of forces against assigned forces, and expectations for use.

Without those plans, the tactical-level planning necessary to exercise knowledge of GRF capabilities among the stakeholders (Army, Air Force, CCMDs, etc.) may be lacking. What this entails is for those appropriate stakeholders to exercise that knowledge through the development of planning scenarios in support of the foundational orders setting up the GRF; planning conferences (virtual or otherwise) to work out details of employment; and exercises for key portions to ensure mechanisms work appropriately and readiness is known. Below, we develop further the coverage and implications for future development of the GRF access strategies.

Realistic exercises are key to ensuring and validating the GRF's readiness. While some current exercises include deployment of airborne GRF components, these exercises rarely include a full and realistic force package, to include all enabler and support assets or include expected threat and access conditions. For example, few exercises are conducted to assess planning factors for mass aircraft refueling and equipment cross-loading at ISBs. Historically, rapid deployment of GRF has faced unanticipated challenges and operational "friction" that posed risks to mission success. Joint airborne exercises should be designed explicitly to identify and assess implications of possible challenges and validate accepted planning assumptions. While composing the entire GRF deployment process could require extensive time and resources, DoD and the services can seek to design exercises that stress and assess each of the components separately.

Recommendations:

- Army should develop GRF exercises that include realistic and likely force packages, to include potential division, corps, and echelons-above-corps enablers. Exercise design should require realistic execution of key GRF deployment functions, such as equipment and ammunition outload, rapid ISB establishment and operation, and rigging special cargo (e.g., high-mobility artillery rocket system [HIMARS]).

- In cooperation with the Army, the Air Force should explicitly identify the airfield operations capabilities required to prepare ISBs at various levels of austerity for use by the GRF and regularly validate the availability, readiness, and responsiveness of these capabilities.

CCMD Considerations

This report described two main categories of access, staging, and direct access. In all cases other than "direct, nonstop" access to small portions of USSOUTHCOM, those categories entail some use of ISBs. Chapter Five provided a taxonomy of ISBs based on a near-term look at what accessing those ISBs for refueling or longer-term staging might mean. The broad, global mandate for the GRF means that having the most staging options available will be instrumental to obtaining strategic surprise and helping enable mission success.

The use of primary ISBs will certainly be desirable, as they have well-established capabilities and ample resources to support GRF operations in multiple places. However, some CCMDs do not have such well-established sites and will rely on more austere bases, which may not have the pedigree to warrant high confidence for future

Table 11.1
Coverage for Access Concepts

Access options	USSOUTHCOM (%)	USAFRICOM (%)	USEUCOM (%)	USCENTCOM (%)	USPACOM (%)
Direct, nonstop	44	0	0	0	0
Direct, off-site refueling	65	8	21	0	0
Direct, one-stop (airdrop)	83	36	83	0	0
Direct, one-stop (air land)	97	56	96	36	5
Direct, one-stop, off-site refueling (airdrop)	83	61	93	57	6
Staging, primary ISBs	8	23	86	98	21
Staging, primary and secondary ISBs	46	38	87	98	56
Staging using primary, secondary, and additional ISBs	63	81	92	99	76

NOTE: Staging shows percentage of CL double covered at 1,000 nautical miles. Direct shows single coverage.

Table 11.2
Access Strategies for GCCs

CCMD	Access Strategy
USAFRICOM	Combinations of direct access and staging through Europe in the north, limited direct access through sites in USAFRICOM in the west, and staging at austere basing throughout.
USCENTCOM	Limited direct access through developed basing in USEUCOM, and staging at robust basing in both USEUCOM and USCENTCOM.
USPACOM	Staging at both robust and austere bases.
USSOUTHCOM	Direct access in the northern portions for airland and airdrop; direct, off-site refueling and staging for intermediate portions; and staging for airdrop at more austere bases further south.
USEUCOM	Mostly direct access from CONUS with robust options for staging.

operations. Chapters Six through Ten illustrated what kind of coverage each CCMD might have with each access concept. A summary of those calculations is shown in Table 11.1.

The table broadly illustrates a few things. First, that direct access is largely limited to USSOUTHCOM, USEUCOM, and small portions of USAFRICOM. In each of those cases, ISBs are used for refueling, at least. Second, for staging, the primary ISBs provide very good coverage only in USEUCOM and USCENTCOM, and the other GCCs have to use secondary and additional to get close to complete access. Third, the table shows that USPACOM and USSOUTHCOM, in particular, have only three-quarters or less coverage, even if we use all the ISBs identified in this study.

While detailed in Chapters Six through Ten, the access strategies for each CCMD are summarized in Table 11.2. These strategies are a vision for how rapid access is accomplished, with appropriate constraints applied.

Plans and planning for GRF operations are necessary. Rapid deployment of the airborne GRF and support forces requires effective Joint execution and synchronization of numerous complex multiservice functions and components, such as aircrew generation, assembly of enablers, outload, and ISB operations. To validate the airborne GRF's capability and assess potential risks to its timely deployment, DoD components should develop more explicit consideration of key GRF enabling functions and their associated requirements, such as host-nation coordination, staging of deployment support capabilities, and availability of personnel.

Joint Staff and CCMD should, in concert with the Joint GRF members, provide applicable plans for executing GRF operations in each AOR. While these plans cannot cover the broad mandate for a GRF force, they should help ensure that key variables for access are deliberately considered in advance of possible operations. Going into specific prioritization of threats or regions within the CCMDs was outside the scope of this study, but the Joint Staff and CCMDs should engage in a prioritization of potential GRF deployments and associated development of ISBs and infrastructure to support possible operations. This prioritization can build from a more limited look at specific plans but should be more inclusive on which ISBs are expected to be used and thus need to have known and planned infrastructure improvements. MOG, parking, fuel, beddown spacing, and other infrastructure determined in conjunction with the Army should be part of this prioritization of development. This study was agnostic to current plans in determining the CCMD metrics; however, a more detailed look at specific countries and plans could help to focus in on a prioritized listing of countries and regions.

