



PROJECT AIR FORCE

- CHILDREN AND FAMILIES
- EDUCATION AND THE ARTS
- ENERGY AND ENVIRONMENT
- HEALTH AND HEALTH CARE
- INFRASTRUCTURE AND TRANSPORTATION
- INTERNATIONAL AFFAIRS
- LAW AND BUSINESS
- NATIONAL SECURITY
- POPULATION AND AGING
- PUBLIC SAFETY
- SCIENCE AND TECHNOLOGY
- TERRORISM AND HOMELAND SECURITY

The RAND Corporation is a nonprofit institution that helps improve policy and decisionmaking through research and analysis.

This electronic document was made available from www.rand.org as a public service of the RAND Corporation.

Skip all front matter: [Jump to Page 1](#) ▼

Support RAND

[Purchase this document](#)

[Browse Reports & Bookstore](#)

[Make a charitable contribution](#)

For More Information

Visit RAND at www.rand.org

Explore [RAND Project AIR FORCE](#)

View [document details](#)

Limited Electronic Distribution Rights

This document and trademark(s) contained herein are protected by law as indicated in a notice appearing later in this work. This electronic representation of RAND intellectual property is provided for non-commercial use only. Unauthorized posting of RAND electronic documents to a non-RAND website is prohibited. RAND electronic documents are protected under copyright law. Permission is required from RAND to reproduce, or reuse in another form, any of our research documents for commercial use. For information on reprint and linking permissions, please see [RAND Permissions](#).

This product is part of the RAND Corporation monograph series. RAND monographs present major research findings that address the challenges facing the public and private sectors. All RAND monographs undergo rigorous peer review to ensure high standards for research quality and objectivity.

Intratheater Airlift Functional Needs Analysis (FNA)

John Stillion, David T. Orletsky, Anthony D. Rosello

Prepared for the United States Air Force

Approved for public release; distribution unlimited



RAND

PROJECT AIR FORCE

The research described in this report was sponsored by the United States Air Force under Contract FA7014-06-C-0001. Further information may be obtained from the Strategic Planning Division, Directorate of Plans, Hq USAF.

Library of Congress Cataloging-in-Publication Data

Stillion, John.

Intratheater airlift functional needs analysis (FNA) / John Stillion,
David T. Orletsky, Anthony D. Rosello.

p. cm.

Includes bibliographical references.

ISBN 978-0-8330-4755-7 (pbk. : alk. paper)

1. Airlift, Military—United States—Planning. 2. Transportation, Military—United States. 3. United States. Air Force—Transportation. I. Orletsky, David T., 1963– II. Rosello, Anthony D. III. Title.

UC333.S75 2011

358.4'4—dc22

2009028672

The RAND Corporation is a nonprofit institution that helps improve policy and decisionmaking through research and analysis. RAND's publications do not necessarily reflect the opinions of its research clients and sponsors.

RAND® is a registered trademark.

© Copyright 2011 RAND Corporation

Permission is given to duplicate this document for personal use only, as long as it is unaltered and complete. Copies may not be duplicated for commercial purposes. Unauthorized posting of RAND documents to a non-RAND Web site is prohibited. RAND documents are protected under copyright law. For information on reprint and linking permissions, please visit the RAND permissions page (<http://www.rand.org/publications/permissions.html>).

Published 2011 by the RAND Corporation

1776 Main Street, P.O. Box 2138, Santa Monica, CA 90407-2138

1200 South Hayes Street, Arlington, VA 22202-5050

4570 Fifth Avenue, Suite 600, Pittsburgh, PA 15213-2665

RAND URL: <http://www.rand.org>

To order RAND documents or to obtain additional information, contact

Distribution Services: Telephone: (310) 451-7002;

Fax: (310) 451-6915; Email: order@rand.org

Summary

This document presents the results of the FNA that RAND Project AIR FORCE produced for USAF intratheater airlift. The FNA is the second in a series of three analyses that together comprise a CBA required as part of the JCIDS. The first, the FAA, identified the operational tasks, conditions, and standards needed to achieve military objectives—in this case, certain intratheater airlift missions.¹

