

# Persian Gulf Security



## Evaluating Possible Airfield Deployment Options

Middle East Contingencies

William D. O'Malley

**DISTRIBUTION STATEMENT A**  
Approved for Public Release  
Distribution Unlimited

Project AIR FORCE  
**RAND**

# Persian Gulf Security

20010815 048

## Evaluating Possible Airfield Deployment Options

Middle East Contingencies

*MR-1353-AF*

William D. O'Malley

Prepared for the United States Air Force

Project AIR FORCE

RAND

Approved for public release; distribution unlimited

The research reported here was sponsored by the United States Air Force under Contract F49642-01-C-0003. Further information may be obtained from the Strategic Planning Division, Directorate of Plans, Hq USAF.

**Library of Congress Cataloging-in-Publication Data**

O'Malley, William D.

Evaluating possible airfield deployment options : Middle East contingency / William D. O'Malley.

p. cm.

MR-1353

Includes bibliographical references.

ISBN 0-8330-2999-1

1. Air bases—Middle East. 2. Air bases, American—Middle East. 3. Military planning—United States. I. Title.

UG635.M628 O45 2001

358.4'17'0956—dc21

2001031640

RAND is a nonprofit institution that helps improve policy and decisionmaking through research and analysis. RAND® is a registered trademark. RAND's publications do not necessarily reflect the opinions or policies of its research sponsors.

*Cover design by Maritta Tapanainen*

© Copyright 2001 RAND

All rights reserved. No part of this book may be reproduced in any form by any electronic or mechanical means (including photocopying, recording, or information storage and retrieval) without permission in writing from RAND.

Published 2001 by RAND

1700 Main Street, P.O. Box 2138, Santa Monica, CA 90407-2138

1200 South Hayes Street, Arlington, VA 22202-5050

201 North Craig Street, Suite 102, Pittsburgh, PA 15213-1516

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; Internet: [order@rand.org](mailto:order@rand.org)

---

## PREFACE

---

Given its systemic interest in international economic stability, the United States is unlikely to abandon its current role as the ultimate guarantor of global access to energy supplies in the greater Middle East. Future aggression by Iraq, Iran, or any other antagonist against the oil-rich states of the Arabian Peninsula (or, less likely, the Caspian Basin) would doubtless trigger an American military response.

At the same time, the United States and its NATO partners retain only a small military presence in the Middle East, and that presence is likely to decrease over the next decade. As a result, the success of U.S. regional strategy rests heavily on the projection of military power and on access to bases and other facilities in the region. Yet continued and unconstrained U.S. access to key facilities is by no means a foregone conclusion.

In light of the uncertainties attending continued regional access, this study explores alternative U.S. Air Force basing options for supporting contingencies in the Middle East. In our efforts to examine alternative basing options, we developed a systematic methodology for assessing and rank-ordering possible regional deployment airfields. Although our initial case study focuses on the Middle East, we believe that the methodology has general application and can support future U.S. Air Force deployment planning for a range of potential contingencies in this or any other region.

This report was prepared in support of ongoing research on the present and planned capabilities of allied air forces to augment the ability of the U.S. Air Force to protect the steady flow of oil. This re-

search was conducted within the Strategy and Doctrine Program of Project AIR FORCE. Research conducted for this report was completed in September 2000.

## **PROJECT AIR FORCE**

Project AIR FORCE, a division of RAND, is the Air Force federally funded research and development center (FFRDC) for studies and analyses. It provides the Air Force with independent analyses of policy alternatives affecting the development, employment, combat readiness, and support of current and future aerospace forces. Research is performed in four programs: Aerospace Force Development; Manpower, Personnel, and Training; Resource Management; and Strategy and Doctrine.

---

## CONTENTS

---

|                                                          |       |
|----------------------------------------------------------|-------|
| Preface .....                                            | iii   |
| Figures .....                                            | ix    |
| Tables .....                                             | xi    |
| Summary .....                                            | xiii  |
| Acknowledgments .....                                    | xxi   |
| Glossary .....                                           | xxiii |
| Chapter One                                              |       |
| AIRCRAFT OPERATIONAL PLANNING FACTORS .....              | 1     |
| Background .....                                         | 2     |
| Methodology .....                                        | 8     |
| Operational Planning Factors for Military Aircraft ..... | 11    |
| Operational Planning Factors for a Composite AEF .....   | 15    |
| Sortie Rate .....                                        | 20    |
| Growing Threat Concerns .....                            | 23    |
| Airfield Survey .....                                    | 30    |
| Chapter Two                                              |       |
| MIDDLE EAST .....                                        | 33    |
| Nature and Geographic Distribution of Airfields .....    | 33    |
| A More Detailed Look at the Installations .....          | 41    |
| Routine-Use Facilities .....                             | 43    |
| Today's Planning Dilemma .....                           | 45    |
| Country-by-Country Assessment of Available Airfields ... | 46    |
| Bahrain .....                                            | 47    |
| Cyprus .....                                             | 50    |

|                                                                                      |     |
|--------------------------------------------------------------------------------------|-----|
| Djibouti . . . . .                                                                   | 52  |
| Egypt . . . . .                                                                      | 54  |
| Israel . . . . .                                                                     | 57  |
| Jordan . . . . .                                                                     | 64  |
| Kuwait . . . . .                                                                     | 67  |
| Oman . . . . .                                                                       | 70  |
| Qatar . . . . .                                                                      | 76  |
| Saudi Arabia . . . . .                                                               | 78  |
| Syria . . . . .                                                                      | 86  |
| Turkey . . . . .                                                                     | 90  |
| United Arab Emirates . . . . .                                                       | 96  |
| Yemen . . . . .                                                                      | 100 |
| Iran as a Long-Term Possibility . . . . .                                            | 102 |
| <b>Chapter Three</b>                                                                 |     |
| BLACK AND CASPIAN SEA REGIONS . . . . .                                              | 105 |
| General Characteristics of Central European and Former<br>Soviet Airfields . . . . . | 105 |
| Nature and Geographic Distribution of Airfields . . . . .                            | 108 |
| Country-by-Country Assessment of Available Airfields:                                |     |
| Eastern Europe . . . . .                                                             | 113 |
| Bulgaria . . . . .                                                                   | 113 |
| Moldova . . . . .                                                                    | 117 |
| Romania . . . . .                                                                    | 117 |
| Ukraine . . . . .                                                                    | 120 |
| Country-by-Country Assessment of Available Airfields:                                |     |
| South Caucasus Region . . . . .                                                      | 123 |
| Armenia . . . . .                                                                    | 123 |
| Azerbaijan . . . . .                                                                 | 125 |
| Georgia . . . . .                                                                    | 128 |
| Southern Russia . . . . .                                                            | 131 |
| <b>Chapter Four</b>                                                                  |     |
| IMPLICATIONS FOR MILITARY PLANNERS . . . . .                                         | 135 |
| Alternative Airfields May Prove Valuable and Even<br>Essential . . . . .             | 136 |
| Alternative Airfields Hedge Against the Uncertainties<br>of the Future . . . . .     | 136 |
| Implications for U.S. Military Planning . . . . .                                    | 137 |
| Where Are AEFs Coming From? . . . . .                                                | 140 |
| How Soon Must They Be There? . . . . .                                               | 140 |

|                                                                                            |     |
|--------------------------------------------------------------------------------------------|-----|
| Where Can They Deploy? . . . . .                                                           | 141 |
| Evaluating Alternative Airfields . . . . .                                                 | 141 |
| Appendix                                                                                   |     |
| A. CHARACTERISTICS OF SELECTED AIRFIELDS IN THE<br>MIDDLE EAST . . . . .                   | 151 |
| B. CHARACTERISTICS OF SELECTED AIRFIELDS IN THE<br>BLACK AND CASPIAN SEA REGIONS . . . . . | 161 |
| Bibliography . . . . .                                                                     | 171 |



---

## FIGURES

---

|                                                                                                                  |     |
|------------------------------------------------------------------------------------------------------------------|-----|
| 1.1. Assessment Methodology . . . . .                                                                            | 9   |
| 1.2. Some Fields Are Beyond the Radius of Action of Most Allied Aircraft . . . . .                               | 21  |
| 1.3. Daily Sortie Rate Model . . . . .                                                                           | 23  |
| 1.4. Potential Threat of Iraqi TBMs to Regional Airfields . .                                                    | 26  |
| 1.5. Potential Threat of Iranian TBMs to Regional Airfields . . . . .                                            | 29  |
| 2.1. Dividing the Region into Zones to Help Planners Quickly Categorize and Evaluate Airfields . . . . .         | 37  |
| 2.2. Middle East Deployment Options That Will Support the Maintenance of a High Daily Sortie Rate . . . . .      | 39  |
| 2.3. Constellation of Airfields in the Middle East with an 8000-Foot-Plus Hard-Surface Main Runway . . . . .     | 42  |
| 2.4. Current Preidentified Constellation of AEF Deployment Bases. . . . .                                        | 45  |
| 2.5. Constellation of Possible AEF Deployment Airfields in Israel and Jordan . . . . .                           | 61  |
| 2.6. Oman's Major Military Installations . . . . .                                                               | 71  |
| 2.7. Possible AEF Deployment Airfields in the UAE and Oman . . . . .                                             | 74  |
| 2.8. Airfields in Turkey That Meet Our Criteria . . . . .                                                        | 92  |
| 2.9. Possible Deployment Airfields in the UAE and Oman . . . . .                                                 | 98  |
| 2.10. Potential Deployment Airfields in Iran . . . . .                                                           | 102 |
| 3.1. Constellation of Airfields in the Black and Caspian Sea Region with an 8000-Foot-Plus Main Runway . . . . . | 111 |
| 3.2. Possible Deployment Airfields in the Central European States Bordering the Black Sea . . . . .              | 114 |

|      |                                                         |     |
|------|---------------------------------------------------------|-----|
| 3.3. | Possible Deployment Airfields in the South              |     |
|      | Caucasus States . . . . .                               | 127 |
| 3.4. | Constellation of Airfields in the Southern Russian      |     |
|      | Republics with an 8000-Foot-Plus Main Runway . . . . .  | 132 |
| 4.1. | Possible Backup AEF Deployment Bases: A                 |     |
|      | Proposal . . . . .                                      | 139 |
| 4.2. | Approximate Geographic Laydown of the Airfields in      |     |
|      | Zones I–IV: Iraqi Scenario . . . . .                    | 143 |
| 4.3. | Possible AEF Deployment Airfields: Black and            |     |
|      | Caspian Sea Regions . . . . .                           | 148 |
| A.1. | Constellation of Airfields in the Middle East with an   |     |
|      | 8000-Foot-Plus, Hard-Surface Main Runway . . . . .      | 150 |
| B.1. | Constellation of Airfields in the Black and Caspian Sea |     |
|      | Regions with an 8000-Foot-Plus Main Runway . . . . .    | 160 |

---

## TABLES

---

|                                                                                                      |     |
|------------------------------------------------------------------------------------------------------|-----|
| 1.1. Operational Characteristics of AEF Support Aircraft . .                                         | 13  |
| 1.2. Operational Characteristics of Military Combat Aircraft . . . . .                               | 14  |
| 1.3. Notional AEF . . . . .                                                                          | 16  |
| 1.4. Preferred Physical Characteristics for an AEF Deployment Base . . . . .                         | 18  |
| 1.5. AEF Deployment: Resource Requirements of Concern . . . . .                                      | 19  |
| 1.6. Radius of Operation of Major NATO Tactical Combat Aircraft . . . . .                            | 21  |
| 1.7. Iraqi Ballistic Missile Capabilities . . . . .                                                  | 25  |
| 1.8. Iranian Ballistic Missile Capabilities . . . . .                                                | 28  |
| 2.1. Country Distribution of 8000-Foot-Plus Runways Across the Middle East . . . . .                 | 34  |
| 2.2. Country Distribution of 10,000-Foot-Plus Runways Across the Middle East . . . . .               | 36  |
| 3.1. Country Distribution of 7500-Foot-Plus Runways in the Black and Caspian Sea Regions . . . . .   | 109 |
| 3.2. Country Distribution of 10,000-Foot-Plus Runways in the Black and Caspian Sea Regions . . . . . | 110 |
| A.1. Characteristics of Selected Airfields in the Middle East . . . . .                              | 154 |
| B.1. Characteristics of Selected Airfields in the Black and Caspian Sea Regions . . . . .            | 164 |



---

## SUMMARY

---

Since the end of the Gulf War, the U.S. military has participated in more than 50 contingencies worldwide that have called for some level of military force deployment. Throughout this period, it has become evident that, no matter where or when the next such crisis arises, airpower will be a key and early-entry component of any response package that is formulated. Yet while the United States can project limited airpower over long distances, current and next-generation ground-based tactical combat aircraft cannot efficiently conduct high-tempo, long-duration operations from extended ranges; to the contrary, such aircraft are far more effective when operating out of airfields in the contingency theater. If the West seeks to establish a presence or to employ military power in distant regions effectively, coalition forces will thus require access to the contingency theater and to specific facilities within that theater.

In an effort to shape regional security environments and to enhance U.S. relations with countries in their area of responsibility (AOR), regional commanders-in-chief (CINCs) develop and execute theater engagement plans. In part, such programs seek to support timely access to key regional facilities. U.S. and NATO air forces routinely conduct joint training exercises with several Middle Eastern air forces, and the United States has established working agreements for access rights to specific facilities and for the prepositioning of sets of combat equipment and wartime consumables. Yet significant access problems in that region remain.

## **WHY ARE WE INTERESTED IN ALTERNATIVE AIRFIELDS IN THE REGION?**

This study was motivated by our recognition that the United States and its allies currently have an access problem in the Middle East that is likely to worsen with time. It has also become apparent that the Gulf War planning factors that have long dominated Western analysis of this region are rapidly being eroded by ongoing military-technical and political changes. No longer can U.S. planners assume that coalition air units will continue to be stationed on the Arabian Peninsula, and no longer can they rely on unopposed access to the key regional airfields and port facilities that remain the backbone of U.S. deployment strategy for this region.

Still other problems confound U.S. access in the region. The proximity of many key regional facilities to the anticipated conflict zone, for example, augments the operational value of these facilities but increases their vulnerability to attack. Moreover, it is unlikely that in the next conflict our regional adversaries will afford U.S. forces free access to facilities that support force deployment or the time needed to establish the infrastructure to sustain and employ those deployed military forces. In short, it is clear that regional actors have absorbed many lessons from the Gulf War. Thus, U.S. planners cannot expect to rerun the Desert Shield deployment tapes and achieve anywhere near the same results.

At the same time, it is not clear that U.S. military planners are fully exploiting the rich constellation of potential deployment airfields on or near the Arabian Peninsula that can effectively support air operations. Current coalition operations in the region use only a small number of airfields, most of which are located within 400 nautical miles of Iraq's border. Additionally, those airfields most directly supporting ongoing air operations over southern Iraq are on the eastern side of the Peninsula and close to the Persian Gulf. Since the Gulf War, the host countries and coalition partners (principally the United States) have invested heavily in upgrading the operational and quality-of-life attributes of several of these facilities. Most of these airfields are commonly identified as first-priority U.S. Air Force air expeditionary force (AEF) deployment bases and are well located to optimize the daily combat sortie rate of assigned tactical aircraft. Because this proximity breeds vulnerability to attack, however, these

airfields may no longer be the best facilities from which to conduct high-tempo air operations during a future crisis. This is especially true the farther into the future one takes the planning window, as additional time allows potential regional protagonists greater opportunity to upgrade their military capabilities.

In consonance with these findings, this report examines the operational capabilities of hundreds of commercial airfields and military airbases in 22 states across the Middle East and the Black and Caspian Sea Basins. The intent was to identify those airfields that best meet the operational requirements for the deployment of a U.S. or composite European air task force. We began by developing a systematic methodology for evaluating the support capabilities of each possible deployment airfield. We then used this methodology to review the available data on the regional airfields toward the goal of identifying those that could best support and sustain the deployment of an AEF-size air package.

## IMPLICATIONS FOR U.S. MILITARY PLANNING

The results of RAND's HALT modeling indicate that the coalition success rate is highly sensitive to how quickly airpower can deploy to and become fully operational in the theater. Put another way, it is not merely how quickly we can get there but, more important, how much combat power can be applied early against an adversary's ground offensive. How much and how soon are contingent in turn on a variety of factors, including the readiness, combat capability, and deployability of the designated air units. From our perspective, these factors are all tied directly to how quickly coalition air forces gain access to regional deployment bases and how effectively these facilities can support and sustain high-tempo combat operations.

The question of early access appears to be in dispute for almost all countries on the Peninsula with the possible exceptions of Kuwait and Oman. Kuwait will likely continue to be the pawn of any future Iraq-generated contingency, and this vulnerability will render it dependent on the United States for its security, thereby ensuring ready access. By contrast, Oman's tie with the United States has significant depth and is not principally threat driven. Rather, Oman has proven to be a steadfast supporter of U.S. regional goals over the years, having established long-standing security agreements with the United

States and having supported the prepositioning of U.S. military stocks in its country. As for the other countries on the Peninsula, the complex political and military currents both within each state and across the region as a whole could easily interact in ways that severely challenge future U.S. military access. All of the Gulf Cooperation Council (GCC) states, especially Saudi Arabia, face major systemic problems. The domestic volatility of many of these conservative states ensures cautious negotiation and a reluctance to grant Western forces "unnecessary military access." Iraq and Iran are both aware that access is critical to the regional projection of the West's combat power, and it thus seems probable that extreme pressure will be brought to bear to deny or at least delay such access.

The U.S. planning dilemma is that its deployment strategy for the region is heavily dependent on early access to preidentified deployment bases in Kuwait, Saudi Arabia, Bahrain, Qatar, and possibly Jordan. Yet all of these countries are susceptible to the problems and pressures outlined above. In the absence of an unambiguous threat to their well-being, these governments might not be able to justify such a move, and as a result early and free access to military facilities is unlikely. Thus, there are very real reasons U.S. planners should not be satisfied with placing too much stock in ready access to only a handful of deployment airfields.

There are also growing concerns over the threat posed to regional operating bases and other deployment support facilities by accurate mid-range ballistic missiles as well as cruise missiles. How realistic these concerns are and how soon they will be actualized depend on the operational range and future fielding of these weapons by a few key regional actors. Today's operational plans for an Iraqi contingency should not be immediately affected, but within the next decade this concern will likely be very real and must influence such planning. For an Iranian contingency, the problem is already real, as are the vulnerabilities it breeds. The willingness of the states on the Peninsula to provide access to their facilities is likely to be further called into question as first Iran and later Iraq gain the ability to directly threaten their homelands with ballistic missiles.

Planners must therefore place renewed emphasis on those force protection issues needed to counter threats from ballistic or cruise missiles. One possible solution is to operate from facilities that are out

of harm's way or at least at a more extended range from the threat. Wherever possible, we have therefore looked for deployment options that place forces outside of projected missile range. In reviewing current preferred options, we found that two of the five preidentified AEF deployment bases on the Peninsula are within range of Iraq's projected tactical ballistic missile (TBM) capability, including operational bases in Kuwait and Jordan. In an Iranian contingency, three of the five—Kuwait, Bahrain, and Qatar—will be within range of currently fielded Iranian systems. Given this growing vulnerability, operational planners should expand their options and consider the viability of using other deployment bases that are outside of missile range, designating these bases as primary, alternative, or redeployment bases.

In considering possible bases for inclusion in an alternative planning set, U.S. planners must also ensure that bases are adequate to the task, that they can effectively sustain high-tempo combat operations, and that force protection will be a manageable requirement. To begin with, a U.S. AEF places a heavy burden on any airfield; only a few regional installations have a runway long enough or sufficient ramp space to support a full AEF deployment package. This significantly limits the number of airfields that are realistically adequate to the task.

One can further categorize possible deployment airfields by using two competing concerns: the vulnerability of given airfields to ballistic missile attack and our desire to optimize the daily combat sortie rate. Range to the conflict zone is the key factor in evaluating the relevance of either concern and in identifying preferred deployment belts. This report outlines four distinct deployment zones, each of which carries its own operational benefits and constraints. Although deployment to an airfield in Zone I would optimize aircraft sortie rate, Zone I airfields are also within the projected range of potential adversary ballistic missiles and are thus considered vulnerable. Zones II through IV are beyond (or at extended) ballistic missile range, and airfields in these zones are thus considered less at risk. As range from deployment bases to the crisis zone extends, however, daily sortie rates will dramatically decline, especially as one moves from Zone II to Zone IV. These belts are not fixed but will shift in response to changes in the threat, operational environment, or capability of coalition air forces.

Given the projected ballistic missile capability of both Iran and Iraq, prudent planning would require that future operating bases be no less than 300 nautical miles—and preferably 400 nautical miles—from possible missile launch locations. Moreover, the daily sortie rate model we used suggests that if one seeks to optimize the daily sortie rate for today's mix of tactical combat aircraft and, in turn, the munitions delivery of the combat aircraft, one should operate from deployment bases no farther than 900 nautical miles, and preferably 800 nautical miles, from the conflict zone. Thus, preferred planning ranges are between 400 and 800 nautical miles—ranges that correspond to those of Zone II.

As we found, the number of airfields across the Middle East that meet the AEF's minimum physical characteristics is relatively small, and such airfields are heavily concentrated in the GCC states, especially Saudi Arabia. In Zone II, Saudi Arabia is critical because it has the heaviest concentration of large, fully AEF-capable airfields. Moreover, most of these airfields were built as military or joint-use facilities, and the necessary military infrastructure is therefore in place. These fields often support Western military and support aircraft, as many regional air forces fly such aircraft; Western munitions and support standards are common; and local air force personnel are trained in Western tactics and operational procedures. Consequently, these installations have much of the equipment and are manned by many of the key technical personnel that are needed to support deploying coalition air units. The sheer size of Saudi Arabia also allows for a natural redundancy and depth in the constellation of possible AEF deployment bases. Bahrain and Qatar are also in Zone II and are important for similar reasons. Unfortunately, the number of possible deployment bases in each of these countries is small.

Although Kuwait is an excellent location from which to run quick-turnaround combat missions over Iraq (or, for that matter, Iran), its proximity to the anticipated conflict zone means that the few adequate installations in Kuwait will be at great risk (Zone I).

If the United States seeks to establish an alternative set of AEF deployment bases in the region, we suggest that it begin by expanding the available options in Saudi Arabia. A number of bases across this large country will provide additional depth to the deployment con-

stellation, will allow for replenishment through ports outside the Persian Gulf, and lie outside both Iraqi and Iranian TBM range. Turkey's size, location, and number of possible AEF deployment airfields add capability and depth to operations from the north, but many of the facilities in the eastern quadrant of the country are vulnerable to Iraqi or Iranian ballistic missiles.

A number of capable airfields in eastern Egypt should also be considered in this context. Operating from one or two of these airfields would put an AEF only 600 to 700 nautical miles from the conflict zone (Zone II)—not much farther from Baghdad than U.S. Air Force–Europe (USAFE) aircraft operating from Incirlik, Turkey, but outside projected TBM range and hence less vulnerable. Few Egyptian facilities, however, are as robust and ready to support high-tempo combat operations by Western air forces as those available in GCC states.

Also in Zone II is Israel. There are only a few airfields in Israel south of Tel Aviv that are large enough and whose force protection requirements are manageable enough to allow for the deployment of an AEF. These airfields have been built to support Western aircraft; their support procedures are Western; and their equipment as well as the skills of Israeli technical support personnel could assist in deploying coalition units. There are, however, a number of constraints to efficient combat operations that should be considered here; for example, overflight rights would be required, as there is no direct access to Saudi Arabia or Iraq, and significant political baggage would be associated with using Israeli facilities. Consequently, this option would have to be considered cautiously.

Although Zone III airfields are farther from Baghdad, thereby reducing combat sortie rates, such airfields can lend depth to operations while also providing secure facilities for logistics and combat support operations. They are a viable alternative to Zone II airfields when access to those is not available or when it is delayed. The principal cost will be the extended range to target and the resulting reduction in delivered combat power. In the south, several Omani airfields warrant consideration. The United States and other NATO air forces have frequently used these facilities as transportation hubs and support bases both during and after the Gulf War.

Clearly, none of the airfields in the Black or Caspian Sea regions are true replacements for available facilities in the Middle East. Some Georgian and a few Ukrainian airfields are the most reasonable options. The Zone II airfields in Georgia are not much farther from Baghdad than Incirlik, Turkey. In the event of an Iranian contingency, installations in the north will become extremely important because Iran's center of gravity and capital are in the north. The Zone III airfields in southeastern Ukraine (on or near the Crimea) are also within reasonable flight distance. In both countries, however, facilities are not optimized to support Western combat operations; U.S. and NATO aircrews are not familiar with them; and there are no prepositioned stocks or sustainment chains either established or envisioned for quickly opening the logistical lines of communication (LOCs) necessary to sustain deployment and operations.

It is possible to broaden the number of potential AEF deployment bases. We have identified a number of viable alternatives, but this process cannot end simply by adding a selected number of these alternatives to the planning base. If one expects to deploy quickly to any of these facilities, bring the elements of the AEF up to full operational status, and sustain high-tempo combat operations, deployment cannot be ad hoc. To the contrary, planning, negotiation, and preparation are all necessary. These alternative bases must be duly identified and host nations contacted regarding potential future use. Moreover, this process will not be accomplished without costs, especially if the U.S. Air Force and NATO want to maintain their rapid deployment goals.

---

## ACKNOWLEDGMENTS

---

The author wishes to thank his colleague Roy Gates for the significant contributions he made to this report. Without Roy's assistance, he would not have been able to collect and interpret the volumes of airfield data needed to complete this regional survey. Moreover, he thanks Roy for all of the maps and map graphics that were prepared for this publication. The author is also indebted to colleagues Daniel Byman, John Peters, Stuart Johnson, Richard Sokolsky, John Stillion, Paul Killingsworth, and Jeff Marquis for their thoughtful reviews of earlier drafts of this report. Another RAND colleague, Nora Bensahel, thoroughly reviewed the draft and provided many valuable suggestions that significantly improved the report's content and structure. A significant debt is also owed to both Paul Killingsworth and John Stillion for the groundbreaking work they have done in the area of aerospace deployment and for the contribution their work made to this publication. In the end, however, any mistakes or oversights are solely the responsibility of the author.



---

## GLOSSARY

---

|        |                                             |
|--------|---------------------------------------------|
| AAA    | Anti-aircraft artillery                     |
| AB     | Airbase                                     |
| AC     | Aircraft                                    |
| AEF    | Air expeditionary force                     |
| AEW    | Air expeditionary wing                      |
| AF     | Air Force                                   |
| AFB    | Air Force Base                              |
| AFH    | Air Force Handbook                          |
| AFP    | Air Force Pamphlet                          |
| AFRC   | Air Force Reserve Command                   |
| AMC    | Air Mobility Command                        |
| AMRAAM | Advanced medium-range air-to-air<br>missile |
| ANG    | Air National Guard                          |
| AOR    | Area of responsibility                      |
| APOD   | Aerial port of debarkation                  |
| APOE   | Aerial port of embarkation                  |

|                    |                                                                                             |
|--------------------|---------------------------------------------------------------------------------------------|
| ASP                | Asphaltic Concrete                                                                          |
| ATC                | Air traffic control                                                                         |
| AWACS              | Airborne Warning and Control System                                                         |
| BIT                | Bituminous                                                                                  |
| C <sup>2</sup>     | Command and control                                                                         |
| C <sup>3</sup> ISR | Command, control, communications, intelligence, surveillance, and reconnaissance            |
| C <sup>4</sup> ISR | Command, control, communications, computers, intelligence, surveillance, and reconnaissance |
| CALCM              | Carrier air-launch cruise missile                                                           |
| CAS                | Close air support                                                                           |
| CINC               | Commander-in-chief                                                                          |
| CON                | Concrete                                                                                    |
| CONUS              | Continental United States                                                                   |
| CSAR               | Combat search and rescue                                                                    |
| DIA                | Diameter                                                                                    |
| DoD                | Department of Defense                                                                       |
| EAf                | Expeditionary aerospace force                                                               |
| GCC                | Gulf Cooperation Council                                                                    |
| GPS                | Global Positioning System                                                                   |
| GRE                | Graded earth                                                                                |
| GRS                | Grass surface                                                                               |
| HQ                 | Headquarters                                                                                |

|        |                                                           |
|--------|-----------------------------------------------------------|
| IRBM   | Intermediate-range ballistic missile                      |
| JTF    | Joint task force                                          |
| LCN    | Load classification number                                |
| LOC    | Line of communication                                     |
| MHE    | Materiel-handling equipment                               |
| MOB    | Main operating base                                       |
| MRBM   | Medium-range ballistic missile                            |
| NATO   | North Atlantic Treaty Organization                        |
| NAVAID | Navigational aid                                          |
| NBC    | Nuclear, biological, and chemical                         |
| NIMA   | National Imagery and Mapping Agency                       |
| nm     | Nautical mile                                             |
| OOTW   | Operations other than war                                 |
| PCN    | Pavement classification number                            |
| PEM    | Pembroke (type of composite runway construction material) |
| PGM    | Precision-guided munitions                                |
| Prepo  | Prepositioning                                            |
| RAF    | Royal Air Force (British)                                 |
| SAM    | Surface-to-air missile                                    |
| SAN    | Sand                                                      |
| SAR    | Search and rescue                                         |
| SEAD   | Suppression of Enemy Air Defenses                         |
| SLV    | Surface-launch vehicle                                    |

|           |                                           |
|-----------|-------------------------------------------|
| SRBM      | Short-range ballistic missile             |
| SSM       | Surface-to-surface missile                |
| SWA       | Southwest Asia                            |
| TBM       | Tactical ballistic missile                |
| UAE       | United Arab Emirates                      |
| UNSCOM    | United Nations Special Commission on Iraq |
| USAFE     | U.S. Air Force–Europe                     |
| USCENTCOM | U.S. Central Command                      |
| WMD       | Weapons of mass destruction               |

---

**AIRCRAFT OPERATIONAL PLANNING FACTORS**

---

This study was motivated by our recognition not only that the United States and its allies in the Middle East have an access problem now but that this problem is likely to worsen in the near future as the political environment continues to change both across the region and within many of the individual states. In addition, the Gulf War planning factors that have long dominated Western analysis of and planning for operations in this region are rapidly being eroded by ongoing military-technical and political changes. With these concerns in mind, our goal was to understand better the types of operational problems that could be encountered in the region and to determine whether viable deployment options are available that will allow Alliance air forces responsive access to airfields that are secure, can support the required level of operations, and can meet mission requirements.

Toward this goal, we not only looked at the operational capabilities of the commercial and military airfields on the Arabian Peninsula but also cast our net farther out to include more countries across the greater Middle East and in the Black and Caspian Sea Basins. Our intent was to identify those airfields that are not likely to be part of current U.S. Air Force plans for the region and, having done so, to highlight those that best met U.S. operational requirements and could effectively support an AEF-size deployment package.

On the basis of available information, we were able to compile a fairly comprehensive profile of most of the major airfields in the region. With this level of detail, we were then able to develop an informed picture of plausible deployment options and to compare the

merits of each. This type of assessment can be done far in advance of a crisis and can be updated as changes occur. It thus has the potential to provide both the planning and the operational communities with a more complete picture from which to do some practical “what if” contingency planning and, based on that planning, to:

- take those actions necessary to update or revise established regional contingency plans,
- improve force projection options to account for any changes in the security environment, and
- make planning decisions in response to a fluid crisis situation if necessary.

## BACKGROUND

The U.S. Air Force is moving away from its Cold War reliance on forward-deployed units and well-established regional main operating bases (MOBs) for the conduct of combat operations. With the aim to reduce the operating budget and yet be more responsive in today's more uncertain security environment, U.S. national military strategy must be prepared to project power to crisis regions around the world. General Michael E. Ryan, Air Force Chief of Staff, explained the situation as follows:

Today, the Air Force is no longer a Cold War garrison force focused on containment. We no longer have the massive preplanned bed-down bases [overseas] with the enormous fixed infrastructure of the past.<sup>1</sup> Now we are faced with more numerous challenges that require the capability for rapid, tailored responses to many regions and many situations, from humanitarian operations to full-scale combat. That paradigm shift demands that we change our mindset, procedures and, when necessary, our employment structure. After careful study, Air Force senior leaders concluded these

---

<sup>1</sup>With the end of the Cold War, the Air Force decreased its permanent overseas bases from more than 50 to 17, leading to more deployments from CONUS bases. Moreover, deployments during the Cold War essentially centered on rotations into and out of well-known, fully equipped U.S. Air Force-owned and -operated MOBs in Europe or the Far East. Additionally, these deployments were generally in support of operational requirements that were well understood and frequently rehearsed.

changes are indeed necessary and we'll be able to best meet the challenges of the next century as an Expeditionary Aerospace Force. We will adapt procedures to operate as a rapid deployable force that is more capable of exploiting the unique aspects of air and space power: range, speed, flexibility and precision—to the fullest capacity.<sup>2</sup>

As General Ryan indicates, today's U.S. national security strategy and the Air Force's evolving operational concept depend on power projection and on the rapid deployment of airpower packages that are tailored to meet specific commander-in-chief (CINC)-directed mission requirements. To support this force projection requirement, the Air Force is restructuring itself into an expeditionary aerospace force (EAF),<sup>3</sup> redefining its long-standing organizational concept, and establishing ten prepackaged air expeditionary forces (AEFs) from a combination of active, guard, and reserve units. These AEFs will combine those assets necessary to support any force deployment under a single peacetime organizational umbrella.<sup>4</sup> Although many AEF component units will not be collocated, all will be connected for purposes of planning, training, and deployment. To ensure rapid response, the Air Force will maintain two of these AEFs on alert and prepared for immediate deployment. In addition to the two AEFs on alert, the Air Force is designating two "rapid response" wings that

---

<sup>2</sup>See General Michael E. Ryan, "Signature Article: Our Expeditionary Aerospace Force," posted on the Air Force Web site at <http://www.afmc-mil.wpafb.af.mil/HQ-AFMC/XP/ao/eafweb/sig.htm>, and Glenn W. Goodman, Jr., "An Expeditionary Aerospace Force: USAF Plans Fundamental Shift in How It Responds to Global Contingencies," *Armed Forces Journal International*, September 1998, available at <http://www.afji.com/mags/1998/august/an%20expeditionary%20aerospace%20forc/index.html>.

<sup>3</sup>According to General Ryan, the EAF concept has two primary goals. The first is to provide greater stability and predictability to Air Force personnel by periodically rotating the deployment burden around the entire force, which is intended to address many of the readiness, training, and retention problems the Air Force faces. The second is to enhance the deployability and tailorability of the CONUS-based force, thereby improving the responsiveness and utility of airpower support to the regional CINCs.

<sup>4</sup>Although the ten AEFs will not be identical, the Air Force intends to organize them so that they possess roughly the same combat capability. This composite organization will include fighters, bombers, tankers, airlifters, command and control (C<sup>2</sup>), radar and electronic warfare aircraft, and space intelligence, surveillance, and reconnaissance assets along with the appropriate complement of support personnel (e.g., security, medical, and mission support).

will also be prepared to react quickly to evolving crises and to support regional deployments. This means that, at any given time, two AEFs and one rapid response wing will be ready to deploy.<sup>5</sup>

The predesignated AEFs represent a toolbox of capabilities as well as a force package that can be tailored to meet mission-specific requirements from the approximately 150 aircraft; 10,000 to 12,000 personnel; and support equipment assigned to each AEF.<sup>6</sup> The resulting force package will deploy as an Air and Space Expeditionary Task Force and will be integrated into the CINC's Joint Task Force (JTF). Adding more AEFs in the manner of building blocks will allow the theater CINC to aggregate operational capabilities and build the air package necessary to meet specific mission needs.<sup>7</sup>

Although U.S. long-range bombers can project airpower around the world, the bulk of the combat power tied to an AEF will take the form of tactical fighters. Yet the operational characteristics of current and next-generation ground-based tactical aircraft are such that the U.S. Air Force cannot effectively conduct high-tempo, long-duration combat operations from extended ranges.<sup>8</sup> Clearly, tactical combat aircraft are much more effective when operating out of airfields in the contingency theater. It is therefore critical that access be acquired both to the contingency theater and to specific facilities within that theater. These forward operating bases may range from

---

<sup>5</sup>See Paul S. Killingsworth, Lionel A. Galway, Eiichi Kamiya, Brian Nichiporuk, Timothy L. Ramey, Robert S. Tripp, and James C. Wendt, *Flexbasing: Achieving Global Presence for Expeditionary Aerospace Forces*, Santa Monica: RAND, MR-1113-AF, 2000, pp. 11–13.

<sup>6</sup>From a planner's perspective, the bottom line is that there is no standard AEF deployment package. The goal is to minimize the size and deployment footprint of any deployment package. In the end, however, the nature and scale of this force package will be driven by mission requirements, force protection needs, and the type and size of the support package needed to supplement the existing host-country infrastructure and to sustain the deployed force package at the in-theater base. As we will discuss later, the aircraft mix will also dictate many of the minimally acceptable physical characteristics of our deployment base(s).

<sup>7</sup>Also as a rough planning tool, a single AEF has the combat power to attack approximately 200 targets per day. See John A. Tirpak, "The EAF Turns One," *Air Force Magazine*, October 2000, p. 24.

<sup>8</sup>As we will discuss in greater detail later, if air units are stationed near the crisis or conflict zone, the sortie rate, the volume of ordnance that can be delivered daily, and how quickly the air units can react to changes in the operational environment will all be improved.

preidentified bases containing prepositioned support equipment, supplies, fuel, munitions, and a support infrastructure fully compatible with U.S. aircraft to less prepared locations with minimal in-place support.<sup>9</sup> Even in the face of such challenges and uncertainties, the Air Force expectation is that "an AEF can deploy to a forward base, arm airplanes, and strike enemy targets within a few days."<sup>10</sup> For the tactical air units, the length of this time line will depend on whether ready access can be gained to these regional airfields and their support infrastructure as well as on the airfields' capabilities.

As previously mentioned, it has also become apparent that the Gulf War planning factors that have recently dominated Western analysis of the Middle East are being steadily eroded by military-technical and political changes. As a result, U.S. planners cannot assume that Western forces will continue to enjoy the use of "friendly" airfields and port facilities that have long been the backbone of their Middle East deployment strategy. Moreover, the proximity of many of these key regional facilities to the anticipated conflict zone not only adds to their operational value but also increases their vulnerability. Capabilities exist today that would allow adversaries to attack many of these facilities. There is also growing uncertainty about whether U.S. forces will be afforded free and timely access to necessary deployment support facilities or have all the time they need to establish or activate the essential infrastructure for employing and sustaining coalition air forces operating from those facilities.<sup>11</sup>

<sup>9</sup>The level of in-place support at designated forward operating bases will substantially affect both the speed of deployment and how quickly the deployed unit can be fully operational.

<sup>10</sup>According to *Air Force Magazine*, the Air Force believes that an "AEF's first bombers could hit targets within 24 hours, but fighters could deploy and do the same within 48 hours." See John A. Tirpak, "The Long Reach of On-Call Airpower," *Air Force Magazine*, December 1998, pp. 22-23. The Air Force's recent vision statement, "Global Vigilance, Reach, and Power" (see <http://www.af.mil/vision/>), further asserts that lead wings from the on-call AEFs can dispatch to a barebones facility, set it up, and begin combat operations within 48 hours. General Ryan also states that the AEF construct makes it possible to put up to five AEFs into a battle theater within 15 days, assuming that the Air Force has ready access to all the necessary airlift. See Tirpak, "The EAF Turns One," p. 24.

<sup>11</sup>The point is that all regional actors have absorbed many lessons from the Gulf War, and we cannot expect to rerun the deployment tapes from Desert Shield/Desert Storm and have anywhere near the same results.

Deployment planners must also confront the fact that few regional airfields have in place the full suite of infrastructure, equipment, and materiel that U.S. and other Western air forces need for efficient and sustained operations. Cooperative efforts and U.S. funding assistance have thus far supported the upgrading of some regional airfields to near-NATO standards—and if the Air Force can focus its regional deployments on airfields with these capabilities, it will be able to simplify the process and reduce the time needed both to deploy military units and to bring those units up to full operational status. Yet this “upgrade” effort has understandably focused on only a small constellation of preidentified “deployment airfields,”<sup>12</sup> and its anticipated benefits will thus be realized only if one of these airfields is used. To be sure, there are some advantages to be gained by focusing one’s regional strategy on free and continued access to a small number of support facilities and airfields, but we cannot afford to restrict our planning at the expense of operational flexibility. The region’s future political and security environment remains clouded in uncertainty, and many possible developments could affect U.S. access to the region, especially among the conservative sheikdoms that form the backbone of current U.S. policy. All of this argues for the United States to hedge its bets and develop a broader range of AEF deployment bases. In this context, there appear to be three possible options worth considering:<sup>13</sup>

1. Extend the airfield infrastructure upgrade program to many more airfields across the region.
2. Establish the support structure at CONUS-based installations and deploy from these installations, when needed, the units, equipment, and materiel necessary to upgrade the operational capability of regional airfields to acceptable standards and open the flow of consumables such as fuel, munitions, and spare parts.

---

<sup>12</sup>The current Air Force basing structure in Southwest Asia (SWA) centers on four installations on the Arabian Peninsula: Prince Sultan, Saudi Arabia; Ahmed Al Jaber, Kuwait; Shaikh Isa, Bahrain; and Doha International, Qatar. Azraq (Shaheed Mwaffaq), Jordan, has also gained greater prominence of late. Three of these airfields (Ahmed Al Jaber, Shaikh Isa, and Doha) are located on or near the Persian Gulf, making resupply from the sea plausible.

<sup>13</sup>For more details see Paul Killingsworth, “Implementing an Effective Aerospace Expeditionary Force,” Santa Monica: RAND, unpublished briefing, November 1998.

3. Extend the airfield upgrade actions to a broader but focused constellation of regional airfields but go beyond the upgrades proposed by Option 1. The additional steps would include the prepositioning of much if not most of the heavy equipment and materiel and at least two weeks' worth of the consumable stocks needed to support a deployed AEF to a support base in the region. Getting these assets into the region will simplify the deployment process, decrease the demand on strategic lift, and reduce the time needed to move this support package to designated deployment airfields.<sup>14</sup>

Option 1 is too expensive to be practical. Options 2 and 3 both afford Air Force planners greater operational flexibility so that they can effectively adjust plans and deploy AEF units to alternative airfields (or possibly countries) as dictated by changes in the political or security environment. The prepackaging of airfield support units, equipment, and stocks under a single planning group in peacetime provides additional flexibility. This will allow for the rapid deployment of tailored capabilities packages that will be able to open and operate airfields to U.S. standards and provide the support necessary to sustain operations. There are clear tradeoffs among these three options, with the key tradeoffs being cost; how much strategic lift will be required; and how long it will take to deploy an AEF, its support package, and its supplies and then bring the deployment base and the air unit(s) up to full operational status. Details on these tradeoffs and a recommended course of action are discussed in earlier RAND work.<sup>15</sup>

From the perspective of ensuring optimum operational flexibility (broad range of deployment bases) and minimizing the number of additional days needed to bring AEF components to full operational

---

<sup>14</sup>Support equipment and theater assets dominate the deployment requirement. Estimates are that 85 to 90 percent of the deploying tonnage of an AEF is dedicated to its support package, which will include munitions, fuel, shelter, vehicles, force protection, and engine and avionics repair. If preconflict action could reduce the demand on C-17 sorties dedicated to moving this package by only 30 or 40 and allow their employment elsewhere, it would considerably affect the number of strategic airlifters available for other missions. See Killingsworth, "Implementing an Effective Aerospace Expeditionary Force," unpublished briefing.

<sup>15</sup>Ibid. See also Killingsworth et al., *Flexbasing: Achieving Global Presence for Expeditionary Aerospace Forces*.

status at airfields that are not preidentified, the preferred alternative appears to be Option 3.<sup>16</sup> Before we begin to make such commitments, however, we must ascertain whether there are viable basing alternatives in the event that the preferred deployment airfields are not available. Toward that end, this study seeks to outline the broader constellation of capable airfields that are available to support U.S. and NATO coalition operations in the Middle East and possibly the Caspian Basin.

## METHODOLOGY

In this study, we reviewed the operational capabilities of hundreds of airfields in 22 states across the Middle East and the Black and Caspian Sea regions<sup>17</sup> in efforts to determine which installations can support the operational needs of a deploying U.S. or composite NATO air package. As subsequent discussion indicates, we used the physical space and support requirements of a single notional AEF as our baseline template for evaluating what those operational needs will be.<sup>18</sup> We then assessed, in general terms, which installations provided the best support. Figure 1.1 outlines the methodology that was used to assess whether the physical capabilities of each of these airfields are compatible with the needs of a deploying AEF. During the course of this research, we focused on those processes highlighted on the left side of Figure 1.1.

---

<sup>16</sup>RAND modeling suggests that success in the HALT phase of any contingency operation is highly dependent on how quickly airpower can engage the advancing enemy force, with success measured by how soon the advance can be stopped.

<sup>17</sup>Our country review was divided into two geographic regions: the Middle East and the Black and Caspian Sea. The countries addressed in the Middle East included: Bahrain, Cyprus, Djibouti, Egypt (selectively), Israel, Iran, Jordan, Kuwait, Oman, Qatar, Saudi Arabia, Syria, Turkey (selectively), the United Arab Emirates (UAE), and Yemen. Countries in the Black and Caspian Sea regions included Armenia, Azerbaijan, Bulgaria (selectively), Georgia, Moldova, Romania (selectively), southern Russia, and the Ukraine (selectively).

<sup>18</sup>Granted, the nature and location of the airfield(s) supporting any deployment package will vary depending on several factors, not the least of which are the type of contingency and mission requirements. We have consciously avoided that step by assuming that our deployment package is the notional AEF and that it must be prepared to support combat operations. We believe that by using this notional package as our scaling requirement, the resulting standards are high enough to render any of the selected airfields sufficiently robust to support most other air packages.

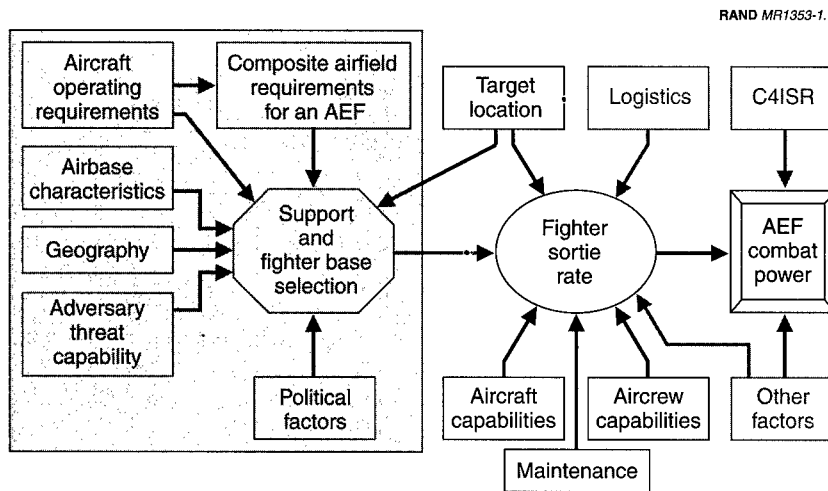


Figure 1.1—Assessment Methodology

The first step in this methodology is to establish the minimum takeoff and landing requirements for the various types of aircraft in an AEF and then to identify the minimum operational planning factors for runway length, width, load classification number (LCN), and ramp/apron parking space. The next step is to estimate the composite requirements for our notional AEF. Since there is no standard AEF template, we developed a notional deployment package that was used throughout this process to establish our baseline (this package will be outlined in greater detail below).

We next established the physical characteristics of each of the airfields, focusing on those airfields that met our minimum criteria: at least one runway in “good” condition, longer than 7500 feet, and wider than 145 feet.<sup>19</sup> Our concern was whether a given airfield could support the minimum operational planning factors for an AEF. We recognized that the physical attributes of an airfield can be

<sup>19</sup>These parameters were used to support the first screening cut because they represented minimum operational criteria for the fighters most likely to be assigned to a U.S. or NATO AEF.

changed (e.g., lengthening a runway, adding ramp space), but certainly not quickly.

Our next concern was whether an AEF could effectively conduct combat or combat support operations from a given airfield. Our key tasks appeared to be twofold: first, to assess how well a given airfield could support such operations (quality), and, second, to review and merit-rank the airfields in each country. We began this process by evaluating which elements of the standard military airfield infrastructure are available at each airfield—e.g., munitions bunkers, aircraft shelters, hangars, and life support structures (housing, messing, medical). In contrast to the physical characteristics, shortfalls identified in infrastructure were generally not “show stoppers,” as either workarounds or deployment packages were available that could be used to bring airfields up to minimum operational standards. To be sure, we would prefer to stage only to airfields that meet all established standards, but other factors often dictate that a lesser-quality airfield be used as our deployment base. There will be a cost, however, with the required steps necessary to solve existing problems likely slowing the deployment process and/or affecting the initial tempo of operations.

Three additional factors will help one prioritize which airfields are preferred over the others:

- First, how far is a given base from the conflict zone, and how will this distance affect daily operations, including daily sortie rate, munitions delivery, fuel consumption, and the like?
- Second, what are the potential capabilities of enemy forces, and do these forces present a direct threat to a given deployment base? The threat of most immediate concern is that of cruise missiles or tactical ballistic missiles (TBMs), possibly with weapons of mass destruction (WMD), especially those that can be targeted against deploying or deployed Alliance forces. For simplicity's sake, we used the projected range of our potential adversary's TBMs to establish how vulnerable a single airfield or series of airfields will be.
- Finally, the key political question is whether the environment in the host country or region will allow U.S. and allied forces ready

access to key airfields and other deployment support facilities. The intent is to identify where there will likely be problems and where there will not.

Using this methodology, we looked for airfields and host countries that meet the following criteria:

- meet the operational needs of deploying aircraft as defined in Tables 1.1 and 1.2 and summarized in Table 1.4;
- have operational deficiencies that can be quickly corrected through the deployment of support units, equipment, or stocks and the installation can readily be resupplied;
- are airfields with which U.S. and NATO forces are familiar wherever possible;
- are within reasonable operational strike range of the scenario-based crisis area;
- are outside the strike zone of enemy tactical surface-to-surface missile (SSM) systems;
- can reasonably be accessed by U.S. and NATO military forces during any future regional crisis; and
- can be secured and defended.