Recommendations:

- The Joint GRF community should conduct habitual, collaborative planning to address the requirements for a broader range of missions than has historically been reviewed through the planning process (e.g., WMD-E, flexible deterrent options).
- Plans should incorporate clusters as necessary, per discussions above, and how the services plan to coordinate and operate at disparate sites. This is particularly appropriate for USAFRICOM and USPACOM, where multiple geographically distinct sites may be necessary.
- Table top planning among key stakeholders (CCMDs and Joint Force) should be made habitual to update ISB choices in a changing environment and help seed investments in infrastructure for developing the most austere basing. The challenges to each CCMD will be different in terms of ISB and throughput analysis, and therefore planners should highlight those constraints appropriately.
- Included in planning should be a shared understanding of which ISBs GRF operations would be run through, specific planning expectations for site use, and a list of any applicable infrastructure improvements necessary to enable operations.
- For the more developed CCMDs (USEUCOM and USCENTCOM), the planning should identify a robust set of possible ISBs for future use, with the expectation that a select few would actually be used in a given operation. This strategy might be termed a "Five use Two" strategy, where five sites are identified from current primary ISBs that provide redundant coverage of the AOR, with the expectation that one or two of those might be actually used in some future operation.
- USPACOM has the most forces assigned to it from the Army out of all CCMDs, and those forces include some airborne units. Limited planning with the GRF should therefore highlight which plans are appropriate for the GRF missions and ensure that key access variables are covered. USPACOM plans should discernably show when GRF forces might be called vice the assigned forces already in theater to help define those roles applicable to the GRF.
- Identify the current and required equipment in Army Prepositioned Stocks (APS) to support GRF employment. Make recommendations for changes to APS com-

position to meet identified GRF equipment needs and identify when those stocks can be utilized for GRF operations.

- Ensure that the DLA has current "into plane" fuel contracts in place to support GRF requirements in more austere locations. These contracts are a quick way to ensure that fuel will be available for use given short time frames for GRF employment.

Exercises should begin with more developed CCMDs. Exercises that test key aspects of GRF employment and access are needed. Exercises that test access issues and unearth other issues are an important part of declaring a ready capability. Those exercises can start with more developed CCMDs like USEUCOM and USCENTCOM, with readily available and large ISBs, but can then expand to include more austere ISBs as well. Choosing exercise in one of the more well-developed (from an ISB standpoint) CCMDs will help to define key missing parameters for GRF employment like throughput for refueling operations, beddown of GRF elements in terms of staging, and possible sustainment and mission command requirements, among others. Eventual exercises might then move to different CCMDs to test other aspects of operations. Absent recent experience, these exercises should be both a training event as well as input to defining key TTPs and doctrine.

Limited site preparation should ensue, pending plans and other factors. Site preparation in USEUCOM and USCENTCOM is more about selecting ISBs for possible use and ensuring that the requirements provided by the Army in terms of sustainment and other factors, and requirements for how air operations would be run supplied by the Air Force, are agreed to among stakeholders.

Austere bases in USAFRICOM, USPACOM, and USSOUTHCOM are foundational to GRF employment. Preparing ISBs in advance of possible operations will remain a challenge, because of the changing nature of relationships and rather austere conditions present at some locations in terms of access to basic infrastructure, fuel, etc. Therefore, preparing some key ISBs in regions important to the GCC should be done in concert with plans drawn up earlier to help prioritize locations for investment. The most austere of those locations noted in this study will entail relationships and agreements to be worked out and limited infrastructure built to ensure GRF operations, including runway improvements and sustainment capabilities.

The GRF capabilities are still seen, at times, as a replacement for assigned forces. Therefore, development of the more austere basing in USPACOM to support GRF operations may be warranted, pending balancing of assigned and GRF force mission sets.

Recommendation: Work with DLA to ensure that a minimum amount of fuel is on contract at top-tiered sites.

APPENDIX A

Selected Sources of Data

RAND applied current doctrine as the primary guide for scenario development and wider analysis. For scenario aspects that are heavily mission specific or not clearly defined by doctrine, RAND used subject-matter expertise to appropriately tailor doctrinal constructs. The key Joint and Army doctrine documents that define the requirements and concepts of employment associated with 82nd Airborne operations and used to inform RAND scenario development include

Joint Concept for Entry Operations (JCEO) (2014): The JCEO describes the vision of the Chairmen of the Joint Chiefs of Staff for how Joint Forces will "enter onto foreign territory and immediately employ capabilities to accomplish assigned missions." The JCEO describes a broader range of purposes for entry operations beyond current doctrine on forcible entry and a need to form mission-tailored Joint Forces for entry operations. The JCEO identifies four basic categories of entry forces: support forces, initial entry forces (IEF), reinforcing entry forces (REF), and follow-on forces. The JCEO identifies 21 required capabilities the future Joint Force will need to effectively conduct entry in increasingly contested environments, to include the ability for

- command and control of forces in austere or degraded environments
- accessing Joint fires at the lowest tactical echelon (potentially the platoon) in a timely manner to support independent schemes of maneuver
- executing effective and complementary Special Operations Forces (SOF) and conventional forces (CF) integration
- operating against A2/AD threats such as increasingly capable enemy surface-to-air missiles (SAMs) and integrated air defense systems (IADS) capabilities, precision guided ballistic missiles, complex obstacles, WMD and related chemical, biological, radiological, and nuclear (CBRN) materials, and enemy aerial systems
- IEF to conduct the initial entry into an operational area through strategic, operational, and tactical mobility (often requiring specialized training, organization, and equipment)
- REF to quickly deploy and maneuver onto the initial assault objectives to provide additional firepower, protection, mobility, and required capabilities to ensure the survival of the initial entry force

- building, opening, assessing, repairing, and improving expeditionary airfields.