The CBA itself was initiated to analyze a potential deficiency in intratheater airlift capability. It was prompted by concerns that demands from the ongoing global war on terrorism and new U.S. Army operational concepts under consideration might result in a shortfall in the USAF's capabilities to deliver personnel and equipment to increasingly numerous and dispersed theater operating locations. Routine supply of a moderately sized ground combat force using the existing intratheater airlift system is challenging.²

The FAA identified three broad operational mission areas for intratheater airlift.³ These mission areas are the ability to provide (1) routine sustainment; (2) time-sensitive, mission-critical (TS/MC) resupply; and (3) maneuver capabilities to U.S. and allied forces across

¹ Orletsky, Rosello, and Stillion, 2011.

² While the U.S. Army has a limited fixed-wing airlift capability (currently consisting primarily of C-23 and C-12 aircraft), the USAF has primary responsibility for joint air mobility missions and the bulk of the joint capability for fixed-wing air mobility.

³ Meeting at Air Mobility Command, December 8, 2005, and subsequent discussions with USAF and U.S. Army personnel.

all operating environments. The FNA assesses the ability of current assets to deliver the capabilities that the FAA identified.

Routine sustainment is defined as the steady-state delivery of required supplies and personnel to units. TS/MC resupply is defined as the delivery of supplies and personnel on short notice, outside the steady-state demands. The maneuver mission is defined as the transport of combat teams around the battlefield using the intratheater airlift system. These three operational mission areas have different characteristics and impose different requirements on the intratheater airlift system.

Aggregate Intratheater Airlift Needs and Current Capabilities

Over the past several years, two relevant studies have addressed the total amount of fixed-wing intratheater airlift capability the USAF will need in the future.⁴ The largest and most widely known of these studies is the Mobility Capabilities Study (MCS) conducted as a joint effort by the Office of the Secretary of Defense (OSD) Director of Program Analysis and Evaluation (PA&E) and the Joint Staff.⁵ As a follow-up to that study, the Intratheater Lift Capability Study (ITLCS) took a more-detailed look at intratheater lift requirements in wartime.⁶ Both studies used OSD-approved planning scenarios as the basis for the mobility demand. These scenarios were set in 2012 and used the weapons and force structures planned to be operational at that time.

Although the studies produced ranges for total fixed-wing intratheater airlift needs that were based on differing assumptions about the location, concepts of operation, duration, intensity, and simultaneity of

⁴ A third study is sometimes discussed, but it was based on a planning year of 2005 and was not considered here.

⁵ U.S. Department of Defense and the Joint Chiefs of Staff, *Mobility Capabilities Study*, Washington, D.C., December 2005, Not Available to the General Public.

⁶ ITLCS analyzes intratheater airlift in somewhat more detail than the models used in the MCS. The overall intratheater airlift demand identified in ITLCS is only marginally different from the MCS.

the contingencies and conflicts that produce such needs, both found a consistent level of demand. The minimum C-130 total aircraft inventory was determined to be 395 aircraft.

Three models of the C-130 have been assigned to the mobility air forces (MAF): C-130E, C-130H, and C-130J. On January 3, 2007, there were 405 MAF C-130E/Hs on a total aircraft inventory basis. In addition, there were 37 MAF C-130Js, for a total fleet of 442 aircraft.⁷ A large and growing portion of the C-130 fleet is either restricted or grounded due to fatigue-related cracking of key structural components of the center wing box. Many older aircraft are currently restricted from carrying useful cargo loads or are grounded because of fears that fatigue-related cracks in their center wing box structures could propagate in flight and result in a catastrophic collapse of the center wing structure. As of January 2007, 45 C-130Es and C-130Hs were operating under flight restrictions because of the risks accumulated fatigue damage pose.⁸ These flight restrictions on weight and flight profile are severe. As a result, restricted aircraft have limited use as airlifters. (See pp. 10–14.)

Possible Sources of Increased Intratheater Airlift Demand

Recent intratheater lift studies have established the basic demand, but several other factors could increase the capability needed. These include the desire to minimize vulnerable ground movements in counterinsurgency environments, the dispersed nature of the global war on terror, and emerging Army concepts of operation that stress operational maneuver and resupply by air.