We also looked for those deployment options that offer Air Force planners the greatest operational flexibility and redundancy. In this report, we applied the methodology outlined above to a Middle Eastern contingency, but the methodology has general application to any set of contingencies.

## **OPERATIONAL PLANNING FACTORS FOR MILITARY AIRCRAFT**

In order to assess which airfields can support the deployment of an expeditionary task force tailored from one of the AEFs or a composite NATO equivalent, one must first identify the general operational characteristics of the deploying aircraft and, on the basis of these findings, derive the preferred physical characteristics of a deploy-

ment base.<sup>20</sup> Table 1.1 outlines the operational characteristics of the U.S. support aircraft of concern.<sup>21</sup>

Table 1.2 provides similar information on a range of combat aircraft. As this table indicates, the fighters and fighter-bombers do not need runways that are as long, wide, or capable of bearing as much weight as those needed by the heavier airlift and tanker aircraft outlined in Table 1.1.

Runway length and width are key operational planning factors that are commonly used as first-cut criteria in assessing whether the United States or its allies can feasibly run air operations from an airfield. Because of their preferred minimum takeoff runway length of 11,800 feet, the KC-10 and KC-135 tankers<sup>22</sup> will be the drivers in establishing the minimum physical characteristics of any base that can support the deployment of all aircraft assigned to our notional

<sup>20</sup>The AEF remains an evolving concept that is not tied to any single force structure. Rather, the structure will be tailored to specific environmental and mission requirements. The notional AEF includes a deployable element of 60 to 75 aircraft, with another 100 or so active and reserve aircraft on call. Therefore, the AEF package could conceivably expand to approximately 175 aircraft. The initial deployment package centers around a strike package of 36 combat aircraft (a mixture of F-15C [air superiority], F-16CJ [Suppression of Enemy Air Defenses, or SEAD], F-16CG [strike], and F-15E [strike] aircraft) that is supported by surveillance/C<sup>2</sup>, search-and-rescue, lift, and tanker aircraft.

<sup>21</sup>Listed are aircraft type, the minimum landing distance with a maximum payload, the minimum takeoff runway length with a maximum payload, the minimum takeoff runway length with a zero or nominal payload, the minimum runway width required, the operational runway planning factor used in our assessment, the ramp and apron space required to park one aircraft, and the preferred LCN. The LCN is a numeric value that determines how much weight a particular runway can hold without causing permanent damage. Each aircraft has a specified LCN that identifies how much stress it is expected to exert on the runway. Aircraft type and gross weight determine LCN. Normally, the LCN of an aircraft should not exceed that of the runway, taxiway, or ramp on which it operates. Airport authorities may authorize exceptions. See *Military Airlift: Airlift Planning Factors*, U.S. Air Force Pamphlet 76-2, May 29, 1987.

<sup>22</sup>For planning purposes, the operational planning requirements for both the KC-10 and KC-135 and the E-3 are assumed to be approximately the same, although the lighter KC-135 and E-3 would require an LCN of only 50.

Table 1.1  
Operational Characteristics of AEF Support Aircraft<sup>a</sup>

| Aircraft Type    | Minimum Runway Landing <sup>b</sup> | Minimum Runway Takeoff Weight <sup>c</sup> | Minimum Takeoff Runway Minimum Load <sup>d</sup> | Minimum Runway Width | Operational Planning Factor <sup>e</sup> | Ramp Space Required (ft <sup>2</sup> ) | Preferred LCN |
|------------------|-------------------------------------|--------------------------------------------|--------------------------------------------------|----------------------|------------------------------------------|----------------------------------------|---------------|
| C-5 <sup>f</sup> | 5000                                | 12,200                                     | 7200                                             | 150                  | 8,000 × 150                              | 64,524                                 | 48            |
| C-17             | 3000                                | 7,500                                      | 3500                                             | 90                   | 4,500 × 90                               | 47,500                                 | 48            |
| C-130            | 3000                                | 6,250                                      | 2600                                             | 60                   | 4,000 × 80                               | 15,519                                 | 37            |
| C-141            | 5000                                | 9,000                                      | 5920                                             | 98                   | 6,000 × 100                              | 31,362                                 | 50            |
| KC-10            | 5400                                | 11,800                                     | 8480                                             | 148                  | 10,000 × 150                             | 34,800                                 | 77            |
| B-747            | 6600                                | 11,000                                     | 8000                                             | 142                  | 8,500 × 150                              | 52,500                                 | 70            |

<sup>a</sup>All lengths and widths are in feet. The operational data presented were extracted from several sources, including *Airlift Planning Factors* (current version) and *Jane's All the World's Aircraft 1999/2000* (London: Sampson Low, Marston & Co., 1999).

<sup>b</sup>Minimum runway distance required for landing with full load (maximum takeoff weight).

<sup>c</sup>Minimum takeoff runway length needed with full load. This distance defines minimum runway requirements if one seeks to use the airfield as a full operating base, moving maximum cargo into and out of a given aerial port of debarkation (APOD).

<sup>d</sup>Minimum takeoff runway length needed with zero payload.

<sup>e</sup>The operational planning factor represents a runway distance that will allow for landing with a maximum payload and takeoff with a nominal payload and that provides for a little extra distance to ensure safety and a little extra operational flexibility.

<sup>f</sup>In support of Joint Endeavor, C-5s are operating into and out of Taszar, Hungary, which has an 8200- × 197-foot runway. They are, however, flying out with only a nominal load.

**Table 1.2**  
**Operational Characteristics of Military Combat Aircraft**

| Aircraft Type | Operational Planning Factor <sup>a</sup> | Ramp Space Required (ft <sup>2</sup> ) <sup>b</sup> | Preferred LCN |
|---------------|------------------------------------------|-----------------------------------------------------|---------------|
| F-15          | 8,000 × 150                              | 6,000                                               | ~30           |
| F-16          | 7,500 × 100                              | 5,000                                               | ~30           |
| F-117         | 7,500 × 100                              | 5,500                                               | ~30           |
| Tornado       | 7,000 × 100                              | 5,500                                               | ~30           |
| B-52          | 12,000 × 250                             | 50,000                                              | 114           |
| B-2           | 8,000 × 150                              | 34,000                                              | 75            |

<sup>a</sup>All lengths and widths represent optimum safety distances, and aircraft could work off of smaller airfields if necessary. For planning, however, we are using the greater distances to ensure that most AEF aircraft can use the airfield.

<sup>b</sup>Aircraft parking space is based on requirements outlined in *Facility Requirements*, U.S. Air Force Handbook AFH-32-1084, September 1, 1996, Table 2.6.

AEF.<sup>23</sup> If these tankers limit their takeoff weight to less than the maximum, they can operate off shorter runways (approximately 10,000 feet), thereby increasing the number of deployment options available.<sup>24</sup> Clearly, any of the aircraft outlined in Tables 1.1 or 1.2 can operate—and have operated—out of more austere airfields and off shorter runways than those suggested by our planning factors. It is our intent, however, to ensure that those airfields considered meet the peacetime operational criteria, thereby allowing room for some operational degradation.

<sup>23</sup>During the course of this study, we are sizing airfield requirements to match the deployment needs of an AEF tailored for combat. This places a high-end requirement on our planning requirements. If the contingency warrants something less than a combat-tailored force package, the requirements will likely be reduced and many more regional airfields may be able to support the air package in lesser contingencies. It is most probable that any of the airfields that we identify as capable of supporting the deployment of an AEF should also be capable of supporting most lesser contingencies.

<sup>24</sup>The runways at Incirlik Airbase, Turkey, are only 10,000 feet in length, and the U.S. Air Force–Europe (USAFE) routinely operates all manner of AEF aircraft out of this installation, including KC-10/135 tankers. See “Reserve Units Pick Up Support of AEF 8,” *Air Force News*, July 17, 2000, available at [http://www.af.mil/news/Jul2000/n20000717\\_001074.html](http://www.af.mil/news/Jul2000/n20000717_001074.html).

## OPERATIONAL PLANNING FACTORS FOR A COMPOSITE AEF

The U.S. Air Force's current operational concept is based on the deployment from CONUS of air combat packages that will meet the specific needs of a regional CINC and be tailored to mission requirements. Although the organization and structure of this AEF are still evolving, the Air Force's Expeditionary Air Force Implementation Directorate has developed a flexible notional structure that is well balanced and can be used to support a wide range of mission requirements (see Table 1.3).<sup>25</sup> All AEFs will have fighters for air-to-air, precision strike, and Suppression of Enemy Air Defenses (SEAD) capabilities as well as bombers, tankers, and transports. Specialized sensor aircraft such as E-3 Airborne Warning and Control System (AWACS) and RC-135 Rivet Joint intelligence aircraft will be assigned only as needed.<sup>26</sup>

As outlined in the previous section, the aircraft driving the required runway length for any AEF deployment base is the KC-10/135 tanker, which prefers 11,800 feet for a maximum-weight takeoff. Heavy tankers can operate from a shorter runway, but the tradeoff will be in the number of gallons of fuel that it can deliver—and this shortfall will likely translate into a need for additional daily tanker sorties or aircraft. To optimize the number of possible deployment bases, we decided to use 10,000 feet as the minimum runway length for the support package<sup>27</sup> and, in turn, for the full AEF. For the fighter

---

<sup>25</sup>This notional AEF package comes from a November 1998 Pentagon briefing by Major General Donald G. Cook, USAF, Director for EAF Implementation, entitled "Evolving to an Expeditionary Aerospace Force: The Next Air Force." As noted earlier, the AEF remains a developing concept to which no single force structure is assigned. Rather, it is anticipated that the AEF would be specifically tailored to meet operational and mission requirements. This notional force is intended merely to provide some parameters to an AEF. The AEF is a composite organization that will include a group of shooters and support aircraft. The forward-deployed element in our example includes a package of 75 aircraft, which represents the anticipated initial force requirement for a future SWA contingency. The other 100 aircraft would remain at their home station in an on-call posture, ready to respond rapidly if necessary.

<sup>26</sup>Tirpak, "The EAF Turns One," p. 23.

<sup>27</sup>This planning factor assumes that tanker aircraft are taking off with less than the maximum load of fuel, as an 11,800-foot runway length is preferred for KC-10 and KC-135 tankers taking off with a maximum load. As noted in Table 1.1, these tanker aircraft can operate out of airfields with runways of only 8500 feet but with only a nomi-

**Table 1.3**  
**Notional AEF<sup>a</sup>**

| Forward Deployed | Capabilities <sup>b</sup>   | On Call <sup>c</sup> |
|------------------|-----------------------------|----------------------|
| 18 x F-15C       | Air to air                  | 6                    |
| 10 x F-15E       | PGM                         | 14                   |
| 8 x F-16CJ       | SEAD                        | 10                   |
| 12 x A-10        | Antiarmor/CAS               | 14 (ANG)             |
| 3 x E-3          | Surveillance/C <sup>2</sup> | 0                    |
| 3 x HH-60        | CSAR                        | 9                    |
| 8 x C-130        | Intratheater airlift        | 10 (ANG)             |
| 4 x KC-10        | Air refueling               | 2                    |
| 3 x KC-135       | Air refueling               | 7 (AFRC)             |
| 3 x KC-135       | Air refueling               | 7 (ANG)              |
| 3 x C-21A        | Transportation              | 6                    |
| 0 x B-52/B-1     | CALCM                       | 6                    |
| 0 x B-2          | Stealth                     | 3                    |
| 0 x F-117        | Stealth                     | 6                    |
| Total: 75        | —                           | 100                  |

<sup>a</sup>According to General Donald Cook "high demand/low density" assets such as U-2s, EC-130s, RC-135s, and E-8s will be tasked to support the AEF as required. See Cook, "Evolving to an Expeditionary Aerospace Force: The Next Air Force."

<sup>b</sup>PGM = precision-guided munitions; CAS = close air support; CSAR = combat search and rescue; CALCM = carrier air-launch cruise missile.

<sup>c</sup>ANG = Air National Guard; AFRC = Air Force Reserve Command.

package, the F-15 is the driver, preferring a runway length of 8000 feet.

If this notional AEF were to deploy to a contingency theater, we estimate that some 1.6 million square feet of ramp and apron space would be required to park and generally support its operation.<sup>28</sup> The

nal operational load, which is adequate for airlifters supporting a force deployment. Carrying a nominal load is not a viable option for tankers, however; whenever possible, the minimum runway length for tankers should thus be 10,000 feet or more. KC-10/135 tankers routinely operate out of Incirlik Airbase, which has runways of only 10,000 feet, so it can be done. Wherever possible, however, the goal remains 11,800 feet.

<sup>28</sup>These parking space requirements are derived from the single-aircraft requirements listed in Chapter 2 of *Facility Requirements*, "Category Group 11 Airfield Pavements," and are outlined in greater detail in John Stillion's unpublished Project AIR FORCE

scale of this requirement assumes that the fighters and the support aircraft are collocated. The impact of this ramp space requirement may overwhelm the capabilities of a single base, but it can be tempered through the expedient of dividing the AEF into two or more packages and deploying them to separate airfields. Operationally, this would not be a difficult situation. However, dual-base operations would increase the number of support and security personnel and the quantity and mix of equipment needed to sustain high-tempo combat operations and provide adequate force protection for the deployed air units. Wherever possible, preference should therefore be given to a single-field deployment.

If dual basing is considered, the fighter or strike package will require approximately 560,000 square feet of hard-surface ramp space—some 360,000 square feet for the combat aircraft and an additional 200,000 square feet for its supporting airlift.<sup>29</sup> Additionally, the fighters can operate from an airfield with only an 8000-foot-long runway. As one would expect, there are far more airfields in the region that can support the minimum operational requirements of the strike package than can support the full AEF.

For the AEF support package, approximately 1.1 million square feet of ramp space will be needed—almost 900,000 square feet for the combat support aircraft and an additional 200,000 square feet for airlift operations.<sup>30</sup> Based on these parameters, the preferred physical characteristics of AEF deployment airfields are outlined in Table 1.4, which lists the characteristics for the full notional AEF and then the two component parts, the fighter and support packages. As noted, these are preferred airfield characteristics, and it would not be unusual for Air Force elements to operate from smaller airfields.<sup>31</sup>

---

briefing entitled "Operational Elements of AEF Basing Strategy: Preliminary Analysis and Insights," Santa Monica: RAND, July 1999.

<sup>29</sup>This 200,000-square-foot requirement assumes that an area 200 feet wide and 1000 feet long is required to accommodate the loading and unloading of airlifters. See Stillion, "Operational Elements of AEF Basing Strategy," unpublished briefing.

<sup>30</sup>Ibid.

<sup>31</sup>For example, the safety distance could be reduced between the parked aircraft, which could save as much as 15 to 20 percent on the space requirement.

**Table 1.4**  
**Preferred Physical Characteristics for an AEF Deployment Base**

| Type            | Minimum Runway Length (ft) | Minimum Runway Width (ft) | Minimum LCN | Minimum Ramp Space (ft <sup>2</sup> ) |
|-----------------|----------------------------|---------------------------|-------------|---------------------------------------|
| Full AEF        | 10,000                     | 150                       | 70          | 1,600,000                             |
| Fighter package | 8,000                      | 150                       | 40          | 560,000                               |
| Support package | 10,000                     | 150                       | 70          | 1,100,000                             |

From the notional AEF structure of 60 to 75 aircraft (Table 1.3), one can derive a series of additional planning and assessment factors. For example, this notional AEF should consume approximately 230,000 gallons of jet fuel per day, or some 1.6 million gallons a week, in support of high-intensity combat operations.<sup>32</sup> These rough planning figures suggest that local fuel storage should be available for approximately 900,000 gallons of jet fuel. If such storage is not physically available at the in-theater airfield, the AEF will have to deploy temporary storage bladders to handle fuel storage requirement shortfalls. Similarly, the notional strike package can deliver approximately 100 tons of munitions per day, which provides us with a rough planning factor for the necessary capacity of the base's ordnance storage facility.<sup>33</sup> Although these planning factors are not precise, they do give us estimates of the required infrastructure as well as a reference point for assessing which airfields in our data set can most readily support this scale of flight operations.

These planning factors highlight the fact that, beyond the physical parameters of the airfield, a number of other resource requirements will be needed to sustain the deployment and employment of an AEF. Our concern is not only for the equipment but also for the personnel. From the deployment planner's perspective, one must be

<sup>32</sup>With an increase in both crew ratio and the number of supporting tankers, this consumption could increase to some 300,000 gallons per day and approximately 2.2 million gallons per week. For planning purposes, we would like to ensure that three to five days worth of fuel is maintained in local storage. For more details, see Stillion, "Operational Elements of AEF Basing Strategy," unpublished briefing.

<sup>33</sup>These planning factors were provided by John Stillion and are outlined in "Operational Elements of AEF Basing Strategy," unpublished briefing.

concerned about whether existing airfield resources will adequately support the AEF's combat systems as well as provide the services required by deploying personnel—and, in turn, determine whether the resources available through the local deployment airfield will serve the needs of the deploying air unit(s) completely, partially, or not at all. (See Table 1.5 for a partial checklist of the types of resource concerns to be considered.)

**Table 1.5**  
**AEF Deployment: Resource Requirements of Concern**

| Resource Requirements                                | Phases of Operation       |            |                            |              |
|------------------------------------------------------|---------------------------|------------|----------------------------|--------------|
|                                                      | Readiness/<br>Preparation | Deployment | Employment/<br>Sustainment | Redeployment |
| Fuel                                                 |                           |            |                            |              |
| Fuel storage                                         |                           |            |                            |              |
| Fuel points                                          |                           |            |                            |              |
| Shelters                                             |                           |            |                            |              |
| Aircraft shelters                                    |                           |            |                            |              |
| Maintenance bays                                     |                           |            |                            |              |
| Munitions                                            |                           |            |                            |              |
| Ammunition storage                                   |                           |            |                            |              |
| Weapons-handling equipment                           |                           |            |                            |              |
| Vehicles                                             |                           |            |                            |              |
| Cargo handling equipment                             |                           |            |                            |              |
| Fuel trucks                                          |                           |            |                            |              |
| Force protection                                     |                           |            |                            |              |
| Engine repair                                        |                           |            |                            |              |
| Flight line maintenance<br>(personnel and equipment) |                           |            |                            |              |
| Aviation package<br>(aircraft and crews)             |                           |            |                            |              |
| Reparable components                                 |                           |            |                            |              |
| Life support facilities                              |                           |            |                            |              |
| Housing                                              |                           |            |                            |              |
| Messing                                              |                           |            |                            |              |
| Medical                                              |                           |            |                            |              |

One's assessment of whether or not the resources outlined in Table 1.5 are available at the designated deployment airfield will feed into the planner's evaluation of how much assistance can be provided directly from those resources readily available at a given airfield or from broader host-nation support. What is not available must be transported along with any deploying AEF. On the basis of the limited data available, we have made baseline assessments of the availability of several of these resources at each of the airfields reviewed. The results are briefly discussed in the country assessments in Chapters Two and Three and are also included in the appendices.

## **SORTIE RATE**

Figure 1.2 outlines the unrefueled operational ranges of NATO's principal tactical combat aircraft. These ranges are portrayed in this figure as if Baghdad were the destination.<sup>34</sup> For our planning factors, we are using 450 nautical miles as the operational radius for the F-16, 600 for the F-15E, and 700 for the Tornado. These ranges translate into an estimated radius of operation for the NATO tactical aircraft deploying in our AEF.

Using this simple tool, we can ascertain which of the airfields identified as potential AEF deployment bases in this report are within or very near the operational radius of these combat aircraft (including several airfields in the Caucasus). To be sure, operational mission ranges will differ significantly for the same aircraft depending on a number of factors, including weapon load and flight profile, but we will leave this level of planning detail to Air Force planners. For our purposes, the planning factors we have chosen are conservative operational radii and will thus help assess whether such fighter aircraft can conduct unrefueled missions from a given deployment field (see Table 1.6).

---

<sup>34</sup>For illustrative purposes, the radius circles portrayed in Figure 1.2 center on Baghdad. One can estimate how these operational circles will move north or south as the focus of a given operation shifts.

RAND MR1353-1.2

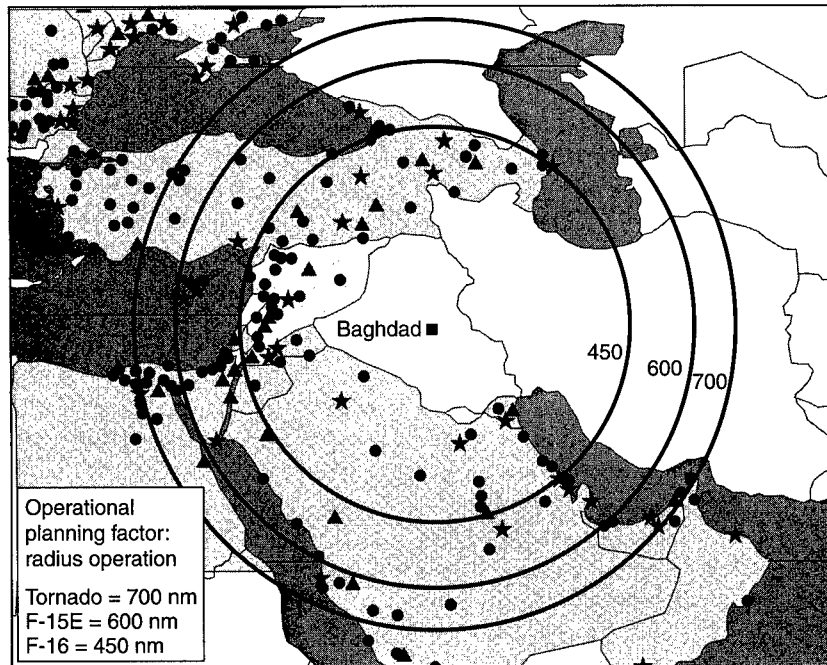


Figure 1.2—Some Fields Are Beyond the Radius of Action of Most Allied Aircraft<sup>35</sup>

Table 1.6

Radius of Operation of Major NATO  
Tactical Combat Aircraft

| Aircraft Type | Planning Factor: Radius of Operation (nm) |
|---------------|-------------------------------------------|
| Tornado       | 700                                       |
| F-15E         | 600                                       |
| F-16          | 450                                       |

<sup>35</sup>Note that symbols used in Figures 1.2, 1.4, and 1.5 refer to tier categorizations of the airfields that will be described in detail in Chapters Two and Three.

We are also interested in how the range to the target area will affect the daily sortie rate that the AEF's combat aircraft can generate. For illustrative purposes, we used a simple spreadsheet model that was developed at RAND for F-15s and F-16s (see Figure 1.3).<sup>36</sup> This model underscores that the daily sortie rate for any aircraft will be affected by how far it is stationed from the target zone, with this range in turn influencing both flight time and the required amount of time the aircraft and its crew spend on the ground doing mission preparation and providing pre- and postflight services and maintenance.<sup>37</sup> The daily sortie rate derived from this model is based on only one crew per aircraft. The sortie rate would improve if more than one crew were available per aircraft.

Figure 1.3 indicates that the daily sortie rate drops dramatically for missions beyond 800 nautical miles. We may disagree over the exact range at which this dramatic decrease occurs depending on our assumptions regarding the aircraft's operational parameters, but the resulting profile of the sortie rate curve should be consistent with Figure 1.3. The daily sortie rate that an air unit can generate will dictate the volume of munitions it can deliver on target(s), which is the key factor that must be considered. For Air Force planners, the goal is to balance the operational tradeoffs between those factors that push the proposed deployment base farther away from the crisis zone (e.g., ensuring that its deployed units are operating from a safe and secure facility) and those that pull the location of the deployment base closer to the action (e.g., optimizing the possible daily sortie rate).

---

<sup>36</sup>For details on how this model was derived and how it is used, see John Stillion and David Orletsky, *Airbase Vulnerability to Conventional Cruise-Missile and Ballistic-Missile Attacks: Technology, Scenarios, and U.S. Air Force Responses*, Santa Monica: RAND, MR-1028-AF, 1999, Appendix B, pp. 81–84.

<sup>37</sup>Note that as the distance between an aircraft's operational base and its target increases, the sortie rate decreases as a result of two factors. The first and most obvious factor pivots on the fact that flight time has increased. In this model, however, the flight time increase also leads to increased maintenance on systems that are sensitive to sortie duration. Thus, as sortie duration increases, maintenance personnel not only have less time to work on a given aircraft (the more time it spends in the air the less time it spends on the ground) but also have more work to do. See Stillion and Orletsky, *Airbase Vulnerability to Conventional Cruise-Missile and Ballistic-Missile Attacks*.

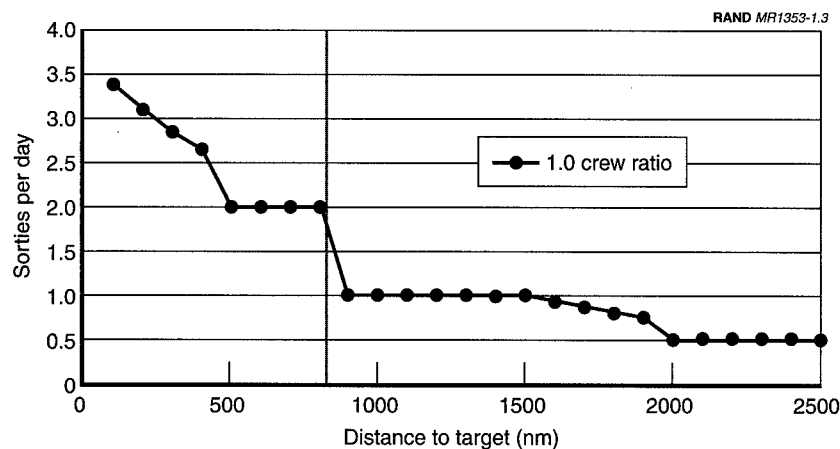


Figure 1.3—Daily Sortie Rate Model

## GROWING THREAT CONCERNS

Both Iraq and Iran have demonstrated that they can employ SSM systems.<sup>38</sup> To date, however, the military significance of these systems for actual combat use has been limited by their unreliability and inaccuracy. Yet the increasing proliferation of key enabling technologies is providing a vehicle for improving both the reliability and accuracy of such systems. Although Iraq remains constrained by post-Gulf War, U.N.-mandated sanctions and trade embargoes, Iran has been able to exploit these technological developments fully and continues to upgrade and extend the range of its weapon arsenal.

The enabling technologies that have recently become available include Global Positioning System (GPS) guidance systems, which provide a relatively cheap, simple, and effective means of improving ballistic and especially cruise-missile guidance systems. It has been estimated that this technology could improve the accuracy of existing ballistic missiles to near 100 meters, thereby allowing nearly all

<sup>38</sup>Syria is also pursuing an aggressive program to obtain its own TBM capability.

nations to obtain cruise missiles with a level of accuracy that has heretofore been available only to technologically advanced states.<sup>39</sup>

At the same time, improved weapon accuracy is only the first step toward rendering SSM systems both militarily effective and affordable for targeting an airfield, with its parked aircraft, munitions and fuel storage facilities, radars and C<sup>2</sup> structure, and runways. The proliferation of submunition technology, which is much more effective against such targets, is yet another enabler. Chemical munitions are an additional option, and both Iraq and Iran have already demonstrated that they can employ TBMs with such munitions. In the end, therefore, it is the combination of increased accuracy provided by GPS guidance and much-improved warhead efficiency that will reduce the projected number of missiles required to attack a deployment airfield successfully from hundreds to merely dozens.<sup>40</sup> As a result of these developments, there is a heightened level of concern regarding the vulnerability of regional deployment bases and the other fixed installations that service and support deployed air units, as even the continued threat of attack will affect air operations, potentially delaying deployment and disrupting or even closing down operations.<sup>41</sup> This concern is compounded by the fact that most European allies lack the equipment and the capabilities to protect their deployed forces against nuclear, biological, and chemical (NBC) attack or to operate effectively in a contaminated environment. Moreover, many allies have failed to adapt their doctrines, force structures, operations, and logistics practices to meet

<sup>39</sup>For more details, see Stillion and Orletsky, *Airbase Vulnerability to Conventional Cruise-Missile and Ballistic-Missile Attacks*, pp. 5–17.

<sup>40</sup>*Ibid.*

<sup>41</sup>The TBM capability and potential of Iran and Iraq currently represent the most advanced and longest-range threat to possible deployment airfields in the region. The West closely monitors developing programs in these two states and maintains a good assessment of current capabilities. There are also indications that lesser-developed programs are under way in other regional states. For example, there are reports that the Syrians are developing an advanced, mobile, solid-fueled, longer-range TBM system with an estimated range of 500 km (310 miles) and good accuracy. If this is the case, Syria's TBM will be able to hit targets anywhere in Israel and as far afield as Ankara. This is another example of the regional proliferation of these systems, reportedly with Chinese and Iranian assistance, and represents a further change in the region's security environment. For more details, see "Israel Keeps an Eye on Syrian Missile Programs," *Global Intelligence Update*, August 11, 1999, available at <http://www.stratfor.com>.

the unique demands imposed by power projection operations in an NBC environment.<sup>42</sup>

Iraq's longer-range TBM programs were terminated following the close of the Gulf War and remain prohibited under U.N. sanction.<sup>43</sup> Prior to this, however, Iraq had a highly active research program with an array of systems in production and development (see Table 1.7). The concerns and threat perceptions that drove those programs remain and may have even grown in the eyes of Iraq's current leadership. We are therefore assuming that Iraq will resurrect its Scud B, Al Hussein, and Al Hijarah programs over the next decade

**Table 1.7**  
**Iraqi Ballistic Missile Capabilities<sup>a</sup>**

| System      | Name | Alternate<br>Missile Type <sup>b</sup> | Supplier | Maximum<br>Range (km) | Payload<br>(kg) | Status      |
|-------------|------|----------------------------------------|----------|-----------------------|-----------------|-------------|
| Ababil 100  |      | SRBM                                   | Domestic | 150                   | nk <sup>c</sup> | Development |
| SS-1 Scud B | R-17 | SRBM                                   | Russia   | 300                   | 985             | Prohibited  |
| Al Hussein  |      | SRBM                                   | Domestic | 600+                  | 250             | Prohibited  |
| Al Hijarah  |      | SRBM                                   | Domestic | 650+                  | 250             | Prohibited  |
| Badr 2000   |      | MRBM                                   | Domestic | 900                   | 450             | Prohibited  |
| Al Abbas    |      | MRBM                                   | Domestic | 900+                  | 350             | Terminated  |
| Al Abid     |      | SLV/IRBM                               | Domestic | 2500+                 | nk              | Terminated  |
| Tammouz 1   |      | MRBM                                   | Domestic | 2000                  | 750             | Terminated  |

<sup>a</sup>This information was extracted from the Centre for Defence and International Security Studies Web site at [http://www.cdiss.org/iraq\\_t.htm](http://www.cdiss.org/iraq_t.htm).

<sup>b</sup>SRBM = short-range ballistic missile; MRBM = medium-range ballistic missile; SLV = surface-launch vehicle; IRBM = intermediate-range ballistic missile.

<sup>c</sup>nk = not known.

<sup>42</sup>Most NATO member states have little deployment capability and continue to fall behind the evolving Alliance goals for deployment in any environment.

<sup>43</sup>Under the terms of the 1991 United Nations Security Council Resolution 687, the United Nations Special Commission on Iraq (UNSCOM) has a mandate to destroy or make harmless "all ballistic missiles with a range greater than 150 km, and related major parts, and repair and production facilities." There is also an accompanying embargo on the transfer of those goods and technologies that could support the continuation of Iraq's ballistic missile program.

and that its TBMs will have a potential range of 140–650 km.<sup>44</sup> The employment of such weapons will threaten a number of deployment bases, as illustrated in Figure 1.4.

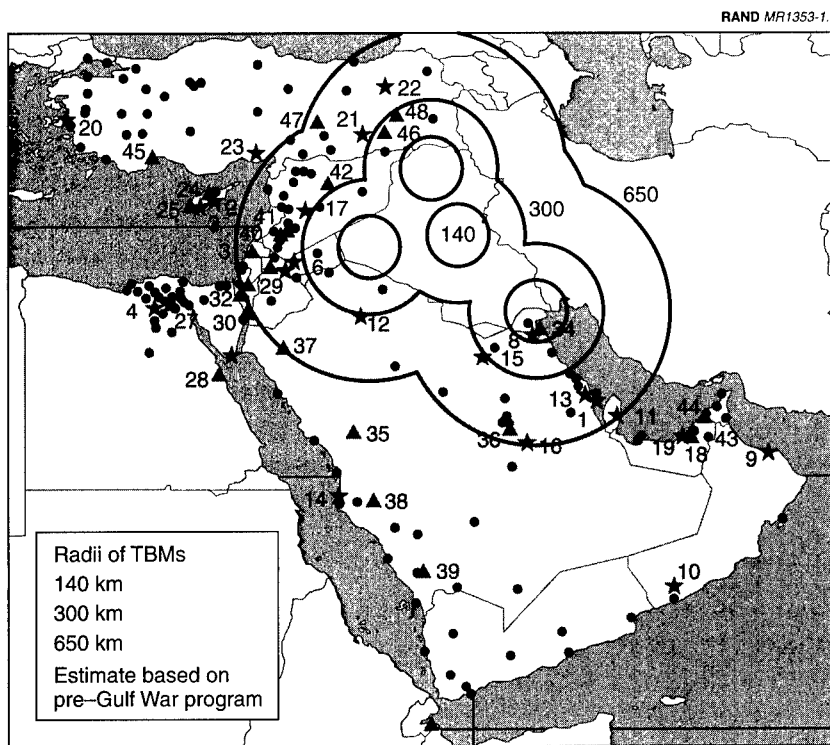


Figure 1.4 —Potential Threat of Iraqi TBMs to Regional Airfields

<sup>44</sup>The Centre for Defence and International Security Studies, Lancaster University, UK, maintains a country-by-country survey of ballistic and cruise missile holdings, noting aero-industrial capabilities where relevant. The group's current assessment for Iraq indicates that "although the U.N. may have destroyed much of Iraq's ballistic missile infrastructure, it cannot destroy the mountain of knowledge and human expertise that grew up alongside it. Neither has the U.N. been able to eliminate completely Iraq's Pre-War missile inventory. In the short term, then, Iraq will continue to pose a limited threat to the region with missiles that may be armed with WMD warheads. But given its past success at circumventing international controls, it would be foolish to believe that Iraq will not recover a substantial 300- to 600-km-range ballistic missile capability in the next ten years." See [http://www.cdiss.org/iraq\\_b.htm](http://www.cdiss.org/iraq_b.htm).

Like Iraq, Iran has developed a highly active ballistic missile program<sup>45</sup> and has a number of TBM variants in service or in development. Iran employed large numbers of TBMs in its extended conflict with Iraq (1980–1988). Moreover, Iran sees its neighbors (e.g., Iraq and Pakistan) pursuing their own TBM and WMD programs. Ballistic missiles have become an important part of Iran's military arsenal and strategy. As Table 1.8 indicates, Iran currently has in service systems with ranges up to 550 km, and we estimate that over the next decade it will deploy a TBM with a range of at least 750 km without much difficulty.<sup>46</sup>

As Figure 1.5 shows, the capability of Iran's current and projected TBMs (in combination with its cruise missile capability) will significantly reduce the number of "low risk" deployment options on the Arabian Peninsula. Iran's projected missile capability will place in jeopardy all of the installations (ports, airfields, etc.) along the Persian Gulf and throughout most of the eastern half of the Arabian Peninsula.<sup>47</sup> As a result, most of the airfields that the U.S. Air Force

<sup>45</sup>A recent article in *Jane's International Defence Review* portrays the scope of Iran's program as follows: "Iran, which with Russian, North Korean and other assistance, is developing a missile-manufacturing capability that is viewed in the region, and beyond, with deepening concern." See Ed Blanche, "Shifting Sands, Changing Prospects: Spending in the Middle East Maintained as Tension Continues," *Jane's International Defence Review*, November 2000, p. 28.

<sup>46</sup>In July 2000, Iran successfully tested its Shahab-3 medium-range, liquid-fueled missile. Estimates are that this system has entered limited production and that the military is forming units to accept the deployment of this missile system. See Ed Blanche, "Iran Forms Five Units for Shahab Ballistic Missiles," *Jane's Defence Weekly*, July 12, 2000, available at <http://ebird.dtic.mil/jul2000/s20000712forms.htm>, and "Iranian Shahab-3 Missile Test Sparks Pentagon Concern," *Aerospace Daily*, July 19, 2000, available at <http://ebird.dtic.mil/jul2000/s20000719iranian.htm>.

<sup>47</sup>The combined effect of these missile systems and Iran's antiship capability will also place U.S. naval ships operating in the Persian Gulf in jeopardy, as these missile systems could target large naval vessels in a constrained operating environment that limits maneuvering. Although current Iranian command, control, communications, intelligence, surveillance, and reconnaissance (C<sup>3</sup>ISR) capabilities will limit the overall effectiveness of this threat to moving targets, the threat to key ports and other facilities as well as stationary or slow-moving ships will remain real. Its ability to place in jeopardy all major vessels in the Gulf will increase significantly as Iran's C<sup>3</sup>ISR systems improve. Moreover, the Iranian military has sufficient firepower to control the Straits of Hormuz, if only temporarily. These capabilities would likely force the carrier battle groups and naval air out of the Gulf and restrict their operation to the Indian Ocean, limiting their use to operations over southern Iran. This situation would place greater demands on early-entry ground-based air.

**Table 1.8**  
**Iranian Ballistic Missile Capabilities**

| System     | Name     | Alternate Type | Missile Supplier         | Export Customers | Maximum Range (km) | Payload (kg) | Status      |
|------------|----------|----------------|--------------------------|------------------|--------------------|--------------|-------------|
| Mushak 120 | Iran 130 | SRBM           | Domestic                 | None             | 120                | 190          | In service  |
| Mushak 160 |          | SRBM           | Domestic                 | None             | 150                | 190          | Terminated? |
| CSS-8      | M-7      | SRBM           | China                    | None             | 160                | 190          | In service  |
| Mushak 200 |          | SRBM           | Domestic                 | None             | 200                | 500          | Terminated? |
| Scud B     |          | SRBM           | North Korea/<br>domestic | None             | 320                | 985          | In service  |
| Zelzal 2   |          | SRBM           | Domestic                 | None             | 400(est.)          | nk           | In service  |
| Scud C     |          | SRBM           | North Korea              | None             | 550                | 500          | In service  |
| Shihab 3   |          | MRBM           | Domestic /Russia         | None             | 1300+              | 750          | Tested      |
| Zelzal 3   |          | MRBM           | Domestic                 | None             | 1500               | 1000         | Development |
| Shihab 4   |          | MRBM           | Domestic /Russia         | None             | 2000+              | 1000         | Development |

SOURCE: Centre for Defence and International Security Studies Web site at [http://www.cdiss.org/iran\\_tb.htm](http://www.cdiss.org/iran_tb.htm).

is currently using or frequenting on the Arabian Peninsula would be at risk in a confrontational Iranian contingency—including the AEF deployment bases of Ahmed Al Jaber, Kuwait; Shaikh Isa, Bahrain; and Doha International, Qatar. Prince Sultan, Saudi Arabia, which houses the largest U.S. Air Force regional presence, is at the fringe of current Iranian TBM capability but falls well under the umbrella of the projected future range of such systems. In the north, Incirlik Airbase, Turkey, should not be affected, but many of the airfields east of it that have serviced coalition air units in the past will be within range and hence vulnerable.

In short, future planning concerns and constraints will differ dramatically from crisis to crisis depending on the identity of the regional adversary, with an Iranian scenario clearly placing the greatest number of installations on the Arabian Peninsula at risk. If this scenario were to develop, most of the installations that supported coalition

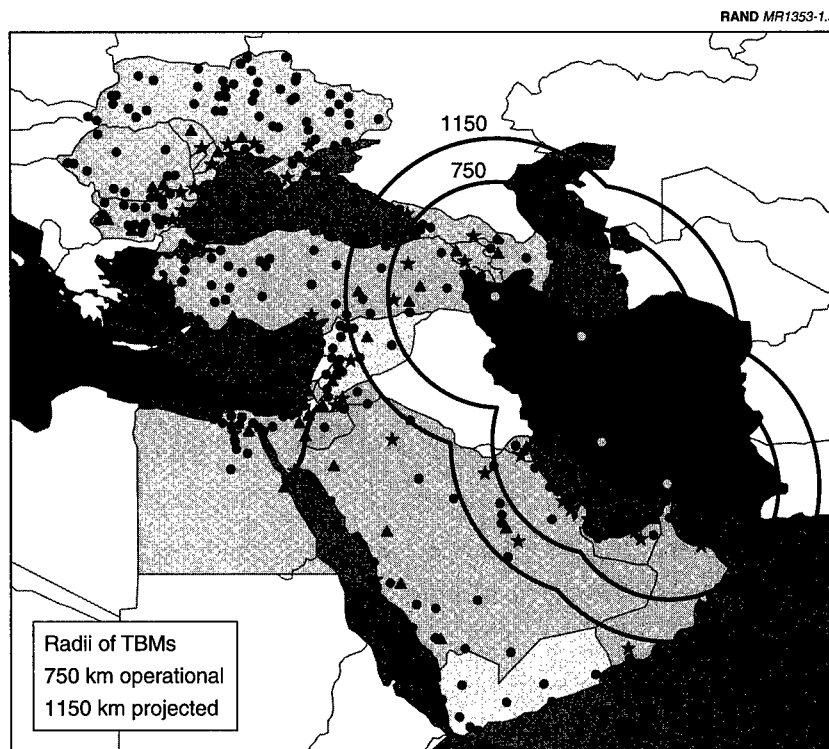


**Figure 1.5—Potential Threat of Iranian TBMs to Regional Airfields**

air operations during the Gulf War would fall under Iran's TBM umbrella. This suggests that in the absence of a much-improved anti-TBM capability, there is a growing need for operational flexibility and for the development of detailed alternative basing plans that establish coalition deployment bases beyond the effective operational range of such systems. Clearly, coalition air units must be prepared to operate from airfields with which they have less familiarity and that may not be as well configured, equipped, or stocked to support Western combat air units. Prior planning for such a contingency, along with the regional prepositioning of airfield support material, will be necessary to ensure that the deployment time line does not become too extended.

## AIRFIELD SURVEY

As noted earlier, our first-order concern about each airfield centers on the length, width, and LCN of its runways. We are also interested in whether these airfields have:

- unused ramp and apron space to support the parking and servicing of deploying aircraft;
- fuel available, including what types and in what volume;
- above- or underground fuel storage tanks, including condition and capacity;
- secure ammunition storage sites (e.g., warehouses or bunkers);
- a fenced perimeter and security force, civilian or military;
- hangars to support aircraft servicing and maintenance;
- aircraft shelters/bunkers to protect deployed aircraft; and
- life support facilities to support deployed personnel.

Data to support such assessments were derived from several databases, with the available data varying greatly in age and quality.<sup>48</sup> The most suspect data are associated with the airfields and airbases located in the newly independent states of the former Soviet Union. This is especially true for the states in the South Caucasus and Caspian Basin, where the data generally date back to the Soviet era. Put simply, we are not sure what the effects of nine years of regional crisis, conflict, and economic downturn may have been on the condition of these airfields.

The assessments that follow are based on available data and are meant to serve as a base evaluation of whether given regional airfields can support the operational deployment of a U.S. or a composite, multinational AEF-size air task force. In cases where the United

---

<sup>48</sup>The National Imagery and Mapping Agency Airfield database was our principal source for information on the physical characteristics of the airfields. Other sources used included *The Military Balance* (London: International Institute for Strategic Studies, 1998, 1999, and 2000); the various country assessments in "Periscope," the USNI database; and a number of journal articles that focused on operations at several regional airfields.

States or other Western militaries have frequently operated from a given airfield, sufficient ground truth is available to warrant more definitive conclusions. In many more cases, we do not have access to such first-hand information, and the assessments presented thus represent our best estimate of the operational capabilities inherent in each airfield, with validation awaiting a closer assessment by a U.S. Air Force survey team. Our intent is to expand the constellation of potential deployment airfields to include a broader range of regional states, thereby allowing U.S. planners to move deployments to alternative airfields when access to preidentified facilities is delayed, restricted, or denied for any reason. We have not considered individual contingency or specific mission requirements, which we recognize will also play an important role in determining preferred deployment bases. These issues, however, lie beyond the scope of this report, which is more narrowly focused on identifying those facilities that can effectively support the crisis or combat deployment of an AEF.

The next two chapters review our assessment of all airfields in the Middle East and in the Black and Caspian Sea regions that could support a range of possible mission requirements in either the oil-rich Middle East or the Black Sea and Caspian Basin.



---

## Chapter Two

---

### MIDDLE EAST

---

#### NATURE AND GEOGRAPHIC DISTRIBUTION OF AIRFIELDS

Our assessment indicates that approximately 154 military and commercial airfields in the countries of the Middle East<sup>1</sup> have hard-surface runways with lengths greater than 8000 feet and runways that are rated in good or better condition.<sup>2</sup> In several countries, few if any airfields have the 10,000-foot-plus runways that our full AEF package favors, in which case smaller airfields—which at a minimum can support major combat elements of an AEF—will have to suffice.

Table 2.1 provides a snapshot of where these potential deployment airfields are distributed across the region and in which countries they

---

<sup>1</sup>For this study, we have restricted our assessment of airfields in the Middle East to Bahrain, Cyprus, Djibouti, Egypt (focusing on its northeastern sector, which is closer to the region of concern), Israel, Jordan, Kuwait, Oman, Qatar, Saudi Arabia, Syria, eastern Turkey, United Arab Emirates (UAE), and Yemen.

<sup>2</sup>Although the discussion in Chapter One indicates that a runway of 10,000 feet is preferred for AEF operations, we used 8000 feet for the initial screen of all regional airfields. We did so because the fighter package and most support aircraft can operate from 8000-foot runways, with only the U.S. Air Force's heavy lifters and tankers requiring the longer runway. We are therefore seeking to optimize the number of possible deployment airfields even if some will not be able to support the full complement of aircraft assigned to our notional AEF. If the heavy lifters and tankers are required to support a given contingency, alternative basing options such as dual-basing will have to be considered.

Table 2.1  
Country Distribution of 8000-Foot-Plus Runways Across the Middle East

|              | Distance to Baghdad (nm) |     |     |     |     |     |     |      |      |      |  | Country Totals |
|--------------|--------------------------|-----|-----|-----|-----|-----|-----|------|------|------|--|----------------|
|              | 300                      | 400 | 500 | 600 | 700 | 800 | 900 | 1000 | 1100 | 1200 |  |                |
| Bahrain      |                          |     | 2   |     |     |     |     |      |      |      |  | 2              |
| Cyprus       |                          |     | 5   | 1   |     |     |     |      |      |      |  | 6              |
| Djibouti     |                          |     |     |     |     |     |     |      | 1    |      |  | 1              |
| Egypt        |                          |     | 3   | 12  | 15  |     |     |      |      |      |  | 30             |
| Israel       | 1                        | 7   |     |     |     |     |     |      |      |      |  | 8              |
| Jordan       | 1                        | 5   | 1   |     |     |     |     |      |      |      |  | 7              |
| Kuwait       | 3                        |     |     |     |     |     |     |      |      |      |  | 3              |
| Oman         |                          |     |     |     |     |     | 1   | 2    | 1    |      |  | 4              |
| Qatar        |                          |     |     | 1   |     |     |     |      |      |      |  | 1              |
| Saudi Arabia | 8                        | 4   | 10  | 2   | 4   | 2   | 5   |      |      |      |  | 35             |
| Syria        | 10                       | 10  |     |     |     |     |     |      |      |      |  | 20             |
| UAE          |                          |     |     |     | 9   | 2   |     |      |      |      |  | 11             |
| Turkey       | 4                        | 5   | 5   | 1   | 1   | 1   |     |      |      |      |  | 17             |
| Yemen        |                          |     |     |     |     |     |     | 1    | 6    | 2    |  | 9              |

are concentrated.<sup>3</sup> It also shows how far each country's airfields are from Baghdad, the operational zone for an Iraqi contingency.<sup>4</sup>

Table 2.2 further indicates that 79 airfields, or slightly more than half of the airfields listed in Table 2.1, have hard-surface runways of more than 10,000 feet and more than one million square feet of hard-surface ramp and apron space.<sup>5</sup> As outlined in Chapter One, a 10,000-foot runway is the minimum runway length necessary to support operations by all aircraft assigned to our notional AEF effectively.<sup>6</sup>

Continuing with our Iraq contingency-planning example, we divided our simple matrix (Table 2.1) into four distinct zones according to their relative distance from Baghdad before displaying these data. These divisions are driven by two operational factors: the potential threat presented to the deployment bases by enemy TBMs and the need to maintain a high daily sortie rate. The latter is critical if coalition forces are to optimize the combat capability of the deployed AEF. These belts are not fixed but will shift in response to changes in the threat, the operational environment, or the capability of the coalition air forces. Figure 2.1 briefly outlines the basic criteria we used to establish these zones and the parameters that govern each.

As Table 2.2 indicates, Zone I airfields are located close enough to Baghdad to be vulnerable to Iraq's projected TBM capability. Currently, such an Iraqi threat is not a major force protection

---

<sup>3</sup>The total numbers of airfields for both Egypt and Turkey are only partial because we have geographically restricted our data for both of these states. This issue will be discussed in greater detail in the country sections of this chapter.

<sup>4</sup>For simplicity, we have used the flight distance in nautical miles from each airfield to Baghdad as a common reference point. This is not to suggest that the only possible future regional contingency is Iraq; rather, we are using examples familiar to U.S. military planners to illustrate the application of our methodology. Any other reference point can easily be used as well.

<sup>5</sup>Many airfields in the Middle East, especially among the rich Arab states, have main runways of more than 10,000 feet and millions of square feet of ramp space.

<sup>6</sup>The most demanding aircraft for both runway length and ramp space are the heavy, wide-bodied support aircraft, especially the KC-10 and C-5, as well as the heavy KC-135 tanker.