Joint Publication 3-18, Joint Forcible Entry Operations (2012): This doctrine document presents the principles of Joint Forcible Entry Operations (JFEO) and forcible entry capabilities across all services. This document describes the primary phases and considerations for JFEO across functions. Joint Publication (JP) 3-18 describes the concept of airborne operations as landing intact with weapons, ammunition, and other combat equipment and prepared for combat immediately to aggressively seize and hold objectives until linkup is accomplished. JP 3-18 also identifies the primary limitations of airborne forces, to include their dependence on the availability of airlift assets, fire support, and combat service support resources, and their high vulnerability to enemy attack by ground and air. This doctrine defines the missions, forces, and key considerations applied in the RAND scenarios.

Joint Publication 3-17, Air Mobility Operations (2013): JP 3-17 describes how air mobility operations are conducted to enable commanders to execute the joint functions of movement and maneuver and sustainment. JP 3-17 identifies the key methods for airland and airdrop delivery of forces and equipment as applied in the RAND scenarios. This doctrine also describes the key types of airlift capabilities, to include intertheater, intratheater, and Civil Reserve Air Fleet (CRAF), included in the RAND scenarios and analysis. This document also describes key infrastructure and airfield operations to rapidly deploy airborne forces as used in RAND analysis of intermediate staging bases (ISBs).

Army Field Manual 3-99 (Final Draft), Airborne and Air Assault Operations (2012): Army Field Manual 90-26, published in 1990, is the most current doctrine for Army airborne operations. However, the Army plans to publish new doctrine for airborne and air assault in the near future. Currently, the final draft of FM 3-99 is the most appropriate reference for current Army consideration of airborne capabilities and employment concepts. This document describes the following constructs as applied in RAND's analysis:

- fundamental principles for airborne operations
- phases of airborne operations (Preparation & Deployment, Assault, Stabilization of the Lodgement, Introduction of Follow-On Forces, and Termination or Transition Operations)
- capabilities generally required for airborne operations by Army Warfighting Function
- echelons of command responsibility of airborne operations
- organization and echelonment of airborne forces.

Concept Plan (Internal to the 82nd): An internal concept plan describes key terminology and concepts applied in 82nd Airborne Division execution of GRF operations. It includes base plans for the three primary airborne GRF mission sets and basic task organizations appropriate to each of the three GRF mission sets for additional refinement based on mission-specific considerations. This plan guides the execution of airborne exercises, such as the Joint Operational Airborne Exercise. RAND used these internal documents to ensure analysis accurately assesses employment of 82nd Airborne–specific capabilities and concepts in the RAND scenarios.

APPENDIX B

Aircraft Ranges Used in Calculations

Introduction

This section describes the modeling assumptions for C-17 and C-130 aircraft for performing airdrops under different cases. The results of these modeling efforts inform the ranges and accessibility of aircraft to each of the CCMDs under different CONOPs.

Modeling C-17 Extended Range Airdrop Ranges

According to the *C-17 Flight Manual Performance Data, USAF Series C-17A Aircraft*,[1] the maximum weight for C-17 aircraft performing an airdrop of personnel is 385,000 pounds (p. 5-67. Note: The 385,000-pound weight restriction does not apply to C-17 aircraft performing a cargo airdrop). With this assumption, the ability to perform airdrops for a CL is severely limited. To execute an airdrop of personnel, the cargo must be very limited, and the C-17 performing the airdrop must land and refuel at a nearby airfield shortly after performing the airdrop.

Table B.1 shows the weights of each of the necessary elements of the C-17 Extended Range (ER) immediately prior to the commencement of an airdrop.

Table B.1
Minimum Weight of C-17 Aircraft Carrying Personnel at Airdrop

Weight Components	Weight (lbs)
Operating (empty) C-17 ER	282,500
Minimum fuel reserve (10% max)	24,485
Payload (PAX) for large-A echelon	34,300
Total minimum weight at airdrop	**341,285**

[1] *C-17 Flight Manual Performance Data, USAF Series C-17A Aircraft*, McDonnell Douglas Corporation, F33657-81-C-2018, January 2005.

If a C-17ER weighs the maximum 385,000 pounds at the commencement of the airdrop, it would weigh no more than 385,000 – 34,300 = 350,700 pounds immediately following the airdrop mission, allowing for 43,715 pounds of fuel to be consumed prior to landing. According to C-17 fuel consumption values developed by RAND based on Air Force Pamphlet 10-1403,[2] a C-17 (weighing this amount) can have a range of almost 1,200 nautical miles before needing to land.

An alternative we consider is an increase in the maximum airdrop weight of the C-17ER of 15,000 pounds (i.e., 400,000 pounds total weight at airdrop) due to the potential use of a single troop door,[3] which would require a very long drop zone or multiple passes per aircraft. Testing is under way to increase the max weight to 400,000 pounds for personnel drops using both doors, but this is not yet approved.[4] The restriction of total weight during airdrop to 385,000 pounds is due to potential dangers to the parachute deployment produced by wake vortices, causing the parachutes to centerline, which could be avoided with a single door. With this additional weight allowance, and using the assumptions in Table B.1, a C-17 could weigh as much as 400,000 – 34,300 = 365,700 pounds after airdrop; this allows for 58,715 pounds of fuel to be consumed before reaching the 10 percent fuel reserve limit. The ability to carry an additional 15,000 pounds of fuel at airdrop provides significant increases in range, as a C-17ER could fly almost 1,700 nautical miles to a refueling base while maintaining the required reserve.