⁷ The 442 MAF aircraft do not include the LC-130s and the WC-130s, since these are special-mission aircraft that are specially configured and fly specific nonmobility missions. These aircraft can and do fly Air Mobility Command missions but may not always be available. Further, their special equipment may limit the amount and type of cargo they can carry. As a result, the discussions in this monograph do not include these among the MAF aircraft.

⁸ An inspection and repair process can be undertaken to remove these restrictions and return the aircraft to unrestricted operations for several additional years. Not all aircraft pass the inspection or can be repaired economically.

To explore how these new elements could affect the demand for USAF intratheater airlift capacity, we examined two plausible vignettes. We chose these to examine the consequences of operating from a high, hot desert environment and a low jungle environment, using Afghanistan and Indonesia as notional deployment locations. We looked at both routine sustainment and TS/MC resupply of a sizable ground force. Each vignette involved supplying and sustaining a ground force of approximately six brigade combat teams (BCTs). To examine a spectrum of demands, we varied the types of brigades involved.

Routine Sustainment

Although the current Army concept for future operations does not involve large multi-BCT forces operating without a ground line of communication, the trend is toward more-dispersed ground-force operations. Future ground forces will rely on increased aerial distribution.⁹ Such concepts as mounted vertical maneuver will likely rely more heavily on aerial sustainment than do current operations. To better understand the possible implications of routine sustainment, we looked at a case that provided 100 percent by air. Our analysis found that routine sustainment of a moderately sized ground combat force using the existing intratheater airlift system is extremely challenging.

In most of the cases we analyzed, the number of C-130s required to supply six BCTs by air represents a very large fraction of the existing C-130 fleet. The CH-47D helicopter fleet faces even greater challenges.

Time-Sensitive, Mission-Critical Resupply

We examined how intratheater airlift assets might be used to ensure that each combat battalion could take delivery on TS/MC resupply items in 8 hours or less. Our analysis shows that the existing intratheater airlift assets can be combined to provide a robust, responsive TS/MC resupply system with a reasonably small commitment of resources. (See pp. 56–57.)

⁹ See U.S. Army Aviation Center, Futures Development Division, Directorate of Combat Developments, *Army Fixed Wing Aviation Functional Needs Analysis Report*, Fort Rucker, Ala., June 23, 2003b, p. 16-17.

Our analysis also suggests that returns rapidly diminish if resources are allocated to this mission beyond the levels we chose: Additional investments do not further reduce in-transit time. This, combined with the fact that in-transit time accounts for only part of the total time between request and delivery, suggests that it may be more fruitful to invest in improved logistics management processes and procedures to realize substantial reductions in the total TS/MC resupply performance. (See pp. 57–60.)

Further, we determined that, in large countries with sparse air-field infrastructure, significant areas are simply beyond the reach of the existing CH-47 fleet to supply Army maneuver units. (See pp. 47–48.)

Findings

The current requirement for intratheater airlift is 395 C-130s. Current USAF policies are restricting and grounding aircraft because of structural fatigue issues associated with the center wing box. If these policies remain in place and if nothing else is done, the number of unrestricted C-130s available to the USAF is projected to fall below the minimum threshold of 395 early in the next decade. This situation alone is sufficient justification for examining options for increasing USAF intratheater airlift capacity through an FSA. (See pp. 13–14.)

In addition to this identified requirement, several factors could increase the amount of intratheater airlift needed. If routine resupply of a multi-BCT Army unit for an extended period is adopted as an intratheater airlift task, additional airlift assets would be required. Robust TS/MC resupply of a sizable ground force, on the other hand, can be accomplished with relatively few airlift assets. Since routine resupply is not a requirement and since TS/MC resupply takes relatively few assets, the FSA should focus on ensuring that the intratheater airlift fleet continues to meet the 395 C-130 requirement identified in the MCS. This requirement needs to be met in light of the large number of aircraft that are expected to undergo flight restrictions and groundings during the next two decades.