Table 2.2  
Country Distribution of 10,000-Foot-Plus Runways Across the Middle East<sup>a</sup>

| Zones        | I   |     |     |     | II  |     |     |      | III  |      |   |  | IV |  |    |  | Country Totals |
|--------------|-----|-----|-----|-----|-----|-----|-----|------|------|------|---|--|----|--|----|--|----------------|
|              | 300 | 400 | 500 | 600 | 700 | 800 | 900 | 1000 | 1100 | 1200 |   |  |    |  |    |  |                |
| Bahrain      |     |     | 2   |     |     |     |     |      |      |      |   |  |    |  | 2  |  |                |
| Cyprus       |     |     |     |     |     |     |     |      |      |      |   |  |    |  | 0  |  |                |
| Djibouti     |     |     |     |     |     |     |     |      |      |      |   |  | 1  |  | 1  |  |                |
| Egypt        |     |     |     |     | 4   | 4   |     |      |      |      |   |  |    |  | 8  |  |                |
| Israel       |     |     | 2   |     |     |     |     |      |      |      |   |  |    |  | 2  |  |                |
| Jordan       |     | 4   | 1   |     |     |     |     |      |      |      |   |  |    |  | 5  |  |                |
| Kuwait       | 1   |     |     |     |     |     |     |      |      |      |   |  |    |  | 1  |  |                |
| Oman         |     |     |     |     |     |     |     | 1    | 2    | 1    |   |  |    |  | 4  |  |                |
| Qatar        |     |     |     |     | 1   |     |     |      |      |      |   |  |    |  | 1  |  |                |
| Saudi Arabia | 6   | 1   | 10  | 2   | 3   | 2   | 5   |      |      |      |   |  |    |  | 29 |  |                |
| Syria        | 2   | 4   |     |     |     |     |     |      |      |      |   |  |    |  | 6  |  |                |
| UAE          |     |     |     |     |     | 6   | 2   |      |      |      |   |  |    |  | 8  |  |                |
| Turkey       | 3   | 3   | 3   | 0   | 1   |     |     |      |      |      |   |  |    |  | 10 |  |                |
| Yemen        |     |     |     |     |     |     |     |      | 1    | 0    | 1 |  |    |  | 2  |  |                |

<sup>a</sup>Table 2.1 outlines where all airfields meeting our minimum criteria are located. The data in Table 2.2 are more restrictive and show where there are airfields with 10,000-foot-plus runways. As indicated in Chapter One, this is the preferred runway length for a complete AEF deployment package. Deployments to airfields with runways of this length are favored.

RAND MR1353-2.1

| Threat of attack                                                                                           | Two sorties/<br>crew day                                                                     | Declining<br>sortie rate                                                                  | Heavy support<br>requirement                                                                                                                         |
|------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0                                                                                                          | 400 nm                                                                                       | 800 nm                                                                                    | 1100 nm                                                                                                                                              |
| Extended range<br>of this zone is<br>defined by the<br>ballistic missile<br>capability of the<br>adversary | Outside of TBM<br>range, with<br>extended range<br>determined by<br>the sortie rate<br>model | Sortie rate falls<br>below 2/crew day<br><br>Extended range<br>requires tanker<br>support | Extended range<br><br>Only one sortie/day<br>for tactical combat<br>aircraft and heavy<br>support<br><br>Longer-range<br>aircraft possible<br>option |
| Zone 1                                                                                                     | Zone 2                                                                                       | Zone 3                                                                                    | Zone 4                                                                                                                                               |
| Risky?                                                                                                     | Preferred                                                                                    | Backup                                                                                    | Last Resort                                                                                                                                          |

**Figure 2.1—Dividing the Region into Zones Helps the Planner Quickly Categorize and Evaluate Airfields**

concern, as it is doubtful that Iraq now possesses a militarily significant number of TBMs. Iraq has, however, retained the know-how to reconstitute its production facilities. Thus, TBMs will likely be back in Iraq's weapon inventory within the next decade or less and will present U.S. forces with a very real concern.<sup>7</sup> Without a robust an-

<sup>7</sup>As noted earlier, the Iraqis maintained a robust ballistic missile development program through the close of the Gulf War. They employed TBMs in both the extended war with Iran (1980–1988) and the Gulf War, having reportedly launched 361 Scud and Al Hussein missiles against six Iranian cities, including Tehran—that is, more than 500 km from the border. During the 1990/1991 Gulf War, Iraq fired 88 Al Hussein missiles at targets in both Israel and Saudi Arabia. Ballistic missiles play a role in Iraq's military doctrine and strategy and have become a necessary part of Iraq's military equipment inventory, and its regional adversaries are pursuing their own programs. U.N. Security Council Resolution 687, April 1991, targeted Iraq's WMD and long-range delivery system programs but allowed the country to continue the development and fielding of missiles with a range of less than 150 km. This enabled Iraq to keep its research teams and facilities essentially intact. Since the Gulf War, Iraq has developed and tested two SRBMs; the Ababil-100, which has a range of 130–140 km with a 300-kg payload, has been fielded, and the Al Samoud, which has an estimated range of 150 km, began test-firing in 1997. Thus, Iraq's development and production capability is still intact. With the further erosion or lifting of the sanctions, Iraq should once again gain access to the technologies necessary to produce TBMs with capabilities at least equivalent but more likely superior to those of the Al Hussein. See Mark Hewish, "Ballistic Missile Threat Evolves," *Jane's International Defence Review*, October 2000, pp. 38–44.

timissile competence, airfields within approximately 400 nautical miles of the Iraq border will therefore be at risk, especially if enemy forces have fielded new, more accurate mid-range TBMs.

For Kuwait and Syria, the only airfields large enough to support the deployment of all aircraft in an AEF are located in Zone I, and force protection will therefore be a major concern. For Kuwait, political commitment may dictate the deployment of U.S. air units regardless of the risk, but how long U.S. air units can effectively operate from deployment bases in Kuwait remains an open question. In the absence of a realistic Iraqi missile threat, allies can and should take advantage of the proximity to the crisis area of Zone I airfields. If several of these excellent Zone I staging bases were used, coalition air forces could maximize their daily sortie rate and munitions delivery. If this Iraqi scenario were turned into an Iranian one, however, the midrange TBM threat would become very real, and AEF deployments to airfields in Zone I would be risky, to be considered only when there are no other alternatives and coalition planners are willing to accept the risk.

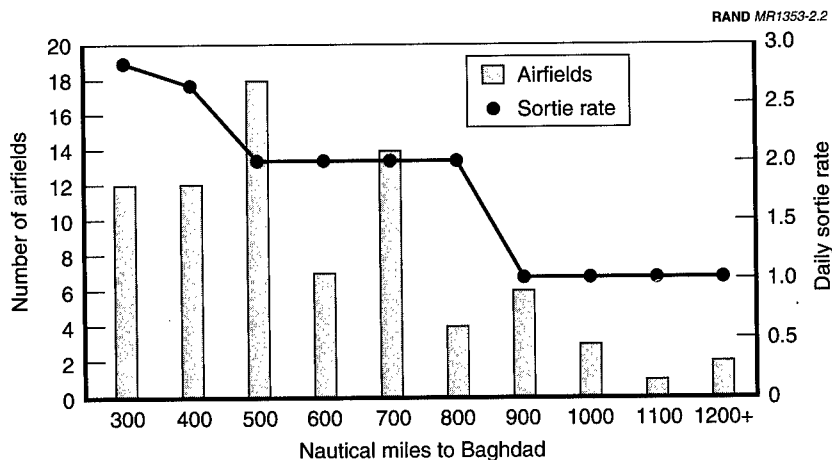
Zone II airfields are located beyond the projected operational capability of Iraqi TBMs but are close enough to ensure that coalition air can maintain a daily sortie rate per combat aircraft of approximately 2. Airfields in this zone are considered crucial to the projection of airpower into the Middle East, with Saudi Arabia particularly critical for a number of reasons. These include:

- It has the largest concentration of Zone II airfields.
- Most Saudi airfields were built as military or joint-use facilities and thus
  - have most of the necessary infrastructure as well as skilled aircraft technicians in place; and
  - routinely support Western-type aircraft.
- Saudi airfields are generally large enough to accommodate the deployment of a complete AEF force package.
- There are enough excellent airfields spread across the breadth and depth of the country to provide a natural redundancy.

- It is centrally located on the Arabian Peninsula, and its airfields are well placed to support any number of possible regional contingencies.

Airfields in several other Gulf Cooperation Council (GCC) countries can be described in a similar fashion; however, their numbers are much smaller. This is especially true for Bahrain and Qatar, whose large, well-structured installations are also in Zone II.

Zone III airfields are located at an extended range from the crisis area, and tactical combat aircraft operating from airfields in this zone cannot maintain the desired rate of 2 sorties per day.<sup>8</sup> Figure 2.2 applies our sortie rate model to the range distribution of our set of



Notes: Includes airfields having a 10,000-foot-plus runway. Sortie rate is calculated based on one crew per aircraft.

**Figure 2.2—Middle East Deployment Options That Will Support the Maintenance of a High Daily Sortie Rate**

<sup>8</sup>Moreover, the added range to target will increase fuel consumption, reduce daily munitions delivery rates, impact air crew readiness, accelerate aircraft life cycle costs, and reduce the command's ability to support quick reaction missions.

regional airfields with runways longer than 10,000 feet, highlighting the number of airfields from which Alliance aircraft can conduct at least two sorties per day. As noted earlier, the sortie rate (calculated on the basis of one crew per aircraft) drops off dramatically when the target range exceeds approximately 800 nautical miles.

To be sure, this is not to say that combat operations cannot be conducted from 800 nautical miles or more, because they can be and have been. However, running operations at such a long range will:

- degrade the amount of munitions tactical air can deliver in a 24-hour period;
- significantly degrade the AEF's ability to halt an adversary's offensive (as range to target increases and the sortie rate declines, more strike aircraft are needed to maintain the same level of offensive airpower);
- increase fuel consumption and decrease daily munitions demand and delivery; and
- place a higher demand on tankers, thereby increasing the number required.

It can thus be seen that the range from Zone III airfields to the anticipated crisis area limits the role of these airfields in supporting tactical combat operations. For this reason, such airfields are more frequently used as staging bases for support aircraft or as regional logistics terminals or transit points. However, Zone III airfields will have to be considered for use in support of tactical combat operations if access to airfields in Zone I or II is not available or is deemed too risky.

Zone IV airfields are more than 1000 nautical miles from the crisis zone and should not be considered viable deployment locations for tactical air except when closer deployment bases cannot be obtained.

For an Iraqi scenario, more than 55 percent of the larger airfields are in Zone II, and another 30 percent are in Zone I. In the absence of a realistic missile threat, this means that more than 85 percent of the region's possible AEF deployment airfields are within approximately 900 nautical miles of Baghdad. Currently, the Air Force is routinely

using only a half-dozen, or roughly 10 percent, of the AEF-capable airfields in the region. Air Force planners will thus have several possible options open for consideration in the event that the preidentified deployment bases are not available.

### A MORE DETAILED LOOK AT THE INSTALLATIONS

Figure 2.3 displays the locations of all the airfields given in Appendix A, citing each using the identification number associated with its entry in that database.<sup>9</sup>

In this figure, the stars represent airfields that have been categorized as first tier by virtue of the fact that they have the best infrastructure and geographic location to support our operational requirements as well as protection requirements that are considered to be within tolerance.<sup>10</sup> The triangles represent second-tier airfields, which are marginally less capable than first-tier fields but could readily stand in for primary fields. The ovals in Figure 2.3 represent the rest of the fields in the region that meet the baseline criteria of a hard-surface main runway greater than 8000 feet in length. Also graphically represented as squares in this figure are those Air Force logistical preposition sites that are nearest to our operational regions: Aviano, Italy; Thumrait, Oman; and Diego Garcia.

<sup>9</sup>These data are included in spreadsheet format in Appendix A. The data on the spreadsheets are organized first by assigned tier (first or second), then in alphabetical order by country for each tier group, and finally by the name of the airfield. For each of the airfields, the spreadsheet lists the name of the facility, its location, the length and width of its runways, the type of surface for each runway, ramp and apron space in square feet, the number of aprons (where known), and the size and number of hardstands (where known). Additionally, the square footage of all available ramps, aprons, and hardstands is aggregated into a composite number that represents a snapshot of what is available. The spreadsheet also includes “yes,” “no,” or “unknown” assessments as to whether fuel and fuel storage facilities, ordnance storage facilities or bunkers, secure perimeter and security personnel, hangars, aircraft shelters or bunkers, barracks, and mess facilities are available at each airfield. The airfields have been identified as civilian, military, or joint use. Also included, where known, are the types of aircraft routinely operating from or stationed at each airfield.

<sup>10</sup>We tried to select a few first- and second-tier airfields in each of the countries of interest. The intent was to ensure that alternative options were available whenever possible so as to provide ready backup in the event that primary fields were closed to U.S. or NATO access for any number of reasons—e.g., attack damage, high threat, or political reluctance on the part of host countries.

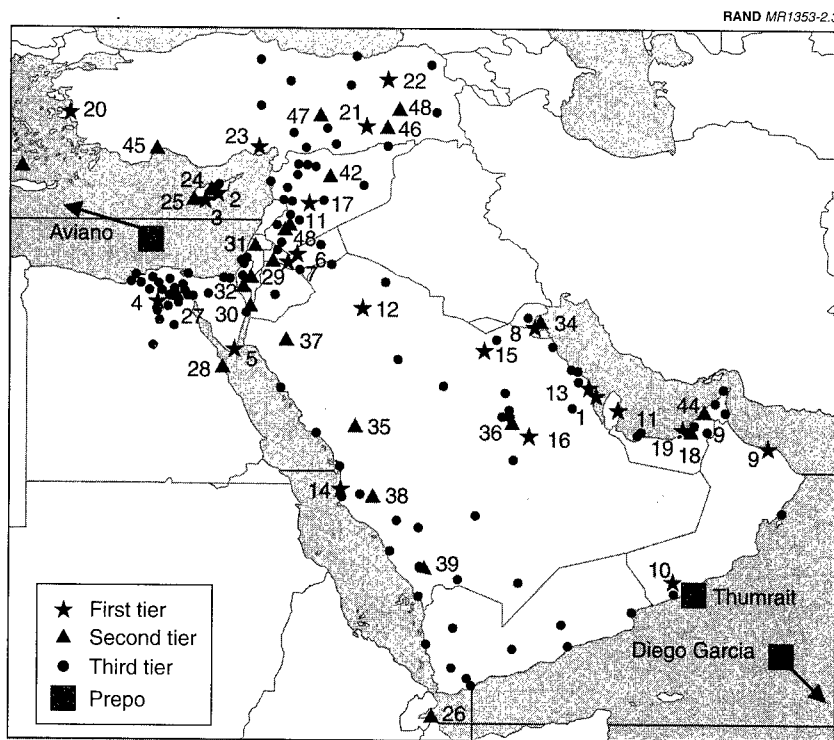


Figure 2.3—Constellation of Airfields in the Middle East with an 8000-Foot-Plus Hard-Surface Main Runway

Our assessment indicates that there are 23 first-tier airfields in 11 Middle Eastern countries: Bahrain, Cyprus, Egypt, Jordan, Kuwait, Oman, Qatar, Saudi Arabia, Syria, the United Arab Emirates (UAE), and Turkey.<sup>11</sup> We also identified 25 second-tier airfields in ten countries: Cyprus, Djibouti, Egypt, Israel, Jordan, Kuwait, Saudi Ara-

<sup>11</sup>A few airfields in Israel met these criteria, but a combination of the aircraft load they were already supporting and the political sensitivities associated with operating U.S. or NATO air units out of Israel suggested that we treat them as second rather than first tier. Although Yemen was among the countries we reviewed, we found no airfields there that met our criteria, especially given the current security environment in the country.

bia, Syria, Oman, and Turkey. The remaining 120 airfields are classified as third tier. There are no identification numbers associated with these airfields, and they are not included in the database in Appendix A.

### Routine-Use Facilities

Over the years, Western air forces have frequented only a small percentage of the more than 150 airfields in the greater Middle East, with all too many of the other airfields little known to NATO planners. There is, however, a smaller set of regional airbases that frequently service coalition aircraft. Prince Sultan, Saudi Arabia (18 in Figure 2.3), and Ahmed Al Jaber, Kuwait (10), are the primary airfields supporting patrols over the southern Iraq no-fly zone<sup>12</sup> as part of Operation Southern Watch.<sup>13</sup> The Air Force also periodically uses Shaikh Isa, Bahrain (1), Doha International, Qatar (13), and Ali Al Salem, Kuwait, as secondary or support airfields for this operation.<sup>14</sup> Furthermore, the Air Force recently completed the temporary deployment of an AEF to Shaheed Mwaffaq Airbase, Jordan. Aircraft from this Air Force unit supported Operation Southern Watch from its Jordanian deployment base. This facility could possibly be used in a future regional crisis.

Air operations in support of Operation Northern Watch, which controls the no-fly zone over northern Iraq,<sup>15</sup> are supported out of Incirlik Airbase, Turkey (23).<sup>16</sup> By virtue of its geographic location,

<sup>12</sup>The southern no-fly zone includes all Iraqi territory south of the 33rd parallel.

<sup>13</sup>Operation Southern Watch is supported by the Combined Joint Task Force-Southwest Asia. A combination of rotational units from the United States, the United Kingdom, France, and Saudi Arabia have participated in this task force, to which more than 200 coalition aircraft have been frequently assigned.

<sup>14</sup>Current assessments indicate that all of these airfields could quickly transition from peacetime status to the support of high-tempo U.S. Air Force or coalition combat operations—specifically, within 48 hours for Prince Sultan, 96 hours for Ahmed Al Jaber and Shaikh Isa, and 144 hours for Doha. For details, see Killingsworth, "Implementing an Effective Aerospace Expeditionary Force," unpublished briefing.

<sup>15</sup>The northern no-fly zone includes all Iraqi territory north of the 36th parallel.

<sup>16</sup>The headquarters for the U.S. 39th Air and Space Expeditionary Wing and for the Combined Task Force Operation Northern Watch is at Incirlik Airbase. U.S., British, and Turkish air force units rotate in and out of Incirlik in support of the task force. A

Incirlik is not necessarily the most convenient Turkish airbase from which to support operations over Iraq,<sup>17</sup> but U.S. Air Force–Europe (USAFE) is the airbase’s principal tenant, and the airfield operates under joint U.S. and Turkish Air Force management. Without clearance through Syrian airspace, all operational missions from Incirlik must travel some 250 nautical miles east in Turkish airspace before they can turn south and cross the Turkish-Iraqi border.

The six airbases shown in Figure 2.4 are the U.S. Air Force’s principal regional deployment bases and will likely continue to be primary U.S./coalition deployment airfields for the foreseeable future. The Air Force planning goal is to be able to initiate operations from any or all of these deployment airfields within 48 to 144 hours of receipt of a tasking order, depending on the existing capabilities of proposed airfields and the operational assumptions made. As stated earlier, deployment times such as these depend on:

- coalition familiarity with the airfield;
- the compatibility of airfield capabilities and infrastructure with the needs of the deploying AEF;
- the ability to correct operational deficiencies quickly through the deployment of support units, equipment, or stocks;
- the existence of three days of operational stocks either prepositioned or easily deployed with the unit, with the capability to begin the flow of sustainment stocks within a three-day window; and
- ready access to airfields and other deployment support facilities in the host country.

To establish these preconditions, a routine working relationship must be established between U.S. Air Force elements, the host countries, and specific installations. Toward this end, U.S. efforts

---

combination of combat aircraft, including U.S. F-15s and F-16s, British Jaguars and Tornados, and Turkish F-4Es, have supported this mission.

<sup>17</sup>Both Diyarbakir (21) and Erzurum (22) are closer to Turkey’s common border with Iraq. Both are dual-use airfields that are capable of supporting high-intensity combat operations. Diyarbakir currently supports two Turkish F-16 squadrons and has hosted NATO deployments and training in the past.

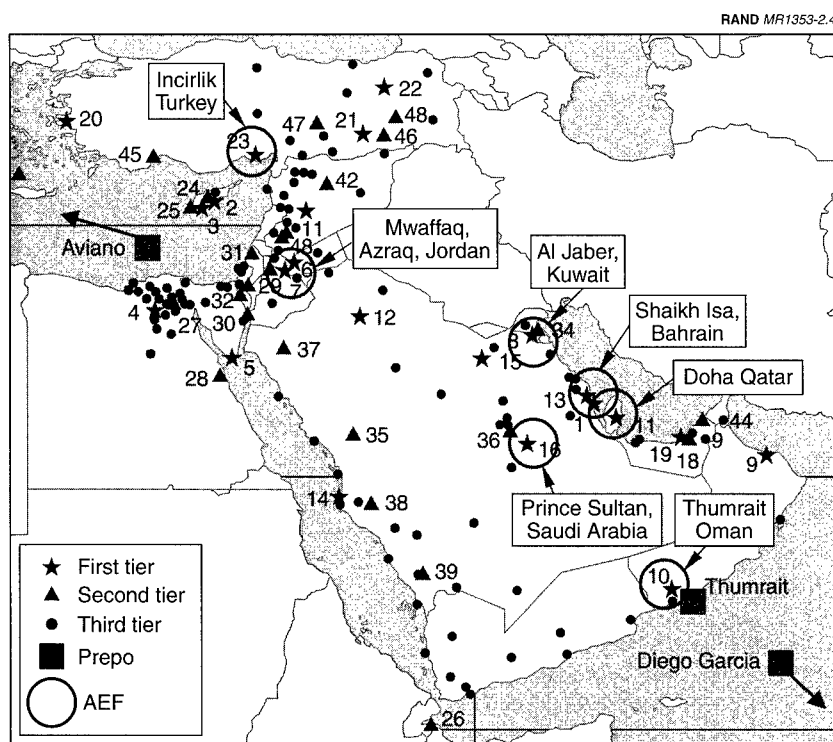


Figure 2.4—Current Preidentified Constellation of AEF Deployment Bases

have focused on establishing access rights to and routinely operating out of a few key airfields in the region.

### Today's Planning Dilemma

The planning dilemma that the United States currently faces is that its deployment strategy for the region rests heavily on early access to its preidentified deployment bases in Bahrain, Saudi Arabia, Qatar, Kuwait, and possibly Jordan. In any type of contingency, the willingness of these states to allow timely access to their facilities will therefore be critical. Yet the fragile political environment that characterizes all of these countries can easily be jeopardized, and the conservative leadership may then prove unwilling to support openly any

U.S. military action that might further destabilize their regimes. This situation is underscored by the fact that the region's political balance has changed dramatically since the close of the Gulf War and continues to change at an accelerated pace. In less than two years, for example, two key regional leaders who had ruled for decades—King Hussein of Jordan and President Assad of Syria—have died, and several other key leaders in the region are aging or are in ill health. As a result, questions of succession and pressures for political reform crosscut many of the region's states, adding to the prevailing uncertainty. The current deployment planning set is thus heavily dependent on the willingness of five conservative—and socially and economically fragile—regimes.

Adding to this potential uncertainty is the fact that three of the five countries hosting the U.S. Air Force's preidentified deployment airfields are located on or near the expected crisis zone(s). We anticipate that all of these states will be subject to immense military and domestic pressures regardless of whether the contingency involves Iraq, Iran, or both. It is also probable that as the perceived Iraqi threat diminishes and as relations with Iran improve, a number of Gulf states will find it increasingly difficult to support a continued U.S. military presence—especially a large-scale and highly visible one. Given this environment and the uncertainties it breeds, it is conceivable that, in the absence of an unambiguous threat to their well-being, any or all of these states could deny the United States early and free access to their military facilities. Thus, there are very real reasons U.S. planners should not be satisfied with putting too much faith in ready access to a handful of deployment airfields and should instead begin planning for alternative deployment options.

## **COUNTRY-BY-COUNTRY ASSESSMENT OF AVAILABLE AIRFIELDS**

The key airfields of the greater Middle East are discussed in some detail in this section. As the previous section suggests, planners must consider two key questions when reviewing possible alternative options:

- the physical characteristics of the airfields—i.e., whether they can support the deployment and sustain the operations of an AEF-size air package; and
- access—i.e., the probability that the host country will readily provide U.S. or alliance air forces access to their facilities.

In this chapter, we will briefly address each of these questions on a country-by-country basis, with emphasis placed on identifying the physical characteristics of the airfields reviewed and the types of operations each can support. We will also address the current political environment and the question of access, but unlike the physical characteristics of the region's airfields, the political and security environment is always subject to change, often dramatically and without significant forewarning.

## Bahrain

Despite its small size, Bahrain is important for regional collective security and for the projection of U.S. and/or Alliance military power into the region. It is located near Iran and Iraq and near the main shipping channels to Kuwait and Saudi Arabia's oil and gas terminals on the Gulf.<sup>18</sup> Bahrain has a population of about 650,000, of which nearly one-third comprises non-nationals and foreign workers. Although the majority of its population is Shi'ite, the country's ruling family is Sunni Muslim. Leaders of the Shi'ite majority have long accused the ruling family and the Sunni community of discrimination and repression, on occasion taking their complaints to the streets.<sup>19</sup>

The U.S. military's relationship with Bahrain began in 1949 with the stationing of three naval warships in the country. Since that time, Bahrain has allowed an increased U.S. military presence and has facilitated U.S. access to the Middle East in numerous crises, including the 1973 Arab-Israeli war and the Gulf War.<sup>20</sup> During the Gulf War,

<sup>18</sup>Bahrain is a tiny archipelago in the Persian Gulf that is strategically located just 15 miles from the coast of Saudi Arabia.

<sup>19</sup>See, "Changes in Bahrain Eyed with Trepidation," Stratfor, Inc., January 10, 2001, available at <http://www.stratfor.com/home/giu/archive/011001>.

<sup>20</sup>The island kingdom houses several U.S. regional military commands, including U.S. Central Command (USCENTCOM) regional headquarters and Fifth Fleet head-

Bahraini pilots flew strikes on Iraq, and the island was used as a base for military operations.<sup>21</sup> Since the war, airfields in the Kingdom have periodically been used to support Operation Southern Watch and several other contingencies.<sup>22</sup>

In 1991, the United States signed a defense cooperation agreement with Bahrain that allows access to Bahraini ports and airfields as well as the prepositioning of equipment and supplies.<sup>23</sup> Bahrain relies heavily on the United States for military training and security assistance, purchasing 98 percent of its weapons, training, and spare parts from the United States. Although these factors do not guarantee access in times of crisis, they do suggest that, barring major disagreements with U.S. intentions or significant external pressure,<sup>24</sup> the Kingdom would be favorably disposed to support U.S. action.

Because of its small size and limited wealth, Bahrain has not taken a leading role in regional or international affairs. Rather, it generally pursues a policy of close consultation with neighboring states. Moreover, Bahrain fears exposing itself politically to criticism at home and to hostility from either Iran or Iraq. Although there may be some delays for consultation and negotiation, Bahrain will likely support U.S. and allied operations to meet major threats from Iraq and Iran. It will, however, limit its involvement in most other confrontations.

Bahrain has a small military establishment, limited military infrastructure, and only two airfields that meet our requirements: Bahrain

---

quarters. Moreover, Bahrain has allowed the United States to expand its naval facility and presence at Juffair, which is now the largest facility of its type in the region and services the Navy's Fifth Fleet.

<sup>21</sup>See Bruce W. Watson (ed.), *Military Lessons of the Gulf War*, London: Greenhill Books, 1991, p. 226.

<sup>22</sup>U.S. Air Force fighter and support aircraft detachments periodically rotate in and out of Bahrain, most frequently stationed at Shaikh Isa.

<sup>23</sup>The Bahrain-U.S. security relationship dates back more than 50 years. See Gerry J. Gilmore, "Cohen to Bahrain: Thanks for 50 Years of Partnership," American Forces Press Service, November 21, 2000, available at <http://www.defenselink.mil/news/Nov2000/n1116200011161.html>.

<sup>24</sup>Bahrain is a member of the GCC and is subject to the politics of this regional organization. In addition, as a small state it is extremely susceptible to bilateral pressure from its larger neighbors, particularly Saudi Arabia. This is not unique to Bahrain, as the other small states of the Gulf are similarly subject to external pressure.

International and Shaikh Isa (1 in Figure 2.3). Bahrain International is an excellent airfield with a long (12,000-foot-plus), hard-surface runway and ample ramp and apron space. Coalition forces used this airfield both during and after the Gulf War. It is, however, Bahrain's principal commercial airport, and U.S. forces should therefore try to avoid using it to support coalition combat operations.<sup>25</sup>

Shaikh Isa is a post-Gulf War construction project that was built exclusively for use as a military airbase. It has all the necessary components of a military support infrastructure in place and has a military security perimeter. Shaikh Isa is Bahrain's main fighter base, supporting F-16<sup>26</sup> and F-5 operations. Its main runway is a 12,467-foot-long, 147-foot-wide asphalt strip with an LCN of 84. The airfield has approximately 1.4 million square feet of ramp and apron space and more than 20 dispersal hardstands (104 × 100 feet). The airfield is well placed to support air operations over southern Iraq, as it is situated only 550 nautical miles from Baghdad. The field has supported the deployment of aircraft as large and heavy as the C-5, B-1B, and B-52. Shaikh Isa has supported the extended deployment of composite air expeditionary wings (AEWs)<sup>27</sup> and more than 1100 troops several times over the past few years and could sustain the extended deployment of a larger AEF. In addition, the airfield has frequently supported bilateral U.S.-Bahraini exercises and Operation Southern Watch missions. The United States has negotiated a tem-

<sup>25</sup>Bahrain International should be considered only as a backup to Shaikh Isa for combat operations. It could, however, play a critical role in coalition logistics operations supporting deployed forces.

<sup>26</sup>Bahrain has a mixture of F-16Cs and F-16Ds in its inventory. It is also buying AIM-120B advanced medium-range air-to-air missiles (AMRAAMs) as the principal air-to-air system for its F-16s. See Blanche, "Shifting Sands, Changing Prospects," p. 34.

<sup>27</sup>The AEW represents the wing-size component of an AEF. The recent deployment by the 347th AEW to Shaikh Isa included 12 F-15Cs from Elgin Air Force Base, Florida; 12 F-16Cs from Moody Air Force Base, Georgia; 6 F-16C/Js from Shaw Air Force Base, South Carolina; 2 B-1s from Ellsworth Air Force Base, South Dakota; 4 KC-135Rs from Fairchild Air Force Base, Washington; and a Patriot battery from Fort Bliss, Texas. This AEW was able to run between 70 and 80 sorties per day in support of Operation Southern Watch. See "Air Combat Command Bases Ready to Deploy AEF to Persian Gulf," Air Force News Service, November 19, 1997, available at [http://www.af.mil/news/Nov1997/n19971119\\_971468.html](http://www.af.mil/news/Nov1997/n19971119_971468.html); "Air Expeditionary Force Deploying to Southwest Asia," Air Force News Service, November 21, 1997, available at [http://www.af.mil/news/Nov1997/n19971120\\_971479.html](http://www.af.mil/news/Nov1997/n19971120_971479.html); and "366th Wing F-15Es," Air Force News Service, August 1998, available at <http://www.af.mil/photos/Aug1998/98824f15e.html>.

porary basing agreement for access to this airbase. Shaikh Isa is an excellent AEF deployment base for an Iraqi contingency, but it is only 170 nautical miles from Iran's coast, and any air units supporting combat operations over Iran from here would thus be at risk.

## Cyprus

Cyprus's location outside the Middle Eastern crisis zone offers additional operational security for any deploying U.S. or NATO forces. It also provides some political shelter from the emotionally charged issues that usually surround Middle East crises. Unfortunately, however, Cyprus is not devoid of nationalism and religious friction. To the contrary, the island remains divided between Greek and Turkish (Christian and Moslem) factions as a result of a civil war, and tensions between the two communities continue to smolder.<sup>28</sup> These tensions were recently revisited with the controversy over Greek Cypriot efforts to purchase and install a Russian S-300 surface-to-air missile unit to provide air defense over their sector of the island.

As a result of its civil war and continued tension between these two ethnic groups, Cyprus remains divided, with Greek, Turkish, British, and U.N. force components all stationed there. Several military airfields remain under British control. Over the years, American and U.N. security entities have nonetheless used airfields on the island to support a broad range of mission requirements in the region. If NATO sanctions the proposed Middle East contingency and both Greece and Turkey support this operation, NATO could probably gain sanctioned use of facilities on the island. Even without such a sanction, coalition forces could likely negotiate access to one or more of the British-controlled airfields.

The airfields on Cyprus are between 500 and 600 nautical miles from Baghdad. More important, however, is the fact that one cannot fly into Iraq without crossing Syrian and possibly Lebanese airspace.

---

<sup>28</sup>Hostilities in 1974 divided the island into two de facto autonomous areas—a Greek Cypriot area controlled by the internationally recognized Cypriot government (59 percent of the island's land area) and a Turkish Cypriot area (37 percent of the island)—separated by a U.N. buffer zone (4 percent of the island).

Thus, overflight rights would be necessary.<sup>29</sup> Another important constraint is that none of the airfields has runways long enough to accommodate U.S. strategic tankers (KC-10/135) operating with more than a nominal load of fuel. Smaller tankers would thus have to be used in their place, or the strategic tankers could operate out of another location (e.g., Turkey) and rendezvous for refueling over the Mediterranean.

Six airfields on Cyprus—four commercial and two British-controlled military fields that are operational but in caretaker status—meet our basic operational criteria. Two fields, Larnaca (2 in Figure 2.3) and Akrotiri (3), have been classified as first tier.

Larnaca, a commercial field located at the southeastern end of the island, has an 8858- × 148-foot hard-surface runway (LCN 70). The Greek Cypriot Army headquarters is located near the airfield. The field has ample ramp and apron space (2.7 million square feet) and is a heavily trafficked passenger and cargo airport. As with all other airfields on the island, Larnaca's proximity to a seaport would facilitate resupply from the sea. Although Larnaca is a dual-use field, we are unsure of what military support infrastructure, if any, is in place. Moreover, even though the airfield's physical characteristics suggest that it can support AEF combat operations, one would prefer to avoid running such operations from a commercial airfield. Larnaca could, however, be used to support airlift and other support operations (except KC-10/135 tanker operations that require a longer runway).

Akrotiri is a British RAF-operated facility that was constructed and maintained as a military airbase. The field has an 8995- × 200-foot asphalt runway that is rated in good condition and that has an LCN of 100. It has been used to support medium bomber and heavy transport operations over the years. Indications are that the runway could service any NATO combat or transport aircraft and more than three million square feet of ramp and apron space are available to

---

<sup>29</sup>If the contingency involved Iran, the distance and overflight requirements would be much more severe. The distance to Tehran from Cyprus is well over 900 nautical miles and requires overflight of both Syria and Iraq or a more extended flight north and across Turkish airspace. Cyprus would not be a primary planning option for any Iranian scenario.

handle the parking and servicing of deployed aircraft. Akrotiri has good security and also has in place most components of a military support infrastructure, including barracks, mess facilities, hangars, and ammunition bunkers—although there is some doubt about the status of its fuel storage tanks. Akrotiri could potentially support an AEF (less the strategic tankers); however, some time and dedication of assets would be required to ramp the airfield back up to full-time service.

The two second-tier airfields in Cyprus are Nicosia (24) and Pafos International (25). Pafos is a commercial airport that routinely handles wide-bodied passenger and cargo craft, and it could support logistics operations for most contingencies. However, the airfield's infrastructure would not effectively support combat operations.

The last plausible airfield on Cyprus is Nicosia, which is currently closed and under caretaker control by the British RAF. This airfield was maintained by the British as a military airbase for many years, and it is now headquarters for the small Greek Cypriot Air Force and its five aircraft and fifteen helicopters. However, it remains closed to full-time active use and could not support the deployment of any number of large, heavy airframes without some repair and upgrades. At the same time, the field's two runways (9704 × 150 feet and 6000 × 150 feet) are still rated in good condition, and the base's support infrastructure remains in usable/habitable condition—although questions persist, as with Akrotiri, with regard to the status of its fuel storage facility. In all, estimates are that a minimum of six to eight weeks would be needed to reactivate the airfield. Nicosia also offers ample hard-surface ramp and apron space (approximately two million square feet) and with time and outside support could accommodate an AEF.

## Djibouti

Djibouti is strategically located astride the Bab al Mandab Straits at the southern entrance to the Red Sea and the Suez Canal and off the Arabian Peninsula. Its distance from the expected conflict zone(s) reduces the direct threat posed to Djibouti and the political or military pressures that can be imposed by likely aggressors. Djibouti is a former French colony, and long-standing agreements with France provide for continued military and economic assistance. France

maintains a military presence in the country<sup>30</sup> and is the major provider of military equipment, training, and other assistance to the country's small national force.

The United States provides Djibouti with less than \$500,000 in economic support and military aid annually. Nonetheless, Djibouti permits the U.S. Navy access to its seaports and airports. The importance of that access to the United States has grown with its increased naval presence in the Indian Ocean and Persian Gulf. The Djiboutian government has generally been supportive of U.S. and Western interests, as was demonstrated during the Gulf crisis of 1990–1991. With French assistance, it is expected that Djibouti would again afford U.S. and coalition military forces access to its air and seaports during another Middle East crisis.

Only one airfield in Djibouti—Djibouti Amouli—fits our basic parameters. Because of its distance from our principal scenario locations, we have categorized it as a second-tier field. This airfield is located approximately 1300 nautical miles from Baghdad and nearly as far from southwestern Iran. With a short flight up the Red Sea, aircraft can gain direct access to southwestern Saudi Arabia and could support operations over the southwestern half of the Peninsula.

Djibouti Amouli (26 in Figure 2.3) is a jointly operated commercial and military field located near the strategic southern entrance to the Red Sea. The base was constructed with an eye toward supporting military operations, and all the necessary infrastructure is therefore in place. The airfield is also collocated with a good seaport and can be easily replenished from the sea.

The French Air Force permanently maintains a small contingent of aircraft and associated support personnel and equipment at this airfield. The French used Djibouti as a staging base during the Gulf War. The field has an excellent 10,335- × 148-foot hard-surface runway with an LCN of 86 and has more than 1.7 million square feet of ramp and apron space. The field could support the deployment of all

---

<sup>30</sup>France has approximately 1500 troops stationed in Djibouti, including elements of one marine infantry battalion, one Foreign Legion regiment, and one air force squadron (Mirage fighters, helicopters and tactical air defense units). See *The Military Balance: 1998/99*, London: International Institute for Strategic Studies, 1999, pp. 248–249.

types of NATO aircraft, including heavy bombers with a partial load. It could also serve as a logistics hub or support the deployment of an AEF, especially in the event that a conflict advances deep into Saudi territory.

## Egypt

U.S. security assistance and military-to-military relations with Egypt are close and continue to improve through combined operations and an extensive combined-exercise program that focuses on expanded interoperability and coalition warfare. Since the 1978 Camp David peace accords, the United States has subsidized Egypt's armed forces with more than \$30 billion in assistance. Egypt receives approximately \$2.1 billion annually—\$1.3 billion in foreign military financing and \$800 million in economic support fund assistance—and is the largest recipient of U.S. military and economic aid after Israel. The United States also provides excess defense equipment worth hundreds of millions of dollars annually.<sup>31</sup>

The Egyptian military participated in the Gulf War,<sup>32</sup> and the state played a central role in maintaining a unified anti-Iraq coalition within the Arab community. As a result of the country's role in the Gulf War, U.S. reliance on Egypt as a strategic asset in times of crisis has significantly improved. Access to Egyptian facilities for logistics support, for example, has been critical to the conduct of Red Sea maritime interception operations as well as to humanitarian relief and other operations other than war (OOTW) throughout the Middle East and Northern Africa. The U.S. military exercise program with Egypt is the largest in the region, spanning the spectrum from large force maneuvers such as Bright Star to Special Operations Forces exercises.

---

<sup>31</sup>See Howard Schneider, "U.S. Aid Fueling the Development of Modern Egypt," *Washington Post*, December 26, 2000, p. 1.

<sup>32</sup>The Egyptian Army deployed more than 40,000 troops to Saudi Arabia. Egypt's air force did not participate in the air war. In 1990, the United States also forgave \$7.1 billion in past Egyptian military debt in return for Egypt's support of Operation Desert Shield. The Europeans followed suit and also forgave a significant debt. See Watson, *Military Lessons of the Gulf War*, pp. 226–241.

Egypt clearly maintains the largest, if not the most competent, military capability among the Arab states. The military is midway through its conversion from Soviet-era equipment and doctrine to a Western model, with a full transition expected by 2005. For the Egyptian Air Force, the F-16 is becoming a common feature, and many of its personnel are now familiar with Western operational standards and practices.<sup>33</sup>

Egypt is key to U.S. policy throughout the region and has generally been supportive of long-term U.S. security policy goals toward Iraq and Iran. Often, however, it does not support specific U.S. actions or policy and does not hesitate to express its opposition publicly. Although specific circumstances will dictate whether Egypt supports U.S. access to its facilities, leaders outside of Cairo are not likely to heavily influence Egypt's decisions. Egypt will also seek to bolster its image as a leader in the Arab world and to assure itself of a role in any operation that could affect the region's longer-term security environment. Moreover, Egypt's foreign and security policy decisions still play heavily among the Arab states, and its actions will likely influence others. It is highly probable that Egypt would support any coalition effort to stop overt aggression anywhere in the region. For smaller-scale regional contingencies, however, Egyptian support will be situationally dependent and much more problematic given its recent lukewarm support of U.S. Gulf policy.

Egypt has more than 100 operational airfields that meet our basic parameters, but we have restricted our search to the northeast corner of the country so that aircraft would not be too far outside reasonable operating distance to either Iraq or Iran. Even within this small segment of the country, there are 30 possible airfields, with two of these categorized as first tier and two as second tier.

The two first-tier airfields in Egypt are Cairo West (4 in Figure 2.3) and Sharm El Sheikh (5). Cairo West is a large military airbase located on the outskirts of Egypt's capital. It houses an Egyptian fighter regiment and has all of the necessary military infrastructure in place. The airbase has three operational runways,<sup>34</sup> two of which are

---

<sup>33</sup>The Egyptian Air Force now has more than 130 F-16s in its aircraft fleet. See Schneider, "U.S. Aid Fueling the Development of Modern Egypt," p. 1.

<sup>34</sup>R1 = 9730 × 196 feet, R2 = 9125 × 147 feet, and R3 = 8710 × 130 feet.

rated in good condition and the third in poor condition. The field also has more than 1.8 million square feet of hard-surface ramp and apron space. Moreover, two of Cairo West's runways have excellent LCNs (75 and 107), meaning that the airfield can support even the largest NATO aircraft; estimates are that approximately 20 wide-bodied and roughly 200 fighters could be accommodated simultaneously. U.S./NATO aircraft have frequently used this airfield; planners and operators are familiar with the facility;<sup>35</sup> and we anticipate that little time would be needed to prepare the airbase for an AEF-size deployment. It is within approximately 700 nautical miles of Baghdad, and aircraft operating from this base have direct access to western Saudi Arabia.

Sharm El Sheikh has significant potential but needs upgrading if it is to support the extended operational deployment of a sizable force package. The airfield was originally built by the Israeli Air Force as an operational combat base and is strategically located on the southern tip of the Sinai Peninsula at the southern entry point to the Gulf of Suez and the Gulf of Aqaba. Because it was built as a military installation, most of its infrastructure remains in place. It is roughly 100 nautical miles closer to western Saudi Arabia than Cairo West and approximately 600 nautical miles from Baghdad. Sharm El Sheikh is now a commercial airport servicing Egypt's tourist industry on the Sinai. The airfield has two excellent 10,105- × 148-foot runways with LCNs of 120. The airfield can support even the heaviest NATO transport or combat aircraft with the exception of B-52 bombers, which prefer a wider runway.<sup>36</sup> However, the field has only about 50,000 square feet of ramp and apron space. Although not a long-term solution, its second runway could be closed to traffic and used as an extended ramp, which would provide some 1.5 million square feet of parking space. For the longer term, there is sufficient open space adjacent to the airfield to expand the runways or the

---

<sup>35</sup>See, for example, Technical Sergeant Ann Bennett, "Base Operating Support Vital to Bright Star Mission," Air Force News Service, November 15, 1999, available at [http://www.af.mil/news/Nov1999/n19991115\\_992091.html](http://www.af.mil/news/Nov1999/n19991115_992091.html), and Staff Sergeant Dee Ann Poole, "Joint Reception Center Staff Welcomes Bright Star '98 Participants," Air Force News Service, October 23, 1997, available at [http://www.af.mil/news/Oct1997/n19971023\\_971338.html](http://www.af.mil/news/Oct1997/n19971023_971338.html).

<sup>36</sup>U.S. peacekeepers in the Sinai periodically use the airfield to support replenishment and personnel turnover operations.

ramp and apron space. In its current configuration, the airfield could accommodate a squadron of fighters or fighter-bombers, but a few weeks would likely be needed to ramp it up for such a mission. The field could easily be replenished from the sea.

The two second-tier airfields in Egypt are Bilbays (27) and Hurghada (28). Bilbays is located near Cairo and is a large, active military airbase with five active hard-surface runways ( $R1 = 11,425 \times 150$  feet,  $R2 = 9534 \times 160$  feet,  $R3 = 8448 \times 150$  feet,  $R4 = 4960 \times 150$  feet, and  $R5 = 5017 \times 150$  feet). The LCN for all of these runways is estimated at 59, which will constrain operations by heavy bombers, heavy transports (747s and C-5s), and heavy tankers (KC-10s and KC-135s). The Egyptian Air Force uses the base to support its Air Force Academy and pilot training. The field has more than one million square feet of ramp and apron space and could support the deployment of an AEF. However, it has only limited permanent fuel storage capacity, which would constrain extended operations without the deployment of fuel bladders to supplement available on-base storage.

The better of the two second-tier fields is Hurghada, which is located on the Red Sea approximately 200 nautical miles south of Cairo and 660 nautical miles from Baghdad, just across the Red Sea from western Saudi Arabia. Hurghada is a joint-use field that was recently upgraded to support international commercial flights. It is also an active fighter base, with three squadrons stationed there. Its military support structure appears to be intact, and the field does have ammunition storage bunkers, aircraft shelters, military barracks, and mess facilities. The field also has three active hard-surface runways ( $R1 = 13,124 \times 143$  feet,  $R2 = 9843 \times 131$  feet, and  $R3 = 6860 \times 65$  feet) and more than 1.8 million square feet of ramp and apron space. Given that large commercial jet aircraft are now being operated into and out of Hurghada, the rated LCN of 35 is suspect and should be reevaluated. If the LCN will tolerate it, Hurghada's size could support the deployment of any NATO aircraft and a full AEF. The airfield's proximity to the Red Sea will allow resupply by sea.

## Israel

Israel is the most militarily capable state in the Middle East, and its military systems—especially its aircraft—are compatible with those of the United States and many other Western countries. The Israeli

Air Force maintains a robust constellation of airbases throughout the country, and all of its commercial fields were built as joint-use facilities. These airfields are well structured and equipped to support high-tempo combat operations and are manned by highly skilled personnel who are experienced in supporting Western combat and support aircraft, munitions, and the like. Despite these attributes, running military operations out of Israel for any contingency in the Middle East currently carries a heavy political price. It is therefore an option that must be considered carefully and balanced with operational needs.

Tremendous hostility toward Israel among the local Arab populace is common throughout the Middle East. Israeli participation in any contingency would therefore threaten the legitimacy of the U.S. and allied operation in Arab and Muslim eyes, making it far harder for regional allies to work closely with Washington. Active Israeli participation would also be unpopular in Israel, as the populace is currently looking toward the peace process to reduce regional conflict.

Confounding this issue is the fact that the positive movement on central "peace process" issues that had distinguished the past few years was replaced in late 2000 by renewed hostility between the Israeli military and security forces and the Palestinians. On September 28, 2000, fighting once again erupted in Jerusalem and then spread to other areas of Israel and the West Bank, with several hundred personnel killed and wounded on both sides. This latest conflict threatens both the central peace process and the positive steps that had been taken by a number of Israel's Arab neighbors to open limited economic and diplomatic relations with Israel. Moreover, it undermines what some had viewed as growing acceptance of Israel's self-defense needs by many of Israel's Arab neighbors.<sup>37</sup>

---

<sup>37</sup>See Ian O. Lesser, Bruce R. Nardulli, and Lory A. Arghavan, "Sources of Conflict in the Greater Middle East," in Zalmay Khalilzad and Ian O. Lesser (eds.), *Sources of Conflict in the 21st Century: Regional Futures and U.S. Strategy*, Santa Monica: RAND, MR-897-AF, 1998, pp. 171–230, for a more detailed discussion of how progress in the Arab-Israeli peace process would affect Persian Gulf security. See also John Kifner, "1987 Palestinian Uprising and This One Are Different in Many Ways," *International Herald Tribune*, November 20, 2000, available at [www.ihf.com/articles/1917.htm](http://www.ihf.com/articles/1917.htm), for a brief discussion of the background and implications of the Israeli-Palestinian violence that began in September 2000.

In response to this renewed conflict, the Arab states called for two summit meetings—first of the Arab League in October 2000 and then of the 56-member Organization of the Islamic Conference in November 2000. Both summits boisterously supported the Palestinians and bitterly denounced Israel's actions.<sup>38</sup> This move reflects the increased outpouring of anti-Israeli feeling present in many of the Arab states and the additional pressure it is placing on the leaders of those states. Both gatherings ended with agreements that member states would initiate actions aimed at increasing Israel's international isolation.<sup>39</sup>

Egypt fought long and hard at these summit meetings to preserve its diplomatic ties to Israel, arguing that more could be accomplished by keeping the lines of communication open. On November 22, 2000, however, a disappointed President Mubarak recalled his ambassador from Tel Aviv. This step demonstrated President Mubarak's frustration not only with the continued lack of success of U.S. efforts to bring about a cease-fire and renew positive negotiations but also with his own failure to mediate restraint among all parties.<sup>40</sup> We thus appear to have reached yet another crossroads in the Middle East's security dilemma, and it is unclear what long-term effects these latest clashes will have on the broader peace process and on future relations between Israel and its Arab neighbors.

In short, no one can say with assurance how the political and security environment in the region will evolve over the next ten years. It

<sup>38</sup>Despite the hostile rhetoric, the more moderate countries prevailed, and the conferences endorsed only a call for member states to reduce their economic and political contact with Israel. See Susan Sachs, "Muslim Nations Bitterly Denounce Israel at Summit," *New York Times*, November 13, 2000, p. 1; Howard Schneider, "Muslim States Split on Anti-Israel Action," *Washington Post*, November 14, 2000, p. 38; and Hugh Pope, "Islamic Summit Shows Frustration, Discontent with U.S. in Middle East," *Wall Street Journal*, November 15, 2000, p. 23.