Modeling C-17 Airdrop Ranges Without Extended Range Capabilities

Early versions of the C-17 aircraft do not have extended range capabilities (non-ER). These non-ER C-17s represent approximately 25 to 30 percent of the existing C-17 aircraft.[5] Non-ER C-17s have a slightly lower empty operating weight (276,500 instead of 282,500) due to the lack of the extra fuel tank. This lower weight allows for greater on-hand fuel at airdrop, which increases the postairdrop range. With a 385,000-pound weight restriction at airdrop, the preairdrop range is considerably shorter than that of the C-17ER, as the non-ER C-17 fuel capacity is approximately 65,000 pounds less. Table B.2 shows the weights of each of the necessary elements of the non-ER C-17 immediately prior to the commencement of an airdrop.

This lower minimum weight would allow for 385,000 – 328,881 = 56,119 pounds of fuel immediately after airdrop, resulting in a postairdrop range of 1,300 nautical miles. For the alternative case where the weight restriction would be raised to 400,000

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2 Air Force Pamphlet 10-1403, 2011.

3 Rob Bardua, *C-17 Test Team Conducts Airdrop Tests*, Air Force Flight Test Center Public Affairs, February 7, 2003.

4 MAJ Brad Rueter, 18th Air Force, Scott AFB, personal communication with author, June 10, 2014.

5 Jamie Hunter, ed., *Jane's All the World's Aircraft: In Service 2014/2015*, Ihs Global, 2014.

Table B.2
Minimum Weight of non-ER C-17 Aircraft Carrying Personnel at Airdrop

Weight Components	Weight (lbs)
Operating (empty) C-17 ER	276,500
Minimum fuel reserve (10% max)	18,081
Payload (PAX) for large-A echelon	34,300
Total minimum weight at airdrop	**328,881**

pounds, the additional 15,000 pounds of fuel would extend the non-ER C-17 postairdrop range to a maximum of 1,807 nautical miles.

Table B.3 provides a summary of these cases, and Figure B.1 shows the maximum ranges before and after airdrop for a C-17 (both ER and non-ER) under the assumption that *postairdrop range is maximized*. The maximum range of the C-17 preairdrop is determined by taking the lesser of the maximum ranges of the C-17s carrying personnel and the C-17s carrying cargo, given that their postairdrop range has been maximized. As a result, the maximum range preairdrop is determined by the (heavier) cargo flights, as those distances are less than those possible with (lighter) C-17s carrying personnel, due to their larger payloads. Given that most C-17s are ER capable and that only a minority of flights are cargo, we assume all cargo flights are performed with C-17ER aircraft. Thus, the preairdrop ranges for the non-ER C-17s are calculated only for the lighter personnel payloads.

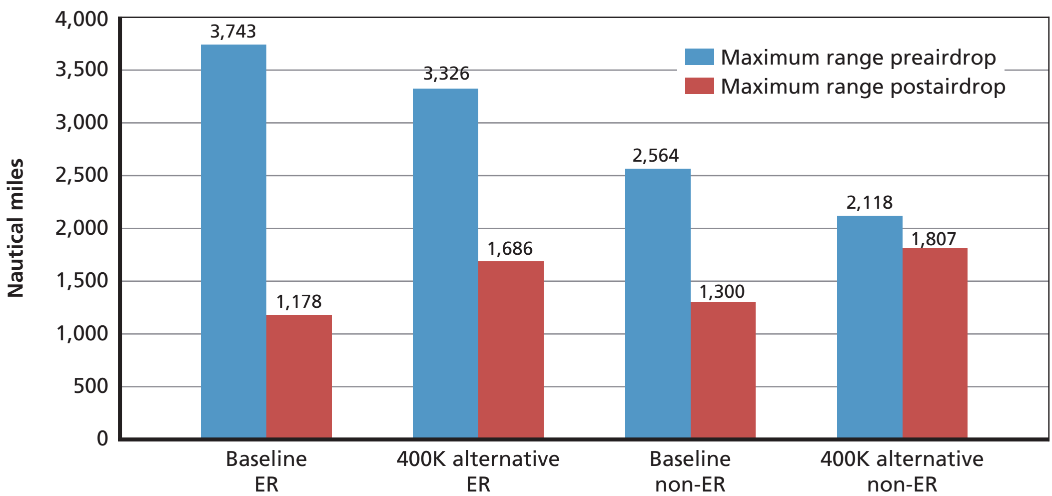
Given that for larger alpha echelon a mix of non-ER and ER C-17s would very likely be utilized in most scenarios involving significant numbers of C-17s,[6] we restrict the postairdrop range to 1,178 nautical miles and the preairdrop range to 2,564 nau-

Table B.3
Assumptions (in pounds) for Each of the C-17 Airdrop Excursions

Cases	Baseline ER	Alternative ER	Baseline non-ER	Alternative non-ER
Operating (empty) C-17	282,500	282,500	276,500	276,500
Minimum fuel reserve	24,485	24,485	18,081	18,081
Max cargo for large-A echelon	34,300	34,300	34,300	34,300
Maximum weight at airdrop	385,000	**400,000**	385,000	**400,000**

6 Rueter, 2014.

Figure B.1
Maximum C-17 Ranges Under Different Weight Restriction Assumptions



RAND *RR1161-B.1*

tical miles (or 1,000 nautical miles and 2,500 nautical miles, respectively, to obtain more conservative, round planning values).

Modeling C-17 Ranges for Airland

In determining access to the various CCMDs, we model the ranges for both ER and non-ER C-17s under various payloads for airland, as some scenarios will not need airdrop capabilities, even in the alpha echelon. The C-17ER can carry an additional 10,000 gallons of fuel, converting the basic C-17's center wing dry bay into a fuel tank.[7] The maximum range for a non-ER C-17 carrying 90,000 pounds of cargo is 3,600 nautical miles.[8] For the C-17ER, with the same payload, it is approximately 4,250 nautical miles. Our model, based on similar data sources, shows for a C-17ER with 54,000 pounds of cargo a maximum range of 5,274 nautical miles, essentially identical to Cassidy, who lists 5,250 nautical miles as the maximum range when carrying 58,000 pounds of cargo. For simplification purposes, we assume a 5,250–nautical mile range for this payload during our access modeling for each of the CCMDs under this CONOP. However, it is unlikely that all C-17s in a particular scenario would be ER-capable.

For a generic alpha echelon force package of C-17s, we assumed a total of 27 C-17 aircraft are needed, with 20 of the 27 primarily transporting personnel, each with a cargo weight of 34,300 pounds. The remaining seven aircraft transport equipment

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[7] Cassidy, Joseph, *C-17 Transportability of Army Vehicles*, Newport News, Va.: Military Traffic Management Command, Transportation Engineering Agency, May 2002.

[8] All ranges assume landing with a 10-percent fuel reserve.

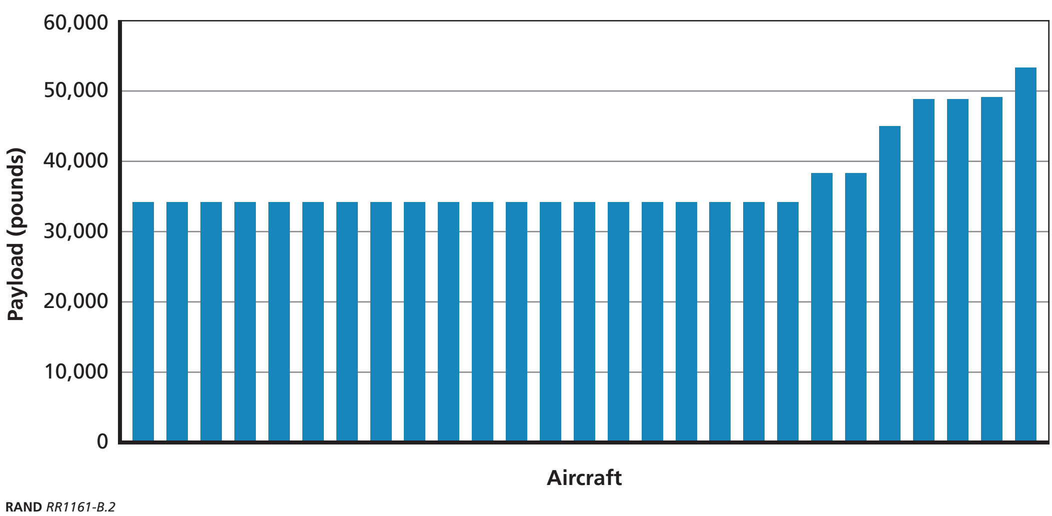
with cargo weights varying from 38,500 to 54,000 pounds. Figure B.2 shows the distribution of these weights.

Therefore, in calculating the alpha echelon access to CCMDs where we assume a mix of C-17ER and C-17 aircraft, the maximum range for the entire fleet (limited by the shortest maximum range of any aircraft) is 4,300 nautical miles. This differs considerably from the 5,274–nautical mile maximum range when the entire fleet is composed of C-17ER aircraft. However, in many of the planning documents, including Cassidy and the Air Force Pamphlet,[9] a standard planning payload weight of 45 short tons (90,000 pounds) is often assumed, which reduces the range of non-ER C-17s to 3,600 nautical miles. Since our payloads are less than this standard planning factor, we utilize the estimated range based on the likely payloads for a generic alpha echelon performing an airland. Therefore, we assume the limiting range of 4,300 nautical miles, based on the range of a non-ER C-17 with a payload of 34,300 pounds.

Modeling Ranges for C-130J Aircraft

For many of the CONOPs, C-130 aircraft could be used to supplement C-17 usage, especially for the bravo echelon. For our modeling purposes, we assume all C-130 aircraft utilized will be of types C-130J or C-130J-30, a stretch version with a 15-foot fuselage extension.[10] According to C-130 fuel consumption values developed by RAND

Figure B.2
Payload for Each C-17 Aircraft for Alpha Echelon



9 Air Force Pamphlet 10-1403, 2011.

10 Note that there is no weight constraint over the drop zone for the C-130 as there is on the C-17.

based on the Air Force Pamphlet 10-1403,[11] a C-130J with a payload of 20,000 pounds has a maximum range of 2,356 nautical miles. A C-130-J30 with a payload of 35,000 pounds has a maximum range of 2,597 nautical miles.[12] The maximum radius range of a C-130J performing a 20,000-pound airdrop is 1,019 nautical miles. A C-130J-30 with a 35,000-pound payload has a radius range of 1,300 nautical miles. Therefore, for planning purposes with a mixture of C-130J and C-130J-30 aircraft, we calculate accessibility based on a 1,000–nautical mile radius for both airdrop and airland missions. This value is identical to the C-17 radius for airdrop missions, though we can assume much larger ranges where C-17s either land or commence their airdrop mission from a site different from where they refuel postairdrop.

Summary of Assumed Ranges for Access Under Different CONOPs

Based on the modeling and analyses outlined in the prior sections, we implement a set of range guidelines for each set of CONOPs, which then are used in our modeling to produce access metrics, such as number of accessible ISBs, CLs reached, CCMD population accessible, among others.