<sup>39</sup>*Ibid.*

<sup>40</sup>President Mubarak has long staked his political credibility on playing the role of a trusted mediator between the Palestinians and the Israelis. His most recent efforts have, however, failed to bring about any sustained relief from the bloodletting or to restrain Israeli use of military force. Instead, these efforts have exposed both Mubarak and his administration to "a relentless storm of criticism from Arab commentators and other Arab leaders who said he should not deal with Israeli officials until the fighting stops." See Susan Sachs, "Mubarak's Angry Response to Israel Signals Key Shift by Egypt," *New York Times*, November 22, 2000, p. 3.

is possible that the peace process may get back on track, that the principal Arab states on the Peninsula may once again pursue improved relations with Israel, and that Israel's security concerns may gain broader acceptance among its neighbors. In this positive scenario, many conservative Arab states might prove willing to accept an Israeli military reaction in response to overt aggression by one of its neighbors. If this aggression has broader regional implications and involvement, they might even accept U.S. or Alliance military use of Israeli facilities to support a regional coalition response. Although it remains highly unlikely that these states would accept direct Israeli military participation in any coalition-based military response, one can imagine one or two possible scenarios in which Israeli participation in a coalition response to an aggressor's offensive military action would be preferred to unilateral Israeli military action. Future developments and the specifics of the crisis situation will dictate what roles the Arab states will approve for Israel and its military forces and facilities in any future contingency operation. Military planners must therefore take these Arab concerns into account when developing any coalition response that requires force deployments into the region and that includes the participation of local militaries.

There are, in any case, four second-tier airfields<sup>41</sup> in Israel that we would consider viable options: Nevatim Airbase (29 in Figure 2.5), Ovda (30), Ramat David Airbase (31), and Ramon Airbase (32). All four airfields have multiple hard-surface runways and an extensive military infrastructure in place, including ammunition bunkers, aircraft shelters, military barracks, mess facilities, and military-type security.

Ovda (30), which is located in southern Israel slightly more than 520 nautical miles from Baghdad, appears to be the best option. Although originally constructed as a military airbase, it is now used as a commercial terminal as well. In its military capacity, it is used principally as an air force reserve installation, supporting flight

---

<sup>41</sup>In view of the potential political problems associated with operating out of Israel, none of the airfields in that country have been classified as first tier. The intent was to use the second-tier classification to highlight the fact that there will be political costs associated with the use of Israeli airfields in support of combat operations elsewhere in the region.

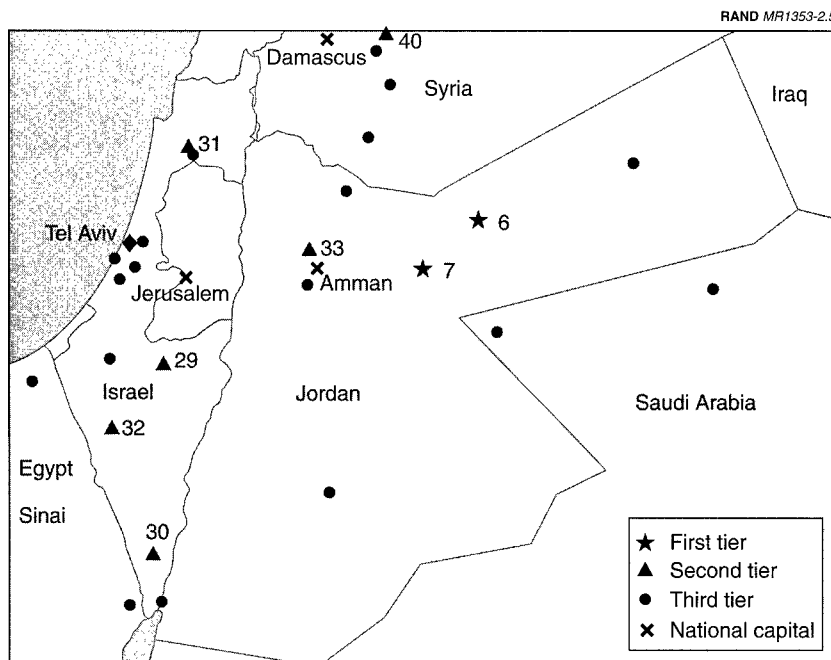


Figure 2.5—Constellation of Possible AEF Deployment Airfields in Israel and Jordan

training, deployments, and the storage and maintenance of reserve aircraft. Ovda has two active runways, R1 (9843 × 148 feet) and R2 (8530 × 148 feet), with an estimated LCN of 67. Moreover, the fact that it is now primarily a commercial airfield confers a number of benefits:

- the field is not as congested with active combat aircraft;
- it is configured to support large, wide-bodied aircraft and heavy, outsized cargo; and
- it offers more than one million square feet of ramp and apron space.

Although its limited fuel storage would restrict sustained operations if not supplemented by the deployment of fuel bladders, Ovda could

support the deployment of most elements of an AEF. In addition, Ovda's location along the principal line of communication (LOC) and fuel pipeline linking Elat on the Gulf of Aqaba with the rest of Israel would allow for the resupply of key, bulky, and high-use expendables (e.g., fuel, ammunition, water, and food) from the Gulf.

The other three Israeli airfields are military airbases that support fighter operations. Ramat David is located in northern Israel opposite the Golan Heights. Both Nevatim and Ramon are located in southern Israel south of Jerusalem and are better located to support operations into southwestern or southern Iraq, Kuwait, or northern and central Saudi Arabia. All three fields have limited open ramp and apron space, and the number of permanently stationed combat units and aircraft compounds the problem. These factors would limit the deployment of any large coalition task force. If deployment were planned to any of these airfields, the problem of congestion could be mitigated if the assigned Israeli fighter squadrons were to redeploy and consolidate at other fields<sup>42</sup>—thereby opening operational space—or if the deploying coalition forces were to bed down at more than one location.

Of these three airfields, Nevatim Airbase (29) appears to be the best option, as it has four active hard-surface runways,<sup>43</sup> one nearly 11,000 feet long and another more than 8500 feet long. It also has the necessary military support infrastructure in place (e.g., ammunition bunkers, aircraft shelters, security, military barracks, and mess facilities). Nevatim is slightly closer to Baghdad than is Ovda (approximately 500 nautical miles), but its major drawback is that it has only 600,000 square feet of hard-surface ramp and apron space, which would limit the scale of any temporary deployment to 30 to 40 aircraft. The number of square feet of available parking area could be increased if R4's 200,000-square-foot area were to be used as ad-

<sup>42</sup>The feasibility of this option will be highly dependent on the nature of the crisis. The Israelis would not consider such steps if they would affect the state's overall security. It is possible, however, that some consolidation could take place without significantly affecting the combat capability of the squadrons involved and, in turn, the overall security of Israel.

<sup>43</sup>R1 = 10,991 × 147 feet, R2 = 8530 × 147 feet, R3 = 7230 × 67 feet, and R4 = 2806 × 70 feet.

ditional ramp space<sup>44</sup>—in which case Nevatim could support all the tactical combat assets assigned to our notional AEF.

Ramon (32) is a major Israeli fighter base with two F-16 squadrons. It has two long hard-surface runways, R1 (9876 × 148 feet) and R2 (8858 × 148 feet). The reported LCN of only 25, if correct, would limit operations from this field to tactical combat aircraft.

Ramat David (31) is an excellent airbase with three long hard-surface active runways. There are four fixed- and one rotary-wing squadrons stationed at this field. The airbase has little excess ramp and apron space (only 700,000 square feet total), however, and thus an AEF deployment would be limited in scale without the redeployment of some or all the Israeli assets. Ramat David is located in northern Israel north and east of Tel Aviv and is well situated to support operations over central Iraq, but it is also within Iraq's projected TBM range.

As noted earlier, there are some operational concerns and constraints associated with any operations conducted out of Israel. These include:

- First, any coalition air operations out of Israel would require transit through Jordanian and possibly Syrian airspace.
- Second, most of Israel's northern airfields are within range of Iraq's projected TBMs. The Israeli airfields south of Tel Aviv, however, are generally some 500 nautical miles or more from Baghdad and outside its projected TBM range.
- Third, because most Israeli military airfields are heavily used, open ramp and apron space will be a problem. Dual basing is an option given that all Israeli commercial fields are designed for both military and commercial use and possess longer runways

---

<sup>44</sup>R4 is also very narrow and is usable by only a few types of aircraft. If R3 were also closed to traffic and used for ramp space, an additional 400,000 or more square feet of parking space would be available. Although the LCNs of R3 and R4 are unknown and might not be sufficient to support large heavy aircraft in the AEF package, they would probably be adequate to support tactical combat aircraft.

and more ramp space that can support coalition logistics/support operations.<sup>45</sup>

Israel could play a contributing role in allied operations. Although Saudi Arabia dwarfs Israel's base capacity, Israeli capabilities are considerable and could greatly augment U.S. operations, particularly in the early days of a crisis. However, Israeli participation would strain any regional coalition even if it were more palatable to Arab states than has been the case in the past.

## Jordan

Since the close of the Gulf War, Jordan has distanced itself from Iraq, and U.S. and Western relations have improved steadily. U.S. military ties with Jordan are not as strong as those with the GCC states, but the United States has renewed its security assistance program, and regular military exchanges are occurring once again.

In November 1996, President Clinton declared Jordan "a major non-NATO ally," and U.S. efforts to better Jordan's degraded military capability and readiness were expanded. Toward this end, the two states have renewed their combined-exercise program, and the United States transferred excess F-16A/B aircraft to the Jordanian Air Force. Moreover, the United States recently completed the temporary deployment of an AEF to Jordan, and this air expeditionary task force conducted operations over Iraq in support of Operation Southern Watch from its Jordanian deployment base.<sup>46</sup>

---

<sup>45</sup>For example, Ben Gurion International, which is not one of our selected fields, is Israel's international passenger and cargo port of entry and is an excellent option. Ben Gurion International is one of the few airfields in Israel that has runways longer than 10,000 feet and ample open, hard-surface ramp and apron space. It could effectively be used as an intermediate logistics or support base if necessary. Additionally, most of the Israeli Air Force's fixed-wing transport assets are stationed at Ben Gurion, as is the planning headquarters for these air units. We shied away from identifying this airport as a priority option because of its importance as the country's principal commercial airfield.

<sup>46</sup>See Technical Sergeant Pat McKenna, "Controlling the Air," *Airman*, October 1996, available at <http://www.af.mil/news/airman/1096/air.htm>; Technical Sergeant Pat McKenna, "Air Jordan: Slammin' and Jammin' over the No-Fly Zone," *Airman*, August 1996, available at <http://www.af.mil/news/airman/0896/air.htm>; Technical Sergeant Eric L. Robinson, "Jordanian Deployment Ends," Air Force News Service, June 1996, available at [http://www.af.mil/news/Jun1996/n19960625\\_960607.html](http://www.af.mil/news/Jun1996/n19960625_960607.html);

King Hussein's recent death and the accession to the throne of his son add some uncertainty to the question of whether Jordan will support any future U.S./NATO contingency, especially if the renewed violence between the Israelis and Palestinians continues and progress in the ongoing peace process is derailed. Jordan's location bordering the West Bank and Israel makes it highly sensitive to the state of relations between the Palestinians and Israelis.<sup>47</sup>

Although King Abdullah appears committed to retaining good relations with the West, the United States and its coalition partners should not count on early access to airfields in Jordan.<sup>48</sup> It is anticipated that the small Kingdom of Jordan will avoid overtly defying Baghdad and will continue to balance diplomatically its relations between its stronger regional neighbors and the numerous nonregional states with interests in the area. Any access gained will thus be situationally dependent, will require heavy diplomatic negotiations, and will likely be contingent on participation by other Arab states.

There are eight airfields in Jordan that have hard-surface runways greater than 8000 feet in length. Six of these facilities are military or joint-use airfields,<sup>49</sup> with three of these airfields representing good options. Two are designated first-tier airfields: Prince Hasan Airbase (6 in Figure 2.5) and Shaheed Mwaffaq Airbase (7; the nearest city is Azraq). The other airfield, Marka International (33), is classified as second tier.

---

and Technical Sergeant Eric Robinson, "Tankers Support Fighters in Jordan." Air Force News Service, May 10, 1996, available at [http://www.af.mil/news/May1996/n19960510\\_960447.html](http://www.af.mil/news/May1996/n19960510_960447.html).

<sup>47</sup>Protests in support of the Palestinians are common across Jordan, highlighting some of the tensions underlying Jordanian society, with its relatively wealthy, westernized middle and upper classes. See Howard Schneider, "Jordanian King Faces New Test As Palestinians Raise Tensions," *International Herald Tribune*, November 11, 2000, available at <http://www.iht.com/articles/1100.htm>.

<sup>48</sup>Even in this time of renewed regional violence, King Abdullah continues to try to balance his relations with the Palestinians, Israel, the United States, and the West as a whole. There is growing concern that continued Palestinian-Israeli violence could breed extremism in the region, "a trend worrisome to Jordan because of its peace treaty with Israel and ties to the West." Ibid.

<sup>49</sup>The Jordanian Air Force has units stationed at five major operating bases: Shaheed Mwaffaq, Prince Hasan, Marka (Al Matar Airbase), King Faisal Bin Abdul Aziz Airbase, and King Hussein.

Shaheed Mwaffaq is an active fighter base<sup>50</sup> that is located north and east of Amman. It is less than 400 nautical miles from Baghdad and within projected range of Iraqi TBMs. As noted earlier, the base has hosted major elements of a U.S. Air Force AEF and has supported Air Force Operation Southern Watch missions. The airfield has an excellent single hard-surface runway of 9777 × 148 feet with an LCN of 115. The runway could support operations by any NATO tactical combat and transportation aircraft. However, the size of any possible deployment would be constrained by its limited ramp and apron space (only 400,000 square feet, which is less than one-third of the number of square feet of parking space preferred for our notional AEF) and by its modest support infrastructure. The base does have a standard military infrastructure, including bunkers, hangars, ammunition storage areas, on- and off-base billeting and mess facilities, and good perimeter security. Despite its limited parking space, the base could support operations by the AEF's 36 or so combat aircraft, if they are accompanied by a nearly complete deployment support package. Operational ramp and apron space could be conserved by deploying the larger support aircraft somewhere else in Jordan—for example, at Prince Hasan, which is only 27 miles away.

Prince Hasan Airbase is Jordan's major fighter base and flight-training school. It is located farther east and north of Amman than Shaheed Mwaffaq and is also less than 400 nautical miles from Baghdad. The airbase has an excellent 9896- × 140-foot hard-surface runway with an LCN of 78. Prince Hasan has more than one million square feet of ramp and apron space and a robust military infrastructure. The airfield can support all NATO combat aircraft and most wide-bodied and heavy-lift support aircraft. The base has good physical security and several mobile air defense units deployed nearby. Prince Hasan could support deployment and operations by most elements of our notional AEF.<sup>51</sup>

Marka International is a joint-use field and one of Amman's commercial airports; separate military ramps and terminals are available.

---

<sup>50</sup>An attack squadron of Mirage F-1 fighters and an air defense squadron of F-16 fighters are stationed here.

<sup>51</sup>The heavy, wide-bodied tankers could operate from Prince Hasan Airbase, but not at their maximum takeoff weight.

Although managed by the civil authority, Marka remains Jordan's major military airport and serves as headquarters for the Royal Jordanian Air Force. It can support a range of aircraft, but VIP, transport, and cargo aircraft and helicopters (both airlift and attack) are the principal military aircraft routinely stationed there. Marka is located roughly ten miles east-northeast of Amman in close proximity to key road and rail LOCs. The airfield includes most military infrastructure, although the status of available ordnance storage and aircraft bunkers is unclear. Marka has a good 10,781- × 148-foot hard-surface runway. If accurate, its LCN of 54 will restrict access to some of the larger, heavy, wide-bodied support aircraft but would not constrain deployment by any NATO tactical combat and most support aircraft. The field has nearly three million square feet of ramp and apron space and could easily support the deployment of an AEF-size force package.

A full AEF could be supported in Jordan only if the aircraft were deployed to more than one installation (dual basing). Jordan would face many fewer constraints were it to support a European composite air task force because it would not include the large number of heavy, wide-bodied aircraft its U.S. counterpart would.

## Kuwait

Kuwait is wholly dependent on U.S. military protection against its larger neighbors. Reflecting this relationship, U.S. military relations with Kuwait continue to grow as the United States supports the restructuring and modernization of Kuwait's military forces,<sup>52</sup> the conduct of an extensive joint and combined training program, and the near-continuous presence of U.S. forces in the Kingdom. U.S. and other Western air forces are stationed at Ahmed Al Jaber and Ali Al Salem Airbases, conducting Operation Southern Watch missions from these installations. The infrastructure at Ahmed Al Jaber has been upgraded since the Gulf War and can now support large-scale,

---

<sup>52</sup>In support of its modernization efforts, Kuwait is buying large quantities of sophisticated aircraft, tanks and armored vehicles, and air defense systems from the United States and its Western allies. See Blanche, "Shifting Sands, Changing Prospects," p. 35, and Gerry J. Gilmore, "Cohen: U.S.-Kuwait Ties 'Have Never Been Stronger,'" American Forces Press Service, November 20, 2000, available at [http://www.defenselink.mil/news/Nov2000/n11152000\\_200011155.html](http://www.defenselink.mil/news/Nov2000/n11152000_200011155.html).

high-tempo air operations. In addition, the United States has prepositioned a unit set of combat equipment for a mechanized brigade in Kuwait and regularly rotates troops in to exercise their deployment plans and the equipment set. A bilateral agreement between the two states provides for Kuwait to transfer \$35 million annually to defray the cost of U.S. military support and presence.

Given its geographical position and vulnerability, Kuwait will provide U.S./NATO forces access to its facilities in the event of any future crisis involving Iraq. Kuwait has tightened its security ties with the other GCC states, having signed a mutual defense pact in December 2000. This pact calls for the pooling of the defense resources of the six oil-rich Gulf states and increases the number of soldiers assigned to the GCC's rapid-deployment force from 5000 to 22,000. Officials also indicated that the pact by the GCC, which failed to defend its fellow member Kuwait when Iraq invaded it a decade ago, stipulates that "an attack on any member would be considered an attack against all states." This is considered the most important agreement signed by the GCC to date in that it provides for the first time a strong legal framework to support future security cooperation.<sup>53</sup>

In the event that a future regional crisis does not directly involve Kuwait but does necessitate U.S. force deployments, Kuwait would likely provide assistance if the crisis threatened any of its Gulf Arab neighbors or if other Gulf states were already on board.<sup>54</sup> However, Kuwait's resources are limited in terms of both basing and combat capability.

The Kuwaiti Air Force is stationed at three airfields in this small country:<sup>55</sup> Kuwait International (34 in Figure 2.3—a second-tier

---

<sup>53</sup>According to Bahrain's foreign minister, Sheik Mohammed ibn Mubarak Khalifa, "This is the most important agreement signed by the GCC because for the first time it puts a legal framework to this type of cooperation." See "6 Gulf States Sign Region's First Defense Pact," *Los Angeles Times*, January 1, 2001. Only the test of time will provide us with a fair evaluation of how strong and effective this pact will be in the face of a future regional security crisis.

<sup>54</sup>Because of the obvious threat from Baghdad, Kuwait is more sensitive to the potential Iraqi threat than it is to Iran. However, Kuwait is sensitive to Iran's ability to stir up its large Shi'a minority.

<sup>55</sup>Kuwait is only 17,820 square kilometers in size, which is slightly smaller than New Jersey.

airfield), Ahmed Al Jaber Airbase (8—a first-tier airfield), and Ali Al Salem Airbase. These bases are near both Iran and Iraq, which confers advantages as well as disadvantages. This proximity means, for example, that even short-legged aircraft flying unrefueled missions from Kuwait can strike targets in southern Iraq or along the Iranian littoral, the most likely theaters for regional conflicts. Yet the proximity of these Kuwaiti installations to the Iraqi border also underscores how vulnerable they are to a large-scale Iraqi attack. Indeed, the airfields are within range of even short-range Iraqi TBMs. For the United States, this means that a limited-warning Iraqi attack on Kuwait could place at risk the prepositioned U.S. equipment sets and supplies as well as any air assets operating out of the Kingdom.

Ahmed Al Jaber is Kuwait's principal military airbase and is the home of most of its combat aircraft—a fighter wing (F/A-18) and a training squadron. The base is located roughly 26 miles southwest of Kuwait City. The United States and its Southern Watch allies are flying operational missions out of Al Jaber, and their aircraft, aircrews, and support personnel are stationed there.<sup>56</sup> The airbase has two long, parallel hard-surface runways (9847 × 148 feet and 9843 × 131 feet) with an LCN of 60. There is significant room for runway extension, an estimated 6000 feet. Al Jaber has more than 2.5 million square feet of ramp and apron space and has the requisite military infrastructure in place (much of it recently upgraded to support deployed coalition aircraft and air crews).<sup>57</sup> Its runways can support the deployment of any NATO aircraft. There is also ample room and

<sup>56</sup>Al Jaber has hosted a number of U.S. combat and support units over the last several years, including: A-10, F-117, and C-130 squadrons. See Jim Garamone, "Kuwait OKs Long-Term U.S. Presence, Base Upgrades," American Forces Press Service, October 25, 1999, available at [http://www.defenselink.mil/news/Oct1999/n10251999\\_9910253.html](http://www.defenselink.mil/news/Oct1999/n10251999_9910253.html); Linda D. Kozaryn, "Hamre Says U.S. Forces Essential in Gulf," American Forces Press Service, December 2, 1997, available at [http://www.defenselink.mil/news/Dec1997/n12021997\\_9712022.html](http://www.defenselink.mil/news/Dec1997/n12021997_9712022.html); and Secretary of Defense William J. Perry, "DOD News Briefing," September 17, 1996, available at [http://www.defenselink.mil/news/Sep1996/t091796\\_t0917ira.html](http://www.defenselink.mil/news/Sep1996/t091796_t0917ira.html).

<sup>57</sup>Construction and infrastructure upgrades are still in progress at Al Jaber, which will become an aerial port of debarkation and a logistics hub for Kuwait. Both the ramps and the runways are being expanded to handle larger aircraft and more traffic. See Garamone, "Kuwait OKs Long-Term U.S. Presence, Base Upgrades," and Christopher Moore, "JTF/SWA Commander Discusses EAF, Iraq," *Air Force News*, August 2, 2000, available at [http://www.af.mil/news/Aug2000/n20000802\\_001156.html](http://www.af.mil/news/Aug2000/n20000802_001156.html).

support at Al Jaber to accommodate an AEF, less the strategic tankers.

Kuwait International is a civilian-controlled but joint-use airfield that serves as the headquarters of the Kuwaiti Air Force and is home to a transportation and fighter squadron. The airfield is located eight miles south of Kuwait City and is the country's principal international port of entry. It can support sustained heavy transport operations and offers extensive open apron space to support large numbers of wide-bodied transportation or support aircraft. Its main runway can accommodate all NATO airlift, tanker, and other support aircraft as well as any combat aircraft. Kuwait International has two long hard-surface runways (11,152 × 150 feet—LCN 100—and 11,483 × 148 feet—LCN 25) and offers more than five million square feet of open ramp and apron space. At the same time, it has few permanent military facilities such as barracks and mess halls. Life support facilities such as these would have to be provided either at a bivouac area or at commercial facilities downtown. The airfield could support an AEF, but as with Al Jaber, its proximity to the Iraqi border causes one to question how long this facility could be effectively used in any scenario involving Iraqi offensive operations.

Ali Al Salem Airbase is principally a military aerodrome for helicopters and tactical airlift. Its main runway does not meet our minimum criteria, but additional construction and upgrades are scheduled. The project will expand the capabilities of the airfield so that it can support more and larger fixed-wing aircraft.<sup>58</sup> Coalition theater support aircraft use it to meet Southern Watch mission requirements.

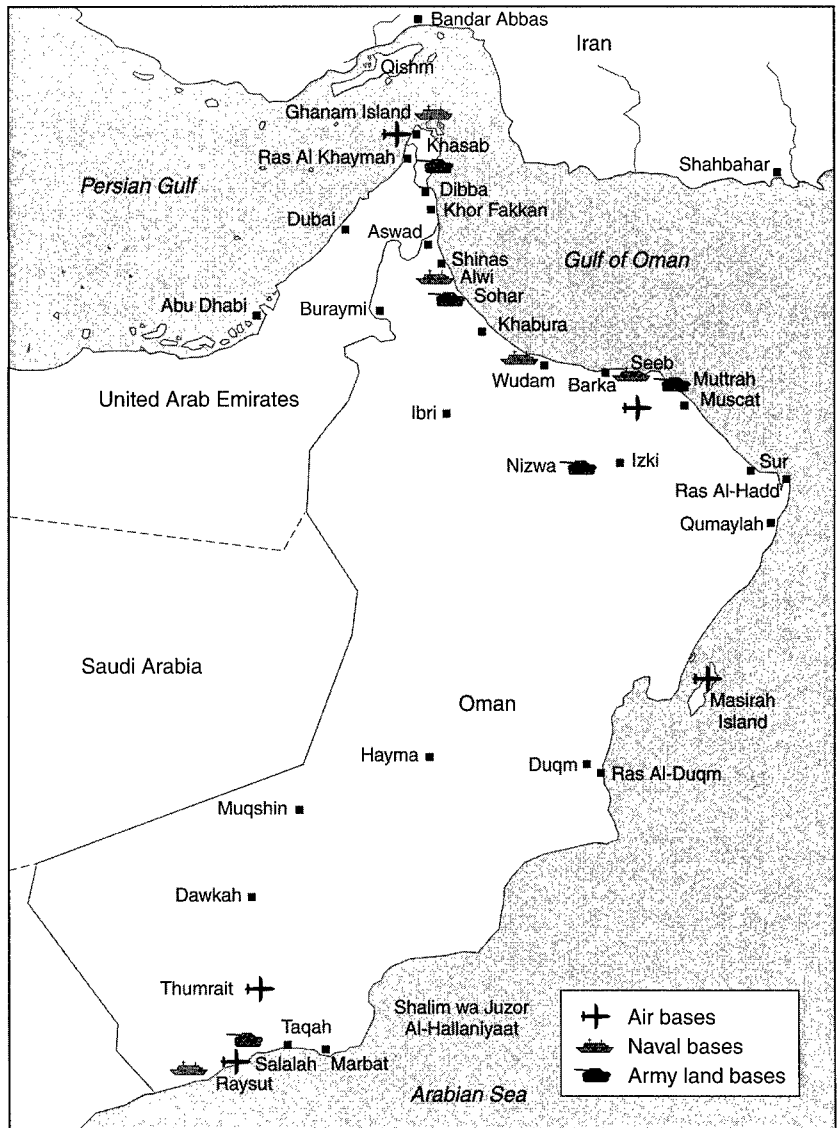
## **Oman**

Oman's strategic location at the Strait of Hormuz, its extensive Indian Ocean coastline, and its considerable military infrastructure, which can support U.S. power projection into the region, render it a valuable ally (see Figure 2.6). U.S. military aircraft were first granted

---

<sup>58</sup>Garamone, "Kuwait OKs Long-Term U.S. Presence, Base Upgrades."

RAND MR1353-2.6



SOURCE: Kechichian, *Oman and the World: The Emergence of an Independent Foreign Policy*, p. 91.

Figure 2.6—Oman's Major Military Installations

access to Omani air facilities during World War II.<sup>59</sup> Oman informally reinstated U.S. access privileges to its air facilities on Masirah Island in 1973, and a formal access agreement was finalized two years later.<sup>60</sup>

In the aftermath of the Iranian revolution and the Soviet invasion of Afghanistan, a more extensive access agreement was negotiated and signed in 1980. This agreement authorized U.S. forces contingent use and access to Omani facilities at Salalah, Thumrait, Masirah Island, Mutrah, Seeb, and Khassab.<sup>61</sup> Moreover, the agreement allowed the United States to preposition supplies and equipment at three large depots in Oman.<sup>62</sup> In 1981, the scale of U.S. military and economic assistance, military sales, military-to-military contacts, and joint exercises saw a sharp increase as the Reagan administration escalated activities in concert with its fielding of the U.S. armed forces' rapid-deployment force.<sup>63</sup>

---

<sup>59</sup>RAF-operated facilities at Salalah in Dhufar and on Masirah Island.

<sup>60</sup>The Ford administration at the time interpreted the move as a counteraction to the growing Soviet presence in the Middle East. For more details, see Joseph A. Kechichian, *Oman and the World: The Emergence of an Independent Foreign Policy*, Santa Monica: RAND, MR-680-RC, 1995, pp. 140–150.

<sup>61</sup>The agreement was signed by the sultanate despite heated opposition from a number of its GCC partners. The agreement was not a base accord per se, since Oman requested that Washington provide advance notice of the landing or mooring of vessels entering the sultanate. See Kechichian, *Oman and the World: The Emergence of an Independent Foreign Policy*, pp. 147–150. See also *U.S. Security Interests in the Persian Gulf*, Report of a Staff Study Mission to the Persian Gulf, Middle East, and Horn of Africa, October 21–November 13, 1980, Committee on Foreign Affairs, U.S. House of Representatives, March 16, 1981, pp. 16–17.

<sup>62</sup>When the program was initiated, the stocks in these depots were generally meant to support U.S. naval operations in the Indian Ocean and Persian Gulf. In terms of contingencies, the agreement provided the United States with access to Omani military facilities in circumstances where both countries would benefit from such usage. Logistically, the agreement greatly enhanced U.S. military capabilities in and around the Indian Ocean where Washington was closely monitoring Soviet naval activity. Additionally, Masirah Island was planned as an alternative landing field for B-52 bombers operating out of Guam, as the British were at the time refusing the U.S. Air Force access to Diego Garcia. Op. cit., pp. 148–149.

<sup>63</sup>Part of this program included the upgrading of military facilities on Masirah Island and at the international airport at Seeb that would be used by U.S. forces. The Omani government encouraged this construction as well as the prepositioning of arms, equipment, and fuel for use by U.S. forces during an emergency. For the U.S. Air Force, these new or upgraded facilities can effectively support tactical air operations,

The evolving strength of the U.S.-Oman relationship also engendered general support for U.S. objectives in the Middle East, with Oman sometimes taking positions contrary to those of its Arab neighbors.<sup>64</sup> Additionally, Oman's operational distance from Iraq and the anticipated conflict zone shelters it from direct Iraqi threats, thereby reducing the political impact of any efforts at intimidation. In 1990, Oman and the United States renewed their ten-year-old facilities access agreement, and Oman supported U.S. action following Iraq's invasion of Kuwait. During the Gulf War, its air force and army both deployed contingents to Saudi Arabia as part of the coalition's JTF,<sup>65</sup> granted U.S. forces operational use of its air and seaport facilities, and authorized the withdrawal of materiel and equipment from U.S. prepositioned stocks. There is general agreement within the military community that U.S. Air Force access to prepositioned stocks in Oman was critical during the early stages of the Gulf War.<sup>66</sup>

Following the Gulf War, Oman pursued a force modernization program with the support of the United States and its European allies.<sup>67</sup> U.S. and Omani armed forces also participate in a robust combined-exercise program aimed at enhancing security cooperation. Although Oman prefers to avoid open opposition to either Iraq or Iran, it remains a staunch ally that, when necessary, will provide the United States and its allies with strong support. In the event of an offensive military action similar to Iraq's invasion of Kuwait, Oman

---

military airlift operations, and the prepositioning of Air Force war readiness material. Op. cit., pp. 152-153.

<sup>64</sup>In the early 1980s, the sultan described his country's foreign policy ties to the U.S. as follows: "The security of the conservative Arab Gulf monarchies facing multi-pronged threats required the military assistance that only the United States was capable and willing to provide." Op. cit., p. 152.

<sup>65</sup>See Watson, *Military Lessons of the Gulf War*, pp. 226-241.

<sup>66</sup>In March 1991, General Schwarzkopf visited Oman's sultan to personally acknowledge "the modest but important Omani role in the War." Schwarzkopf stressed "their support during the early stages of the conflict before major U.S. reinforcements arrived in the theater." Op. cit., pp. 157-158.

<sup>67</sup>The sultanate's current five-year defense plan expires this year, with the low oil prices of the last few years tempering the proposed scale of the program. The new, 2001-2005 plan is currently being negotiated. See Blanche, "Shifting Sands, Changing Prospects," p. 35. Oman is currently spending about \$1.6 billion, or 11.1 percent of its annual GDP (based on FY99 data), on defense. See Central Intelligence Agency, *World Fact Book: 2000*, available at <http://www.odci.gov/cia/publications/factbook/geos/mu.html#Military>.

should be one of the first states to provide U.S. and coalition forces access to its facilities, assuming that Oman feels that the interests at stake warrant the use of military force. If the concern is Iran, the problem is very different for Oman because it can be directly threatened.

Oman has five airfields that meet our minimum operational criteria, with two of these—Seeb International (9 in Figure 2.7) and Thumrait (10 in Figure 2.7)—considered first-tier airfields. Two of the other three airfields—Masirah Island and Salalah—also meet our operational needs; however, they do not have the same capabilities or strategic value as the two first-tier fields.

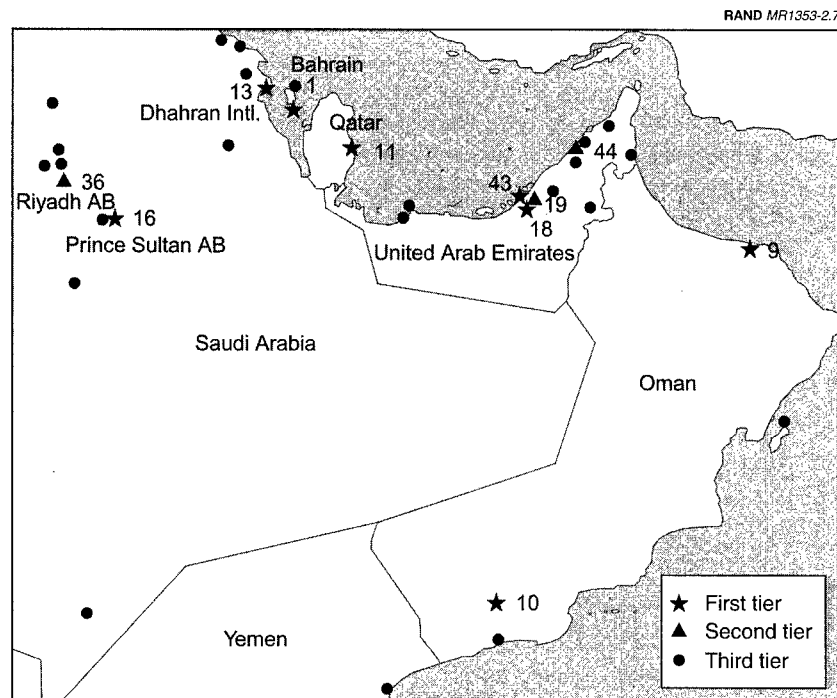


Figure 2.7—Possible AEF Deployment Airfields in the UAE and Oman

Seeb International is located on the desert coastal plain near the Gulf of Oman roughly 14 miles west of Muscat, Oman's capital. The airfield's main runway is a 11,762- × 148-foot, hard-surface strip with an LCN of 84.<sup>68</sup> The airfield has more than five million square feet of open ramp and apron space, with both the taxiways and the aprons having LCNs of 89 to 93. Seeb is an all-weather, joint-use field and is the home station of the Omani Air Force, with its four squadrons of transport aircraft and helicopters.<sup>69</sup> The airfield has in place most of the standard military infrastructure, including an ordnance storage area, secured perimeter and military guards, a tactical ground-based air defense unit nearby, access to local LOCs, hangars, and an established bivouac area; however, it has no shelters or bunkers and only limited military barracks and mess facilities. Its large apron space could easily support an estimated 16 C-5s, 40 C-141s or C-17s, and 155 fighter-bombers at a time. The airfield can also support U.S. bombers, including B-52s with a reduced combat load. It is located approximately 900 nautical miles from Baghdad, placing it beyond Iraq's projected TBM range. Its location and large aircraft capability make Seeb an ideal logistics or combat support base. The distance does, however, mean that tactical combat operations will be extended and will require aerial refueling support. Consequently, combat operations from Seeb or deeper in Oman will not be a first priority. However, if an aggressor penetrates deep into Saudi Arabia or access to Saudi bases is restricted or denied, combat operations from Seeb would assume a higher priority. Seeb has been used by coalition air forces in the past and routinely supports joint training missions. The airfield could easily support high-tempo logistics or AEF combat operations.

Thumrait (or Thumrayt) is a military airbase located in the southwestern portion of Oman 44 miles north of Salalah and close to the Arabian Sea. Thumrait's main runway is 13,123 × 148 feet with an LCN of 100.<sup>70</sup> There is a total ramp and apron area of more than 1.5

<sup>68</sup>The secondary strip is a short (2461- × 98-foot) graded-earth runway that would have little value for fixed-wing military operations.

<sup>69</sup>The U.S. Air Force has had access to Seeb since the 1980s and has supported the construction of facilities and infrastructure at the airfield.

<sup>70</sup>The secondary sand surface strip is 6358 × 150 feet, with an LCN of 100.

million square feet. The Omani Air Force stations two squadrons of tactical fighters (Jaguars) here. Thumrait is a large and well-equipped base that could easily support another two to three fighter squadrons. Moreover, the field is capable of handling all aircraft in NATO's inventory, including up to 12 C-5s or KC-135s at a time. The base has a robust infrastructure, including permanent military barracks and mess facilities, as well as three established bivouac areas with fixed facilities. The U.S. Air Force has prepositioned logistics support stocks at Thumrait; therefore, logistical support operations for any regional contingency will be run through the base.<sup>71</sup> Although its location more than 1000 nautical miles south of Baghdad limits its use as a first-priority tactical combat base, it could support an AEF and, if Iraqi operations penetrate deep into Saudi Arabia or access is restricted to better located regional airfields, could be used to support tactical air operations. Thumrait is better located to support operations in southwestern Iran and is outside Iran's projected TBM range. Like Seeb, Thumrait's proximity to a good port allows for effective resupply from the sea.

Masirah Island is an excellent military airbase with a main runway of more than 10,000 feet and a secondary runway longer than 8000 feet.<sup>72</sup> The island is located in the Arabian Sea and lies more than 1200 nautical miles from Baghdad. The air and naval bases on this island were established by the British long before World War II, and the United States has had access to these facilities since the early 1940s. The military infrastructure has been modernized several times over the years with the support of both the United Kingdom and the United States. The U.S. Navy has been the principal U.S. user of the island's facilities, supporting its Indian Ocean and Persian Gulf deployments. Its location also affords ready access to both the Straits of Hormuz and southwestern Iran, and it is at the fringe of projected Iranian TBM range.

---

<sup>71</sup>See Kechichian, *Oman and the World: The Emergence of an Independent Foreign Policy*, p. 157.

<sup>72</sup>R1 = 10,005 × 148 feet, LCN unknown; R2 = 8446 × 148 feet, LCN unknown.

## **Qatar**

U.S. and coalition forces were granted access to Qatari facilities in the first days of Operation Desert Shield. Qatar actively participated in the Gulf War, deploying ground and air units to Saudi Arabia as part of the Joint Forces Command.<sup>73</sup> U.S. military relations with the country's have expanded and have been formalized since the Gulf War. In June 1992, the two countries signed a defense cooperation agreement that allows the United States to preposition equipment, supplies, and a small support detachment at Doha<sup>74</sup> and supports a highly successful bilateral exercise program. The country's small armed forces are generally equipped and trained from the West, with its air force flying European fighters.

Qatar generally supports Western aims in the region, especially with respect to Iraq. Additionally, it is located outside Iraq's projected TBM range and hence is less vulnerable to political and military pressure from Baghdad.<sup>75</sup> The evolving relationship between the United States and Qatar suggests that, if asked, Doha would again allow U.S. and coalition forces access to its limited power projection support facilities; however, Qatar would be unlikely to support unilaterally any future U.S.-sponsored military action in the region. The scale and timing of any support would be situationally dependent, and Qatar would likely follow the actions of its Arab neighbors closely.

The small country of Qatar has only one airfield that meets our minimum operational criteria, Doha International (11 in Figure 2.7), and it is roughly 610 nautical miles south of Baghdad. The airfield is the country's international commercial terminal, but it does have a

---

<sup>73</sup>The air unit was a squadron of Mirage fighters. See Watson, *Military Lessons of the Gulf War*, pp. 226–227.

<sup>74</sup>Prepositioning includes an equipment set for one U.S. armored brigade. See Gerry Gilmore, "Cohen Visits, Reaffirms UAE, Qatar Ties," American Forces Press Service, November 20, 2000, available at [http://www.defenselink.mil/news/Nov2000/n11202000\\_200011203.html](http://www.defenselink.mil/news/Nov2000/n11202000_200011203.html).

<sup>75</sup>However, Qatar is well within range of Iranian TBMs and is extremely sensitive to political and military developments in Iran.

military side with separate ramps and terminal. Doha is the home station for Qatar's small air force (two fixed-wing and three rotary-wing squadrons) and for the ground-based tactical air defense forces assigned to it. The airport has one long hard-surface runway that is 15,000 × 151 feet with an LCN of 100. Doha is an all-weather airfield that has more than 3.7 million square feet of ramp and apron space. Allied combat aircraft, airlifters, and a range of support aircraft used Doha as their operational base during the Gulf War as well as during follow-on crisis and regional exercises. The airport routinely handles large, wide-bodied commercial passenger and cargo aircraft and can support all NATO combat and support aircraft. Adequate equipment and trained personnel are available to support moderate airlift operations, but additional personnel and equipment would be needed to support large-scale, high-tempo operations or operational deployment by combat units. The estimated airfield sortie rate for airlifters is roughly 240 C-130s or C-17s, or 88 C-5s per day. There is sufficient parking to accommodate more than 100 tactical combat aircraft or 20 to 30 C-17-size airlifters. Given its military role, Doha has in place much of the military infrastructure of concern, including an ordnance storage area, hangars, a small number of aircraft bunkers, and 365,000 gallons of fuel storage capacity. The fuel storage would be sufficient for most operational levels but might need supplementing if high-tempo AEF-scale operations were conducted. The field's location would allow direct resupply from the Gulf. Doha could support the deployment of an AEF, but an airfield support package would have to be deployed with the air task force.<sup>76</sup>

## **Saudi Arabia**

Saudi Arabia is the largest and most influential state on the Arabian Peninsula and is strategically located between the Red Sea and the Persian Gulf. Saudi Arabia has a long tradition of working with the United States against Iraq, Iran, and other regional threats. Saudi air and naval facilities have been used to support the projection of U.S. military power into the region. In 1987–1988, the United States deployed air assets to Saudi Arabia as part of Operation Earnest Will,

---

<sup>76</sup>Few resident host-nation support personnel have experience supporting U.S. combat aircraft; therefore, this capability will have to deploy with any assigned units.

which was initiated in response to Iranian threats to Gulf shipping. During the Gulf War, Riyadh not only opened its facilities to coalition forces but also provided a vast array of financial, logistical, and materiel support. Ground and air units from its armed forces were also assigned to the coalition force and participated in combat operations.<sup>77</sup> Since the war, the Kingdom has allowed the West to use Prince Sultan Airbase as the headquarters of—and as a staging base for—Operation Southern Watch.<sup>78</sup>

Since the Gulf War, Saudi Arabia has modernized and increased the size of its armed forces, and the Saudi Air Force and its associated airbases have been major recipients of this modernization effort. The principal combat aircraft in the Saudi Air Force are U.S. or European, and most of its pilots as well as many of its senior support personnel have been trained in the West. Moreover, the large constellation of military and joint-use airfields in the country are well designed to support military operations; however, these fields would generally require some preparation before they could support high-tempo combat operations.

Saudi Arabia depends heavily on the United States for its security as well as for the training and maintenance of its armed forces. U.S. forces stationed in the Kingdom train and supervise their Saudi counterparts and run missions from Saudi facilities. However, the host government prefers that U.S. visibility be minimized, as vocal domestic and regional opposition to Western military presence in the Kingdom remains. Indicative of these concerns is the fact that the United States and Saudi Arabia have not signed either a formal defense cooperation agreement or an access agreement.

Saudi political support has generally been consistent with U.S. regional goals but has differed at times, which has resulted in a restriction of U.S. military access to or use of Saudi military facilities on occasion.<sup>79</sup> The Saudi government prefers accommodation to con-

<sup>77</sup>The Saudis had 175 combat aircraft operating with the coalition air force, including Tornados, F-5s, and F-15s. See Watson, *Military Lessons of the Gulf War*, pp. 226–227.

<sup>78</sup>Saudi Arabia is paying one-third of the annual operational cost of Southern Watch. See *The Military Balance: 1998/99*, p. 118.

<sup>79</sup>For example, Riyadh refused to support U.S. actions to punish Iraq in 1996 for violating the northern protected zone, and Saudi Arabia refused to support several sub-

frontation in its foreign policy and is reluctant to act before the other party's actions become apparent. As a result, it will authorize a military response by its own forces or forces stationed on its soil only when there is no doubt that the Saudi state or one of its regional allies faces a direct threat. In more ambiguous cases, Riyadh will likely try to distance itself from Washington and may hesitate before deciding on access. Ever conscious of its own domestic pressures and regional standing, the Kingdom's leadership would prefer to negotiate and compromise a dispute before resorting to military action, even if such caution would further complicate the country's security concerns. The greatest risk, therefore, is that the Saudis may delay making access decisions during a crisis, thereby hindering a U.S. deployment.

Saudi Arabia has the largest concentration of possible AEF deployment airfields on the Arabian Peninsula, with 40 that meet our minimum operational criteria. Most of these installations have a main runway greater than 10,000 feet in length and more than one million square feet of open hard-surface ramp and apron space. Most of these facilities, especially the military and joint-use airfields, routinely support operations by Western support and combat aircraft. Moreover, most of the necessary equipment and facilities are on hand. Clearly, given the number of excellent airfields and the variety of locations and operational depth they provide, there is little doubt that Saudi Arabia will continue to receive first priority in planning for any future regional contingency requiring AEF deployments.

Most of the 40 airfields cited above could effectively support military operations. Therefore, unlike most other countries it is not a question of identifying the few fields that we could use; rather, we focused on those airfields that have a military affiliation, have hosted Western military aircraft in the past, and provide good operational flexibility and depth. Toward this end, we identified five first-tier and five second-tier airfields that are well distributed throughout the country, with many other reasonable alternatives that could be considered. These first-tier airfields are Al Jouf (12 in Figure 2.3),

---

sequent U.S. military responses to Baghdad's refusal to cooperate with U.N. weapon inspectors.

Dhahran International (13), King Abdul Aziz International (14), King Khalid Military City (15), and Prince Sultan Airbase (16).

Prince Sultan Airbase is the best choice and is the principal airfield from which U.S. and allied air units are conducting Operation Southern Watch. This facility benefited from post-Gulf War construction<sup>80</sup> and was designed to meet military specifications and support high-tempo operations. The airfield is well configured to service all NATO aircraft and is an all-weather facility with no operational constraints for large, wide-bodied aircraft. U.S. and allied aircraft, aircrews, and support personnel are stationed at Prince Sultan.<sup>81</sup> The airbase was constructed to meet military specifications and has an extremely long hard-surface runway (13,143 × 148 feet with an LCN of 71) and more than 15 million square feet of open ramp and apron space.<sup>82</sup> Baghdad is roughly 580 nautical miles from Prince Sultan, and the airbase is outside Iraq's projected TBM range. There is also a tactical surface-to-air missile (SAM) site just west of the airfield, providing additional air defense support. Prince Sultan could easily support an AEF or two and sustain high-tempo operations for an extended period of time. Operations could be initiated from this facility in 48 hours or less—and even faster if the Southern Watch task force is still deployed here.

<sup>80</sup>In search of greater operational security following the bombing of a U.S. military housing facility (Khobar Towers), the U.S. Air Force moved its operations from Riyadh to Prince Sultan Airbase in September 1996. The facility is located in a desolate area some 50 miles southeast of the Saudi capital. See Linda D. Kozaryn, "Desert Sands in Store for U.S. Forces," American Forces Press Service, August 5, 1996, available at [http://www.defenselink.mil/news/Aug1996/n08051996\\_9608057.html](http://www.defenselink.mil/news/Aug1996/n08051996_9608057.html). The 225-square-mile installation is surrounded by miles of empty desert, and U.S. forces work inside a double-fenced area at its center. Construction continues on many of the airbase's support facilities. For details on operations at this facility, see William H. McMichael, "Desert Stronghold: A Republic of Sand and Razor Wire," *Air Force Magazine*, February 1999, pp. 44–51.

<sup>81</sup>The base has two sides, Saudi and U.S. operational sectors. The 363rd AEW is the U.S. Air Force controlling element. The 363rd currently has approximately 4200 personnel assigned to Prince Sultan, mostly Air Force. *Ibid.*

<sup>82</sup>All ramp and apron space is concrete and well lit. Fuel storage is generally underground and is delivered to aircraft via one of 44 fuel pits set up on parking spots throughout the ramp, including a separate pit for KC-135s. Military housing and mess facilities are still under construction. Assigned troops are living and working out of established bivouac areas. With the layers of security and about 10 percent of the stationed U.S. troops assigned to the security detail, Prince Sultan has been described as "the most heavily guarded operational installation used by the U.S. military." *Ibid.*

Dhahran International is a joint-use airfield that serves as headquarters for Saudi Arabia's Eastern Air Defense Sector. It is the home station for three tactical fighter squadrons and one training squadron, with Tornado and F-15 aircraft. The airfield is roughly 520 nautical miles from Baghdad and at the outer edge of the projected operational range of Iraqi TBMs. It was used by allied forces during the Gulf War and continues to be used periodically to support force deployments and joint training exercises. Dhahran has three operational runways, two of which are more than 10,000 feet long.<sup>83</sup> Also available are more than eight million square feet of open, hard-surface ramp and apron space as well as a separate ramp and apron for military operations. This airbase's physical layout, military infrastructure (including an excellent hangar, maintenance shops, fuel storage, and ordnance storage),<sup>84</sup> location, and nearby support facilities render it an ideal facility from which to support operations of any type. All facilities and personnel required for aircraft maintenance and operational support are in place. Dual perimeter fencing surrounds the facility, and a large guard contingent provides static and roaming patrols. There are also several SAM sites near the base. Dhahran could easily support the deployment of an AEF or two, be ready to support U.S. air operations within 48 to 72 hours, and sustain high-tempo operations for an extended period of time.