As noted in the prior sections, the postairdrop range on a C-17 is slightly longer than 1,000 nautical miles, as are the ranges for the C-130. In addition, as Table B.4 notes, the preairdrop range of a C-17 is significantly longer than its postairdrop range. While these longer preairdrop ranges are utilized in certain scenarios where the specific basing and contingencies are well-defined for staging and postairdrop refueling, for general CCMD access metrics, we limit our analysis to these more conservative, general planning values.

Table B.4
Range Assumptions for C-17 and C-130 Aircraft for CCMD Access Calculations

Equipment and CONOP	Maximum Range (nm)	Maximum Radius (nm)
C-17 airland	4,300	2,000
C-17 airdrop	2,500 (pre) + 1,000 (post)	1,000
C-130 airland	2,000	1,000
C-130 airdrop	2,000	1,000

11 Air Force Pamphlet 10-1403, 2011.

12 Air Force planning factors for C-130J and C-130-J30 are less than these values. We assume a 10 percent minimum fuel reserve is required upon landing.

APPENDIX C

ICAO Codes

Table C.1
USNORTHCOM

Code	Location	CCMD
KFBG	Fort Bragg	USNORTHCOM
KCHS	Charleston	USNORTHCOM

Table C.2
USAFRICOM

Code	Location	CCMD
DFFD	Ouagadougou	USAFRICOM
DGAA	Kotoka	USAFRICOM
DRRN	Niamey	USAFRICOM
FAWK	Waterkloof	USAFRICOM
FHAW	Ascension Island	USAFRICOM
FKKD	Douala	USAFRICOM
FOOL	Libreville	USAFRICOM
FSIA	Seychelles	USAFRICOM
FVHA	Harare Int	USAFRICOM
GABS	Bamako	USAFRICOM
GOOY	Dakar	USAFRICOM
GQNN	Nouakchott	USAFRICOM
HAAM	Arba Minch	USAFRICOM
HDAM	Camp Lemonnier	USAFRICOM
HKJK	Nairobi	USAFRICOM
HKMO	Mombasa	USAFRICOM
HUEN	Entebbe	USAFRICOM

Table C.3
USCENTCOM

Code	Location	CCMD
HECA	Cairo Intl	USCENTCOM
HECW	Cairo	USCENTCOM
OADY	Dwyer	USCENTCOM
OAHR	Herat	USCENTCOM
OAIX	Bagram	USCENTCOM
OAKB	Kabul	USCENTCOM
OAKN	Kandahar	USCENTCOM
OAMS	Mazar E Sharif	USCENTCOM
OASD	Shindand	USCENTCOM
OASH	Shank	USCENTCOM
OATN	Tereen	USCENTCOM
OAZI	Bastion Airfield	USCENTCOM
OBBI	Bahrain INT	USCENTCOM
OBBS	Isa Ab	USCENTCOM
OETB	Prince Sultan Bin Abdulaziz	USCENTCOM
OJ40	Shaheed Mwaffaq	USCENTCOM
OJAM	Marka Intl	USCENTCOM
OJAQ	Aqaba King Hussein	USCENTCOM
OKAS	Ali Al Salem	USCENTCOM
OKBK	Al Mubarak	USCENTCOM
OKDI	Camp Buehring	USCENTCOM
OMAM	Al Dhafra	USCENTCOM
OMDM	Minhad AB	USCENTCOM
OMDW	Jebel Ali	USCENTCOM
OMFJ	Fujariah	USCENTCOM
OOMN	Al Musana AFB	USCENTCOM
OOTH	Thumrait	USCENTCOM
ORBD	Balad	USCENTCOM
ORBI	Baghdad	USCENTCOM
OTBH	Al Udeid	USCENTCOM

Table C.3—Continued

Code	Location	CCMD
UAFM	Manas	USCENTCOM
UCFM	Manas	USCENTCOM

Table C.4
USEUCOM

Code	Location	CCMD
EBBR	Brussels	USEUCOM
EDDS	Stuttgart	USEUCOM
EGUL	Lakenheath	USEUCOM
EGUN	Mildenhall	USEUCOM
EGVA	Fairford	USEUCOM
EGVN	Croughton AFB	USEUCOM
EGXE	Menwith Hill AFB	USEUCOM
EHBK	USAG Schinnen	USEUCOM
EINN	Shannon	USEUCOM
ETAD	Spangdahlem	USEUCOM
ETAR	Ramstein	USEUCOM
ETIC	Grafenwoehr	USEUCOM
ETOI	Vilseck	USEUCOM
KQNC	Souda Bay	USEUCOM
LBBG	Burgas	USEUCOM
LBSF	Sofia	USEUCOM
LBWN	Varna	USEUCOM
LEMO	Moron	USEUCOM
LERT	Rota	USEUCOM
LFMI	Le Tube	USEUCOM
LGSA	Souda	USEUCOM
LHPA	Papa	USEUCOM
LICZ	Sigonella	USEUCOM
LIPA	Aviano	USEUCOM
LIPT	Vicenza	USEUCOM

Table C.4—Continued

Code	Location	CCMD
LIRN	Naples	USEUCOM
LIRP	Camp Darby	USEUCOM
LLBG	Tel Aviv	USEUCOM
LPLA	Lajes	USEUCOM
LRCK	Constanta	USEUCOM
LROP	Odepeni	USEUCOM
LTAG	Incirlik	USEUCOM
UBBB	Heydar Aliyev	USEUCOM
UGTB	Tbilisi Marneuli	USEUCOM

Table C.5
USPACOM

Code	Location	CCMD
FJDG	Diego Garcia	USPACOM
NSTU	Pago Pago	USPACOM
NZCH	Christchurch	USPACOM
PAED	Elmendorf	USPACOM
PAEI	Eielson	USPACOM
PGSN	Saipan	USPACOM
PGUA	Anderson	USPACOM
PGWT	Tinian	USPACOM
PHBK	Barking Sands	USPACOM
PHIK	Hickam	USPACOM
PHJR	Kalaeloa	USPACOM
PHLI	Lihue	USPACOM
PHNG	Kaneohe Bay MCAF	USPACOM
PHNL	Honolulu Intl	USPACOM
PHOG	Kahului	USPACOM
PHTO	Hilo Intl	USPACOM
PKWA	Bucholz AFF	USPACOM
PTRO	Babelthuap	USPACOM

Table C.5—Continued

Code	Location	CCMD
PWAK	Wake Island	USPACOM
RJBB	Kansai INT	USPACOM
RJCJ	Chitose	USPACOM
RJFF	Fukuoka	USPACOM
RJFU	US Fleet Activities Sasebo	USPACOM
RJOI	Iwakuni	USPACOM
RJSM	Misawa	USPACOM
RJTA	Atsugi	USPACOM
RJTT	Tokyo	USPACOM
RJTY	Yokota	USPACOM
RKJK	Kunsan	USPACOM
RKPE	Chinhae	USPACOM
RKSG	Camp Humphreys	USPACOM
RKSM	Camp Red Cloud	USPACOM
RKSO	Osan	USPACOM
RKTH	MCCS Camp Mujuk	USPACOM
ROAH	Naha AB	USPACOM
RODN	Kadena	USPACOM
ROTM	Futenma	USPACOM
RPLB	Subic Bay	USPACOM
RPLC	Clark	USPACOM
VAGO	Goa	USPACOM
VDPP	Phnom Penh Intl	USPACOM
VTBD	Don Mueang Intl	USPACOM
VTBU	U-taphao	USPACOM
VTUD	Udon Thani	USPACOM
VVCR	Cam Ranh	USPACOM
VVDN	Da Nang	USPACOM
VVTS	Tan Son Nhat	USPACOM
WIHH	Soekarno Hatta Int	USPACOM

Table C.5—Continued

Code	Location	CCMD
WSAP	Paya Lebar AB	USPACOM
WSSS	Singapore	USPACOM
YBAS	Alice Springs	USPACOM
YPDN	Darwin	USPACOM
YSRI	Richmond	USPACOM
PHNG	Kaneohe Bay MCAS	USPACOM
RPVM	Mactan Cebu Intl	USPACOM
YPTN	Tindal AB	USPACOM

Table C.6
USSOUTHCOM

Code	Location	CCMD
MHSC	Coronel Enrique Soto Cano AFB	USSOUTHCOM
MPTO	Tocumen Intl	USSOUTHCOM
MROC	Juan Santamaria Intl	USSOUTHCOM
MSLP	El Salvador	USSOUTHCOM
MTPP	Toussaint Louverture Intl	USSOUTHCOM
MUGM	Guantanamo Bay	USSOUTHCOM
SBGL	Galeao Antonio Carlos	USSOUTHCOM
SBNT	Augusto Severo	USSOUTHCOM
SBRF	Recife, Brazil	USSOUTHCOM
SKBO	Bogota	USSOUTHCOM
SKCG	Rafael Nunez	USSOUTHCOM
SKPQ	Olano Air Field	USSOUTHCOM
SOCA	Cayenne	USSOUTHCOM
SPIM	Jorge Chavez	USSOUTHCOM
TAPA	Antigua (VC Bird International)	USSOUTHCOM
TISX	Rohlsen	USSOUTHCOM
TJSJ	San Juan	USSOUTHCOM
TNCA	Aruba	USSOUTHCOM
TNCC	Curacao	USSOUTHCOM

References

Air Mobility Command, *Global En-Route Strategy*, White Paper, July 14, 2010.

Allen, William J., "Intervention in Panama: Operation JUST CAUSE," in *Short of War: Major USAF Contingency Operations*, A. Timothy Warnock, ed., Air Force History and Museums Program, 2000, p. 173.

Bardua, Rob, *C-17 Test Team Conducts Airdrop Tests*, Air Force Flight Test Center Public Affairs, February 7, 2003. As of December 11, 2015:
http://www.af.mil/News/ArticleDisplay/tabid/223/Article/140025/c-17-test-team-conducts-airdrop-tests.aspx

C-17 Flight Manual Performance Data, USAF Series C-17A Aircraft, McDonnell Douglas Corporation, F33657-81-C-2018, may not be publicly available, January 2005.

Cassidy, Joseph, *C-17 Transportability of Army Vehicles*, Newport News, Va.: Military Traffic Management Command, Transportation Engineering Agency, May 2002.

Enthoven, Alain C., and K. V. Smith, *How Much Is Enough? Shaping the Defense Program, 1961–1969*, Santa Monica, Calif.: RAND Corporation, CB-403, 2005. As of December 11, 2015:
http://www.rand.org/pubs/commercial_books/CB403.html

Gaddis, John Lewis, "Implementing Flexible Response: Vietnam as a Test Case," in Robert J. Art and Kenneth Neal Waltz, eds., *The Use of Force: Military Power and International Politics*, 7th ed., Lanham, Md.: Rowman and Littlefield, 2009, pp. 235–260.

Global Decision Support System (GDSS), Air Mobility Command, accessed April 7, 2014.

Golden Brigade Chapter of the 82nd Airborne Division Association, "82nd Airborne Division (Vietnam) Golden Brigade: History of the Golden Brigade," 2012. As of December 11, 2015:
http://yorkovich.net/gbc/?page_id=7

Haffa, Robert P., *The Half War: Planning U.S. Rapid Deployment Forces to Meet a Limited Contingency, 1960–1983*, Boulder, Colo.: Westview, 1984.