King Abdul Aziz International is one of the largest and most modern airports in the Middle East and is the northernmost of three large airfields in the Jeddah area.<sup>85</sup> The airport is a joint-use facility, with the military side of the airport clearly separated from the commercial side. The Royal Saudi Air Force stations a tactical airlift and training squadron at King Abdul Aziz. The airport has three excellent 10,000-foot-plus hard-surface runways<sup>86</sup> and more than 18 million square

---

<sup>83</sup>R1 = 12,008 × 148 feet with an LCN of 100; R2 = 11,811 × 148 feet with an LCN of 100; and R3 = 7054 × 98 feet with an LCN of only 46.

<sup>84</sup>As an international aerial port of entry, Dhahran is equipped to handle heavy out-sized cargo and all types of wide-bodied aircraft. Most if not all of the required materiel-handling equipment (MHE) needed to support cargo or passenger operations is on hand.

<sup>85</sup>King Abdul Aziz is 12 miles north of Jeddah and some 450 miles southwest of Riyadh and Prince Sultan Airbase.

<sup>86</sup>R1 = 12,467 × 197 feet with an LCN of 102; R2 = 12,106 × 148 feet with an LCN of 102; and R3 = 10,327 × 197 feet with an LCN of 100.

feet of open ramp and apron space. The airport is an all-weather facility, and all runways, taxiways, and aprons are well lit. The airfield is optimized to handle large passenger and cargo flows. It does not routinely support combat operations, so the facilities and available support equipment are not designed for such tasks. Only limited military infrastructure is available at the airport, but there is plenty of room to bring in and set up what is needed. King Abdul Aziz is 750 nautical miles from Baghdad and outside the range of projected Iraqi TBMs. It is also outside Iran's TBM range, so it could support operations over Iran as well as Iraq. The airport is capable of sustained operations for all aircraft in the NATO fleet and could easily support the deployment of an AEF or two. Moreover, the proximity of the airfield to the Red Sea and to the port at Jeddah would facilitate replenishment. The airport was used during the Gulf War to support air operations; however, its proximity to Muslim holy cities may lead the Saudis to limit access to these facilities.

Al Jouf and King Khalid Military City are both located near the Iraqi border and represent superior temporary staging bases. Although their proximity to the border makes them vulnerable, both are excellent facilities from which to stage tactical airlift and helicopters or close air support aircraft, attack helicopters, or fixed-wing aircraft. Al Jouf is located in northwestern Saudi Arabia only 300 nautical miles from Baghdad. The airfield has one runway (12,015 × 148 feet with an LCN of 67) and more than 1.5 million square feet of open ramp and apron space. King Khalid Military City also has a single 12,005- × 148-foot runway with an LCN of 63 and more than 15 million square feet of open ramp and apron space. This airport is significant for its ability to support ground operations in northern Saudi Arabia, southern Iraq, Kuwait, and western Iran. Both airfields are capable of supporting sustained heavy, high-tempo operations; any NATO fixed-wing or rotary aircraft can deploy to these fields.

Most of our second-tier airfields in Saudi Arabia are located in the western part of the country and provide operational depth to our airfield constellation. These airfields are well located to support operations over Iran and include Tabuk (37 in Figure 2.2), Prince Mohammed Bin Abdulaziz (35), Taif (38), King Khalid Airbase (39), and Riyadh Airbase (36).

Riyadh Airbase, also known as King Faisal Airbase, is a joint-use airfield with large and separate military support facilities and aprons. This base, which is located in central Saudi Arabia just north and west of Prince Sultan Airbase, is headquarters for the Royal Saudi Air Force, its Air Force Academy, and several transportation and training squadrons. The airfield has two long hard-surface runways<sup>87</sup> and more than eight million square feet of open ramp and apron space. Riyadh was used by coalition air forces during the Gulf War, but U.S. and allied units have recently been moved to Prince Sultan. The base has all of the necessary military infrastructure in place, including ordnance storage facilities, barracks, and mess halls. Security includes a double perimeter fence and several internal fences, guard towers, static and roving guards, and nearby SAM sites. The base is roughly 500 nautical miles from Baghdad and at the edge of Iraq's projected TBM capability. The airfield has ample parking, taxiways, air traffic control (ATC), navigational aids (NAVAIDs), security, and ground support facilities to support sustained high-tempo operations of any type. Riyadh can accept and support all types of NATO aircraft within 48 to 72 hours and could easily support deployment by an AEF or two.

Tabuk (37) is a joint-use airport that is located in western Saudi Arabia nearly 500 nautical miles from Baghdad at the edge of the projected range of Iraq's TBM systems (also outside projected Iranian TBM range). British Air Force units operated out of Tabuk during the Gulf War. Two squadrons of Saudi F-5 fighters and a regional air defense headquarters are stationed there. The airfield has two excellent 10,000-foot-plus runways<sup>88</sup> and more than two million square feet of open ramp and apron space. This airfield can effectively support large-scale, high-tempo fighter operations as well as the extended deployment of any of NATO's heavy, wide-bodied support aircraft. An AEF deployment is possible, and proximity to the Red Sea will facilitate replenishment.

---

<sup>87</sup>R1 = 13,288 × 147 feet with an LCN of 55; and R2 = 11,778 × 147 feet with an LCN of 60.

<sup>88</sup>R1 = 10,991 × 148 feet with an LCN of 110; and R2 = 10,007 × 148 feet with an LCN of 110.

Prince Mohammed Bin Abdulaziz (35) is also a joint-use airfield that is located 93 miles east-northeast of the Red Sea port city of Yanbu and roughly 580 nautical miles from Baghdad, outside the projected range of both Iraqi and Iranian TBMs. It is an excellent all-weather airport with two good 10000-foot-plus runways<sup>89</sup> and ample open ramp and apron space (2.3 million square feet). The airfield is not specifically configured to support military operations, however, and little of the standard infrastructure is in place. The facility can support large-scale operations, but deployment of a full airfield support team would be required, plus materiel-handling equipment (MHE). This airfield represents an excellent redeployment base when additional depth is required.

Taif (38, also known as King Fahd Airbase) is a joint-use airport with a large permanent military component, four fighter squadrons (F-5 and F-15), two transport squadrons, and a search-and-rescue (SAR) squadron. It is located in southwest Saudi Arabia 75 miles east of the port city of Jeddah, roughly 80 miles from the King Abdul Aziz airfield (14). Its proximity to the Red Sea port of Jeddah will facilitate replenishment from the sea. Taif is located more than 700 nautical miles from Baghdad and outside the projected range of both Iraqi and Iranian TBMs. The airfield has two 10,000-foot-plus hard-surface runways<sup>90</sup> and more than 4.5 million square feet of open ramp and apron space. The military side of the airfield is dedicated to fighter operations, supporting U.S.-produced aircraft. Its military infrastructure is in place and includes ammunition storage, fuel storage and service, hangars and aircraft bunkers, barracks, mess facilities, and security. To support NATO deployment, security would need upgrading, as would life support facilities—including housing, feeding, medical, and administrative areas. On-base fuel storage is also limited and would have to be supplemented with temporary storage. The U.S. Air Force has run extended operations from Taif.<sup>91</sup> The

---

<sup>89</sup>R1 = 12,631 × 147 feet with an LCN of 77; R2 = 10,007 × 147 feet with an LCN of 93.

<sup>90</sup>R1 = 12,254 × 148 feet with an LCN of 115; R2 = 10,991 × 148 feet with an LCN of 115.

<sup>91</sup>See Senior Airman Monte J. Volk, "ACC Commander Visits Base in Saudi Arabia, Addresses Troops," *Air Force News*, October 7, 1997, available at [http://www.af.mil/news/Oct1997/n19971007\\_971265.html](http://www.af.mil/news/Oct1997/n19971007_971265.html).

airfield is capable of sustained fighter operations<sup>92</sup> and with some added facilities would be capable of sustained heavy operations by at least one AEF.

King Khalid Airbase (39) is a joint-use airfield that is located in the far southwestern corner of Saudi Arabia. It is 900 nautical miles from Baghdad and is also outside projected Iranian TBM range. The airfield is a major fighter operational and training base, primarily for F-15s and Tornados. It has two long hard-surface runways (R1 and R2 = 12,467 × 148 feet, LCN 66) and more than 3.8 million square feet of ramp and apron space. The base also has in place a significant military infrastructure, including fuel storage, ammunition storage/bunkers, and aircraft hangars and bunkers. Life support facilities are limited, however, and would have to be supplemented. King Khalid is well equipped to support fighter operations and could handle all U.S. or coalition combat and support aircraft. The airfield could support the deployment of an AEF or two and is capable of sustained, high-tempo operations.

## Syria

In the current political environment, the United States and NATO are not likely to be granted long-term access to Syrian military or commercial airfields. Although unlikely, it is possible that within the next decade the political and security environment may change significantly and such access may be plausible.

Syria's military infrastructure has not received significant attention or funding over the past few years, and its acquisition of combat systems was essentially halted with the collapse of the Soviet Union.<sup>93</sup> The armed forces have not purchased any new combat aircraft since the mid-1980s. The military is pushing for the purchase of new weapon systems, but its efforts remain constrained by the

---

<sup>92</sup>It can also support operations by large, wide-bodied aircraft (C-5 or KC-10).

<sup>93</sup>A \$10 billion to \$12 billion debt owed to Russia remains a serious obstacle to renewed arms sales from Moscow, although negotiations continue despite strong objections by both the United States and Israel. See Blanche, "Shifting Sands, Changing Prospects," p. 35.

state's economic problems, which are not likely to be resolved over the next several years.

Strategically, Syria is on Iraq's western border, and direct access from staging bases in Syria to the northern and central sectors of Iraq is therefore possible.<sup>94</sup> Twenty-two airfields in Syria meet our minimum criteria, six of which have operational runways longer than 10,000 feet. However, few of these Soviet-designed airfields have the expansive parking space common to airfields in other regional states. Moreover, these airfields support Soviet/Russian aircraft operations and generally are not as well prepared to manage the deployment of Western aircraft. Nonetheless, we have identified one first-tier airfield in Syria (Tiyas Airbase, 17 in Figure 2.3) and three second-tier airfields (Damascus International, 40; Dumayr, 41; and Tabqa, 42).

Tiyas Airbase is located in central Syria some 350 nautical miles from Baghdad within the projected range of Iraqi TBMs. The facility is a military airbase that was constructed to support fighter and fighter-bomber operations. Two fighter squadrons (MiG-25/Foxbat), two fighter-bomber squadrons (Su-24/Fencer and Su-22/Fitter), and a training squadron are stationed there. The airfield has one 10,410- × 197-foot hard-surface runway with an LCN of 50, a secondary 10,098- × 184-foot graded-earth runway, and more than two million square feet of open ramp and apron space. If necessary, the hard-surface runway could be extended up to 6000 feet and the available parking space expanded. The military infrastructure at Tiyas is in place; there are military barracks and mess halls both at the airfield and at a separate billeting area off base. The stationed units occupy most if not all existing housing space, and any U.S. or coalition air and support crews deployed would thus have to be bivouacked. There is also an estimated 1.1 million gallons of fuel storage capacity at the base. However, the available fuel is intended for Soviet/Russian-manufac-

<sup>94</sup>Syria is strategically located to support U.S. or coalition operations in the event of another conflict with Iraq. First, there is direct access to Syria and its airbase from the Mediterranean. All of Syria's airbases are along major LOCs and within reasonable driving distance of one of the country's sea ports. Second, operations from Syria do not require overflight rights, since direct access to Iraqi airspace is possible. Third, several of the airfields are capable of supporting an AEF deployment. On the negative side, all airbases in Syria are potentially within range of Iraqi TBMs, especially if they are operating from mobile launchers in west central or northwestern Iraq and near the Syrian border.

tured combat aircraft and thus may not be of sufficient quality to be used over an extended period of time with U.S. and other Western high-performance aircraft.<sup>95</sup> The base can support either logistics or combat operations. The facilities are adequate to support up to 80 to 90 additional combat aircraft and could handle an AEF with the exception of strategic tankers. Base support personnel are not trained or equipped to service Western-type aircraft, so all such personnel and equipment support would have to deploy along with the AEF.

Damascus International (40) is Syria's international air terminal, and thus the facility should not be used to support combat operations unless no other viable option is available. The airport is located just 13 miles southeast of Damascus within easy access of Syria's principal LOCs and roughly 110 miles southwest of Tiyas. It is approximately 400 nautical miles from Baghdad and within the projected range of Iraqi TBMs. The airfield has a military side that is principally used by the Syrian military's air transport units (troops and cargo). It also has two excellent hard-surface runways,<sup>96</sup> more than 3.5 million square feet of existing parking space, and unlimited room for expansion. The airfield can handle jumbo jets and large cargo

---

<sup>95</sup>At least two types of concerns are associated with operating from a Soviet-style field that is supporting older-model Russian aircraft. The first concern centers on the quality of the available jet fuel. Late-model U.S. combat aircraft have computer-controlled fuel management and metering systems that are optimized for JP-8 fuel. In addition, these aircraft require fuel with specific types of anti-icing and other additives. Thus, it is quite possible that available fuel will not meet all of the requirements for long-term use in U.S. jets. On a one-time emergency basis, U.S. combat aircraft can use almost anything that will burn. After the emergency flight, however, the fuel system will likely have to be purged and all of its filters changed. In addition, fuel quantity gauges are set to measure quantities of specific types of fuel and may not show the correct amount of fuel on board if a different type of fuel is used.

There is also a concern about the condition of the storage tanks and impurities in the fuel and about water seepage into underground tanks. The problems created here would be similar to those outlined above.

These problems should be a lesser concern at dual-use airfields that also support international commercial aircraft, as the quality of fuel required by commercial jets is acceptable for high-performance Western combat aircraft. These problems can be overcome but may require the delivery of fuel and storage bladders to the site.

<sup>96</sup>R1 = 11,810 × 148 feet with an LCN of 120; and R2 = 9843 × 148 feet with an LCN of 120.

shipments as well as any U.S. or coalition transport, support aircraft, or combat aircraft.<sup>97</sup>

Dumayr (41) is considered one of the best and most important military airbases in Syria. The airfield is located roughly 20 miles northeast of Damascus and some 385 nautical miles from Baghdad within range of projected Iraqi TBM capability. Fighter, fighter-bomber, and reconnaissance squadrons are stationed at Dumayr. The airbase has good support facilities and hangarage dispersal for fighter aircraft. Its main runway is  $10,335 \times 150$  feet with an LCN of 39, which can support any NATO fighter, fighter-bomber, and most transport aircraft (with the exception of C-5, KC-10, and KC-135). Although the airfield's hard-surface ramp and apron space is limited to 450,000 square feet (about one-third of optimum for our notional AEF), the base's secondary graded-earth runway could supplement its parking and storage space, providing an additional 1.7 million square feet.<sup>98</sup> There is also room to expand the parking space, and the secondary runway could be paved as well. Airfield security is good, as the field has a double-coiled barbed-wire perimeter fence, security points and patrols, and several air defense sites nearby. Barracks, mess facilities, and a bivouac area are also available. Fuel storage is available as well, but the quality of the Soviet/Russian-grade aviation fuel is suspect. The base and its personnel are equipped to support a range of MiG aircraft, so support personnel and equipment would need to be deployed for any Western aircraft operating out of this facility. Estimates are that the field could support three fighter and two transport squadrons, but limited parking and a low LCN would preclude the deployment of a complete AEF.

Tabqa (42) is located in northeastern Syria only 325 nautical miles from Baghdad, within range of projected Iraqi TBMs. The installation is a fighter base with a good operational runway ( $9842 \times 131$  feet with an LCN of 67). Its characteristics are essentially those outlined for Dumayr. It also suffers from a lack of parking space and concern over the quality of the fuel and fuel storage facility. It could not sup-

<sup>97</sup>Estimates are that the existing aprons can handle roughly 20 wide-bodied airlifters or three squadrons of tactical aircraft. The airfield can also handle U.S. strategic tankers.

<sup>98</sup>It is unlikely that the graded-earth surface would be acceptable for U.S. high-performance combat aircraft or heavy lifters.

port the deployment of a full AEF but could handle a fighter and a tactical transport squadron.

## Turkey

Turkey's strategic significance is underscored by its geostrategic position, which bridges Europe with the Middle East, the Caucasus, and, by extension, the broader Caspian Basin. With the close of the Cold War, Turkey has seen a dramatic change in its security environment and security agenda. Since the demise of the Soviet Union, Turkey's security concerns have focused increasingly on the Middle East and, to a lesser degree, on the volatile regions of the former Soviet Union. Although Russia is still of residual concern, it is no longer perceived as the direct military threat it once was,<sup>99</sup> and developments in Iraq, Syria, and Iran are now regarded as a more important security concern. The Gulf War and its demonstration of how new technologies were making Turkey more vulnerable to threats from this region reinforced the relevance of this emerging security emphasis.<sup>100</sup> Turkey actively supported the Gulf War and provided coalition forces access to a number of its military facilities, with several NATO air forces conducting combat operations over Iraq from Turkish airbases.

<sup>99</sup>Over the past two and one-half centuries, Turkey and its predecessor, the Ottoman Empire, fought more than a dozen wars with their northern neighbor, Russia. With the demise of the Soviet Union, however, Turkey finds itself for the first time in centuries without a common border with some form of the Russian empire. The "corrosion" of the Russian military has also reassured the Turks. Concerns over Russian security policy now appear to be more concentrated on Russian ambitions in the Caucasus and Central Asia. For a detailed discussion of Turkey's foreign policy developments and security concerns, see Alan Makovsky, "The New Activism in Turkish Foreign Policy," *SAIS Review*, Winter-Spring 1999; Zalmay Khalilzad, Ian O. Lesser, and F. Stephen Larrabee, *The Future of Turkish-Western Relations: Toward a Strategic Plan*, Santa Monica: RAND, MR-1241-SRF, 2000, pp. 21-23; and F. Stephen Larrabee, "U.S. and European Policy Toward Turkey and the Caspian Basin," in David C. Gompert and F. Stephen Larrabee (eds.), *America and Europe: A Partnership for a New Era*, New York: Cambridge University Press, 1997, pp. 166-190.

<sup>100</sup>See F. Stephen Larrabee, "U.S. and European Policy Toward Turkey and the Caspian Basin," in Robert D. Blackwell and Michael Sturmer (eds.), *Allies Divided: Transatlantic Policies for the Greater Middle East*, CSIA Studies in International Security, Cambridge, MA: MIT Press, 1997, pp. 145-148.

In addition, the reemergence of the Caucasus and Central Asia "has given a new geopolitical dimension to Turkish policy," and Turkey is trying to expand its political, economic, and military links with several states in these regions. The United States is encouraging and supporting a number of Turkey's initiatives in this direction.<sup>101</sup>

Turkey continues to be a leading recipient of U.S. arms,<sup>102</sup> assistance, and training. Although Turkey's foreign and strategic policy concerns have expanded and its relations with Europe have been strained since the close of the Cold War, the country remains firmly allied with the West through its membership in NATO and its close ties with other European institutions.<sup>103</sup> The Turkish military is well integrated into the Alliance, participates in its exercises, supports its Partnership for Peace initiative, and recently supported its military operations against Yugoslavia.

Turkey continues to support U.S. and NATO no-fly operations over northern Iraq, although with some reservations that have periodically limited the conduct of air operations staged from that country. Turkey is highly sensitive to the effect that any future participation in a U.S.-sponsored Gulf contingency might have on its relations with its Middle East neighbors, especially as energy resources from the region become more important to Ankara's security and prosperity. However, Turkey does not appear to have significant disagreements with Washington's regional goals, and if hostile military actions on the scale of Iraq's invasion of Kuwait occur or are threatened, Turkey will probably support U.S. initiatives and provide access to its facilities. If the situation is more ambiguous, Turkey will be much more reluctant to become directly involved unless important Turkish interests are directly threatened.

---

<sup>101</sup>See Khalilzad, Lesser, and Larrabee, *The Future of Turkish-Western Relations: Toward a Strategic Plan*, pp. 25-31.

<sup>102</sup>Because Turkey's economy is weaker than those of other NATO members, the United States has long provided Ankara with grants and loans to finance the purchase of new American weapons and has given the government large quantities of "surplus" used weaponry.

<sup>103</sup>See Larrabee, "U.S. and European Policy Toward Turkey and the Caspian Basin," pp. 145-148.

A total of 42 airfields across Turkey meet our minimum criteria. Although numerous, only a few are close enough to support operations in the greater Middle East and the Caspian Basin. With two exceptions, we have focused on those airfields that are located in the eastern half of the country and are closest to Iraq and Iran (see Figure 2.8). Twenty of these fields are assessed as possible deployment bases, and of these four are identified as first tier: Cigli Airbase (20 in Figure 2.8), Diyarbakir (21), Erzurum (22), and Incirlik (23). Four more are judged to be second-tier: Antalya (45), Batman (46), Erhac (47), and Mus (48).

Because of its NATO membership and strategic location, Turkey will play a critical role in any Middle East or Caspian Basin contingency. It is located on the northwestern fringe of both regions and provides an excellent operational base from which to project military power into either of these regions. For tactical operations, the six airfields in the eastern half of the country—highlighted in Figure 2.7—are all excellent facilities from which NATO air forces can effectively operate.

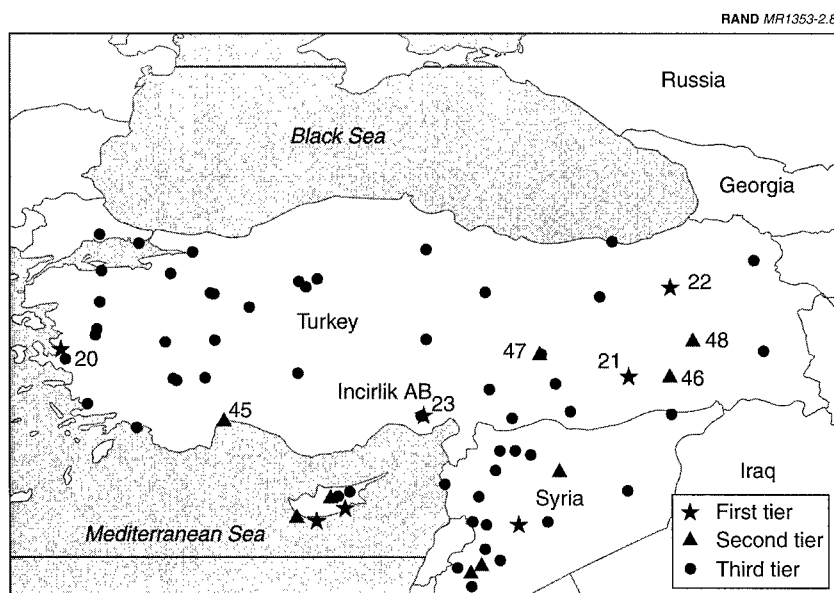


Figure 2.8—Airfields in Turkey That Meet Our Criteria

Incirlik Airbase (23) is the most important U.S. Air Force deployment airfield in Turkey and is the only established forward deployment base for USAFE in the region. The airbase is in southeastern Turkey near the city of Adana and is roughly 500 nautical miles from Baghdad across Syrian airspace, outside the projected range of Iraq's TBMs. During the Gulf War, the U.S. Air Force conducted high-tempo combat operations against northern and central Iraq from Incirlik, and air operations in support of Operation Northern Watch are currently being run out of this installation.<sup>104</sup> Incirlik is solely a military airbase, with two excellent hard-surface runways<sup>105</sup> and more than 2.4 million square feet of open, hard-surface ramp and apron space. The U.S. Air Force is the long-term tenant<sup>106</sup> and has ensured that the military infrastructure is adequate to support AEF-size deployments.<sup>107</sup> Incirlik is capable of supporting 24-hour, all-weather operations, and available facilities can support two squadrons of fighter-bombers. With some support equipment and personnel plus ups, the airbase can support a combined wing with more than 100 aircraft. The one drawback is that Incirlik is not the most convenient Turkish airbase from which to support operations over Iraq by virtue of its geographic location. Without clearance to fly through Syrian airspace, all operational missions must travel from Incirlik approximately 250 nautical miles east in Turkish airspace before they can turn south and cross the Turkish-Iraqi border.<sup>108</sup> Despite this operational drawback, Incirlik remains our best planning option given U.S. operational control and its excellent facilities.

<sup>104</sup>The headquarters for the U.S. 39th Air and Space Expeditionary Wing and for the Combined Task Force Operation Northern Watch is at Incirlik Airbase. U.S., British, and Turkish air force units rotate in and out of Incirlik in support of the task force. The mission has been supported by a combination of combat aircraft, including U.S. F-15s and F-16s, British Jaguars and earlier Tornados, and Turkish F-4Es.

<sup>105</sup>R1 = 10,000 × 148 feet; R2 = 9000 × 148 feet. Both runways have an LCN of 80.

<sup>106</sup>Although the Turkish Air Force is joint manager of the installation, it has no aircraft stationed there.

<sup>107</sup>All preferred NATO navigational equipment and communications are in place. There is existing fuel storage capacity for nearly three million gallons of aviation fuel, ammunition storage, and more than 50 aircraft bunkers. The base can support all NATO combat, transportation, and support aircraft. See "Reserve Units Pick Up Support of AEF 8."

<sup>108</sup>In fact, both Diyarbakir (21) and Erzurum (22) are closer to the Iraqi border and to the potential TBM threat. In addition, both are dual-use airfields, and both are capable of supporting high-intensity combat operations.

Diyarbakir (21) is a joint-use airfield in southeastern Turkey. The airfield has a single hard-surface runway (11,644 × 150 feet with an LCN of 75) and more than 1.2 million square feet of open ramp and apron space.<sup>109</sup> F-16s were forward based at Diyarbakir during the Gulf War. Diyarbakir currently supports two Turkish F-16 squadrons and has hosted NATO deployments and training in the past. The airfield has good military support infrastructure, with ammunition storage, a hangar, aircraft bunkers, and limited on-base barracks and mess facilities. There is, however, room to set up a bivouac area. Diyarbakir is located 220 nautical miles east of Incirlik and provides a shorter, more direct flight path into Iraq, northern Iran, the Caucasus, and the Caspian Basin (although the latter assumes airspace clearance from Armenia and Azerbaijan or Iran). It is less than 400 nautical miles from Baghdad and within projected range of Iraq's longest-range TBMs. The base could support the deployment of an AEF, but supplementary airfield and aircraft support units would have to be deployed early on.

Erzurum (22) is an excellent fighter and fighter-bomber deployment base in northeastern Turkey. The base is just over 400 nautical miles from Baghdad and provides good access to northern Iran, the Caucasus, and the Caspian Basin (with the same overflight requirements noted above). It is on the outer edge of projected Iraqi TBM capability. The airfield is a regional commercial airport and handles passenger and cargo flights by midsize aircraft. It has two 12,000-foot-plus runways with an LCN of about 65. At only 98 feet, R1 is narrow, which will limit its support of military operations. Moreover, the base does not support permanently stationed Turkish Air Force units, and the existing military infrastructure is limited, as is the open parking space of only 300,000 square feet, but this could be expanded significantly if all or part of R1 was used for parking. However, the airfield can handle most NATO aircraft except C-5s, KC-10/135 tankers, and large bombers. The field could thus be used as a secondary deployment base and could support 45 or more tactical combat aircraft as well as a small number of C-130s, C-141s, or C-17s.

---

<sup>109</sup>A separate military ramp at Diyarbakir would help isolate moderate-level military operations from the airfield's commercial operations. If high-tempo military operations are conducted from Diyarbakir, however, they will disrupt normal commercial traffic and operations.

The airfield could not handle deployment of a full AEF and keep both runways open to support operations, as R1 would have to be used for parking space.

Antalya, Batman, Erhac, and Mus are all second-tier airfields in Turkey. Antalya (45) is a NATO rotational fighter base that frequently hosts the deployment of, and provides training support for, NATO air units. The base has two excellent hard-surface runways<sup>110</sup> and more than 3.8 million square feet of open ramp and apron space. Antalya is an international airfield with a military side and a few permanently stationed military units. It can accept all NATO tactical combat and airlift aircraft and could easily host an AEF. The drawback is that this base is roughly 200 nautical miles west of Incirlik and more than 700 nautical miles from Baghdad. All fighter or fighter-bomber sorties from Antalya into either Iraq or Iran would thus be of extended duration and would require aerial refueling. However, the size and capabilities of this base make it an excellent backup combat option as well as a superior support installation.<sup>111</sup>

Batman (46) is well located in southeast Turkey and is closer to Iraq than either Incirlik or Diyarbakir (42 miles east of Diyarbakir). Although its proximity to the target area (some 320 nautical miles from Baghdad) improves the possible sortie rate, airbase security would be a major concern, as Batman is within range of projected Iraqi TBMs and is located in the volatile Kurdish region of the country. Batman has a single 10000-foot-plus hard-surface runway and the necessary military infrastructure. The base supports Turkish and NATO fighter training. Its runway can handle all NATO tactical combat and most transport aircraft, but its limited ramp and apron space (approximately 500,000 square feet) would be a constraint. Batman could handle the deployment of 30 to 35 fighters but would require some upgrades to support sustained air operations.

Erhac (47) is roughly 100 nautical miles closer to Baghdad than Incirlik (about 450 nautical miles from Baghdad) and is outside the projected range of Iraqi TBMs. Erhac is a NATO main operating base that supported air operations during the Gulf War and is also fre-

<sup>110</sup>R1 = 11,155 × 148 feet with an LCN of 80; R2 = 9809 × 148 feet with an LCN of 45.

<sup>111</sup>This airport is capable of handling 20 or more flights per hour and routinely handles jumbo jets and large cargo aircraft.

quently used to support NATO deployments and training. It is a major Turkish fighter base (three squadrons) and has a single 10,000-foot-plus hard-surface runway (10,990 × 148 feet with an LCN of 50). The base has a good military infrastructure and can support all NATO tactical combat and transport aircraft. Although its ramp and apron space is less than desired (800,000 square feet), the field could effectively support a combined European air unit or part of a U.S. AEF.

Mus (48) is also located in southeast Turkey roughly 50 nautical miles north and east of Batman. This is a joint military/civilian airfield that has two hard-surface 11,000-foot-plus runways.<sup>112</sup> R2 is extremely narrow and would have only limited military utility, but if it were closed it could add more than 850,000 square feet of ramp and apron space. Mus is a highly capable fighter and fighter-bomber base that can support all of NATO's tactical combat and transportation aircraft. The base is approximately 350 nautical miles from Baghdad and within the projected range of Iraq's TBMs. It can support an AEF (minus strategic tankers) and would be a good backup field.

### United Arab Emirates

The UAE is strategically located, straddling the Straits of Hormuz and bordering both the Persian Gulf and the Gulf of Oman (see Figure 2.9).<sup>113</sup> In response to potential threats—notably Iranian attempts at intimidation—the UAE continues to improve its military capabilities<sup>114</sup> and expand its security ties with the United States and other Western countries. In support of Operation Southern Watch, the UAE is allowing tankers to operate from its bases.<sup>115</sup>

---

<sup>112</sup>R1 = 11,647 × 148 feet with an LCN of 50; R2 = 11,647 × 74 feet with an LCN of 50.

<sup>113</sup>Use of the UAE port at Fujairah on the Gulf of Oman allows logistical support to reach destinations on the Persian Gulf by high-speed highway without requiring seaborne transit through the Straits of Hormuz.

<sup>114</sup>The UAE is currently midway through a ten-year arms procurement program that calls for the acquisition of \$15 billion worth of military equipment by 2005. See Blanche, "Shifting Sands, Changing Prospects," p. 33.

<sup>115</sup>See John A. Tirpak, "Airpower in the Gulf: 10 Years Later," *Air Force Magazine*, January 2001, p. 28.

The UAE is a major purchaser of arms from a number of Western suppliers, principally U.S., British, and French firms. The backbone of the UAE's future air force will be a combination of the U.S. F-16,<sup>116</sup> the British Hawk (ground attack), and the French Mirage. The UAE's acquisition of the F-16 breaks into what had previously been an almost exclusively French market and will help standardize the front-line air components of the GCC states, thereby facilitating their integration with U.S. air forces in any future regional contingency.<sup>117</sup> As the new aircraft filter into the UAE's air force, an increase in U.S. and European military presence in the country (e.g., trainers, technicians, and advisers) will result. There will also be an increase in the number of UAE Air Force personnel who will be trained in the West. To accommodate this force modernization, the UAE Air Force has been upgrading its military and joint-use airfields as well.

In response to Iraq's invasion of Kuwait, the UAE actively participated in the conflict and assigned more than 4000 troops and 50 Mirage aircraft to the coalition.<sup>118</sup> UAE facilities were also used to support deploying coalition forces. Although the UAE is not a friend of sanctions,<sup>119</sup> it generally supports U.S. regional policy and a strong

<sup>116</sup>On September 16, 1999, the Pentagon announced a potential \$2 billion sale to the UAE of thousands of aircraft missiles, bombs, and ammunition to support a sale of 80 F-16 Block 60 aircraft announced earlier in 1999. The proposed buy includes a host of advanced missiles: 491 AIM-120B AMRAAMs and 12 training missiles; 267 AIM-9M A/2 Sidewinder missiles and 80 training missiles; 163 AGM-88 high-speed antiradiation missiles and four training missiles; 1163 AGM-65D/G Maverick missiles and 20 training missiles; and 52 AGM-84 Harpoon missiles. The UAE will be the first country bordering the Persian Gulf to possess AMRAAMs, the U.S. Air Force's top air-to-air weapon.

The Pentagon news release indicated that "the proposed sale of the weapons and munitions will strengthen the UAE as a potential coalition partner, reducing the dependence on U.S. forces in the region while enhancing any coalition operations the U.S. may seek to undertake." The Pentagon added that "the UAE wants to pattern their newly expanding air force on the USAF model, and wants to be seamlessly included in any future coalition efforts with U.S. forces."

<sup>117</sup>See Blanche, "Shifting Sands, Changing Prospects," pp. 33-34.

<sup>118</sup>See Watson, *Military Lessons of the Gulf War*, pp. 226-241.

<sup>119</sup>It should also be noted that very few countries are friends of the sanctions. The UAE has noted a growing concern over the "deteriorating" condition of the Iraqi population, resulting in calls from within the emirates for relief from the sanctions. In October 1995, the UAE finally broke ranks with the GCC, calling for sanctions to be lifted, and in January 1996 the UAE was the first Gulf state to break the embargo and send medical and food supplies to Iraq. The UAE's most recent efforts to lift the eco-

U.S. presence in the region. The UAE is probably more hostile to Iran at the moment than any other Gulf ally, primarily because of Iran's control of the disputed Abu Musa and Tunb Islands. The UAE will not routinely support U.S. or NATO regional policy, especially military actions. However, if Iraq or any other regional actor initiates offensive actions or in some other manner directly threatens regional stability, the UAE will probably provide access to its facilities as long as there is strong Gulf-state backing for Western military action.

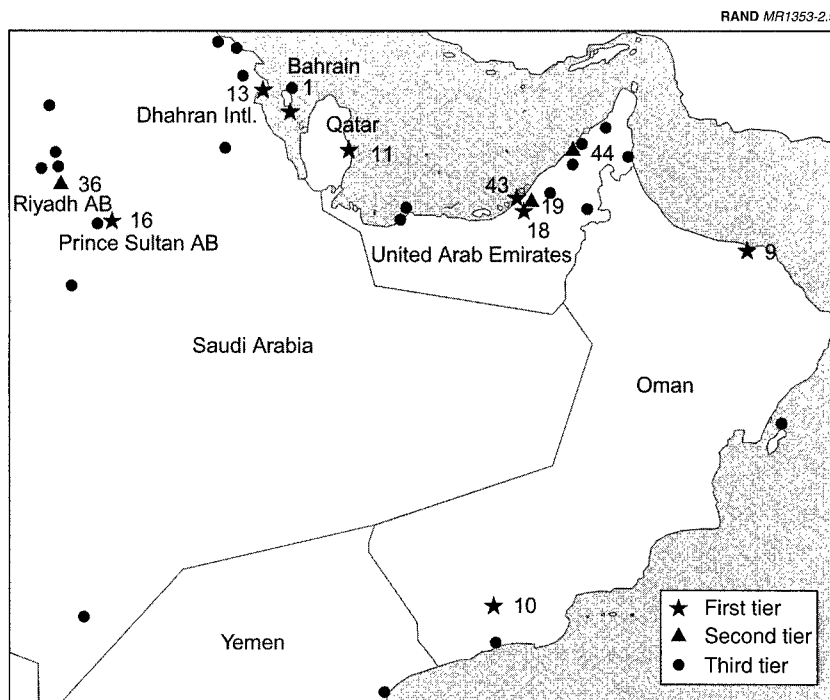


**Figure 2.9—Possible Deployment Airfields in the UAE and Oman**

conomic embargo should not, however, be seen as a sanction of Iraq's regional policy; rather, it underscores the UAE's willingness to take an independent course even in opposition to its allies.

The UAE has 12 airfields that meet our minimum operational criteria. Two of these fields, Al Dhafra (18 in Figure 2.9) and Bateen (19) have been identified as first tier, and two—Abu Dhabi International (43) and Dubai International (44)—have been identified as second tier. All facilities in the UAE are close to the Persian Gulf and can be resupplied by sea. They are roughly 750 nautical miles southeast of Baghdad and outside the projected range of Iraqi TBM systems, but their proximity to the Iranian coast would make them vulnerable to attack in the event of any combat operations conducted against Iran.

Al Dhafra (18) is the only dedicated military airbase in the UAE, and it is a major GCC deployment and training base. The airfield has a single 12,000-foot-plus runway<sup>120</sup> and more than five million square feet of open ramp and apron space. The UAE has approximately two squadrons of fighters and another squadron of trainers stationed at Al Dhafra. The airbase has all of the military infrastructure in place, including ordnance storage bunkers, aircraft bunkers and hangars, fuel storage areas, barracks and mess facilities, a fenced perimeter, roaming security, and a few anti-aircraft artillery (AAA) sites around the field. Al Dhafra is an excellent logistics support facility and can support high-tempo air logistics operations by any of NATO's airlifters or large, wide-bodied commercial passenger or cargo aircraft. The base could support combat operations as long as an aerial support team was deployed along with the combat aircraft to manage and support ground operations.

Bateen (19) has been replaced by a new international airport for civilian flights and is now being used primarily by the small Abu Dhabi Air Force as its headquarters, training site, and principal deployment base. On the commercial side, the airfield is still being used as a freight terminal and routinely handles large, wide-bodied cargo aircraft. Bateen has a single hard-surface 10,499- × 150-foot runway with an LCN of 80 and more than 1.5 million square feet of open ramp and apron space. Like Al Dhafra, Bateen has a well-developed military infrastructure, can accommodate large numbers of passenger and cargo craft, and could support high-tempo logistics

---

<sup>120</sup>R1 = 12,057 × 150 feet with an LCN of 75.

and passenger operations. It is located along the key LOCs leading north into Saudi Arabia and Kuwait. If necessary, the base could support combat operations by an AEF, but predeployment of a ground support package would be necessary. Bateen is located near a Persian Gulf seaport and can easily be replenished from the sea.

The two second-tier fields, Abu Dhabi (43) and Dubai (44), are both international airports that service both passenger and cargo operations. Abu Dhabi International is a new commercial field that has replaced Bateen and is located 10 miles east of it. Abu Dhabi has a 13,452- × 147-foot, main runway with an LCN of 118 and more than 3.4 million square feet of apron and ramp space. It was built as a commercial field and has none of the expected military infrastructure. Although the airfield is not optimized to support combat operations, it could support a heavy transportation or tanker squadron without interfering with normal operations.<sup>121</sup>

Dubai International is a major regional commercial airport, but it has supported major logistics operations in the past. The airfield has a single 13,124- × 150-foot hard-surface runway with an LCN of 120 and more than 6.2 million square feet of open apron and ramp space. Construction is under way on a second parallel runway and taxiway. Based on available space, we estimate that this airfield could accommodate some 15 C-5s, 80 C-130s, 50 C-17s, or more than 300 fighters and will accommodate more when the second runway is completed. It is a commercial field and does not have the normal military infrastructure. It could easily support an AEF but would require predeployment of an aerial support package as well as security personnel to supplement the host-nation security personnel on the perimeter.

## Yemen

Because of its lingering connections with Saddam Hussein's regime, Yemen remains relatively isolated from its Arab neighbors. Although Yemen's government has begun unifying power, experimenting with

---

<sup>121</sup>Such operations do not demand unusual infrastructure support or place impossible demands on a commercial airfield. This is especially true of transport operations, which are similar to the cargo operations routinely conducted at the airfield.

democratic processes, and trying to rebuild relations with its neighbors, the country's economic and social situation remains unstable and until it normalizes relations with its neighbors, prospects for improving its domestic circumstance remain faint. Because of limited resources, Yemen's armed forces remain dependent on financial aid, equipment, and support from abroad. The U.S. military's nascent efforts to incorporate Yemen into its regional military engagement program<sup>122</sup> with ship visits and refueling stops, will likely be set back by the terrorist attack on the U.S. destroyer *Cole* in the Port of Aden.<sup>123</sup> The attack on the USS *Cole* and its aftermath accent the security challenges associated with any deployment to Yemen. The high-visibility deployment of an AEF, which would include the stationing of several thousand U.S. and/or allied personnel and their equipment, and the conduct of highly visible operations from Yemeni airfields, would not be a viable planning option under current circumstances.

Although nine airfields in Yemen meet our basic operational criteria,<sup>124</sup> security concerns and inconsistencies in the available data on the capabilities, as well as the expected deteriorating condition of national airfields, precludes our identification of first- or second-tier airfields. Moreover, the distance of these airfields from both Iraq and Iran (1000 to 1200 nautical miles) makes them an unlikely first option.

<sup>122</sup>General Anthony Zinni, retired CINC USCENTCOM, told a U.S. Senate panel on October 30, 2000, that "in the U.S. Central Command region there are rats' nests or havens for terrorists: Afghanistan with the Taliban; Sudan; Somalia. We don't need Yemen to become another one. We need to provide every incentive to make sure they don't." In an interview before his Senate appearance, General Zinni further stated that "if we do nothing and write these countries off, they are going to become massive sanctuaries . . . I thought we needed more engagement." See Eric Watkins, "Blind to the Danger," *Wall Street Journal Europe*, October 31, 2000.

<sup>123</sup>On October 12, 2000, the USS *Cole* pulled into the Yemeni port of Aden for refueling. During this process, two suicide bombers in an explosives-laden skiff attacked the destroyer. The explosion ripped a jagged, 40- × 40-foot blast hole at the waterline in the ship, killing 17 U.S. Navy sailors and injuring many others. There was widespread reporting on this incident; see, for example, John F. Burns, "A Maimed Destroyer *Cole* Starts for Home," *New York Times*, October 30, 2000.

<sup>124</sup>The locations of these airfields are indicated by dots on the regional map in Figure 2.3.

If access is denied elsewhere or if the operational situation has forced allied forces farther south and air units have to redeploy, two fields in Yemen do warrant consideration. Sanaa International is a joint commercial/military airfield and the home station for most of Yemen's combat aircraft. Aden International is also a joint-use field with a small permanent military contingent. Both airfields have 10,000-foot-plus hard-surface runways and sufficient apron space.

### **IRAN AS A LONG-TERM POSSIBILITY**

Although the current political climate between the United States and Iran would not give the United States or its coalition partners reason to plan force deployments to or conduct air operations from Iran, the situation may well change dramatically over the next decade. Moreover, Iran is strategically located and could be effectively used as a deployment site supporting operations—noncombat or possibly even combat—throughout the Middle East or possibly into the Caspian Basin. To support long-term planning, it is therefore prudent to survey those airfields in Iran that have 8000-foot-plus hard-surface runways and that could possibly serve as deployment bases.

As noted in Figure 2.10, Iran has 66 military and commercial airfields that meet our minimum criteria, several of which have multiple 10,000-foot-plus runways. We have categorized 29 of these airfields as first-tier and 18 as second-tier facilities.

In response to the long-standing threat from Iraq, Iran's airfields are heavily concentrated in the northwest, along or near its border with Iraq and within 400 nautical miles of Baghdad. These locations made good operational sense during the Iran-Iraq war, when many of these airfields were built, but they will likely be well within Iraqi TBM range by 2010. If the situation dictates air deployments to Iran, U.S. and allied forces would be best served under most possible contingencies by using airfields in the southwestern portion of the country or near its southern Gulf coast. These airfields appear to be the easiest to manage and resupply.

If the crisis involves conflict with Iraq, the potential Iraqi TBM threat will force coalition air planners to restrict their consideration to airfields east of the 450-nautical-mile line (Figure 2.9), further limiting the number of available deployment sites. For an Iraqi scenario, the

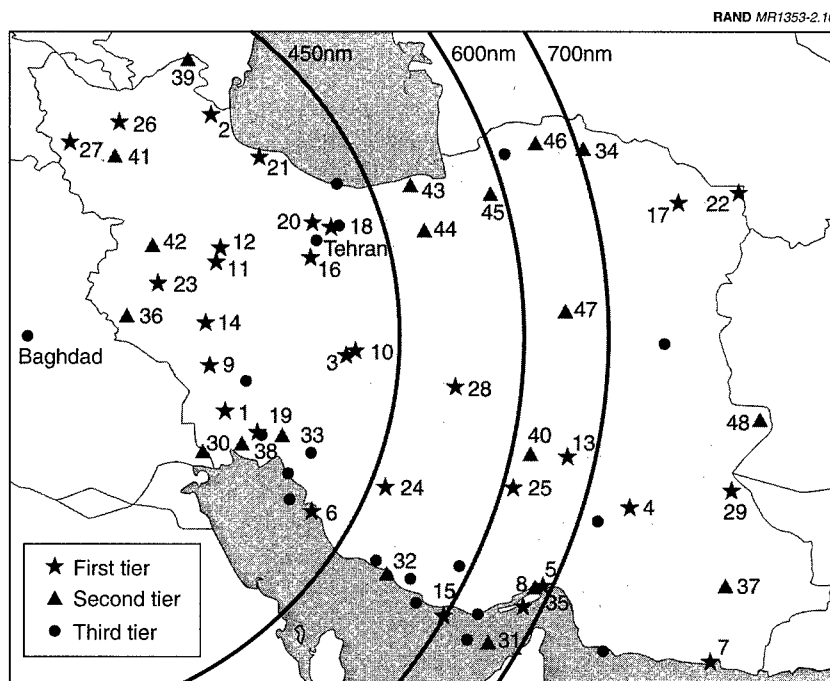


Figure 2.10—Potential Deployment Airfields in Iran

best facilities appear to be the first-tier airfields of Bandar Abbass International (5), Chah Bahar (7), and Kish Island (15). These fields are all on Iran's Gulf Coast and are easy to resupply by sea.

Bandar Abbass is a joint-use airfield that is located approximately 700 nautical miles southeast of Baghdad, outside Iraq's projected TBM range. This airfield has four active runways. Two of these runways are 11,343 × 98 feet with an LCN of 78, and the other two are 12,020 × 148 feet with an LCN of 75. The first two runways are of limited use because of their narrow width (less than 100 feet), but the other two can handle any NATO combat or support aircraft. The base appears to have only limited military infrastructure, but an AEF could be deployed if the requisite support also deployed early on.

Chah Bahar is an Iranian military airbase that has four excellent runways (two 9845- × 150-foot and two 12,517- × 150-foot, all with an

LCN of 100). This airfield appears to have all the required military infrastructure and is capable of handling all U.S. or coalition combat and support aircraft, including the wide-bodied airlifters. The base supports both fighter and transport operations and should be able to support an AEF-size deployment without any major difficulties. Chah Bahar appears to be the best overall facility for any U.S. or coalition deployment, but it is located about 900 nautical miles south of Baghdad, requiring aerial refueling for any tactical combat operations run from this base.

Kish Island is a civil airfield that is the closest of the three to Baghdad (about 600 nautical miles out) and is beyond the projected range of Iraqi TBMs. The fact that it is a civilian airfield with no permanent military contingent does present a challenge to operations but would not preclude deployment. Any deployment here would require a full airfield support package. The field routinely supports 747s and should be able to handle any NATO aircraft. The airfield has four 11,000-foot-plus runways and ample ramp and apron space but lacks any military infrastructure. Moreover, two of the runways are only 98 feet wide and are not usable by many support aircraft. The other two runways are 148 feet wide and have an LCN of 78. The airfield could effectively support the deployment of an AEF, but it would disrupt commercial operations.

The constellation of possible deployment airfields would differ significantly and, in fact, be much broader for any possible contingency into the Caucasus or Caspian Basin. There are several excellent airbases in Northern Iran that could provide effective springboards for any possible future U.S. or NATO air operations—humanitarian or combat—into the landlocked Caspian Basin.

---

## BLACK AND CASPIAN SEA REGIONS

---

For most states in the Black and Caspian Sea regions, military airfield construction closely followed the established Soviet model. An understanding of this model will therefore help us make more informed assessments of those airfields we considered. The initial section of this chapter outlines the general characteristics of this model. The second section then provides a country-by-country review of those airfields that we have identified as most capable of supporting an AEF-size U.S. and/or coalition deployment.

### GENERAL CHARACTERISTICS OF CENTRAL EUROPEAN AND FORMER SOVIET AIRFIELDS

The network of airfields in the former Warsaw Pact, Central European states, and former Soviet republics can be divided into four general categories:

- airfields operated by the national military (air force and air defense troops, navy, or army), with some of these airfields jointly servicing civilian aviation;
- airfields left by the Soviet military but no longer in operation;<sup>1</sup>
- airfields used by commercial companies; and
- airfields administered by local governments or national airlines.

---

<sup>1</sup>There were no Soviet military operating bases in Romania.

These states use two classifications for airfields:

- **Airbases comparable to NATO's MOBs.** These airfields serve as home station for squadrons from an air regiment (a unit comparable to a NATO wing).
- **Reserve airfields to be used only in an emergency or a crisis.** As with NATO's deployment operating bases, no air squadrons are permanently assigned to such facilities. Several of the local militaries do maintain caretaker-type units at such bases. Unfortunately, we do not have good data on which bases fit this latter category.