Haulman, Daniel L., "Crisis in Tropical Africa: Operations Zaire I and II," in *Short of War: Major USAF Contingency Operations*, A. Timothy Warnock, ed., Air Force History and Museums Program, 2000, p. 118.

Hunter, Jamie, ed., *Jane's All the World's Aircraft: In Service 2014/2015*, Ihs Global, 2014.

Lostumbo, Michael, Michael J. McNerney, Eric Peltz, Derek Eaton, David Frelinger, Victoria A. Greenfield, John M. Halliday, Patrick H. Mills, Bruce R. Nardulli, Stacie Pettyjohn, Jerry M. Sollinger, and Stephen M. Worman, *Overseas Basing of U.S. Military Forces: An Assessment of Relative Costs and Strategic Benefits*, Santa Monica, Calif.: RAND Corporation, RR-201-OSD, 2013. As of December 11, 2015:
http://www.rand.org/pubs/research_reports/RR201.html

McAllister, Steve, *AMC En Route Strategy 2013 GERS Brief*, Headquarters Air Mobility Command, 2013, not available to the general public.

Odom, Thomas P., *Shaba II: The French and Belgian Intervention in Zaire in 1978*, Fort Leavenworth, Kan.: U.S. Army Forces Command and General Staff College, 1992.

RAND Corporation, "Joint Staff J31 GRF," briefing slides, Santa Monica, Calif., March 5, 2014.

Rueter, Brad, Major, 18th Air Force, Scott AFB, personal communication with author, June 10, 2014.

Shlapak, David A., John Stillion, Olga Oliker, and Tanya Charlick-Paley, *A Global Access Strategy for the U.S. Air Force,* Santa Monica, Calif.: RAND Corporation, MR-1216-AF, 2002. As of December 11, 2015:
http://www.rand.org/pubs/monograph_reports/MR1216.html

"The Big Picture—United States Strike Command," WDTVLIVE42, uploaded August 12, 2011. As of July 7, 2014:
https://www.youtube.com/watch?v=sCneI1fqycc

U.S. Air Force, Automated Air Facility Information File, continuously updated.

———, Air Force Pamphlet 10-1403, *Air Mobility Planning Factors*, December 12, 2011.

———, Air Force Tactics, Techniques, and Procedures 3-4.1, *Expeditionary Combat Support Planning*, January 2012.

U. S. Congress, *Congressional Record*, V. 149, PT. 14, July 17, 2003, to July 25, 2003, Washington, D.C.: Government Printing Office, 2007. As of December 11, 2015:
http://books.google.com/books?id=mmZkf7dselMC&pg=PA18662&lpg=PA18662&dq=82nd+airborne+tet+offensive+c-141&source=bl&ots=lxZz3jOYtC&sig=5x6zUo_z_tp3zL5AZd70h0y7adY&hl=en&sa=X&ei=6dlFU9LGJ8aN3AWy84H4CA&ved=0CDMQ6AEwAg#v=onepage&q=82nd%20airborne%20tet%20offensive%20c-141&f=false

U.S. Department of Defense, DoD Directive 8260.05, *Support for Strategic Analysis (SSA)*, 2011.

U.S. Joint Chiefs of Staff, *Noncombatant Evacuation Operations*, Joint Publication 3-68, 2007.

———, *Department of Defense Dictionary of Military and Associated Terms*, Joint Publication 1-02, Washington, D.C., November 2010, p. 134.

———, *Joint Forcible Entry Operations*, Joint Publication 3-18, Washington, D.C., November 2012.

———, *Deployment and Redeployment Operations*, Joint Publication 3-35, Washington, D.C., January 31, 2013, p. VI-20. As of December 11, 2015:
http://www.dtic.mil/doctrine/new_pubs/jp3_35.pdf

———, *Joint Concept for Entry Operations*, Distribution Statement A, Washington, D.C., April 7, 2014.

———, *Special Operations*, Joint Publication 3-05, Washington, D.C., July 16, 2014. As of December 11, 2015:
http://www.dtic.mil/doctrine/new_pubs/jp3_05.pdf

Wagoner, Fred E., *Dragon Rouge: The Rescue of Hostages in the Congo*, Washington, D.C.: National Defense University Research Directorate, 1980, pp. 55, 68.

Warnock, A. Timothy, ed., *Short of War: Major USAF Contingency Operations*, Air Force History and Museums Program, 2000, p. 65.

Warnock, A. Timothy, ed., "Dominican Crisis: Operation Power Pack," in *Short of War: Major USAF Contingency Operations*, Air Force History and Museums Program, 2000, p. 65.

The Global Response Force (GRF) is built for rapid response to unforeseen or, more specifically, unplanned operations. Selected Army airborne forces provide a large portion of the GRF and are dependent on joint concepts for deployment and access. This study illustrates a method for determining the best access strategies given constraints in aircraft, intermediate staging bases, operational capabilities, and other factors. The study applies this method to each geographic combatant command and develops specific, tailored strategies for each.

The access strategies are built from multiple analytic techniques: historical aircraft data and platform specifications to determine capabilities and limitations of the air fleet; several airfield databases, site reports, and expert judgments to determine probable intermediate staging base locations and their likely capabilities; multiple deployment concepts for access to minimize operational risks; and detailed geographic and operational analysis to determine global coverage and reach. In the end, we were able to deduce a preferred strategy for each of the combatant commands.

Global access for the GRF is provided partially through the use of well-established staging bases but will necessarily rely on austere basing and complex deployment concepts for particular locations in multiple combatant commands. The study concludes with several recommendations to close those risks, which span the services, combatant commands, and joint staff.

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