Airfields in the Black and Caspian Sea regions are generally less well maintained than those in the Middle East or NATO, and repairs are therefore needed. Several states in the area have begun to upgrade some of their military airfields to full NATO standards (including NAVAIDs, procedures, and infrastructure), but they are the exceptions. Although not standard throughout the region, most of these airfields include the following basic facilities:

- **Takeoff Runway.** The takeoff runways at the airfields in these regions are generally made either of concrete or of a composite material. Some have been repaved several times with a flexible (asphalt) and/or a cement concrete surfacing, but most have not been resurfaced since the late 1980s. The load-bearing capacity of this type of surface has been rated at 40 to 55 PCN (pavement classification number). The typical takeoff runway measures 7500 × 147 feet, but a few measure more than 11,000 feet in length. These runway parameters meet NATO requirements. One concern is that many of these fields are not marked with standard international signage.
- **Main Taxiways.** The main taxiways in the area are generally concrete and run parallel to the takeoff runway but are neither as long nor as wide as that runway, usually measuring only 40 to 50 feet in width. The main taxiway is used only for taxiing and not as an emergency landing strip. Most Soviet-designed airfields have an unpaved strip of land roughly 650 feet wide running parallel to the takeoff runway to serve this role. By contrast, NATO uses its much wider main taxiway as an emergency landing strip.

- **Connecting Runways.** Most airfields in the area have four connecting runways that are the same width as the main taxiway, measuring 40 to 50 feet.
- **Central Plane Preparation Platform.** Located centrally, this platform is used for the preflight preparation of aircraft.
- **Large Parking Hardstands.** With the exception of those fields configured for bomber, airlift, or commercial air operations, many of the airfields in the area lack hardstands suitable for parking heavy strategic transport aircraft, especially the wide-fuselage KC-10s, C-5s, or C-17s. NATO should therefore anticipate that suitable hardstands would have to be built at most military airfields before they could support traditional airlift operations or the stationing of strategic airlifters. This is especially the case if wide-bodied aircraft are expected to park in large numbers and for extended periods of time at a given field. However, if a field were used exclusively as an aerial port of debarkation (APOD) and if the aircraft were expeditiously unloaded, it would be possible to use a portion of the runway, taxiway, or even secondary runway to support the offloading and temporary storage of cargo.<sup>2</sup>
- **Airfield Infrastructure.** The Soviet and Warsaw Pact MOBs were generally built with on-base storage for general-purpose materiel and supplies, spare parts, fuel, and munitions. Structures and hangars are also in place to support the maintenance and servicing of assigned aircraft. However, it is doubtful that any of these facilities are large enough to support U.S. strategic lifters, especially the wide-bodied C-5 and C-17. Yet most if not all major military airbases are linked into the country's road and rail network, which will facilitate the movement of equipment, materiel, and personnel into or out of any airfields designated as APODs/aerial parts of embarkation (APOEs).<sup>3</sup>

<sup>2</sup>Note U.S. Air Force/Air Mobility Command (AMC) operations at Tuzla, Bosnia, and Taszar, Hungary, in support of Operation Joint Endeavor, as they are following similar procedures.

<sup>3</sup>This is the situation that deploying U.S. forces found at the Hungarian air force base at Taszar, which was effectively used as an intermediate staging base supporting NATO operations in both Bosnia and Kosovo.

## NATURE AND GEOGRAPHIC DISTRIBUTION OF AIRFIELDS

Our assessment indicates that 113 military and commercial airfields in the countries of the Black and Caspian Sea regions<sup>4</sup> have hard-surface runways longer than 7500 feet and are rated in “good or better” condition.<sup>5</sup> Table 3.1 shows where these airfields are concentrated and approximately how far they are from Baghdad in nautical miles.

Table 3.2 shows that only 17 of the airfields in these regions have runways with lengths greater than 10,000 feet, and few noncommercial airfields have the ramp/apron space needed to accommodate the full deployment of a U.S. or composite NATO AEF.<sup>6</sup>

The data on the smaller set of airfields that we have identified as first- and second-tier installations are outlined in Appendix B. For most noncommercial airfields in these regions, the information is incomplete and dated. In the Caucasus region, there are also several outstanding questions about the current operating condition of many of these airfields, and prudence would therefore suggest that an airfield survey team visit all airfields considered to be potential deployment bases.

Figure 3.1 displays where each of the airfields represented in the database in Appendix B is located. The stars in this figure represent the 17 airfields in seven countries that are categorized as first-tier airfields. First-tier airfields are those that have the best infrastructure and geographic location to support our operational requirements and whose protection requirements are considered

---

<sup>4</sup>For this study, we have restricted our assessment of airfields in the Black and Caspian Sea regions to Azerbaijan, Armenia, Georgia, and Moldova as well as the regions of Bulgaria, Romania, and Ukraine that are on or near the Black Sea.

<sup>5</sup>Standard Soviet fighter bases have runways of only 7500 feet in length, so we have cast our net a little wider and reduced the preferred length from 8000 to 7500 feet. Runways of this length are long enough for NATO’s tactical combat aircraft, but only a few of the support aircraft, such as the C-130 and C-17 tactical airlifters, can operate effectively from this shorter runway.

<sup>6</sup>As noted earlier, the most demanding aircraft for both runway length and ramp space are the heavy, wide-bodied support aircraft, especially the C-5 airlifter and KC-10 tanker.

Table 3.1  
Country Distribution of 7500-Foot-Plus Runways in the Black and Caspian Sea Regions

|            | Distance to Baghdad (nm) |     |     |     |     |     |     |      |      |      |        | Country |
|------------|--------------------------|-----|-----|-----|-----|-----|-----|------|------|------|--------|---------|
|            | 300                      | 400 | 500 | 600 | 700 | 800 | 900 | 1000 | 1100 | 1200 | Totals |         |
| Azerbaijan | 1                        | 2   | 4   |     |     |     |     |      |      |      |        | 7       |
| Armenia    |                          | 4   |     |     |     |     |     |      |      |      |        | 4       |
| Bulgaria   |                          |     |     |     |     |     | 5   | 12   | 3    |      |        | 20      |
| Georgia    |                          | 2   | 5   | 3   |     |     |     |      |      |      |        | 10      |
| Moldova    |                          |     |     |     |     |     |     | 1    | 1    |      |        | 2       |
| Romania    |                          |     |     |     |     |     |     | 6    | 4    | 3    |        | 13      |
| Ukraine    |                          |     |     |     | 12  | 10  | 15  | 15   | 13   | 7    |        | 57      |

Table 3.2  
Country Distribution of 10,000-Foot-Plus Runways in the Black and Caspian Sea Regions

| Zones      | Distance to Baghdad (nm) |     |     |     |     |     |     |      |      |      |   |  | Country Totals |
|------------|--------------------------|-----|-----|-----|-----|-----|-----|------|------|------|---|--|----------------|
|            | I                        | II  |     |     | III |     |     | IV   |      |      |   |  |                |
|            | 300                      | 400 | 500 | 600 | 700 | 800 | 900 | 1000 | 1100 | 1200 |   |  |                |
| Azerbaijan |                          |     | 1   |     |     |     |     |      |      |      | 1 |  |                |
| Armenia    |                          | 3   |     |     |     |     |     |      |      |      | 3 |  |                |
| Bulgaria   |                          |     |     |     |     |     | 1   |      |      |      | 1 |  |                |
| Georgia    |                          |     |     | 2   |     |     |     |      |      |      | 2 |  |                |
| Moldova    |                          |     |     |     |     |     |     | 1    |      |      | 1 |  |                |
| Romania    |                          |     |     |     |     |     |     | 2    | 1    | 1    | 4 |  |                |
| Ukraine    |                          |     |     |     |     | 2   | 1   |      | 2    |      | 5 |  |                |

within tolerance.<sup>7</sup> The triangles in Figure 3.1 represent the 12 second-tier airfields identified in six countries. These fields are marginally less capable than first-tier fields and could readily stand in for primary fields. The ovals are the remaining 26 fields in the region that meet the baseline criteria of a hard-surface main runway longer than 7500 feet.

Although the bulk of the airfields selected in these regions are along the Black or Caspian Sea coast, most are located at extended ranges from potential contingencies in the Middle East or the Caspian

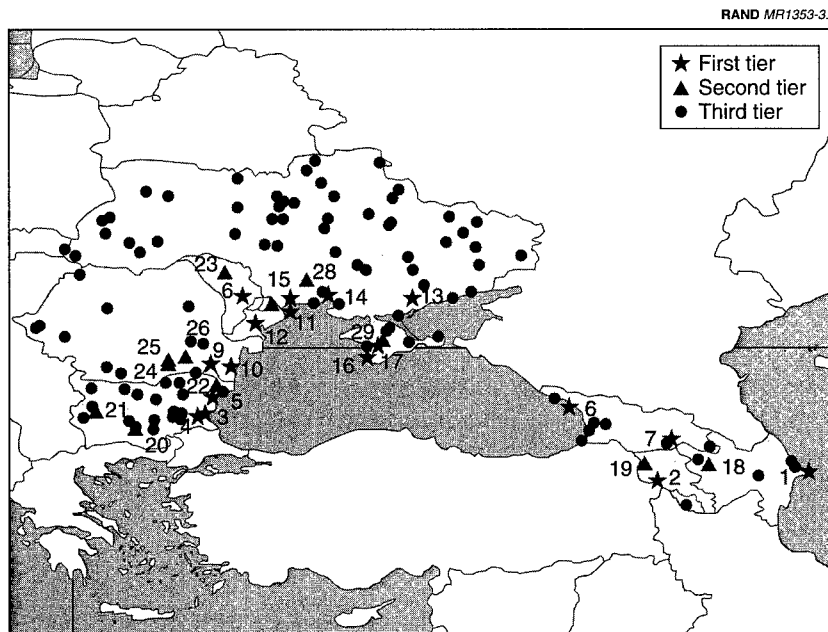


Figure 3.1—Constellation of Airfields in the Black and Caspian Sea Region with an 8000-Foot-Plus Main Runway

<sup>7</sup>We tried to select a few first- and second-tier fields in each of the countries of interest. The intent was to ensure that alternative options were available whenever possible to provide ready backup in the event that primary fields were closed to U.S. or NATO access for any number of reasons—e.g., attack damage, high threat, or political reluctance on the part of host countries.

Basin. Generally, operations from airfields in these countries would thus be considered only if the coalition did not have the required level of access to facilities closer to the crisis area. If necessary, airfields in Bulgaria, Romania, Moldova, and Ukraine could be used as intermediate staging bases to support long-range fighter-bomber, bomber, or, more likely, transportation operations into either region. Because of their location, some airfields in southeastern Ukraine, southern Russia, and the Caucasus could provide alternative deployment sites for operations in the northern quadrant of the Middle East or, if necessary, the Caspian Basin.

In general, operations from airfields in these regions will have the following characteristics:

- flight operations into the Middle East will depend on overflight clearance from one or more regional states;
- the distance to the target area will lie beyond the unrefueled operating range of most NATO tactical combat aircraft;
- daily sortie rate per aircraft will be lower than would be the case if NATO were operating from its preferred base constellation in Turkey and the Gulf states;
- more tankers will be needed in the support package;
- airfields will not be well known to NATO planners, and NATO air units will have had little if any practical experience operating from them;
- access rights will not have been negotiated or established;
- airfields will not be equipped or manned or support crews trained to sustain high-tempo operations by Western military aircraft; and
- the airfields will be built in accordance with Soviet design, will not include the traditional Western military infrastructure, and compatibility and interoperability will likely be a problem.

The points outlined above underscore many of the reasons operating ad hoc from one or more airfields in these regions will not go as smoothly as would be the case if NATO were operating from well-known and frequently visited facilities such as Prince Sultan Airbase,

Saudi Arabia. Put simply, it will take NATO air units more time to deploy to these airfields and then ramp up for sustained combat operations. Even if the political issues are quickly cleared and authorization is granted for U.S. or NATO air units to use given facilities, it will take longer to deploy the air units to these airfields because a larger support package will be needed. The support equipment, stocks, and personnel will all have to be brought in by either air or sea. This will all take additional time, with precisely how much time depending primarily on the scale of the effort, and the capabilities of host airfields.

#### **COUNTRY-BY-COUNTRY ASSESSMENT OF AVAILABLE AIRFIELDS: EASTERN EUROPE**

The states considered in Eastern Europe include Bulgaria, Romania, Moldova, and Ukraine. These states all border on the Black Sea and are strategically located between NATO and the two operational regions of concern, the Middle East and the Caspian Basin (see Figure 3.2).<sup>8</sup> These states, with the possible exception of Moldova, are trying to step further away from Russia, strengthen their relations with the United States and the West, and extend their military ties to NATO to include, if possible, NATO membership. It is therefore likely that under most circumstances these states would be predisposed to grant the United States or NATO a request for operational access to military facilities. As in Chapter Two, we will briefly outline the preferred airfield options country by country.

##### **Bulgaria**

Twenty-five airfields in Bulgaria meet our minimum criteria (see Figure 3.2), but only a few of these airfields are well situated to provide a reasonable support option for any future contingency operations in either the Middle East or the Caspian Basin. We have therefore

---

<sup>8</sup>All of these states are geographically better located to support NATO contingency operations in the Balkans. If the Balkans were the crisis region of concern in this study, we would identify a different constellation of airfields to support such operations. The airfields identified in this figure were selected because they are judged to be the best facilities to support possible future operations in either the Middle East or possibly the Caspian Basin.

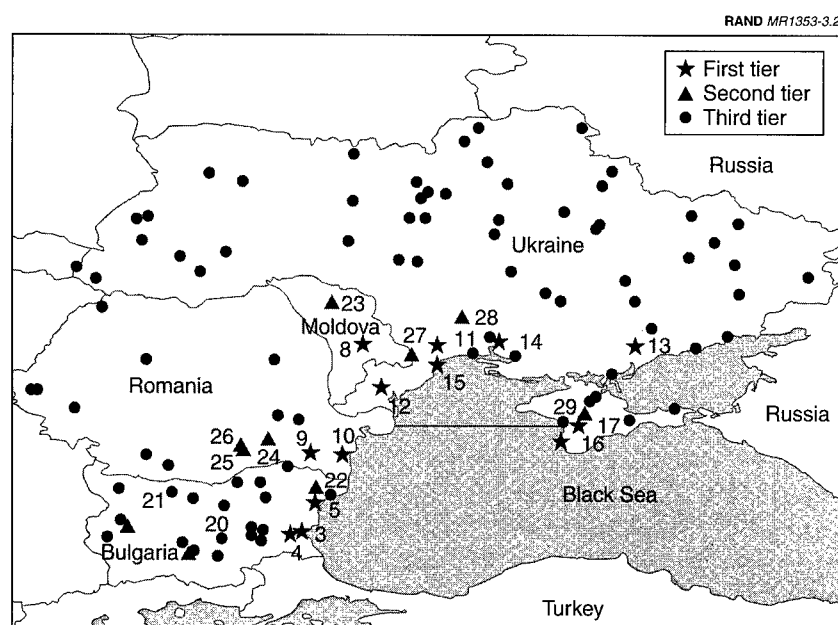


**Figure 3.2—Possible Deployment Airfields in the Central European States Bordering the Black Sea**

focused on those airfields that are near the Black Sea coast. Three airfields are thus categorized as first tier—Burgas (3), Ravnets (4), and Varna (5)—and three are classified as second tier: Plovdiv (20), Sofia (21), and Dobrich (22). Bulgaria is more than 950 nautical miles northwest of Baghdad,<sup>9</sup> and its operational bases would therefore be poor substitutes for operational bases in or closer to the crisis region. The distance to the target area would mean that any tactical operations conducted from bases in Bulgaria would be extremely long and would be characterized by a significantly reduced daily aircraft sortie rate. In short, operations from Bulgaria would not be impossible but

<sup>9</sup>This distance is as a crow flies. The actual operational distance would be much further because Syria would be unlikely to grant U.S./coalition aircraft overflight privileges, and aircraft would thus be required to fly some 200 additional miles east to cross the Turkish-Iraqi border.

would require heavy tanker support on both the out- and inbound legs as well as overflight clearance from states along the route.

Burgas (3) is the largest and most important commercial airfield in Bulgaria. It is a joint-use facility that has supported two MiG-29 fighter squadrons. Burgas has three operational runways, but only one, R1 ( $10,499 \times 147$  feet with an LCN of 75), has a hard surface. The other two runways are R2, a  $12,797 \times 492$ -foot graded-earth runway, and R3, a  $2461 \times 1139$ -foot grass runway. Despite the military presence, this airfield does not have the traditional military infrastructure necessary to support sustained combat operations. It is, however, well configured to support air cargo and aerial support operations by virtue of its more than 1.5 million square feet of available ramp and apron space<sup>10</sup> and routine civil operations. Because of its extensive passenger and cargo operations experience, Burgas should be able to support large-scale operations of this type effectively. To support high-tempo military operations, however, the airfield would need a full airfield support package and MHE, additional security, and life support facilities for deploying personnel.

Ravnets (4) is close to Burgas and is a military airbase with two fighter squadrons. The airbase has two operational hard-surface runways (R1 =  $8206 \times 167$  feet and R2 =  $7532 \times 195$  feet whose LCN is unknown but likely approximates 50). The field has only 250,000 square feet of open ramp and apron space, which is less than that needed for the deployment of a full AEF but sufficient for the 36 to 48 combat aircraft assigned to an AEF. Support aircraft could easily operate out of nearby Burgas. Ravnets is a fighter base and has in place most of the required military infrastructure, including fuel, possibly ammunition storage, hangars, and shelters. However, its fuel storage, security, and life support facilities would have to be upgraded. Moreover, since the fighters stationed there are Soviet-built, the support infrastructure would not effectively support Western airframes, and operations out of this facility would thus require the early deployment of a full air operations support package.

Varna (5) is a joint-use airfield that supports limited military operations. Although military fixed-wing aircraft do frequent the airfield,

---

<sup>10</sup>If R2 and R3 were used as additional parking space, the airfield would have another nine million square feet or more of parking space.

military units permanently stationed at Varna are currently limited to rotary-wing aircraft. The airfield has one hard-surface and one graded-earth runway measuring  $8202 \times 180$  feet with an LCN of 72 for the concrete R1. Varna has more than 2.4 million square feet of open ramp and apron space<sup>11</sup> and could support the deployment of most components of the AEF (with the exception of strategic tankers, which could operate out of Burgas).

The most capable of the three second-tier airfields in Bulgaria is Sofia (21). It is the principal civil airport servicing Bulgaria's capital, but it also supports limited military operations (a transportation squadron). The airfield has a single  $9186 \times 147$ -foot concrete runway with an LCN of 74. The airport could support large-scale logistics support operations, as such operations are common at this airport. The airfield also has good fuel storage, ample ramp and apron space (more than four million square feet), and substantial warehouse space. It is, however, roughly 150 miles east of the three first-tier airfields and thus much farther from Baghdad or other possible contingency areas.

Plovdiv (20) is located in south central Bulgaria and is another civil airfield with limited military operations. It is a possible alternate field.

Dobrich (22) is in northeastern Bulgaria near the Black Sea coast. Like Burgas and Ravnets, it is roughly 950 nautical miles northwest of Baghdad. Dobrich is a joint-use airfield with three stationed fighter/fighter-bomber squadrons. It has a single  $8202 \times 262$ -foot concrete runway with an unknown LCN—likely so. R2 is a graded-earth strip measuring  $8202 \times 262$  feet that could be used to supplement the airfield's available parking space (500,000 square feet). R2 could provide an additional 2.1 million square feet of space. Dobrich is a good alternative fighter/fighter-bomber base. Since the stationed fighters are Soviet-built, however, its infrastructure would not effectively support Western airframes, and a full support package would thus have to be deployed.

---

<sup>11</sup>Another 1.4 million square feet would be available if R2 could be used as well.

## Moldova

Only two airfields in Moldova meet our minimum criteria. These operational bases have only marginal capabilities, are more than 1000 nautical miles from Baghdad, and would be subject to the same operational constraints as those outlined above for Bulgaria.

Kishinev (8 in Figure 3.2) is Moldova's major commercial airport and is classified as a first-tier airfield. It has two hard-surface runways (R1 = 11,778 × 147 feet, concrete, LCN 37, and R2 = 7777 × 131 feet, asphalt, LCN unknown but rated in only fair condition) and more than two million square feet of parking space. It is not a military installation and does not have the infrastructure to support combat operations. The airfield can handle any of NATO's wide-bodied, heavy-lift transport aircraft and could effectively support long-range transport operations. To support such operations, however, the proper MHE would have to be deployed; fuel would be necessary; security would be a concern; and facilities to support the care, feeding, and housing of deployed personnel would be necessary.

Markuleshty (23) is Moldova's principal military airfield and is home to most of its remaining Soviet aircraft. The airbase has an 8235- × 129-foot concrete runway with an unknown LCN and more than 500,000 square feet of parking space. The base has an excellent location and good potential, but little is known about its current condition.

## Romania

Twelve airfields in Romania meet our minimum criteria (see Figure 3.2). Because the power projection contingencies that we are considering are in the Middle East (and possibly the Caspian Basin), however, we have focused only on those airfields that are on or near the Black Sea coast. Two airfields are thus classified as first tier—Cocargeaua or Fetesti (9) and Mihail Kogalniceanu (10)—and three are categorized as second tier: Baneasa-Bucharest (24), Otopeni-Bucharest (25), and Alexeni (26). These operational bases are more than 1000 nautical miles northwest of Baghdad and would be subject to the same operational constraints as those outlined for Bulgaria.

Both first-tier bases are military facilities with active fighter squadrons.

Mihail Kogalniceanu (10) is the better of the two first-tier airbases. It is located in eastern Romania near the Black Sea coast and has an 11,484- x 148-foot concrete main runway with an LCN of 75.<sup>12</sup> The field also has more than 1.5 million square feet of open apron and ramp space. Three fighter/fighter-bomber squadrons (MiG-29 and MiG-23) are stationed at Mihail Kogalniceanu, and the base has all the necessary components of a military infrastructure. NATO's concerns would thus lie primarily in the quality of Soviet-grade fuel stocks; the availability of usable on-base fuel storage; the availability of qualified host-nation ground support personnel and facilities to service Western military aircraft; flight line security; and available facilities to support the care, feeding, and housing of deployed personnel. Mihail Kogalniceanu can handle any NATO combat or transport aircraft and could effectively support the deployment of an AEF.

Cocargeaua (Fetesti) (9) is a military airbase that is home station for two fighter and one reconnaissance squadron (MiG-21). It is located just west of Mihail Kogalniceanu not far from the Black Sea coast. Cocargeaua has a single concrete runway (8202 x 262 feet, LCN unknown) and a graded-earth secondary runway (8202 x 295 feet, LCN unknown).<sup>13</sup> The base has only 250,000 square feet of hard-surface apron and ramp space, which would limit the scale of any deployment. The secondary graded-earth runway could, however, provide up to an additional 2.4 million square feet of parking/work space, subject to the operational constraints of some of the aircraft. This fighter base also has the necessary military infrastructure in place, but NATO must be concerned with the quality of Soviet-grade fuel stocks; the availability of usable on-base fuel storage; flight line security; and available facilities to support the care, feeding, and housing of deployed personnel. Cocargeaua can support any of NATO's tactical combat aircraft and intratheater airlifters and could effectively support the combat elements of an AEF, with the heavier sup-

---

<sup>12</sup>Estimates are that there is room to extend the runway an additional 6000 feet.

<sup>13</sup>Estimates are that the runways could be extended up to 6000 feet in each direction.

port aircraft based at Mihail Kogalniceanu. This would allow the stationing of a second AEF in eastern Romania.

The three second-tier airfields in Romania are joint-use facilities with a small military presence. Two of these fields, Baneasa (24) and Otopeni (25), provide commercial service to Romania's capital city, Bucharest. The third, Alexeni (26), is located near Bucharest. Both Baneasa and Otopeni have long hard-surface runways and routinely handle large commercial wide-bodied passenger and cargo aircraft. Of the two, the runway and facilities at Baneasa are reportedly preferable. Baneasa is an excellent commercial airport that has a 10,499- × 148-foot concrete main runway and more than 1.8 million square feet of ramp and apron space. There is also ample room to expand the runway. Although military aircraft use the airfield, it does not have the traditional military infrastructure found at a combat airbase, and such facilities would therefore have to be established. Baneasa can handle all NATO combat and support aircraft and could support an AEF if a complete support package were deployed along with the unit. It might, however, be better used as a transportation hub.

Otopeni (25) supports military transport and commercial operations and is home station for a military transport squadron. The field has two 11,484- × 148-foot hard-surface runways with an LCN of 93 and more than 1.9 million square feet of parking space, but they are currently rated as in only fair condition. The exact nature of the runway problems are unknown, and the facility thus requires a site survey. Otopeni could potentially be the most robust airfield in Romania and could support either logistics operations or the deployment of an AEF.

Alexeni (26) is a former fighter base that is now being used as a commercial field. The military infrastructure for a combat installation remains in place, but its condition is unknown. Its proximity to Baneasa and Otopeni suggests that it be considered an alternate support base. It has an 8202- × 262-foot concrete main runway and a 10,664- × 328-foot graded-earth secondary runway (LCN unknown). Although the airfield has limited hard-surface parking space, all or part of R2 could be used for this purpose.

## Ukraine

Outside of Russia, Ukraine is the second largest state in the Black Sea region. Its location at NATO's backdoor made the Ukrainian republic a critical player in the defense of the Soviet state, and it housed a significant portion of the USSR's military assets—including ground force and airborne divisions, a naval fleet, and dozens of air force regiments (fighter, fighter/bomber, strategic bomber, and air-lift). The Soviet military constructed a large constellation of airbases in Ukraine to support its air force and naval air units. However, the current Ukrainian Air Force has consolidated its assets to only a few of these airbases and is converting several to commercial fields, joint-use facilities, and reserve military facilities; still others are being leased to the Russian Navy or have been closed. The Ukrainian military is still in transition, and the long-term status of several of these airfields is unknown. Moreover, information on the condition of many facilities is sketchy, especially for those airfields that are not being used as commercial airports.

Ukraine has 66 airfields across the country that meet our minimum criteria (see Figure 3.2). Given that the focus of this research is on the Middle East and Caspian Basin, however, our analysis of possible deployment airfields centered on the southern Black Sea coastal region of Ukraine.<sup>14</sup> Seven airfields in this region are categorized as first tier: Buyalk (11), Chervono-Glinskoye (12), Melitopol (13), Nikolayiv-Kulbakino (14), Odessa (15), Belbek (16), and Simferopol (17). Three are classified as second tier: Limanskoye (27), Martynovskaya (28), and Oktyabrskoye (29).

As with the other Eastern European states, the distance from Ukraine to anywhere in either the Middle East or the Caspian Basin is considerable. The Ukrainian airfields closest to the Middle East are 850 to 900 nautical miles north and west of Baghdad. Although they represent a long flight for U.S. or NATO aircrews, several of these airfields would be viable alternatives if access to closer facilities in the target region were either limited or restricted. However, effective operations from Ukraine into Iraq or Iran will require, at a minimum, authorization to cross Turkish territory.

---

<sup>14</sup>The airfields considered are located within 100 nautical miles or less of the Ukraine's Black Sea coast.

The best airfield alternatives in Ukraine are on or near the Crimean Peninsula. One concern with all facilities on the Peninsula will be their proximity to the Russian military's leased facilities, which could pose some political problems to U.S. or NATO use of nearby facilities in support of a future contingency.

Belbek Airbase (16) is an active fighter/fighter-bomber base located on the Crimean Peninsula near major Black Sea ports. This airfield was built as a military facility and has all the necessary military infrastructure in place. However, it was built to support Soviet military aircraft, and some concerns are thus likely to arise regarding the compatibility of many of its facilities and support equipment with Western aircraft (e.g., fuel, fuel storage, and MHE). Belbek has a single concrete runway that measures  $9150 \times 180$  feet with an unknown LCN—a runway length that will restrict operations by larger and heavy U.S. tankers such as the KC-10 and KC-135. The airfield can, however, handle any NATO tactical combat and most support aircraft and has sufficient ramp and apron parking space to support an AEF.

Simferopol (17) was a joint-use facility that has reportedly been closed, but it is still rated usable. The airfield has two hard-surface runways that are rated in good condition. The main runway measures  $12,159 \times 197$  feet and is concrete, and the second, also concrete, measures  $8858 \times 147$  feet. A third graded-earth runway measures  $4659 \times 115$  feet and is usable as additional parking space if needed. All LCNs are unknown. The airfield has more than two million square feet of hard-surface parking space. Simferopol does not have the necessary military infrastructure to support combat operations and may require a few weeks and a significant investment to bring it back into operational condition. The potential benefit would be a sole-use NATO facility that could be upgraded to support high-volume transport or combat operations. This facility is worth the visit of an Air Force airfield survey team.

The next two airfields are off the Peninsula and are located another 75 to 100 nautical miles from the Middle East.

Melitopol (13) is a joint-use airfield with a tactical airlift support mission. The airfield was originally built by the Soviets to support heavy airlift (i.e., airborne operations) and logistics operations. Melitopol

currently houses most of Ukraine's tactical airlifters. The airfield has two runways (R1 =  $8203 \times 246$  feet, concrete, LCN unknown, and R2 =  $8203 \times 263$  feet, graded earth). Also available are nearly 800,000 square feet of hard-surface parking space and an additional two million square feet if R2 is used for this purpose. Melitopol could support all of the combat assets of an AEF and most of its support aircraft; however, the heavier, more demanding tankers would have to operate out of another airfield.

Nikolayiv-Kulbakino (14) is an active fighter/fighter-bomber base that lies northwest of the Crimean Peninsula; it is also close to one of Ukraine's principal Black Sea ports. The airbase has an excellent runway (R1 =  $10,697 \times 263$  feet, concrete, LCN unknown, and R2 =  $9811 \times 263$  feet, graded earth) and more than five million square feet of parking space. As a military airbase, it has the necessary infrastructure to support combat operations and can readily handle any NATO combat, transport, support, or bomber aircraft. Nikolayiv-Kulbakino is one of the best facilities available in the region and is large enough to support two or more AEFs. Concerns will be the availability of quality fuel and fuel storage; equipment and technical personnel to support Western air operations; and the facilities necessary to support the care, feeding, and housing of deployed personnel.

There are also three second-tier airfields in Ukraine: Limanskoye (27), Martynovskaya (28), and Oktyabrskoye (29). All three of these facilities were Soviet military airbases and continue to provide some military support. Limanskoye and Martynovskaya are active fighter bases with 8200-foot concrete runways (LCN unknown) and roughly one million square feet of parking space. Limanskoye appears to be the better of the two facilities and is capable of supporting all NATO transportation and combat aircraft. Deployment of the combat assets of an AEF is possible.

Oktyabrskoye (29) is a former Soviet naval airbase that operated strategic ASW Bear aircraft. The airfield is well situated on the Crimean Peninsula and has two operational runways (R1 =  $9765 \times 180$  feet, concrete, LCN unknown, and R2 =  $9977 \times 263$  feet, graded earth) and more than 1.2 million square feet of hard-surface ramp/apron space. The airfield should be able to support all NATO transport, support, and combat aircraft (fighters and fighter-

bombers). The unknown factors are LCN, status of military infrastructure, and the field's current status.

### **COUNTRY-BY-COUNTRY ASSESSMENT OF AVAILABLE AIRFIELDS: SOUTH CAUCASUS REGION**

The overall status of individual facilities in Armenia, Azerbaijan, and Georgia is problematic, as only limited information is available on most of these airfields. The exceptions are the few airports that are servicing international traffic, but even at these fields, the level of detailed information that the National Imagery and Mapping Agency (NIMA) generally develops on other international commercial airports is not available. Moreover, the economic, political, and security environment in these countries has been fluid since the breakup of the Soviet Union, and this turmoil is reflected in the operational condition of their airfields. At the same time, the situation is generally improving, and the facilities in these countries are closer to our areas of concern than those in the Eastern European states along the Black Sea coast.

Taken together, more than 20 airfields in this region meet our minimum criteria, with six of these facilities classified as first or second tier. A country-by-country assessment of these airfields follows.

#### **Armenia**

The stability of the Caucasus region continues to be disrupted by the ongoing hostilities between Armenia and its neighbor Azerbaijan. In 1997, Armenia signed a bilateral alliance treaty with Russia that allowed Russia to enhance its military presence in the South Caucasus. Armenia's growing military relationship with Russia has further alienated Armenia from its neighbors and has perpetuated its military dependence on Russia. For NATO air forces, the important military development has been Armenia's full integration into Russia's air defense network and the deployment of Russian ground-based air defense and air force units to conduct the air defense mission.<sup>15</sup>

<sup>15</sup>On April 15, 1999, Russia and Armenia commissioned the command post of their joint air defense system. The command post will supply operational information to a command center in the Russian city of Rostov-na-Donu, whence the information will

Under the current arrangement, Russia is essentially managing Armenia's air defense network.

Armenia's heavy reliance on Russia for security assistance means that U.S. and NATO planners will have to consider how this relationship, as well as the growing presence of Russian military forces in Armenia, would affect any request for access and the subsequent conduct of Alliance air operations either from Armenian bases or over Armenian territory.<sup>16</sup> Unless the political and security situation changes dramatically, planners can anticipate that Russia will be a third party to any negotiations for access to Armenian facilities.

Four airfields in the small state of Armenia meet our minimum criteria—Zvartnots, Shirak, Kumayri, and Yerevan—and all are currently categorized as civilian airfields. One of these, Zvartnots (2, Figure 3.3), has been categorized as first tier and another, Shirak (19), has been classified as second tier.<sup>17</sup> The airfields in Armenia are 400 to 450 nautical miles from Baghdad. Armenia does not have a direct border with Iraq, so overflight privileges would have to be granted by either Iran or Turkey. Restricting the proposed routes to include passage through Turkish airspace will not significantly add to operational distance.

---

be relayed to Russia's air defense headquarters in the Moscow region. Russia and Armenia jointly guard Armenia's airspace. Although Russian officials refer to the Russian-Armenian air defense system as a joint operation, this is misleading because Armenia's role is essentially that of host to a Russian-managed air defense system.

Composed of Russian and Armenian interceptor aircraft, SAMs, and their radars, the "joint" system relies primarily on Russian-owned, Russian-operated MiG-29 aircraft and S-300 missiles, whose deployment in Armenia began in early 1999 and continues. See *Jamestown Foundation Prism*, August 23, 1999.

<sup>16</sup>Current activities suggest that Armenian foreign policy is taking a more Western course for now, but it is too soon to tell what the long-term implications will be and whether Armenia's relations with Russia will be significantly affected. See Tomas Valasek, "Armenia Polarised by Struggle for Power," *Jane's Intelligence Review*, May 2000, pp. 10–12; "Is Yerevan Inching Away from Russia's Orbit?" *Jamestown Foundation Monitor*, March 15, 2000, available at <http://www.jamestown.org>; and "Armenia Courts West Under Russia's Watchful Eye," Stratfor, Inc., available at <http://www.stratfor.com/CIS/commentary/c991203014.htm>.

<sup>17</sup>Kumayri is another airfield with a long main runway (10,500 × 148 feet). Unfortunately, no current information is available on its status. If NATO air operations into the region are contemplated, this base probably merits further examination.

Zvartnots is the major commercial airfield servicing the capital city of Yerevan. Its main runway is  $12,631 \times 184$  feet, is made of asphalt, and has an LCN of 53. A parallel secondary graded-earth runway measures  $12,863 \times 230$  feet. The airport has recently been upgraded and refurbished, especially with regard to its cargo-handling capability. With the deployment of an airfield support package, and subject to the constraint that this is a commercial and not a military airfield, Zvartnots could support long-range, wide-bodied transport operations or fighter and fighter-bomber operations.

Shirak is located in northwest Armenia near the Turkish border. The airfield has a good  $10,564 \times 147$ -foot main runway that could support most NATO aircraft. As with the other airfields in Armenia, little information is available on its current operational status.

## Azerbaijan

Geographically, Azerbaijan is well placed to support any type of airlift or combat operations throughout the Caucasus or Caspian Basin. The Azerbaijanis are actively trying to establish stronger political, economic, and military relations with the United States and other NATO states.<sup>18</sup> However, the type and scope of military cooperation or military assistance that the United States can provide Azerbaijan are currently constrained by congressional legislation<sup>19</sup> and by a reluctance to display preferential support for President Aliyev's government.

On the operational side, there are no direct access routes from Azerbaijan to Iraq, and overflight of several countries would therefore be necessary (see Figure 3.3). Baku is only 500 nautical miles northeast of Baghdad, but this direct route would require overflight of Iran. An

---

<sup>18</sup>Azerbaijan has declared an interest in joining NATO and, in an apparent gesture of military cooperation, offered permanent basing access for U.S. Air Force units at an airfield near Baku. It is unlikely, however, that the United States will take any steps in the near term to accept this offer.

<sup>19</sup>In accordance with the 1992 Freedom Support Act, Section 907, entitled Restriction on Assistance to Azerbaijan, "United States assistance under this or any other Act (other than assistance under title V of this Act) may not be provided to the Government of Azerbaijan until the President determines, and so reports to the Congress, that the Government of Azerbaijan is taking demonstrable steps to cease all blockades and other offensive uses of force against Armenia and Nagorno-Karabakh."

alternative route would be west over Armenia and then south over Turkey into Iraq; however, given the animosity between Azerbaijan and Armenia, it is unlikely that overflight authorization would be granted.<sup>20</sup> The more likely flight path would be northwest through Georgia and then south through Turkey into Iraq, but this route would extend the flight distance to between 800 to 850 nautical miles. Because of these operational constraints, the airfields in Azerbaijan would better support operations into the Caspian Basin.

Seven airfields in Azerbaijan meet our minimum operational criteria,<sup>21</sup> and we have classified one of these fields, Bina, as first tier (1 in Figure 3.3) and another, Gyandzha (18), as second tier. All of the airfields identified are currently categorized as commercial airports with the exception of Sital Chay, which houses most of the residual Soviet military aircraft that remain in the Azerbaijani military's inventory.<sup>22</sup> In addition, most of these airfields lie just outside the projected range of next-generation Iraqi TBMs.<sup>23</sup>

Bina (1) is located near the Azerbaijani capital of Baku and is the country's major international commercial airfield. Azerbaijan recently spent more than \$60 million to upgrade and refurbish the airport. The airfield is a joint-use facility that serves as headquarters for the country's air and air defense forces. It has two long hard-surface

---

<sup>20</sup>The ongoing conflict between Armenia and Azerbaijan would compromise Armenia's willingness to sanction any U.S. or NATO air operations staging from Azerbaijani territory. Beyond this political animosity, planners must also be concerned with the fairly sophisticated air defense network defending Armenian territory. Armenia's air defenses are provided by Russian forces stationed in the country. They are operating S-300 long-range, high-altitude, ground-based air defense missile batteries and are flying MiG-29 interceptors. Therefore, any overflight would require both Armenian and Russian consultation and sanction.

<sup>21</sup>Although the two airfields classified as first and second tier appear to be the most capable of the seven identified in Azerbaijan, a few others—e.g., Kyurdamir, Nasosnaya, Baku-Kala, and Sital Chay—warrant further consideration if the United States or NATO is planning major air operations into or out of the region.

<sup>22</sup>Sital Chay has a 7500- × 180-foot concrete runway and with some work could be considered a possible deployment base. However, its 7500-foot runway currently limits planning to tactical combat and transport aircraft such as the C-130 or C-17, as the field could not effectively handle many of the support aircraft assigned to our notional AEF.

<sup>23</sup>Baku and the important airfields around it are outside of this range.

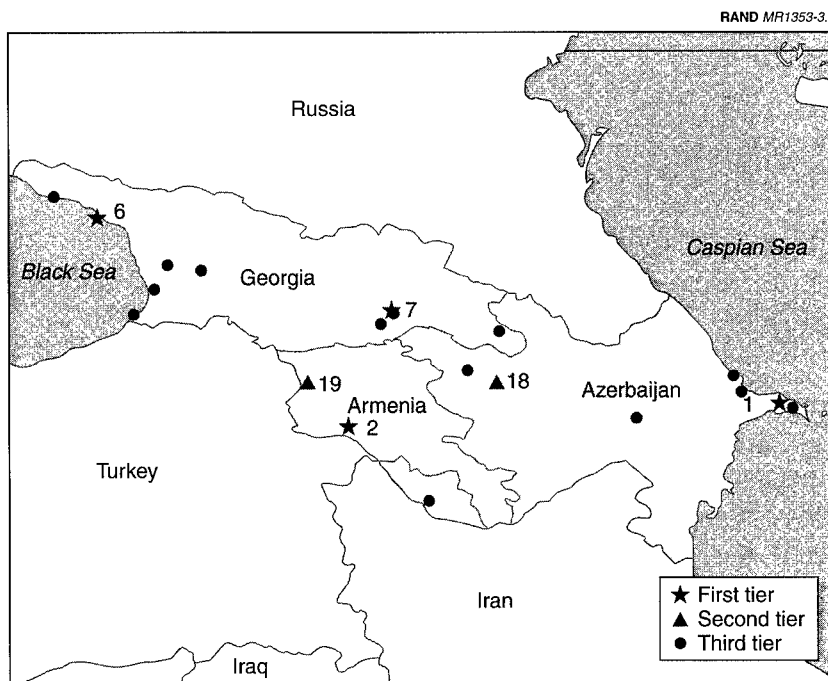


Figure 3.3—Possible Deployment Airfields in the South Caucasus States

runways<sup>24</sup> with an LCN of 68 and more than three million square feet of ramp and apron space. The commercial airfield would be most effective at supporting long-range heavy transports and the movement of personnel or cargo. Bina is large enough to handle a full AEF combat package but does not have the preferred military infrastructure to do so. There is also concern about the quality of the Soviet-grade fuels available and the adequacy of on-base fuel storage. To support military operations, the United States would have to deploy a full aerial port support package; fuel bladders; hire host-nation contract or deploy security personnel; establish an ammu-

<sup>24</sup>R1 = 10,498 × 147 feet (concrete) and R2 = 8858 × 196 feet (asphalt).

nutrition storage site; and set up facilities for the care, feeding, and housing of deployed personnel.<sup>25</sup>

Gyandzha (18) is located in northwest Azerbaijan, closer to Georgia than to Baku. The airfield has an 8202- × 144-foot concrete runway (LCN 38) and more than 1.6 million square feet of parking space. This is a commercial airfield that could provide backup if air operations are run into and/or out of Azerbaijan.

## Georgia

Georgia's location on the Black Sea only 500 to 600 nautical miles from Baghdad means that its airfields provide a good platform from which to conduct operations against Iraq.<sup>26</sup> Georgia's airfield constellation should not be considered a viable replacement for Turkish bases, but Georgia's airfields can supplement operations from airfields in Turkey or provide a limited alternative in the event that access is closed or restricted to the more robust airbases in Turkey.

Like the Azerbaijanis, the Georgian leadership is looking to improve its economic, political, and security relations with the West and to reduce its security ties with Russia. Georgia is an active participant in NATO's Partnership for Peace and has established several bilateral military cooperation agreements with NATO member states. Georgian President Shevardnadze also declared recently that one of his country's principal foreign policy goals is to gain NATO membership.<sup>27</sup> Consequently, Georgia is currently predisposed to cooperate with U.S. or NATO security actions in the region.

---

<sup>25</sup>Another option worth considering if combat operations from Azerbaijan are being contemplated would be to operate the less demanding combat aircraft out of one of the smaller airfields near Bina and to use Bina to handle the larger, heavier, and more demanding airlifters and other support aircraft (tankers, etc.). Three fields worth considering appear to be Sital Chay, which is a military airbase, Baku-Kala, and Nasosnaya.

<sup>26</sup>The range places these airfields outside Iraq's projected TBM range, but they would be at risk from Iranian TBMs.

<sup>27</sup>For example, at a April 29, 1999, news conference, Georgian President Eduard Shevardnadze stated that "we still have a long path to travel before being able to join NATO, [but] it may happen sooner than we imagine." Shevardnadze called for an expansion of Georgia's involvement in NATO's Partnership for Peace program, which, he implied, represents a stage along that path. This is the first public statement by a

Ten airfields in Georgia meet our minimum criteria, and all of these airfields are currently categorized as civilian. Georgia has few military aircraft, and the small number of Su-25 (Frogfoot) aircraft<sup>28</sup> it does have are stationed at Telavi or Marneuli Airbase outside Tbilisi. As with the other regional states, only limited information is available on the current status and physical capacity of Georgia's airfields.

The two first-tier airfields in Georgia are Babushara (6 in Figure 3.3) and Lochini (7). Babushara's location on the Black Sea<sup>29</sup> would facilitate resupply operations from the sea and afford flights the most direct route across Turkey and into Iraq. Babushara is roughly 590 nautical miles north of Baghdad<sup>30</sup> and outside Iraq's projected TBM range. The airfield is a major regional commercial field servicing both passengers and cargo, including international commercial carriers. It has a good 11,942- × 172-foot asphalt main runway that has an LCN of 67. Babushara also has ample parking space (1.3 million square feet), but it does not have the traditional military infrastructure. The airfield can handle any of NATO's combat or support aircraft and could be used by transport, bomber, or fighter aircraft. There is adequate space to support an AEF, but deployment of a full support package; security team; fuel storage; and facilities to support the care, feeding, and housing of deployed personnel would be necessary.

Lochini (7) is also a major commercial airfield that services Georgia's capital, Tbilisi. It has two good hard-surface runways<sup>31</sup> and ample parking space. Although it is not located on the Black Sea coast, Lochini is favorably located on the principal east-west LOCs crossing

---

Georgian leader indicating that accession to NATO represents an operational goal of the country's foreign policy. See "Georgia Aims for Joining NATO," *Jamestown Foundation Monitor*, May 4, 1999, available at <http://www.jamestown.org>.

<sup>28</sup>The Frogfoot is a Russian-built ground support aircraft comparable to the U.S. A-10.

<sup>29</sup>Babushara is located just south of Suknumi in the Abkazian region of Georgia. This area was in dispute for a number of years and has been the subject of civil strife. The security of the airfield does not appear to be a problem, however.

<sup>30</sup>Although the direct distance to Baghdad from Babushara is marginally longer than that from Incirlik Airbase, Turkey, the operational distance is actually shorter because of the extra miles aircraft operating out of Incirlik must fly east to avoid Syrian airspace.

<sup>31</sup>R1 = 9842 × 147 feet with an LCN of 53, and R2 = 8202 × 196 feet with an LCN of 40 and 2.9 million square feet of parking space.

Georgia and linking Tbilisi to the Black Sea. The airfield is 500 nautical miles from Baghdad and at the outer range of projected Iraqi TBMs. It also provides an excellent location for support to regional OOTW-type operations in the Caucasus or deeper into the Caspian region. This airfield could provide the same operational capabilities as Babushara and is subject to the same constraints.

With Turkish assistance, the Georgian air force is modernizing and upgrading the military airfield of Marneuli to NATO standards, and it will be the country's principal military airfield. The 8170 x 130 ft main runway reportedly is being extended as part of the upgrade. This all-weather facility will have plenty of parking space (more than 1.6 million square feet) and much of the military infrastructure in place. Moreover, Turkey has signed a five-year use agreement to guarantee access to the airbase and allow for the permanent stationing of a small number of Turkish air force technicians to service the airfield and flights of Turkish and allied aircraft. The airfield will serve as a logistical hub for future Western military assistance to Georgia. It will be able to support most NATO aircraft, but the support infrastructure and personnel would have to be significantly reinforced to conduct mid- to high-intensity air operations, whether logistical or combat. With these upgrades, the airbase could support most elements of an AEF, but the larger aircraft would be better served operating out of an airfield with a longer runway, such as Lochini, which is about 30 kilometers away.<sup>32</sup>

There are also two airfields in southwestern Georgia near the Black Sea coast city of Batumi that warrant further investigation: Batumi (7260 x 120 feet, asphalt) and Makharadze (7071 x 153 feet, concrete), former Soviet fighter bases—LCNs unknown. Although both fall short of our preferred operational parameters, their excellent location and easy access to the sea could make them good deployment bases for a fighter package. With some effort and investment, these two airfields should be able to support the deployment of the fighter package of an AEF, with the heavier, higher-infrastructure support aircraft deployed to another nearby base.

---

<sup>32</sup>See "Progress in Georgia's Military Relations With NATO Countries," Jamestown Foundation Monitor, April 16, 2001, available at <http://www.jamestown.org>.

## Southern Russia

Subject to the state of political relations between the United States and Russia at the time, Air Force planners may also consider requesting access to airfields in southern Russia, since they provide easy access to both the Caspian Basin and the Middle East. Many of the airfields of interest are on or near the Black Sea coast and provide a viable planning option for operations into northern Iraq, assuming that overflight is granted by Turkey.<sup>33</sup> Figure 3.4 portrays the location of 55 airfields in southern Russian that meet our minimum operational criteria. Only 23 of these fields have been identified as first- or second-tier facilities, and they appear to be worthy of more detailed consideration.

The 13 airfields identified by the stars in Figure 3.4 have hard-surface runways greater than 8000 feet in length, with the 12 triangles representing airfields with a main runway greater than 7500 feet in length. Three of the first-tier airfields (1, 2, and 3) have runways greater than 10,000 feet in length and about 200 feet in width; another four airfields have runways more than 9000 feet in length. The level of detailed information on these airfields is currently far less than that for similar airfields in other countries.<sup>34</sup>

Much of southern Russia is still socially turbulent, especially Chechnya and Dagestan, and remains politically fluid. The security situation will play a significant role in assessing whether to request access

---

<sup>33</sup>Flight distance from the four Russian airfields near the Black Sea coast will range between 600 and 700 nautical miles from Baghdad, assuming overflight clearance from Turkey. These fields could offer viable alternative operating bases for NATO combat aircraft working the northern half of Iraq or eastern Iran. Many of these bases also provide a reasonable staging base from which to support a range of possible contingency operations in the Caspian Basin.

<sup>34</sup>Western personnel still have only limited access to Russian military airfields, especially in this region of the country. Although the NIMA airfield database has respectable information on those airfields that have a commercial role, the information available on the military airfields thus remains sketchy at best. For this reason, we are not providing a detailed assessment of each of the first- and second-tier airfields. Moreover, before any planning takes place, an Air Force airfield survey team needs to visit the preferred fields so that a more informed decision can be made regarding the utility of any of these bases.

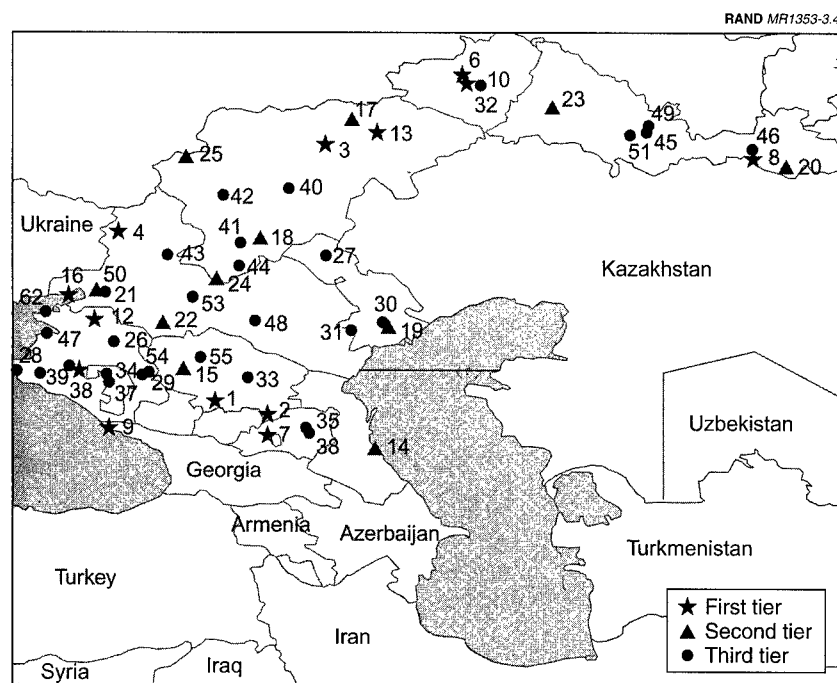


Figure 3.4—Constellation of Airfields in the Southern Russian Republics with an 8000-Foot-Plus Main Runway

to facilities in any of these Russian administrative districts. Moreover, any request by U.S. and/or NATO air forces to conduct operations from facilities in any of these regions will be met by Moscow with great skepticism and probably concern. Moscow's reaction to the operational situation and its willingness to support or hamper proposed contingency operations will obviously have a significant effect on U.S. planning for the use of airfields in southern Russia, but it also may affect planning for the use of airfields in some of the new independent states. It is impossible to predict what the political environment or security circumstances may be several years from now; therefore, we should not rule out the possibility that Russia may be willing to support or even play a direct role in some future U.S.- or NATO-led operations in these regions. It is, however, highly unlikely that any Western air forces will have had much experience working

with any of the Russian airfields in the region, and few, if any, of these facilities will have had any experience supporting Western military aircraft and operations. This means that it will take more time and require the deployment of more support troops and equipment to deploy and establish the necessary support infrastructure at any of these airfields. We estimate that it will take at least seven to ten days to bring any of these airfields up to operational status.

---

**IMPLICATIONS FOR MILITARY PLANNERS**

---

If the United States and its allies hope to employ military power effectively as a compelling instrument in the Middle East or even to establish a visible presence in such a distant region, coalition forces will require access to the contingency theater and to specific facilities within that theater. Granted, the United States does have strategic airpower options allowing it to project limited combat power over long distances. On a level, however, such options have only limited utility, and if sustained combat power is essential to mission requirements, tactical airpower will have to be part of the mix. Yet the operational characteristics of current and next-generation tactical combat aircraft ensure that they cannot efficiently conduct high-tempo, long-duration combat operations from extended ranges, rendering such aircraft much more combat effective when operating from airfields in theater. Moreover, to be most effective, that access must be early and broad enough to permit the timely introduction of military forces of the required size and type. Success in power projection contingencies, whether in deterring conflict or in defeating an aggressor, will be highly sensitive to the timing, type, and degree of access granted by regional states.

Regardless of where or when the next crisis develops, it is safe to say that airpower will play a prominent role in any response package the United States and its allies put together. At a minimum, airpower will have a critical role in transporting U.S. and coalition forces into the crisis region and sustaining them there. If combat power is deemed necessary, airpower is the force component that can most responsively be applied. However, if one is to meet the current U.S. Air Force's deployment planning goal, there is clearly a need to have

a prior understanding of the areas to which these aircraft or the larger AEF combat package can effectively stage. If one seeks to ensure effective support and maximize operational capability, one must first have a clear understanding of what support can and cannot be provided by the host installation and country. Moreover, there must be plans and procedures in place to supplement any shortfalls and to establish the logistics support network necessary to sustain all deployed forces. If the desired deployment time line is to be met, this information and these processes should already be in place and require only last-minute refinement.

#### **ALTERNATIVE AIRFIELDS MAY PROVE VALUABLE AND EVEN ESSENTIAL**

As discussed earlier, U.S. planners can no longer assume that coalition air units will continue to be stationed on the Arabian Peninsula. Many of the GCC states are finding it ever more difficult to justify the presence of Western combat units in their countries and are debating the future of such deployments. These political developments, as well as ongoing military-technical advances in weapon development, must heighten concern about whether Western forces can continue to plan for prompt and unopposed access to the airfields and port facilities that are the backbone of the U.S. military's Middle East deployment strategy.

Yet another factor is that the proximity to the anticipated conflict zone of many of the key facilities supporting U.S. strategy not only adds to their operational value but also enhances their vulnerability to attack. Moreover, it is unlikely that in the next conflict any regional adversary will afford coalition forces free access to the facilities that will be necessary to support deployment or all the time that will be needed to establish the infrastructure to sustain and employ its deployed forces. Furthermore, all regional actors have absorbed many lessons from the Gulf War, especially those associated with the nature of the "extended" U.S. deployment process and the importance of regional reception and operational installations and facilities to it. It thus seems logical that future adversaries will focus on disrupting U.S. access to these facilities, preventing it where possible.

As indicated earlier, however, the planning dilemma the United States faces is that its deployment strategy for the region remains heavily dependent on early access to preidentified deployment bases in Bahrain, Saudi Arabia, Qatar, Jordan, and Kuwait. All of these countries are susceptible to the internal and external pressures opposing U.S. or Western military presence outlined earlier, and they will continue to question the necessity of Western force deployments and action in the region. In the absence of an unambiguous threat to their well-being, these governments may not grant early and free access to their military facilities and, in fact, have denied such access in the past. Thus, there are very real reasons U.S. planners should not be satisfied with placing too much faith in ready access to only a handful of deployment airfields.

Adding to the political concerns in this region is growing anxiety over the threat to regional operating bases and other deployment support facilities presented by accurate midrange ballistic or cruise missiles armed with either lethal submunitions or chemical warheads. Such technical developments place yet another constraint on where coalition air units should deploy. The projected range and future fielding of such weapons will affect when this concern is realized and the deployment implications they bring. Today's operational plans for a future Iraqi contingency should not be affected, but within the next decade this concern will likely be very real. For an Iranian contingency, the problem is already real, as are the vulnerabilities it breeds. Planners must therefore place renewed emphasis on the force protection requirements needed to counter threats posed by ballistic or cruise missiles. These responses range from developing a robust passive and active force protection program to defend the deployment installation to using facilities that are out of harm's way or, at the least, at a more extended range from the threat.<sup>1</sup>

In this study, we have erred on the side of caution and looked for deployment options that are outside current and near-term projected ballistic missile ranges. Our concern stemmed from a review of today's preferred deployment options, which revealed that two of

---

<sup>1</sup>For a more detailed discussion of nature of the threat and a possible range of force protection responses, see Stillion and Orletsky, *Airbase Vulnerability to Conventional Cruise-Missile and Ballistic-Missile Attack: Technology, Scenarios, and U.S. Air Force Responses*.

the five preidentified AEF deployment bases on the Arabian Peninsula are within Iraq's projected missile range, including bases in Kuwait and Jordan. It was also found that, in an Iranian contingency, three of the five bases will be within range of currently fielded Iranian systems, including bases in Kuwait, Bahrain, and Qatar. Given this growing vulnerability, there is clearly a need for the United States and its allies to expand their planning options and consider the viability of using other deployment bases (primary, alternative, and re-deployment) that are beyond missile range.

### **Alternative Airfields Hedge Against the Uncertainties of the Future**

Since the Gulf War, the host countries and coalition partners (principally the United States) have invested heavily in upgrading the operational and quality-of-life attributes of several of these facilities. U.S. efforts have focused on those airfields that are commonly identified as first-priority U.S. Air Force AEF deployment bases (see Figure 4.1).

These airfields (circled in Figure 4.1) are well situated to optimize the daily aircraft sortie rate. However, their proximity to the adversary's territory also enhances the vulnerability of these facilities to attack, thereby reducing their utility for the conduct of high-tempo air operations. This is especially true the farther out into the future one takes the planning window, allowing potential regional protagonists more time and a greater opportunity to upgrade and enhance their military capabilities and reach. The key questions of concern thus seem to be:

- Are Air Force planners minimizing the vulnerability of the present constellation of bases?
- Are they being too conservative and too predictable in their regional deployment planning?
- Will this make the tracking and planning process too easy for tomorrow's adversary?
- Are Western military planners looking to break this tendency by taking full advantage of the rich constellation of potential de-

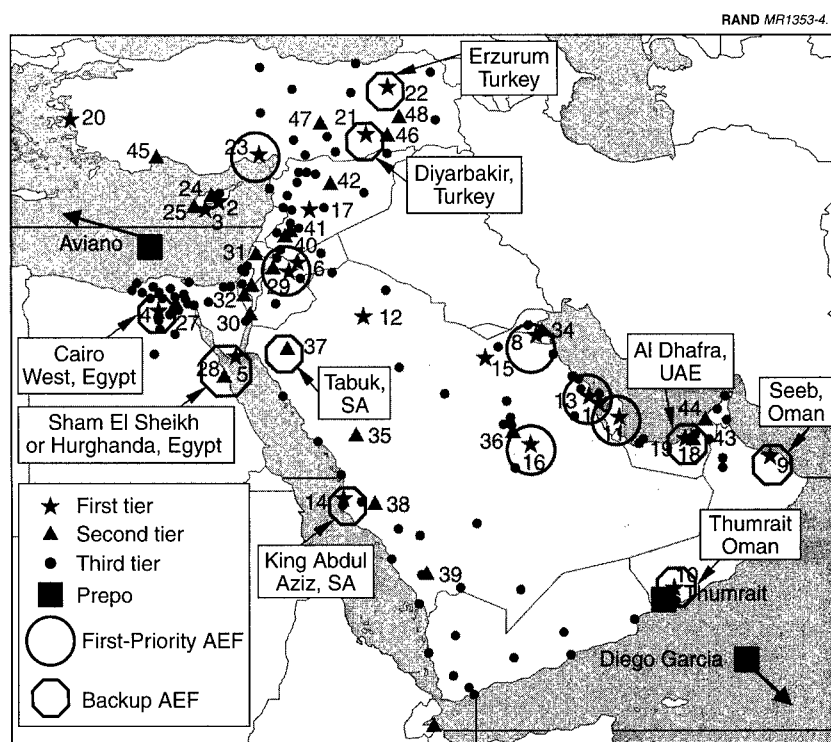


Figure 4.1—Possible Backup AEF Deployment Bases: A Proposal

ployment airfields on or near the Arabian Peninsula that can effectively support air operations?

## IMPLICATIONS FOR U.S. MILITARY PLANNING

For any operational planner, the primary concerns are what force components are needed to meet the CINC's requirements, where those components are coming from, where we want to deploy them (or, more important, where we can deploy them), and how soon they must be there.

### Where Are AEFs Coming From?

According to the current U.S. Air Force vision statement and doctrine, the air units for assignment into any contingency response package will be drawn first from one of the two AEFs on call and, if additional assets are needed, from one of the rapid-response wings on alert. Any of these force packages will most likely come from CONUS—possibly, in part, from the U.S. Air Force's European command. This means that the deployment process alone will take time.

### How Soon Must They Be There?

The results of RAND's HALT modeling indicate that the coalition success rate is highly sensitive to how quickly airpower can deploy to the theater and become fully operational.<sup>2</sup> It is not merely a question of how quickly we can get there but, more important, how much sustained combat power can be applied early in the conflict against an adversary's ground offensive. Air Force expectations, according to its latest vision statement, "Global Vigilance, Reach, and Power," are that "on-call" AEFs can be deployed and operational within 48 hours, with subsequent AEFs following if necessary. Realistically, however, how much Western combat power can enter a conflict and how soon it can do so are contingent on a combination of factors, such as the readiness, combat capability, and deployability of the air units. More important, from our perspective, is the fact that this is all tied directly to how quickly coalition air forces gain access to regional deployment bases and how capable these facilities are in supporting and

---

<sup>2</sup>The intent of RAND's HALT modeling effort has been to use a simple and fairly transparent quantitative approach to estimate the ability of forces employing advanced firepower to attrit and halt an invading mechanized ground force. Several reports describe in detail this analytical framework and the results and findings of the various HALT models. One common feature of these reports is their emphasis on how important it is to get airpower deployed to the crisis zone so as to conduct combat operations against the advancing enemy forces sooner rather than later. See David A. Ochmanek, Edward R. Harshberger, David E. Thaler, and Glenn A. Kent, *To Find, and Not to Yield: How Advances in Information and Firepower Can Transform Theater Warfare*, Santa Monica: RAND, MR-958-AF, 1998; Jimmie McEver, Paul K. Davis, and James Bigelow, *EXHALT: An Interdiction Model for Exploring Halt Capabilities in a Large Scenario Space*, Santa Monica: RAND, MR-1137-OSD, 2000; and Eugene C. Gritton, Paul K. Davis, Randall Steeb, and John Matsumura, *Ground Forces for a Rapidly Employable Joint Task Force: First-Week Capabilities for Short-Warning Conflicts*, Santa Monica: RAND, MR-1152-OSD/A, 2000.

sustaining high-tempo combat operations. It is clear that there is no simple answer to these questions and that the answer will be highly influenced by the specific situation.

### Where Can They Deploy?

As indicated earlier, the question of early access appears to be in dispute for almost all countries on the Peninsula with the possible exceptions of Kuwait and Oman. Kuwait will likely continue to be the pawn in any future Iraq-generated contingency, and this vulnerability and the dependence it creates should ensure ready access. For Oman, the relationship with the United States is much different. Unlike Kuwait, Oman has long-standing security agreements with the United States, allows the prepositioning of U.S. military stocks in its country, and has proven to be a steadfast supporter of U.S. regional goals over the years. As for the other countries on the Peninsula, the complex political and military currents both within these states and across the region could easily interact in ways that severely challenge future U.S. military access. All of the GCC states face major and, in many cases, growing systemic problems. The domestic volatility of many of these conservative states ensures cautious negotiation and a reluctance to grant Western forces "unnecessary military access." Iraq and Iran are both aware that access is critical to the regional projection of the West's combat power, and it therefore seems likely that extreme pressure will be applied to deny or at least delay that access.<sup>3</sup> The willingness of these states to provide access to their facilities is likely to come further into question as first Iran and later Iraq gain the ability to threaten directly the homelands of even the more distant regional U.S. allies with ballistic missiles.

### Evaluating Alternative Airfields

When incorporating additional bases in the planning set, how can one ensure that these bases are adequate to the task, that they can effectively sustain high-tempo combat operations, and that force pro-

<sup>3</sup>See Davis et al., *Mitigating Effects of Access Problems in Persian Gulf Contingencies*, pp. 93-95.

tection will be a manageable requirement? To begin with, a U.S. AEF places a heavy burden on any airfield, and not all regional installations have runways long enough or ramp space sufficient to support a full AEF deployment package. These demands alone significantly limit the number of airfields that are adequate to the task.

One can further classify possible deployment airfields by using two competing concerns: the vulnerability of given airfields to ballistic missile attack and our desire to optimize the daily aircraft sortie rate. Range to the conflict zone is critical to our analysis of both, and we can use these concerns and range to define preferred deployment belts or zones. As noted earlier, we have placed all of the airfields considered into one of four zones. Zone I is within the projected range of a potential adversary's ballistic missiles, and airfields within this zone are considered vulnerable. Zones II through IV are beyond (or at extended) ballistic missile range, reducing the TBM threat to deployment airfields. By contrast, the daily sortie rate declines dramatically as range is extended, especially as one moves from Zones II through IV, with the sortie rate declining as the range from the target area is extended. These zones are not fixed, and their inclusive ranges will shift in response to changes in the threat, the operational environment, or the capabilities of the deployed combat aircraft. Figure 4.2 graphically displays for an Iraqi scenario how these zones would be laid out on our regional map and which airfields fall within each.

Given the projected ballistic missile capability of both Iran and Iraq, prudent planning would require that operating bases be no nearer than 300—and preferably 400—nautical miles from possible launch locations. The daily sortie rate model introduced earlier further suggests that if one wishes to optimize the daily sortie rate and, in turn, the munitions delivery of the assigned combat aircraft, it would be preferable to operate from deployment bases no farther than 900—and preferably 800—nautical miles from the conflict zone. Zone II includes bases between 400 and 800 nautical miles and is our preferred deployment zone.

**What Is the Range of Possible Options?** As we found, the number of airfields that meet the AEF's minimum physical characteristics across the greater Middle East is relatively small and heavily concentrated in the GCC states. In Zone II, Saudi Arabia is critical because it

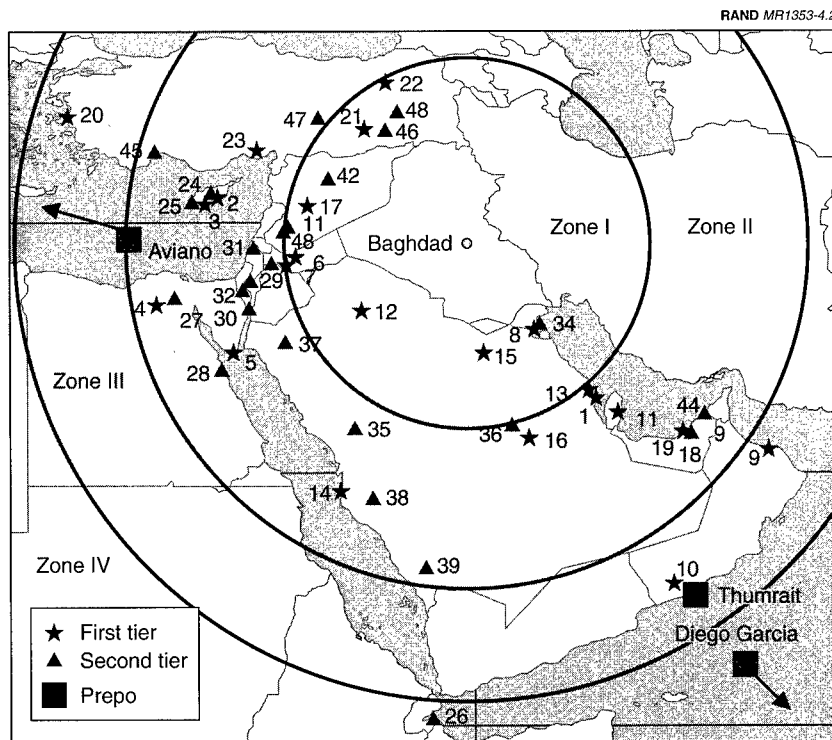


Figure 4.2—Approximate Geographic Laydown of the Airfields in Zones I-IV: Iraqi Scenario

has the heaviest concentration of large, fully AEF-capable airfields in the region. Moreover, most of these installations were built as military or joint-use facilities, and the necessary military infrastructure is therefore in place. These installations often support Western models of combat and support aircraft, as the Saudi Air Force flies Western aircraft. As a result, Western munitions and support standards are common, and Saudi Air Force personnel are trained in Western tactics and operational procedures. Consequently, these installations have much of the equipment and many of the key technical personnel that could support deploying coalition air units. The sheer size of Saudi Arabia also allows for a natural redundancy and depth in the constellation of possible AEF deployment bases.

Our principal deployment base at Prince Sultan will remain an important component of any future contingency operation. In the event of a major conflict, however, this installation alone will not be able to support the number of deploying units required by many contingencies. Tabuk and King Abdul Aziz (see Figure 4.1) have some valuable characteristics that add depth and reduce the vulnerability and complexity of air operations. Both are located in western Saudi Arabia, and operations from these installations can be effectively supported from the Red Sea, which will reduce traffic in the Gulf, get the operational bases farther away from Iran, and place them outside of both Iraqi and Iranian TBM range.

Bahrain and Qatar are also in Zone II and are important for similar reasons. Unfortunately, the number of possible deployment bases in each of these countries is small and they are located on the Gulf and close to Iran's western coast.

In Kuwait, the number of possible deployment airfields is limited, and the problem is compounded by how close these Zone I fields are to the anticipated conflict zone. Ahmed Al Jaber Airbase, Kuwait, is an excellent location from which to run quick-turnaround combat missions over Iraq or Iran, but in the event of a ground offensive or a ballistic missile attack, all installations in Kuwait will be at risk.

The airfield options in Jordan are limited as well, as most of the airfields in this country are built to support Soviet-designed aircraft and air units, and the runways are shorter and available apron/ramp space much less than is preferred for a full AEF. Many of the better installations in Jordan are within projected Iraqi TBM range (Zone I), with a few at more extended ranges and in Zone II. Dual basing would thus be necessary to support any full AEF deployment to Jordan.<sup>4</sup>

In the north, the first concern should be to expand the number of airfields in Turkey that are prepared to support air operations. Because of its geographical position, Turkey is a good platform from

---

<sup>4</sup>As described earlier, "dual basing" refers to spreading the assets of our notional AEF across at least two airfields because they cannot be accommodated at a single field in the area. The usual problems are associated with the runway length and ramp space requirements of the tankers and possibly other support aircraft.

which to run air operations over northern Iraq, northwestern Iran, and the Caucasus or Central Asia. The principal U.S. Air Force and NATO operational base is Incirlik, and it will remain the priority planning option in the future. As with Saudi Arabia, however, Turkey's size, location, and number of possible AEF deployment airfields provide additional depth and capability to operations from the north. Deploying to either or both Diyarbakir and Erzurum would open up additional facilities and allow for the deployment of more operational units in the north; however, these two fields are potentially vulnerable to projected Iraqi or Iranian ballistic missiles. If one is concerned with an Iraqi contingency, the risk would be manageable—but if it is Iranian, a more viable deployment option would be Antalya (west of Incirlik).

Moving west off the Peninsula, several airfields in Egypt should also be considered, as they are less vulnerable to ballistic missile attacks, and aircraft operating from Egypt can fly directly into Saudi Arabia. In the event of an Iraqi contingency, operating from one or two of these Egyptian airfields would put an AEF only 600 to 700 nautical miles from the conflict zone (and thus in Zone II), not much farther than USAFE aircraft operating from Incirlik, Turkey. Most Egyptian facilities, however, are not as robust and ready to support high-tempo combat operations by Western air forces as are those in the GCC states. Cairo West is the best option; as it is exclusively a military airfield, and U.S. and other Western air forces are well acquainted with this installation. Sharm El Sheikh and Hurghada are also well located, but they are not as large or as well prepared to support high-tempo operations. The United States already regularly deploys units to Egypt for training and frequently uses Egyptian air installations to support a range of OOTW operations across the Middle East and northern Africa. Egyptian airfields also routinely serve as important staging and transit points for a wide range of U.S. crisis operations and peacetime deployments and exercises. Egypt generally supports U.S. security goals in the region. Since the Gulf War, U.S.-Egyptian security relations have strengthened, and there should be fewer uncertainties associated with access to facilities in Egypt.

Also in Zone II are Israel and Cyprus. There are only a few airfields in Israel south of Tel Aviv that are large enough and have force protection requirements manageable enough to allow the deployment of

an AEF. These airfields have been built to support Western military aircraft; their support procedures are Western; and the equipment and skills of Israeli technical support personnel could assist deploying coalition units. As mentioned previously, however, there are a number of constraints to efficient combat operations that should be considered: Overflight rights would be required, since there is no direct access to Saudi Arabia or Iraq, and, as argued above, there would be significant political costs associated with using Israeli facilities. Consequently, this option would have to be considered cautiously.

There are a few airfields on the island of Cyprus that could support limited AEF operations. There are no airfields with runways longer than 10,000 feet, so strategic tanker operations would be constrained. Since there is no direct access to Saudi Arabia or Iraq from Cyprus, overflight rights would be necessary.

Zone III airfields are farther from Baghdad, reducing combat sortie rates, but they could provide depth to the operation. They could also provide secure facilities for logistics and combat support operations. They are thus a viable alternative to Zone II airfields when access is not available or is delayed. The principal cost will be the extended range to target, which would result in a reduction in delivered combat power. South of Saudi Arabia, the strategically located UAE has at least four large, operationally favorable airfields: Al Dhafra, Bateen, Abu Dhabi International, and Dubai International. The country straddles Zones II and III, and its facilities lie beyond the projected range of Iraq's ballistic missiles; however, it is located on the coast of the Persian Gulf and very near the Iranian coast. Al Dhafra is the country's only dedicated military airfield; U.S. and other Western air forces frequently use this facility; and it appears to be the best option. This airbase would be an excellent logistics hub, but it could also support high-tempo combat operations if necessary.

Farther to the south, the Omani airfield at Seeb appears to be the best option. U.S. and other NATO air forces have frequently used Seeb, and it also served as a transportation hub and support base during the Gulf War. Seeb is a large installation with a main runway of over 11,000 feet and more than five million square feet of ramp and apron space. It can easily support any NATO aircraft, including B-52s at a reduced weight. The size of this installation suggests that

it can support a full range of possible operations, accommodate large-scale deployments, and provide valuable depth to air operations from Saudi Arabia. It is clearly out of range of potential Iraqi TBMs but would be vulnerable to Iranian missiles. Thumrait is also a major Omani installation that houses prepositioned U.S. Air Force equipment and stocks and that will play a significant role in any contingency. It could also support the deployment of an AEF if additional operational depth was needed in an Iraqi contingency. It is a long way from Iraq, however, and is better located to support operations over southwestern Iran. If the aggressor is Iran, Thumrait is outside Iranian TBM range. Omani facilities are a possible backup in the event that Zone I or II facilities are not available or access is delayed.

Outside of the Middle East a few airfields could supplement or back up more capable facilities in the greater Middle East. Clearly, none of the airfields in the Black or Caspian Sea regions is a true replacement for available facilities in the Middle East. As discussed earlier, Georgian and a few Ukrainian airfields are the most reasonable options.

The Zone II airfields in Georgia are not much farther from Baghdad than Incirlik, Turkey. There are a few airfields in Georgia that should be considered, with the best option Babushara by virtue of its size and proximity to Georgia's ports on the Black Sea (see Figure 4.3). Operations anywhere over the northern third of the Peninsula or Iran could be effectively run from there. In the event of an Iranian contingency, installations in the north will become extremely important because the country's center of gravity and capital are in the north.

The Zone III airfields in southeastern Ukraine (on or near the Crimea) are also within reasonable flight distance and are a plausible option if facilities nearer the crisis zone are not available. In Ukraine, the best airfield alternatives are on or near the Crimean Peninsula, with the best being two active military bases, Belbek and Nikolayiv-Kulbakino, and a former active Soviet military installation that is currently closed, Simferopol. However, these facilities are at least 850 to 900 nautical miles north and east of Baghdad, which would constrain the types of missions they could support.

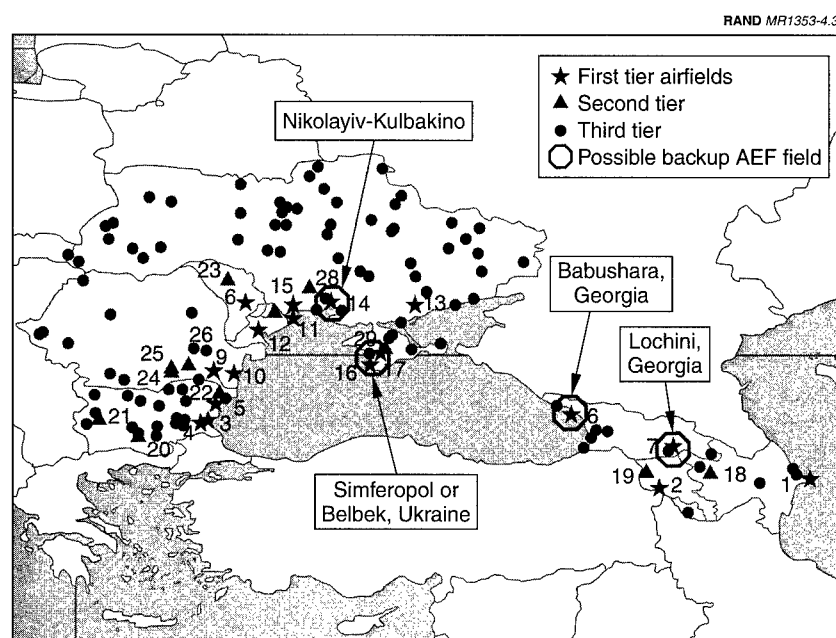


**Figure 4.3—Possible AEF Deployment Airfields: Black and Caspian Sea Regions**

In both Georgia and Ukraine, existing facilities are not optimized to support Western combat operations. Use of any of the aforementioned facilities would thus incur possible operational problems and planning concerns, including the following:

- U.S. and NATO air forces are not familiar with these facilities;
- the facilities are not designed to maintain Western aircraft, and their personnel are not used to supporting such aircraft;
- their infrastructure, equipment, and stocks were intended to support Soviet-designed aircraft and procedures;
- their runways are shorter, and there is generally much less ramp/apron space than is preferred for an AEF; and

- no prepositioned stocks or sustainment chains are envisioned (and clearly none are established) to open quickly the logistical LOCs necessary to sustain any deployment.

**Recommendations.** We are not advocating that the Air Force planners and operators pull the plug on today's traditional constellation of airfields supporting operations in the greater Middle East. We must all recognize, however, that:

- there is a growing sentiment to close down both Northern and Southern Watch Operations;
- the regional deployment of U.S. and other Western air forces in the region may be transient in the future; and
- the airfields currently being used to support the no-fly zone operations over both northern and southern Iraq may not be a good fit for tomorrow's crisis.

As a result, planners need to look beyond this established set of deployment airfields, consider the ongoing political and military-technical changes in the region, and take into account the range of possible regional contingencies beyond Iraq that may draw the U.S. Air Force into the area. The bases that we have identified as possible backup AEF deployment bases are meant to do just that. These are airfields that:

- expand the number of regional deployment airfields and, in turn, the number of AEF-equivalent units that can be stationed in any given sector;
- add depth to the airfield support package, giving the theater CINC greater flexibility to adjust operational locations in response to increases in the threat to one or more of the airbases; and
- provide the CINC with deployment options within tactical range of the target area but off the Peninsula in the event that access authorization is denied or slow in coming.

With these considerations in mind, we have presented in Figures 4.1 and 4.3 our recommendation of what we believe is a well-balanced set of deployment airfields to supplement the current constellation.

From our perspective, this supplemental package of possible deployment airfields represents a recommendation and not necessarily the solution, as which airfields will be unavailable in the next crisis and which will provide the best support to the associated mission requirements will depend on the specific situation. By identifying a broader range of possible options, however, we give planners a known base of airfields to fall back on if one or more of the preferred airfields are not available. For this reason, we believe that planning staffs should run a similar assessment for their areas of responsibility and seriously look to expand their possible deployment constellation, which will provide a hedge against the many uncertainties dominating the security situation in the greater Middle East.

It is relatively easy to broaden the number of potential AEF deployment bases in any theater, but this is an important beginning, as it provides the basis for critical detailed planning.<sup>5</sup> The bottom line is that the process cannot end simply with the addition of a selected number of these airfields to the planning base. If one expects to deploy quickly to any of these facilities, bring the elements of the AEF up to full operational status, and sustain high-tempo combat operations, deployment cannot be ad hoc or wait for extended negotiations. Planning, negotiations, and preparation are all necessary, and these processes should preferably be completed or at least begun before a situation develops in which access is required. Thus, these alternative bases must be duly identified and host nations contacted regarding potential future use before a crisis develops. This process will not be completed without costs, but it must be accomplished if the U.S. Air Force and its alliance partners wish to be favorably positioned to meet their rapid-deployment goals.

---

<sup>5</sup>For some suggested means of confronting the anticipated infrastructure challenges, see Killingsworth et al., *Flexbasing: Achieving Global Presence for Expeditionary Aerospace Forces*.

---

## CHARACTERISTICS OF SELECTED AIRFIELDS IN THE MIDDLE EAST

---

This appendix provides more detailed data for the 48 airfields in the Middle East<sup>1</sup> that we have selected as first or second tier. All of these airfields have one or more major runways made of permanent surface, have a runway length of at least 8000 feet, and are judged to be in fair or good (in other words, usable) condition. Highway strips and temporary airfields are not included.

The following information is provided for all of the airfields:

- Number on map (Figure A.1), name, country, and operator.
- Geographic coordinates of the airfield (degrees and minutes).
- Runway length and width (in feet), surface type of runway (CON = concrete, ASP = asphaltic concrete, PEM = pembroke, BIT = bituminous, GRE = graded earth, GRS = grass, SAN = sand), NIMA assessment of the condition of the runway LCN, and information concerning geographic constraints to extending the length of the runway. Information for any additional runways is provided if more than one runway fits the requirements (permanent surface, 4000 or more feet in length, good/fair condition).

---

<sup>1</sup>For this study, we are using a broader definition for the Middle East that includes Bahrain, Cyprus, Djibouti, northeastern Egypt, Israel, Jordan, Kuwait, Oman, Qatar, Saudi Arabia, Syria, and Yemen.

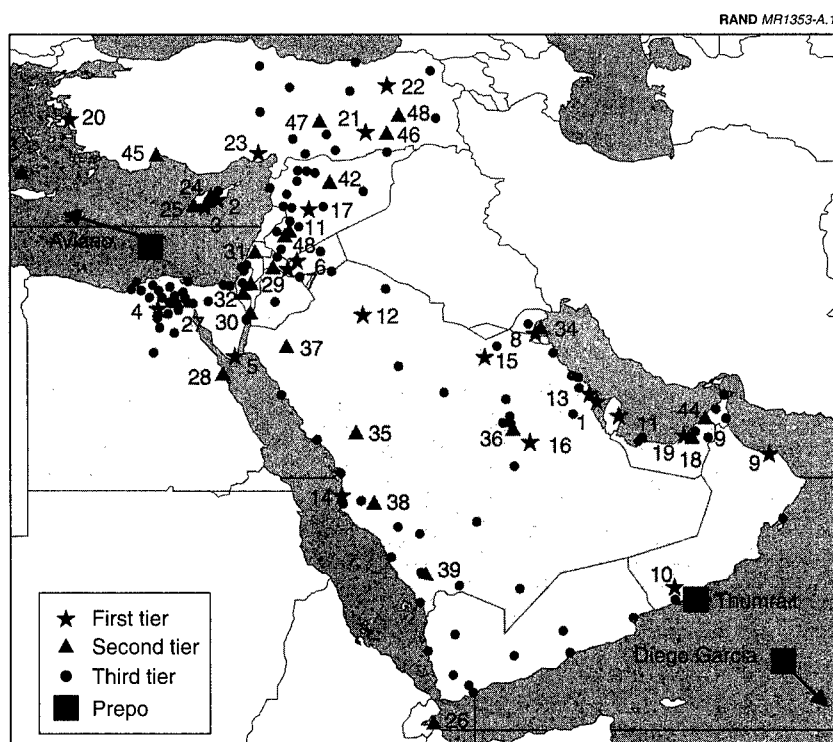


Figure A.1—Constellation of Airfields in the Middle East with an 8000-Foot-Plus, Hard-Surface Main Runway

- Composite total area of the airfield's ramps and aprons (in square feet) that could be used to park and service deployed aircraft, and the total number of aprons. Generally, the composite area includes only hard-surface, good-condition work surfaces.
- Distance in nautical miles to the target zone (Baghdad is the example used here).
- The next seven items assess in yes, no, and unknown terms the availability of key military support infrastructure items: above or underground fuel storage, established and secure ammunition storage site, and physical security standards for the airfield—for example, fenced perimeter and security personnel, hangers for

servicing and repairing aircraft, shelters or bunkers to provide additional security for parked aircraft, and the availability of life support items such as barracks and mess facilities for deployed personnel.

- A remarks section that mentions location relative to the operating zone, the nature and quality of the airfield infrastructure, the current and previous use of the airfield, type of units and aircraft stationed, operational concerns, possible additional support requirements, the type of operations the field can support, and transportation access (road, rail, or inland waterway).

## 154 Evaluating Possible Airfield Deployment Options: Middle East Contingencies

**Table A.1**  
**Characteristics of Selected Airfields in the Middle East**

| ID No.                      | Airfield Name        | Country      | Operator | Latitude | Longitude | Rnwy Len<br>Ft          | Rnwy Wid<br>FT    | Type              | Cond.       | LCN               | Ramp Space<br>Sq Ft/# Aprons |
|-----------------------------|----------------------|--------------|----------|----------|-----------|-------------------------|-------------------|-------------------|-------------|-------------------|------------------------------|
| <b>First Tier Airfields</b> |                      |              |          |          |           |                         |                   |                   |             |                   |                              |
| 1                           | Shaikh Isa           | Bahrain      | Mil      | 25.5506N | 50.3526E  | 12467                   | 147               | ASP               | G           | 84                | 1400000/6                    |
| 2                           | Larnaca              | Cyprus       | Civ      | 34.5217N | 33.3726E  | 8858                    | 148               | ASP               | G           | 70                | 2700000/6                    |
| 3                           | Akrotiri             | Cyprus       | Mil(RAF) | 34.3525N | 32.5916E  | 8995                    | 200               | ASP               | G           | 100               | 3000000/0                    |
| 4                           | Cairo West           | Egypt        | Mil      | 30.0658N | 30.5456E  | 9730<br>9125<br>8710    | 196<br>147<br>130 | ASP<br>ASP<br>BIT | G<br>G<br>P | 75<br>107<br>107  | 1800000/8                    |
| 5                           | Sharm El Sheikh      | Egypt        | Civ      | 27.5855N | 34.2316E  | 10105<br>10105          | 148<br>148        | ASP<br>ASP        | G<br>G      | 120<br>120        | 46398/1                      |
| 6                           | Prince Hasan         | Jordan       | Mil      | 32.0937N | 37.0859E  | 9896                    | 140               | ASP               | G           | 78                | 1000000/4                    |
| 7                           | Shaheed Mwaffaq      | Jordan       | Mil      | 31.4959N | 36.4702E  | 9777                    | 148               | ASP               | G           | 115               | 400000/3                     |
| 8                           | Ahmed Al Jaber AB    | Kuwait       | Mil      | 28.5605N | 47.4731E  | 9847<br>9843            | 148<br>131        | ASP<br>ASP        | G<br>G      | 60<br>60          | 2500000/5                    |
| 9                           | Seeb Intl            | Oman         | Mix      | 25.3535N | 58.1754E  | 11762<br>2461           | 148<br>98         | ASP<br>GRE        | G<br>F      | 84<br>U           | 5400000/5<br>241170/1        |
| 10                          | Thumrait             | Oman         | Mil      | 17.3957N | 54.0129E  | 13123<br>6358           | 148<br>150        | ASP<br>SAN        | G<br>F      | 100<br>100        | 600000/5<br>953700/1         |
| 11                          | Doha Intl            | Qatar        | Mix      | 25.1540N | 51.3354E  | 15000                   | 151               | ASP               | G           | 100               | 3700000/7                    |
| 12                          | Al Jouf              | Saudi Arabia | Mix      | 29.4706N | 40.0600E  | 12015                   | 148               | ASP               | G           | 67                | 1500000/6                    |
| 13                          | Dhahran Intl         | Saudi Arabia | Mix      | 26.1555N | 50.0907E  | 12008<br>11811<br>7054  | 148<br>148<br>98  | ASP<br>ASP<br>ASP | G<br>G<br>G | 100<br>100<br>46  | 8300000/9                    |
| 14                          | King Abdul Aziz Intl | Saudi Arabia | Mix      | 21.4107N | 39.0924E  | 12467<br>12106<br>10827 | 197<br>148<br>197 | CON<br>ASP<br>CON | G<br>G<br>G | 102<br>102<br>100 | 18600000/12                  |
| 15                          | King Khalid Mil City | Saudi Arabia | Mil      | 27.5403N | 45.3141E  | 12005                   | 148               | ASP               | G           | 63                | 15700000/10                  |
| 16                          | Prince Sultan AB     | Saudi Arabia | Mil      | 24.0348N | 47.3450E  | 13143                   | 148               | ASP               | G           | 71                | 15800000/5                   |
| 17                          | Tiyas AB             | Syria        | Mil      | 34.3123N | 37.3750E  | 10410<br>10098          | 197<br>184        | ASP<br>GRE        | G<br>P      | 50<br>U           | 1400000/7<br>1858000/1       |

Characteristics of Selected Airfields in the Middle East 155

Table A.1—continued

| Dist in NMs<br>to Baghdad | Fuel | Ammo Stg | Security | Hangers | Shelters | Barracks | Mess | Remarks                                                                                                                                                 |
|---------------------------|------|----------|----------|---------|----------|----------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| 548                       | Y    | Y        | Y        | Y       | Y        | Y        | Y    | Main fighter base w/ F-16s; C-5 poss;<br>can spt AEF                                                                                                    |
| 545                       | Y    | N        | Y        | Y(lim)  | N        | N        | N    | Civ AF, but exc loc & plenty of ramp;<br>can spt lg trans & med bmbrs                                                                                   |
| 575                       | Y    | Y        | Y        | Y       | N        | Y(lim)   | Y    | RAF op AF - caretaker status; used by<br>med bmbrs, hvy trans & ftrs                                                                                    |
| 715                       | Y    | Y        | Y        | Y       | Y        | Y        | Y    | Parking for 1 C5 or 26 C141 or 46 C130<br>or 200 fighters on 3.8mil sq ft of ramp<br>plus additional 50 ftrs on hardstands                              |
| 610                       | Y    | U        | Y        | Y       | N        | Y        | N    | Built as IS ftr base; ramp lim; open field<br>for overflow; up to C-5/KC-10; 20 ftrs or<br>ftr-bmbrs; needs work + room to expand;<br>worth cost/effort |
| 375                       | Y    | Y        | Y        | Y       | Y        | Y        | Y    | Major Jordanian ftr base and tng schl;<br>plenty of ramp space                                                                                          |
| 400                       | Y    | Y        | Y        | Y       | Y        | Y        | Y    | Ftr base w/ lim support fac; needs work;<br>good op cap and loc                                                                                         |
| 315                       | Y    | Y        | Y        | Y       | Y        | Y        | Y    | Ftr base w/ 2 sqdn A4s; plenty of addl<br>ramp space for 100+ AC                                                                                        |
| 935                       | Y    | Y        | Y        | Y       | N        | Y        | Y    | Loc and lg AC cap make it ideal as log<br>spt base; 40 141s, 16 5s & 155 ftrs<br>on apron space, + 30 B-52s reduced wt.                                 |
| 1070                      | Y    | Y        | Y        | Y       | Y        | Y        | Y    | Major AB in Oman w/ 2 ftr sqdns; spt<br>2 - 3 addl sqdns + all NATO transports                                                                          |
| 610                       | Y    | Y        | Y        | Y       | Y        | N        | Y    | Qatar AF shares fac; can handle all lg<br>AC; parking accom 100+ ftrs & 6 C-5s;<br>separate mil apron & term                                            |
| 310                       | Y    | Y        | Y        | Y       | Y        | Y        | Y    | Good loc & cap of sptng sustained ops;<br>spt most lg transports & all NATO cbt AC                                                                      |
| 520                       | Y    | Y        | Y        | Y       | Y        | Y        | Y    | Saudi F-15s & Toranados stationed;<br>AB fully equipped to spt longterm ops<br>by any NATO AC; can spt 100+ ftrs                                        |
| 750                       | Y    | U        | Y        | Y       | Y        | Y        | Y    | Lg intl airport w/all modern fac & svcs;<br>spts mil ops; cap of sustained ops for all<br>AC in NATO; loc near Islamic holy sites                       |
| 330                       | Y    | U        | Y        | Y       | Y        | Y        | Y    | Excellent loc; huge ramp space - lg ftr<br>deployment poss; handle most lg trans                                                                        |
| 580                       | Y    | U        | Y        | Y       | Y        | N        | N    | AB construction continues; lg AB w/all<br>modn fac; spt all NATO cmt & trans AC;<br>freq used as deploy AB by USAF & allies                             |
| 350                       | Y    | Y        | Y        | Y       | Y        | Y        | Y    | 4 ftr/ftr-bmbr sqdns; adeq fac w/room for<br>exp; R2 as apron; cap of addl 90+ ftrs                                                                     |

156 Evaluating Possible Airfield Deployment Options: Middle East Contingencies

Table A.1—continued

| ID No.                | Airfield Name   | Country | Operator  | Latitude | Longitude | Rnwy Len<br>Ft                        | Rnwy Wid<br>FT                  | Type                            | Cond.                 | LCN                        | Ramp Space<br>Sq Ft/# Aprons |
|-----------------------|-----------------|---------|-----------|----------|-----------|---------------------------------------|---------------------------------|---------------------------------|-----------------------|----------------------------|------------------------------|
| 18                    | Al Dhafra       | UAE     | Mil       | 24.1453N | 54.3252E  | 12057                                 | 150                             | ASP                             | G                     | 75                         | 5000000/5                    |
| 19                    | Bateen          | UAE     | Mix       | 24.2541N | 54.2729E  | 10499                                 | 150                             | ASP                             | G                     | 80                         | 1500000/4                    |
| 20                    | Cigli AB        | Turkey  | Mil       | 38.3042N | 27.0049E  | 9808                                  | 147                             | ASP                             | G                     | 50                         | 1200000/6                    |
| 21                    | Diyarbakir      | Turkey  | Mix       | 37.5337N | 40.1203E  | 11644                                 | 150                             | CON                             | G                     | 75                         | 1200000/8                    |
| 22                    | Erzurum         | Turkey  | Mix       | 39.5723N | 41.1013E  | 12500<br>12500<br>3051                | 98<br>148<br>49                 | CON<br>CON<br>ASP               | G<br>G<br>F           | 64<br>65<br>U              | 300000/6<br>150000/1         |
| 23                    | Incirlik AB     | Turkey  | Mil       | 37.0007N | 35.2533E  | 10000<br>9000                         | 148<br>148                      | CON<br>CON                      | G<br>G                | 80<br>80                   | 2400000/8                    |
| Second Tier Airfields |                 |         |           |          |           |                                       |                                 |                                 |                       |                            |                              |
| 24                    | Nicosia         | Cyprus  | Mix(RAF)  | 35.0915N | 33.1623E  | 9704<br>6000                          | 150<br>150                      | ASP<br>ASP                      | G<br>G                | 70<br>50                   | 2000000/6                    |
| 25                    | Pafos Intl      | Cyprus  | Mix       | 34.4304N | 32.2909E  | 8858                                  | 148                             | ASP                             | G                     | 70                         | 1000000/6                    |
| 26                    | Djbouti Ambouli | Djbouti | Mix (FAF) | 11.3250N | 43.0934E  | 10335                                 | 148                             | ASP                             | G                     | 86                         | 1700000/6                    |
| 27                    | Bilbays         | Egypt   | Mil       | 30.2341N | 31.3605E  | 11425<br>9534<br>8448<br>4960<br>5017 | 150<br>160<br>150<br>150<br>150 | ASP<br>ASP<br>ASP<br>ASP<br>ASP | G<br>G<br>G<br>G<br>G | 59<br>59<br>59<br>59<br>59 | 1000000/5                    |
| 28                    | Hurghada        | Egypt   | Mix       | 27.1058N | 33.4753E  | 13124<br>9843<br>6860                 | 148<br>131<br>65                | ASP<br>ASP<br>ASP               | G<br>G<br>G           | 35<br>U<br>U               | 1800000/3                    |
| 29                    | Nevatim AB      | Israel  | Mil       | 31.1230N | 35.0044E  | 10991<br>8530<br>7230<br>2806         | 147<br>147<br>67<br>70          | ASP<br>ASP<br>ASP<br>ASP        | G<br>G<br>G<br>G      | 75<br>75<br>U<br>U         | 600000/6                     |
| 30                    | Ovda            | Israel  | Mix       | 29.5621N | 34.5611E  | 9843<br>8530                          | 148<br>148                      | ASP<br>ASP                      | G<br>G                | 67<br>67                   | 1000000/4                    |
| 31                    | Ramat David     | Israel  | Mil       | 32.3937N | 35.1056E  | 8500<br>7875<br>7845                  | 170<br>150<br>115               | ASP<br>ASP<br>ASP               | G<br>G<br>G           | 59<br>U<br>U               | 700000/9                     |
| 32                    | Ramon           | Israel  | Mil       | 30.4634N | 34.4000E  | 9876<br>8858                          | 148<br>148                      | ASP<br>ASP                      | G<br>G                | 25<br>25                   | 1200000/7                    |
| 33                    | Marka Intl      | Jordan  | Mix       | 31.5821N | 35.5930E  | 10781                                 | 148                             | ASP                             | G                     | 54                         | 2900000/8                    |

# Characteristics of Selected Airfields in the Middle East 157

Table A.1—continued

| Dist in NMs<br>to Baghdad | Fuel   | Ammo Stg | Security | Hangers | Shelters | Barracks | Mess   | Remarks                                                                                                                                                                                          |
|---------------------------|--------|----------|----------|---------|----------|----------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 760                       | Y      | Y        | Y        | Y       | Y        | Y        | Y      | Home 2 ftrs sqdns; ex airfield cap of spt all NATO AC, inc 60+ C5/day & 100+ ftrs                                                                                                                |
| 750                       | Y      | U        | Y        | Y       | Y        | Y        | Y      | Principally mil trans & Hq AF; accom all NATO AC - 10-20 strat lifters & 200 ftrs                                                                                                                |
| 900                       | Y      | Y        | Y        | Y       | Y        | Y        | Y      | Pilot tng fac; AB maintained to NATO std; ferry point into region; spt all NATO AC vice fully load C5s; fuel stg upgrade                                                                         |
| 350                       | Y      | Y        | Y        | Y       | Y        | Y        | Y(lim) | Reg AF Hq & 2 F-16 sqdns; cap of spt AEF                                                                                                                                                         |
| 430                       | Y      | Y        | Y        | Y       | Y        | Y        | Y      | Lim parking space - could exp w/use of R3; cap of handling all NATO cmbt & trans AC vice C5; can spt AEF                                                                                         |
| 500                       | Y      | Y        | Y        | Y       | Y        | Y        | Y      | Excellent fac; cap of spt all NATO cmbt & trans AC; spt sustained ops w/ AEF                                                                                                                     |
| 565                       | U      | Y        | Y        | Y       | N        | Y        | Y      | AB closed w/RAF caretakers; svc as alt field; could be reactivated in 6-8 wks; spt AEF w/ hvy trans, med bmbrs & ftrs                                                                            |
| 600                       | Y      | Y        | Y        | Y       | U        | N        | Y      | Routinely handles 747s & DC10s; cap spt all NATO hvy trans AC                                                                                                                                    |
| 1310                      | Y      | Y        | Y        | Y       | Y(const) | Y        | Y      | Ex loc - strat contl Red Sea; sea port w/ in 3 mi; Fr AF is perm occupant; spt 1 sqdn hvy trans or med bmbrs or 2 ftr sqn                                                                        |
| 675                       | Y      | Y        | Y        | Y       | Y        | Y        | Y      | Flight tng & med bmbr base; extensive parking - use R4 & 5 as parking; spt all NATO ftr & ftr-bmbr AC + all trans; can spt AEF; lim perm fuel storage cap lim extended ops w/out temp supplement |
| 660                       | Y(lim) | Y        | Y        | N       | Y        | Y        | Y      | Ftr base; ex loc w/plenty of apron space & use R3; lim refueling limits extended ops w/out temp suppl; upgraded to spt intl fits recently but still needs work                                   |
| 495                       | Y      | Y        | Y        | Y       | Y        | Y        | Y      | Home 3 Sqdns IS ftrs, depot maint fac; lim ramp; ramp poss addl 30-40 AC for lim ops; R3&4 poss addl parking                                                                                     |
| 525                       | Y      | Y        | Y        | Y       | Y        | Y        | Y      | Active ftr sqdns moved; used for deply, tng & stor; civ part handles tourists & 747s; spt AEF; extnd ops lim - fuel avail                                                                        |
| 465                       | Y      | Y        | Y        | Y       | Y        | Y        | Y      | Major Israeli AB; 3 sqdn ftrs, 1 recon, 1 atck helos; lim ramp; squeeze in poss addl 30-40 AC for lim ops                                                                                        |
| 520                       | Y      | Y        | Y        | Y       | Y        | Y        | Y      | Major IS ftr base w/2 F-16 sqdns; can spt all NATO cmbt AC; space lim & deply AC park on apron only                                                                                              |
| 435                       | Y      | Y        | Y        | Y       | N        | Y        | Y      | Mil principal user; Hq JO AF; can spt all civ & NATO mil AC; can spt AEF; separate mil ramp & term                                                                                               |

## 158 Evaluating Possible Airfield Deployment Options: Middle East Contingencies

Table A.1—continued

| ID No. | Airfield Name                        | Country    | Operator | Latitude | Longitude | Rnwy Len<br>Ft | Rnwy Wid<br>FT | Type       | Cond.  | LCN        | Ramp Space<br>Sq Ft/# Aprons |
|--------|--------------------------------------|------------|----------|----------|-----------|----------------|----------------|------------|--------|------------|------------------------------|
| 34     | Kuwait Intl                          | Kuwait     | Mix      | 29.1336N | 47.5849E  | 11152<br>11483 | 150<br>148     | CON<br>ASP | G<br>G | 100<br>25  | 5000000/11                   |
| 35     | Prince Mohammed<br>Bin Abdulaziz, SA |            | Mix      | 24.3309N | 39.4218E  | 12631<br>10007 | 147<br>147     | ASP<br>ASP | G<br>G | 77<br>93   | 2300000/5                    |
| 36     | Riyadh AB                            | Saudi Arab | Mix      | 24.4235N | 46.4331E  | 13288<br>11778 | 147<br>147     | ASP<br>ASP | G<br>G | 55<br>60   | 8000000/5                    |
| 37     | Tabuk                                | Saudi Arab | Mix      | 28.2155N | 36.3708E  | 10991<br>10007 | 148<br>148     | ASP<br>ASP | G<br>G | 110<br>110 | 2000000/6                    |
| 38     | Taif                                 | Saudi Arab | Mix      | 21.2900N | 40.3240E  | 12254<br>10991 | 148<br>148     | ASP<br>ASP | G<br>G | 115<br>115 | 4400000/13                   |
| 39     | King Khalid AB                       | Saudi Arab | Mil      | 18.1829N | 42.4820E  | 12467<br>12467 | 148<br>148     | ASP<br>ASP | G<br>G | 66<br>66   | 3800000/11                   |
| 40     | Damascus Intl                        | Syria      | Mix      | 33.2444N | 36.3101E  | 11810<br>9843  | 148<br>148     | CON<br>ASP | G<br>G | 120<br>120 | 3500000/4                    |
| 41     | Dumayr                               | Syria      | Mil      | 33.3634N | 36.4456E  | 10335<br>8335  | 150<br>197     | CON<br>GRE | G<br>P | 39<br>U    | 450000/3<br>1700000/1        |
| 42     | Tabqa                                | Syria      | Mil      | 35.4507N | 38.3355E  | 9842           | 131            | CON        | G      | 67         | 400000/4                     |
| 43     | Abu Dhabi Intl                       | UAE        | Civ      | 24.2558N | 54.3904E  | 13452          | 147            | ASP        | G      | 118        | 3400000/8                    |
| 44     | Dubai Intl                           | UAE        | Mix      | 25.1509N | 55.2152E  | 13124          | 150            | ASP        | G      | 120        | 6200000/6                    |
| 45     | Antalya                              | Turkey     | Mix      | 36.5405N | 30.4730E  | 11155<br>9809  | 148<br>148     | CON<br>ASP | G<br>G | 80<br>45   | 3800000/4                    |
| 46     | Batman                               | Turkey     | Mil      | 37.5544N | 41.0659E  | 10005          | 150            | ASP        | G      | 50         | 500000/5                     |
| 47     | Erhac                                | Turkey     | Mil      | 38.2608N | 38.0530E  | 10990          | 148            | ASP        | G      | 50         | 800000/6                     |
| 48     | Mus                                  | Turkey     | Mix      | 38.4447N | 41.3938E  | 11647<br>11647 | 148<br>74      | ASP<br>ASP | G<br>G | 50<br>50   | 150000/2<br>860000/1         |

Characteristics of Selected Airfields in the Middle East 159

Table A.1—continued

| Dist in NMs<br>to Baghdad | Fuel | Ammo Stg | Security | Hangers | Shelters | Barracks | Mess   | Remarks                                                                                                                                               |
|---------------------------|------|----------|----------|---------|----------|----------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| 305                       | Y    | Y        | Y        | Y       | N        | N        | Y      | Joint use; ftr sqdns based; AB cap of sustained ops for hvy trans & ftr AC; space for 11 C5s or equiv + 100+ ftrs                                     |
| 580                       | Y    | N        | Y        | N       | N        | N        | N      | Ex all weather airport; can spt all NATO AC; cap of spting lg-scale ops; loc provides operational depth                                               |
| 530                       | Y    | Y        | Y        | Y       | N        | Y        | Y      | AF Hq; cap of sustained ops; ample parking; can control & spt lg no. of any type AC; sep mil apron & term                                             |
| 500                       | Y    | Y        | Y        | Y       | Y        | Y        | Y      | Ex loc; can spt lg-scale ftr ops & sustained ops; spt all NATO cmbt & trans AC                                                                        |
| 740                       | Y    | Y        | Y        | Y       | Y        | Y        | Y      | Loc near Red Sea; lg ftr base; cap of spt lg ftr ops & w/ some added fac cap of sustained hvy ops; can spt all NATO cmbt and trans AC                 |
| 905                       | Y    | Y        | Y        | Y       | Y        | Y        | Y      | Major tng & op base for ftrs; AB cap of spt sustained hvy ops w/all NATO cmbt and trans AC vice hvy bmbrs                                             |
| 395                       | Y    | Y        | Y        | Y       | Y        | Y        | Y(lim) | Sys intl airport; joint use w/mil trans; can spt all hvy civ or mil trans & NATO cmbt AC; park 20+ mil trans-3 ftr sqdns                              |
| 385                       | Y    | Y        | Y        | Y       | Y        | Y        | Y      | One of best & most impt mil Abs in SY; ftr & ftr-bmbr base; can spt all NATO ftr, ftr-bmbr or trans AC vice C5; cap spt three ftr and two trans sqdns |
| 325                       | Y    | Y        | Y        | Y       | Y        | Y        | Y      | Ex loc in E SY; major ftr base; can acc ftr sqdn and med trans; can not spt full AEF; lim fuel cap & unk type                                         |
| 755                       | Y    | N        | Y(lim)   | Y       | N        | N        | N      | Ex alt field; cap of handling all hvy civ or mil trans; can spt hvy trans sqdn                                                                        |
| 750                       | Y    | N        | Y        | Y       | N        | N        | Y      | Strat loc; adequate fac & resupply cap spt major log ops by hvy trans; can acc 16 C5s or 40 C17 or 200+ ftrs; can spt all NATO AC                     |
| 700                       | Y    | Y        | Y        | Y       | Y        | Y        | Y      | NATO rotational ftr base; can acc all civ & mil hvy trans AC; can acc AEF                                                                             |
| 320                       | Y    | Y        | Y        | Y       | Y        | Y        | Y      | Ex loc SE TU; NATO fac - pilot tng; can spt 2 sqdns ftrs; acc hvy trans; lim apron; needs work to spt sustained ops                                   |
| 435                       | Y    | Y        | Y        | Y       | Y        | Y        | Y      | Major ftr base; NATO fac; cap of spt all NATO cmbt & trans AC; lim apron                                                                              |
| 350                       | Y    | Y        | Y        | Y       | N        | Y        | Y      | Ex ftr & ftr-bmbr cap base in SE TU; cap of spt all NATO cmbt & trans AC; lim parking - suppl w/R2; can spt AEF                                       |

## Appendix B

---

### CHARACTERISTICS OF SELECTED AIRFIELDS IN THE BLACK AND CASPIAN SEA REGIONS

---

This appendix provides more detailed data for the 29 airfields in the Black and Caspian Sea regions<sup>1</sup> that we have selected as first or second tier. All of these airfields have one or more major runways made of permanent surface, have a runway length of at least 7500 feet, and are judged to be in fair or good (in other words, usable) condition. Highway strips and temporary airfields are not included.

The following information is provided for all of the airfields:

- Number on map (Figure B.1) name, country, and operator.
- Geographical coordinates of the airfield (degrees and minutes).
- Runway length and width (in feet), surface type of runway (CON = concrete, ASP = asphaltic concrete, PEM = pembroke, GRE = graded earth, GRS = grass), NIMA assessment of the condition of the runway, LCN, and information concerning geographic constraints to extending the length of the runway. Information for any additional runways is provided if more than one runway fits the requirements (permanent surface, 4000 or more feet in length, good/fair condition).

---

<sup>1</sup>For this study, we have restricted our assessment of airfields in the Black and Caspian Sea regions to Azerbaijan, Armenia, Georgia, and Moldova as well as the regions of Bulgaria, Romania, and Ukraine that are on or near the Black Sea.

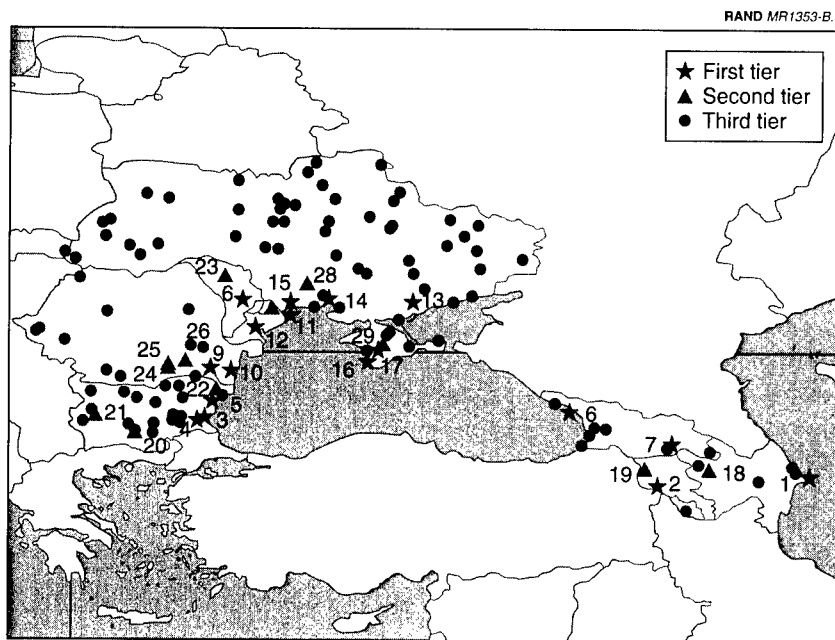


**Figure B.1—Constellation of Airfields in the Black and Caspian Sea Regions with an 8000-Foot-Plus Main Runway**

- Composite total area of the airfield's ramps and aprons (in square feet) that could be used to park and service deployed aircraft, and the total number of aprons. Generally, the composite area includes only hard-surface, good-condition work surfaces.
- Distance in nautical miles to the target zone (Baghdad is the example used here).
- The next seven items assess in yes, no, and unknown terms the availability of key military support infrastructure items: above or underground fuel storage, established and secure ammunition storage site, and physical security standards for the airfield—for example, fenced perimeter and security personnel, hangers for servicing and repairing aircraft, shelters or bunkers to provide additional security for parked aircraft, and the availability of life

support items such as barracks and mess facilities for deployed personnel.

- A remarks section that mentions location relative to the operating zone, the nature and quality of the airfield infrastructure, the current and previous use of the airfield, type of units and aircraft stationed, operational concerns, possible additional support requirements, the type of operations the field can support, and transportation access (road, rail, or inland waterway).

Table B.1

## Characteristics of Selected Airfields in the Black and Caspian Sea Regions

| First Tier Airfields |                         | Country    | Operator | Latitude | Longitude | Rnwy Len<br>Ft         | Width<br>FT        | Type              | Cond.       | LCN          | Ramp Space<br>Sq Ft/# Aprons |
|----------------------|-------------------------|------------|----------|----------|-----------|------------------------|--------------------|-------------------|-------------|--------------|------------------------------|
| ID No.               | Airfield Name           |            |          |          |           |                        |                    |                   |             |              |                              |
| 1                    | Bina                    | Azerbaijan | Civ      | 40.2823N | 50.0318E  | 10498<br>8858          | 147<br>196         | CON<br>ASP        | G<br>G      | 68<br>68     | 3000000/3                    |
| 2                    | Zvartnots               | Armenia    | Civ      | 40.0854N | 44.2348E  | 12631<br>12863         | 184<br>230         | ASP<br>GRE        | G<br>F      | 53<br>U      | 2900000/6<br>2950000/1       |
| 3                    | Burgas                  | Bulgaria   | Civ      | 42.3408N | 27.3050E  | 10499<br>12797<br>2461 | 147<br>492<br>1139 | CON<br>GRE<br>GRS | G<br>U<br>U | 75<br>U<br>U | 1500000/3<br>6298000/1       |
| 4                    | Ravnets                 | Bulgaria   | Mix      | 42.3136N | 27.1622E  | 8206<br>7532           | 167<br>195         | CON<br>CON        | G<br>G      | U<br>U       | 250000/4                     |
| 5                    | Varna                   | Bulgaria   | Mix      | 43.1356N | 27.4928E  | 8202<br>8202           | 180<br>180         | CON<br>GRE        | G<br>G      | 72<br>U      | 2400000/3<br>1476000/1       |
| 6                    | Babushara               | Georgia    | Civ      | 42.5111N | 47.0718E  | 11942                  | 172                | ASP               | G           | 67           | 1300000/3                    |
| 7                    | Lochini                 | Georgia    | Civ      | 41.4018N | 44.5718E  | 9842<br>8202           | 147<br>196         | CON<br>ASP        | G<br>G      | 53<br>40     | 2900000/8                    |
| 8                    | Kishinev                | Moldova    | Civ      | 46.5540N | 28.5553E  | 11778<br>7777          | 147<br>131         | CON<br>ASP        | G<br>F      | 37<br>U      | 2000000/6                    |
| 9                    | Cocargeaia<br>(Fetesti) | Romania    | Mil      | 44.2332N | 27.4336E  | 8202<br>8202           | 262<br>295         | CON<br>GRE        | G<br>G      | U<br>U       | 250000/5<br>2420000/1        |
| 10                   | Mihail<br>Kogalniceanu  | Romania    | Mix      | 44.2142N | 28.2918E  | 11484                  | 148                | CON               | G           | 75           | 1500000/4                    |
| 11                   | Buyalk                  | Ukraine    | Mix      | 46.8933N | 30.6972E  | 8302                   | 164                | CON               | G           | U            | 2000000/3                    |
| 12                   | Chervonoglinskoye       | Ukraine    | Mix      | 45.9463N | 29.3772E  | 8203<br>8203           | 263<br>263         | CON<br>GRE        | G<br>F      | U<br>U       | 1120000/3<br>2150000/1       |

Table B.1—continued

| Dist in NMs<br>to Baghdad | Fuel | Ammo Stg | Security | Hangers | Shelters | Barracks | Mess   | Remarks                                                                                                                                                          |
|---------------------------|------|----------|----------|---------|----------|----------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 506                       | Y    | N        | Y(lim)   | Y       | N        | N        | N      | Cap of spt long-rng hvy trans AC ops; fac, sec, & Sov fuel only lim cmbt depoy; ex loc for CA ops; needs work                                                    |
| 410                       | Y    | N        | Y(lim)   | N       | N        | N        | N      | W/deploy of airfield spt package can spt lg trans or ftr-bmbr/bmbr ops; need mhe, sec & fuel; RU troops (air, gnd & AD) perm stn AM                              |
| 970                       | Y    | N        | Y(lim)   | N       | N        | N        | N      | Ex civ airfield; can acc all civ & mil hvy trans; not set up to acc cmbt AC; need mhe, sec & housing                                                             |
| 980                       | Y    | N        | Y(lim)   | Y       | Y        | N        | N      | Mil AB; cap of spt ftr & ftr-bmbr ops; lim parking; need upgrade sec, fuel & aprons                                                                              |
| 980                       | Y    | Y(lim)   | Y        | Y       | N        | N        | N      | Ex loc w/gd field - lim mil ops; can spt most lg-range civ & mil trans; w/upgrade fuel & housing can spt ftr & ftr-bmbr ops                                      |
| 590                       | Y    | N        | U        | N       | N        | Y(lim)   | Y(lim) | Good field loc on Blk Sea; cap spt trans or bmbr ops; need to upgrade sec, fuel & housing; RU border troops stn in GG                                            |
| 500                       | Y    | N        | U        | Y       | N        | N        | Y      | Good field w/plenty parking; can spt lg-range trans or cmbt ops; nd upgrde mhe, sec, fuel & housing                                                              |
| 1080                      | Y    | N        | U        | Y       | N        | N        | U      | Good field w/plenty parking; can spt lg-range trans ops; need upgrade sec, mhe, fuel & housing                                                                   |
| 1020                      | Y    | Y        | Y        | Y       | Y        | U        | U      | Active mil AB w/lim parking; R2 poss temp parking 2+mil sq ft; loc far east sec RO; R can be extended 6000 ft ea end; need upgrade sec, fuel & housing; AEF poss |
| 990                       | Y    | Y        | Y(lim)   | Y       | Y(lim)   | N        | Y(lim) | Ftr-bmbr AB w/plenty parking; loc far eastern RO; R exten 6000 ft ea end; need upgrade sec, fuel & housing; AEF poss                                             |
| 1025                      | Y    | Y        | U        | Y       | Y        | U        | U      | Active Fencer base; loc near Blk Sea coast; cap spt ftr; ftr-bmbr & trans ops; need more info; upgrade sec, fuel & poss housing; AEF poss                        |
| 1025                      | Y    | U        | Y        | Y       | Y        | U        | U      | Ftr AB w/gd loc/field & plenty parking + R2 suppl parking; upgrade sec, fuel, housing & mhe; can spt AEF                                                         |

Table B.1—continued

| ID No.                       | Airfield Name       | Country    | Operator | Latitude | Longitude | Rnwy Len<br>Ft        | Width<br>Ft       | Type              | Cond.       | LCN           | Ramp Space<br>Sq Ft/# Aprons |
|------------------------------|---------------------|------------|----------|----------|-----------|-----------------------|-------------------|-------------------|-------------|---------------|------------------------------|
| 13                           | Melitopol           | Ukraine    | Mix      | 46.8667N | 35.3036E  | 8203<br>8203          | 246<br>263        | CON<br>GRE        | G<br>F      | U<br>U        | 794500/3<br>2150000/1        |
| 14                           | Nikolayiv-Kulbakino | Ukraine    | Mix      | 46.9372N | 32.0997E  | 10697<br>9811         | 263<br>263        | CON<br>GRE        | G<br>G      | U<br>U        | 5170000/3<br>2580000/1       |
| 15                           | Odessa              | Ukraine    | Civ      | 46.2537N | 30.4036E  | 9187<br>7350<br>9089  | 184<br>197<br>148 | ASP<br>CON<br>GRE | G<br>F<br>G | 34<br>U<br>U  | 500000/2<br>1345000/1        |
| 16                           | Belbek AB           | Ukraine    | Mil      | 44.4112N | 33.3421E  | 9150                  | 180               | CON               | G           | U             | 8398000/3                    |
| 17                           | Simferopol          | Ukraine    | Civ      | 45.0217N | 33.5854E  | 12159<br>8858<br>4659 | 197<br>147<br>115 | CON<br>CON<br>GRE | G<br>G<br>F | 38<br>52<br>U | 2000000/2<br>535700/1        |
| <b>Second Tier Airfields</b> |                     |            |          |          |           |                       |                   |                   |             |               |                              |
| 18                           | Gyandzha            | Azerbaijan | Civ      | 40.4405N | 46.1906E  | 8202                  | 144               | CON               | G           | 38            | 1600000/9                    |
| 19                           | Shirak              | Armenia    | Civ      | 40.4435N | 48.5118E  | 10564                 | 147               | ASP               | G           | 36            | U                            |
| 20                           | Plovdiv             | Bulgaria   | Civ      | 42.0402N | 24.5104E  | 8202<br>3850          | 164<br>400        | CON<br>GRE        | G<br>F      | 67<br>U       | 340000/1<br>1500000/1        |
| 21                           | Sofia               | Bulgaria   | Civ      | 42.4142N | 23.2422E  | 9186                  | 147               | CON               | G           | 74            | 4000000/5                    |
| 22                           | Dobrich             | Bulgaria   | Mix      | 43.3634N | 27.5011E  | 8202<br>8202          | 262<br>262        | CON<br>GRE        | G<br>G      | U<br>U        | 500000/4<br>2149000/1        |
| 23                           | Markuleshty         | Moldova    | Mix      | 47.5145N | 28.1247E  | 8235                  | 129               | CON               | G           | U             | 550000/3                     |
| 24                           | Baneasa - Bucharest | Romania    | Civ      | 44.3011N | 26.0608E  | 10499<br>2986         | 148<br>164        | CON<br>GRE        | G<br>G      | 68<br>U       | 1800000/9<br>490000/1        |

Table B.1—continued

| Dist in NMs<br>to Baghdad | Fuel   | Ammo Stg | Security | Hangers | Shelters | Barracks | Mess   | Remarks                                                                                                                                                                                                       |
|---------------------------|--------|----------|----------|---------|----------|----------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 910                       | Y      | U        | U        | Y       | Y        | U        | U      | Active trans avn base; orig config to spt hvy lifters & log ops for Sov AF; can spt all NATO trans AC                                                                                                         |
| 990                       | Y      | Y        | Y        | Y       | Y        | U        | U      | Ftr & ftr-bmbr base; ex runway & plenty of parking; cap spt all NATO cmbt, trans & bmbrs + AEF; concerns sec, fuel & housing                                                                                  |
| 1005                      | Y      | N        | Y(lim)   | Y       | N        | Y(com)   | Y(com) | Intl comm airport w/lim mil ops; lim CON apron space - suppl w/R3; ex loc near major Blk Sea port; cap spt any NATO AC                                                                                        |
| 845                       | Y      | Y        | Y        | Y       | Y        | Y        | Y      | Act ftr base; ex loc w/good runway & adeq apron space; cap spt any NATO AC; near sea port; concerns fuel, sec & RU mil fac and presence on Crimean Peninsula                                                  |
| 850                       | Y      | N        | Y(lim)   | U       | N        | Y(com)   | Y(com) | Intl comm airport w/plenty of parking; cap of spting lg high vol trans or bmbr ops; can spt all NATO trans or cmbt AC; recently closed but rated usable; may req wk & \$ to rtn but result = single use field |
| 450                       | Y      | Y        | U        | Y(lim)  | Y        | N        | N      | Comm airport w/plenty of parking; no hvy cargo handling equip; need to bring all to spt ops + sec                                                                                                             |
| 445                       | Y      | U        | U        | U       | U        | U        | U      | Ex loc; little known on current op cap of field; RU troops perm str'd                                                                                                                                         |
| 1060                      | Y      | Y        | Y(lim)   | Y       | N        | N        | N      | Loc S central BU; poss alt field; lim parking but can use R2; need to impv sec & fuel; currently spts lim mil ops                                                                                             |
| 1135                      | Y      | N        | Y(lim)   | Y       | N        | N        | N      | High cap comm field w/mil ops; can spt lg-scale log ops; plenty parking & warehouse space; cap spt all NATO trans AC                                                                                          |
| 990                       | Y      | Y        | Y        | Y       | N        | N        | N      | Ex loc; ftr base w/lim parking - suppl w/R2; alt log spt field; need full log spt package                                                                                                                     |
| 1140                      | U      | Y        | U        | Y       | Y        | U        | U      | Ex loc; lim parking; good potential; little know about current op cap                                                                                                                                         |
| 1080                      | Y(unk) | N        | Y        | Y       | N        | N        | N      | Ex comm field w/plenty parking & storage area; cap of spt all NATO trans & cmbt AC; needs fuel stor; comm housing avail; AEF poss                                                                             |

Table B.1—continued

| ID No. | Airfield Name       | Country | Operator | Latitude | Longitude | Rnwy Len<br>Ft | Width<br>FT | Type       | Cond.  | LCN      | Ramp Space<br>Sq Ft/# Aprons |
|--------|---------------------|---------|----------|----------|-----------|----------------|-------------|------------|--------|----------|------------------------------|
| 25     | Otopeni - Bucharest | Romania | Mix      | 44.3415N | 26.0506E  | 11484<br>11484 | 148<br>148  | ASP<br>CON | F<br>F | 93<br>93 | 1920000/3                    |
| 26     | Alexeni             | Romania | Mil      | 44.7096N | 26.7212E  | 8202<br>10664  | 262<br>328  | CON<br>GRE | G<br>G | U<br>U   | 29000/2<br>3500000/1         |
| 27     | Limanskoye          | Ukraine | Mix      | 46.6688N | 30.0111E  | 8203<br>8203   | 263<br>295  | CON<br>GRE | G<br>G | U<br>U   | 956000/3<br>2420000/1        |
| 28     | Martynovskaya       | Ukraine | Mix      | 47.3042N | 31.1532E  | 8195           | 155         | CON        | G      | U        | 1000000/4                    |
| 29     | Oktyabrskoye        | Ukraine | Civ      | 45.3230N | 34.1061E  | 9765<br>9975   | 180<br>263  | CON<br>GRE | G<br>F | U<br>U   | 1260000/3<br>2600000/1       |

Characteristics of Selected Airfields in the Black and Caspian Sea Regions 169

Table B.1—continued

| Dist in NMs<br>to Baghdad | Fuel   | Ammo Stg | Security | Hangers | Shelters | Barracks | Mess | Remarks                                                                                                                                                          |
|---------------------------|--------|----------|----------|---------|----------|----------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1085                      | Y(unk) | U        | U        | Y       | U        | U        | U    | Mil trans/comm ops; field fair cond<br>needs work - exact nature unk;<br>needs airfield survey; good loc &<br>pot spt both log & bmbr ops                        |
| 1070                      | Y(unk) | Y        | Y        | Y       | U        | Y        | Y    | Former ftr base; good runway; lim<br>CON apron space - suppl w/GRE<br>R2; alt spt base for ftr-bmbr &<br>trans AC                                                |
| 1035                      | Y      | Y        | U        | Y       | Y        | U        | U    | Active ftr base; w/R2 plenty of<br>parking; cap spt all NATO trans &<br>cmbt AC; AEF poss                                                                        |
| 1040                      | Y(unk) | Y        | Y        | Y       | Y        | U        | U    | Ftr base; loc just N of Odessa;<br>can spt all NATO trans & cmbt AC;<br>need upgrade fuel; lim info - need<br>survey data                                        |
| 860                       | Y(unk) | Y        | Y        | Y       | Y        | U        | U    | Former Sov naval AB (Bears); ex<br>loc w/good runway & plenty of CON<br>apron; cap of spt all NATO trans &<br>cmbt AC - hvy bmbrs & trans;<br>current status unk |

---

## BIBLIOGRAPHY

---

Abell, John B., Carl Jones, L. W. Miller, Mahyar A. Amouzegar, Robert S. Tripp, and Clifford Grammich, "Strategy 2000: Alternative Munitions Prepositioning," *Air Force Journal of Logistics*, Summer 2000, pp. 40–42.

"Air Combat Command Bases Ready to Deploy AEF to Persian Gulf," Air Force News Service, November 19, 1997, available at [http://www.af.mil/news/Nov1997/n19971119\\_971468.html](http://www.af.mil/news/Nov1997/n19971119_971468.html).

"Air Expeditionary Force Deploying to Southwest Asia," Air Force News Service, November 21, 1997, available at [http://www.af.mil/news/Nov1997/n19971120\\_971479.html](http://www.af.mil/news/Nov1997/n19971120_971479.html).

Air Force Vision statement, "Global Vigilance, Reach and Power," available at <http://www.af.mil/vision/>.

Alexander, John B., *Future War: Non-Lethal Weapons in Twenty-First-Century Warfare*, New York: St. Martin's Press, 1999.

"Armenia Courts West Under Russia's Watchful Eye," Stratfor, Inc., available at <http://www.stratfor.com/CIS/commentary/c991203014.htm>.

Begert, William J., "Kosovo and Theater Air Mobility," *Aerospace Power Journal*, Winter 1999, pp. 11–21.

Bennett, Ann, "Base Operating Support Vital to Bright Star Mission," Air Force News Service, November 15, 1999, available at [http://www.af.mil/news/Nov1999/n19991115\\_992091.html](http://www.af.mil/news/Nov1999/n19991115_992091.html).

Blanche, Ed, "Iran Forms Five Units for Shahab Ballistic Missiles," *Jane's Defence Weekly*, July 12, 2000, available at <http://ebird.dtic.mil/jul2000/s20000712forms.htm>.

Blanche, Ed, "Shifting Sands, Changing Prospects: Spending in the Middle East Maintained as Tension Continues," *Jane's International Defence Review*, November 2000, pp. 28–36.

Brady, Roger A., "Building and Commanding Expeditionary Units: Lessons from Kosovo," *Aerospace Power Journal*, Spring 2000, pp. 12–21.

Burns, John F., "A Maimed Destroyer Cole Starts for Home," *New York Times*, October 30, 2000.

Byman, Daniel L., and Jerrold D. Green, "The Enigma of Political Stability in the Persian Gulf Monarchies," *Middle East Review of International Affairs*, September 1999, available at <http://www.biu.ac.il/SOC/besa/meria/journal/1999/issue3/jv3n3a3.html>.

Byman, Daniel L., and Jerrold D. Green, *Political Violence and Stability in the States of the Northern Persian Gulf*, Santa Monica: RAND, MR-1021-OSD, 1999.

Byman, Daniel L., and Matthew C. Waxman, *Confronting Iraq: U.S. Policy and the Use of Force Since the Gulf War*, Santa Monica: RAND, MR-1146-OSD, 2000.

Byman, Daniel L., Matthew C. Waxman, and Eric V. Larson, *Air Power as a Coercive Instrument*, Santa Monica: RAND, MR-1061-AF, 1999.

Callander, Bruce D., "The New Expeditionary Force," *Air Force Magazine*, September 1998, available at [http://www.afa.org/magazine/1996\\_1998.html](http://www.afa.org/magazine/1996_1998.html).

Central Intelligence Agency, *World Fact Book: 2000*, available at <http://www.odci.gov/cia/publications/factbook/index.html>.

Centre for Defence and International Security Studies Web site, [http://www.cdiss.org/iraq\\_t.htm](http://www.cdiss.org/iraq_t.htm).

"Challenges in the Central Region: An Interview with Anthony C. Zinni," *Joint Forces Quarterly*, Spring 2000, pp. 26–31.

- Cook, Donald G., USAF Director for EAF Implementation, "Evolving to an Expeditionary Aerospace Force: The Next Air Force," Pentagon briefing, November 1998.
- Cordesman, Anthony, *Bahrain, Oman, Qatar, and the UAE*, Boulder, CO: Westview Press, 1997.
- Cordesman, Anthony, *Saudi Arabia: Guarding the Desert Kingdom*, Boulder, CO: Westview Press, 1997.
- Correll, John T., "On Course for Global Engagement," *Air Force Magazine*, January 1999, pp. 22-27.
- Dunn, Michael Collins, "Five Years After Desert Storm: Security, Stability, and the U.S. Presence," *Middle East Policy*, Vol. 4, No. 3, 1996.
- Esposito, John L., "Political Islam and the West," *Joint Forces Quarterly*, Spring 2000, pp. 49-55.
- Facility Requirements*, U.S. Air Force Handbook (AFH) 32-1084, September 1, 1996.
- Frost, Gerald, and Calvin Shipbaugh, *GPS Targeting Methods for Non-Lethal Systems*, IEEE Plans 94, Position Location and Navigation Symposium, April 11-15, 1994.
- Galway, Lionel A., Robert S. Tripp, Timothy L. Ramey, and John G. Drew, *Supporting Expeditionary Aerospace Forces: New Agile Combat Support Postures*, Santa Monica: RAND, MR-1075-AF, 2000.
- Garamone, Jim, "Kuwait OKs Long-Term U.S. Presence, Base Upgrades," American Forces Press Service, October 25, 1999, available at [http://www.defenselink.mil/news/Oct1999/n10251999\\_9910253.html](http://www.defenselink.mil/news/Oct1999/n10251999_9910253.html).
- "Georgia Aims for Joining NATO," *Jamestown Foundation Monitor*, May 4, 1999, available at <http://www.jamestown.org>.
- Gertz, Bill, "Miracle in the Desert," *Air Force Magazine*, January 1997, pp. 60-64.

Gertz, Bill, "Missile Threats and Defenses," *Air Force Magazine*, October 1998, available at [www.afa.org/magazine/1098missile.html](http://www.afa.org/magazine/1098missile.html).

Gilmore, Gerry, "Cohen to Bahrain: Thanks for 50 Years of Partnership," American Forces Press Service, November 21, 2000, available at <http://www.defenselink.mil/news/Nov2000/n1116200011161.html>.

Gilmore, Gerry, "Cohen: U.S.-Kuwait Ties 'Have Never Been Stronger,'" American Forces Press Service, November 20, 2000, available at [http://www.defenselink.mil/news/Nov2000/n11152000\\_200011155.html](http://www.defenselink.mil/news/Nov2000/n11152000_200011155.html).

Gilmore, Gerry, "Cohen Visits, Reaffirms UAE, Qatar Ties," American Forces Press Service, November 20, 2000, available at [http://www.defenselink.mil/news/Nov2000/n11202000\\_200011203.htm](http://www.defenselink.mil/news/Nov2000/n11202000_200011203.htm).

Goodman, Glenn W., Jr., "An Expeditionary Aerospace Force: USAF Plans Fundamental Shift in How It Responds to Global Contingencies," *Armed Forces Journal International*, September 1998, available at <http://www.afji.com/mags/1998/august/an%20expeditionary%20aerospace%20forc/index.html>.

Gritton, Eugene C., Paul K. Davis, Randall Steeb, and John Matsumura, *Ground Forces for a Rapidly Employable Joint Task Force: First-Week Capabilities for Short-Warning Conflicts*, Santa Monica: RAND, MR-1152-OSD/A, 2000.

Hawley, Richard E., Donald N. Fredericksen, Michael B. Donley, and John R. Backsches, "Global Reconnaissance-Strike: Innovative Concept Leverages Existing Programs for Early Answer to Anti-Access Challenge," *Armed Forces Journal International*, June 2000, pp. 52-57.

Hewish, Mark, "Ballistic Missile Threat Evolves," *Jane's International Defence Review*, October 2000, pp. 38-44.

Hines, Jay E., "From Desert One to Southern Watch: The Evolution of U.S. Central Command," *Joint Forces Quarterly*, Spring 2000, pp. 42-48.

"Iranian Shahab-3 Missile Test Sparks Pentagon Concern," *Aerospace Daily*, July 19, 2000, available at <http://ebird.dtic.mil/jul2000/s20000719iranian.htm>.

"Israel Keeps an Eye on Syrian Missile Programs," *Global Intelligence Update*, August 11, 1999, available at <http://www.stratfor.com>.

"Is Yerevan Inching Away from Russia's Orbit?" *Jamestown Foundation Monitor*, March 15, 2000, available at <http://www.jamestown.org>.

*Jane's All the World's Aircraft 1999-2000*, London: Sampson Low, Marston & Co., 1999.

Jumper, John P., "Rapidly Deploying Aerospace Power: Lessons from Allied Force," *Aerospace Power Journal*, Winter 1999, pp. 4-10.

Kechichian, Joseph A., *Oman and the World: The Emergence of an Independent Foreign Policy*, Santa Monica: RAND, MR-680-RC, 1995.

Kemp, Geoffrey, and Robert E. Harkavy, *Strategic Geography and the Changing Middle East*, Washington, D.C.: Brookings Institution Press, 1997.

Khalilzad, Zalmay, and Ian O. Lesser (eds.), *Sources of Conflict in the 21st Century: Regional Futures and U.S. Strategy*, Santa Monica: RAND, MR-897-AF, 1998.

Khalilzad, Zalmay, Ian O. Lesser, and F. Stephen Larrabee, *The Future of Turkish-Western Relations: Toward a Strategic Plan*, Santa Monica: RAND, MR-1241-SRF, 2000.

Khalilzad, Zalmay, David A. Shlapak, and Daniel Byman, *The Implications of the Possible End of the Arab-Israeli Conflict for Gulf Security*, Santa Monica: RAND, MR-822-AF, 1997.

Kifner, John, "1987 Palestinian Uprising and This One Are Different in Many Ways," *International Herald Tribune*, November 20, 2000, available at [www.ihf.com/articles/1917.htm](http://www.ihf.com/articles/1917.htm).

Killingsworth, Paul S., Lionel A. Galway, Eiichi Kamiya, Brian Nichiporuk, Timothy L. Ramey, Robert S. Tripp, and James C.

Wendt, *Flexbasing: Achieving Global Presence for Expeditionary Aerospace Forces*, Santa Monica: RAND, MR-1113-AF, 2000.

Kozaryn, Linda D., "Desert Sands in Store for U.S. Forces," American Forces Press Service, August 5, 1996, available at [http://www.defenselink.mil/news/Aug1996/n08051996\\_9608057.html](http://www.defenselink.mil/news/Aug1996/n08051996_9608057.html).

Kozaryn, Linda D., "Hamre Says U.S. Forces Essential in Gulf," American Forces Press Service, December 2, 1997, available at [http://www.defenselink.mil/news/Dec1997/n12021997\\_9712022.html](http://www.defenselink.mil/news/Dec1997/n12021997_9712022.html).

Kugler, Richard L., *Changes Ahead: Future Directions for the U.S. Overseas Military Presence*, Santa Monica: RAND, MR-956-AF, 1998.

Kugler, Richard L., *U.S.-West European Cooperation in Out-of-Area Military Operations: Problems and Prospects*, Santa Monica: RAND, MR-349-USDP, 1994.

Lambeth, Benjamin S., "Air Power Transformed: How American Air and Space Potential Has Come of Age Since Vietnam," *Armed Forces Journal International*, June 2000, pp. 42-50.

Larrabee, F. Stephen, "U.S. and European Policy Toward Turkey and the Caspian Basin," in Robert D. Blackwell and Michael Sturmer (eds.), *Allies Divided: Transatlantic Policies for the Greater Middle East*, CSIA Studies in International Security, Cambridge, MA: MIT Press, 1997, pp. 143-173.

Larrabee, F. Stephen, "U.S. and European Policy Toward Turkey and the Caspian Basin," in David C. Gompert and F. Stephen Larrabee (eds.), *America and Europe: A Partnership for a New Era*, New York: Cambridge University Press, 1997, pp. 166-190.

Larrabee, F. Stephen, Jerrold D. Green, Ian O. Lesser, and Michele Zanini, *NATO's Mediterranean Initiative: Policy Issues and Dilemmas*, Santa Monica: RAND, MR-957-IMD, 1998.

Lechowich, Richard A., "Crossing Boundaries: Commanders in Chief and Areas of Interest," *Joint Forces Quarterly*, Spring 2000, pp. 34-41.

- Lesser, Ian O., "The Changing Mediterranean Security Environment: A Transatlantic Perspective," in George Joffe (ed.), *Perspectives on Development: The Euro-Mediterranean Partnership*, London: Frank Cass & Co., 1999, pp. 212-228.
- Lesser, Ian O., *NATO Looks South: New Challenges and New Strategies in the Mediterranean*, Santa Monica: RAND, MR-1126-AF, 2000.
- Lesser, Ian O., "Turkey: In Search of a Post-Cold War Role," *Private View*, Vols. 1 and 2, Nos. 4 and 5, Autumn 1997, pp. 90-96.
- Lesser, Ian O., and Ashley J. Tellis, *Strategic Exposure: Proliferation Around the Mediterranean*, Santa Monica: RAND, MR-742-A, 1996.
- Lesser, Ian O., Bruce R. Nardulli, and Lory A. Arghavan, "Sources of Conflict in the Greater Middle East," in Zalmay Khalilzad and Ian O. Lesser (eds.), *Sources of Conflict in the 21st Century: Regional Futures and U.S. Strategy*, Santa Monica: RAND, MR-897-AF, 1998, pp. 171-230.
- Makovsky, Alan, "The New Activism in Turkish Foreign Policy," *SAIS Review*, Winter-Spring 1999.
- McEver, Jimmie, Paul K. Davis, and James Bigelow, *EXHALT: An Interdiction Model for Exploring Halt Capabilities in a Large Scenario Space*, Santa Monica: RAND, MR-1137-OSD, 2000.
- McKenna, Pat, "Air Jordan: Slammin' and Jammin' Over the No-Fly Zone," *Airman*, August 1996, available at <http://www.af.mil/news/airman/0896/air.htm>.
- McKenna, Pat, "Controlling the Air," *Airman*, October 1996, available at <http://www.af.mil/news/airman/1096/air.htm>.
- McMichael, William H., "Desert Stronghold: A Republic of Sand and Razor Wire," *Air Force Magazine*, February 1999, pp. 44-51.
- Military Airlift: Airlift Planning Factors*, U.S. Air Force Pamphlet (AFP) 76-2, May 29, 1987.
- The Military Balance*, 1998/99, London: International Institute for Strategic Studies, 1998.

*The Military Balance, 1999/2000*, London: International Institute for Strategic Studies, 1999.

Moore, Christopher, "JTF/SWA commander discusses EAF, Iraq," *Air Force News*, August 2, 2000, available at [http://www.af.mil/news/Aug2000/n20000802\\_001156.html](http://www.af.mil/news/Aug2000/n20000802_001156.html).

Ochmanek, David A., Edward R. Harshberger, David E. Thaler, and Glenn A. Kent, *To Find, and Not to Yield: How Advances in Information and Firepower Can Transform Theater Warfare*, Santa Monica: RAND, MR-958-AF, 1998.

Perry, William, "DoD News Briefing," September 17, 1996, available at [http://www.defenselink.mil/news/Sep1996/t091796\\_t0917ira.html](http://www.defenselink.mil/news/Sep1996/t091796_t0917ira.html).

Poole, Dee Ann, "Joint Reception Center Staff Welcomes Bright Star '98 Participants," *Air Force News Service*, October 23, 1997, available at [http://www.af.mil/news/Oct1997/n19971023\\_971338.html](http://www.af.mil/news/Oct1997/n19971023_971338.html).

Pope, Hugh, "Islamic Summit Shows Frustration, Discontent with U.S. in Middle East," *Wall Street Journal*, November 15, 2000, p. 23.

"Progress in Georgia's Military Relations With NATO Countries" *Jamestown Foundation Monitor*, April 16, 2001, available at <http://www.jamestown.org>.

"Reserve Units Pick Up Support of AEF 8," *Air Force News*, July 17, 2000, available at [http://www.af.mil/news/Jul2000/n20000717\\_001074.html](http://www.af.mil/news/Jul2000/n20000717_001074.html).

Robinson, Eric L., "Jordanian Deployment Ends," *Air Force News Service*, June 7, 1996, available at [http://www.af.mil/news/Jun1996/n19960625\\_960607.html](http://www.af.mil/news/Jun1996/n19960625_960607.html).

Robinson, Eric L., "Tankers Support Fighters in Jordan," *Air Force News Service*, May 10, 1996, available at [http://www.af.mil/news/May1996/n19960510\\_960447.html](http://www.af.mil/news/May1996/n19960510_960447.html).

- Ryan, Michael E., "Signature Article: Our Expeditionary Aerospace Force," available at <http://www.afmc-mil.wpafb.af.mil/HQ-AFMC/XP/ao/eafweb/sig.htm>.
- Sachs, Susan, "Mubarak's Angry Response to Israel Signals Key Shift by Egypt," *New York Times*, November 22, 2000, p. 3.
- Sachs, Susan, "Muslim Nations Bitterly Denounce Israel at Summit," *New York Times*, November 13, 2000, p. 1.
- Schneider, Howard, "Jordanian King Faces New Test As Palestinians Raise Tensions," *International Herald Tribune*, November 11, 2000, available at <http://www.ihf.com/articles/1100.htm>.
- Schneider, Howard, "Muslim States Split on Anti-Israel Action," *Washington Post*, November 14, 2000, p. 38.
- Schneider, Howard, "U.S. Aid Fueling the Development of Modern Egypt," *Washington Post*, December 26, 2000, p. 1.
- "6 Gulf States Sign Region's First Defense Pact," *Los Angeles Times*, January 1, 2001.
- Stillion, John, and David Orletsky, *Airbase Vulnerability to Conventional Cruise-Missile and Ballistic-Missile Attack: Technology, Scenarios, and U.S. Air Force Responses*, Santa Monica: RAND, MR-1028-AF, 1999.
- Stucker, James P., and Ruth T. Berg, *Understanding Airfield Capacity for Airlift Operations*, Santa Monica: RAND, MR-700-AF/OSD, 1998.
- Sweetman, Bill, "Expeditionary USAF Sets Course: Aerospace Expeditionary Forces Hold Key to Future Readiness," *Jane's International Defence Review*, May 2000, pp. 30-36.
- "366th Wing F-15Es," Air Force News Service, August 1998, available at <http://www.af.mil/photos/Aug1998/98824f15e.html>.
- Tirpak, John A., "Air Chiefs Strengthen Middle East Links," *Aviation Week & Space Technology*, November 20, 2000, p. 61.

Tirpak, John A., "Airpower in the Gulf: 10 Years Later," *Air Force Magazine*, January 2001, pp. 22–30.

Tirpak, John A., "The EAF Turns One," *Air Force Magazine*, October 2000, pp. 20–25.

Tirpak, John A., "The Long Reach of On-Call Airpower," *Air Force Magazine*, December 1998, pp. 34–38.

Tirpak, John A., "Washington Watch: The Leverage of Airpower," *Air Force Magazine*, May 1999, pp. 20–26.

Tripp, Robert S., Lionel A. Galway, Timothy L. Ramey, Mahyar A. Amouzegar, and Eric L. Peltz, *Supporting Expeditionary Aerospace Forces: A Concept for Evolving to the Agile Combat Support/Mobility System of the Future*, Santa Monica: RAND, MR-1179-AF, 2000.

Tripp, Robert S., Lionel A. Galway, Paul S. Killingsworth, Eric L. Peltz, Timothy L. Ramey, and John G. Drew, *Supporting Expeditionary Aerospace Forces: An Integrated Strategic Agile Combat Support Planning Framework*, Santa Monica: RAND, MR-1056-AF, 1999.

Tripp, Robert S., Lionel A. Galway, Timothy L. Ramey, Paul S. Killingsworth, John G. Drew, and C. Christine Fair, "Expeditionary Airpower, Part 2: EAF Strategic Planning," *Air Force Journal of Logistics*, Fall 1999, pp. 4–9.

U.S. Air Force Doctrine Document 2, *Organization and Employment of Aerospace Power*, September 28, 1998.

U.S. Security Interests in the Persian Gulf, Report of a Staff Study Mission to the Persian Gulf, Middle East, and Horn of Africa, October 21–November 13, 1980, Committee on Foreign Affairs, U.S. House of Representatives, March 16, 1981.

Valasek, Tomas, "Armenia Polarised by Struggle for Power," *Jane's Intelligence Review*, May 2000, pp. 10–12.

Volk, Monte J., "ACC Commander Visits Base in Saudi Arabia, Addresses Troops," *Air Force News*, October 7, 1997, available at [http://www.af.mil/news/Oct1997/n19971007\\_971265.html](http://www.af.mil/news/Oct1997/n19971007_971265.html).

Wall, Robert, "Expeditionary Nerve Center," *Air Force Magazine*, August 1998, available at <http://www.afa.org/magazine/0898exp.html>.

Watkins, Eric, "Blind to the Danger," *Wall Street Journal Europe*, October 31, 2000.

Watson, Bruce W. (ed.), *Military Lessons of the Gulf War*, London: Greenhill Books, 1991.

In the interest of preserving economic stability, the United States is likely to continue in its role as guardian of global access to energy supplies in the Middle East. Ultimately, however, the success of U.S. strategy in this region will pivot on ready military access to bases and other facilities throughout the area. Yet in the face of the volatility that has long characterized the region together with ongoing military and political changes there, U.S. planners can no longer rely on timely or unconstrained access to such facilities. The United States and its allies thus have a compelling need for a broader range of potential deployment options in the greater Middle East. Accordingly, this book examines the operational capabilities of commercial and military airfields throughout the Middle East and the Black and Caspian Sea regions, considering the distance of various airfields from projected missile threats; the effect of that distance on combat sortie rates; the ability of various bases to sustain high-tempo combat operations; and the presence of requisite support infrastructure. The author identifies which bases best meet the current and anticipated operational requirements of U.S. and coalition forces.

ISBN 0-8330-2999-1



9 780833 029997

MR-1353-AF