



PROJECT AIR FORCE

- CHILD POLICY
- CIVIL JUSTICE
- EDUCATION
- ENERGY AND ENVIRONMENT
- HEALTH AND HEALTH CARE
- INTERNATIONAL AFFAIRS
- NATIONAL SECURITY
- POPULATION AND AGING
- PUBLIC SAFETY
- SCIENCE AND TECHNOLOGY
- SUBSTANCE ABUSE
- TERRORISM AND HOMELAND SECURITY
- TRANSPORTATION AND INFRASTRUCTURE

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

[Jump down to document](#) ▼

The RAND Corporation is a nonprofit research organization providing objective analysis and effective solutions that address the challenges facing the public and private sectors around the world.

Support RAND

[Purchase this document](#)

[Browse Books & Publications](#)

[Make a charitable contribution](#)

For More Information

Visit RAND at www.rand.org

Explore [RAND Project AIR FORCE](#)

View [document details](#)

Limited Electronic Distribution Rights

This document and trademark(s) contained herein are protected by law as indicated in a notice appearing later in this work. This electronic representation of RAND intellectual property is provided for non-commercial use only. Permission is required from RAND to reproduce, or reuse in another form, any of our research documents.

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

Modernizing China's Military

Opportunities and Constraints

Keith Crane • Roger Cliff • Evan Medeiros
James Mulvenon • William Overholt

Prepared for the United States Air Force
Approved for public release; distribution unlimited



RAND

PROJECT AIR FORCE

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, Hq. USAF.

Library of Congress Cataloging-in-Publication Data

Modernizing China's military : opportunities and constraints / Keith Crane ... [et al.].

p. cm.

"MG-260."

Includes bibliographical references.

ISBN 0-8330-3698-X (pbk. : alk. paper)

1. China—Armed Forces—Reorganization. 2. China—Military policy. I.

Crane, Keith, 1953—

UA835.M63 2005

355.3'0951—dc22

2004030176

The RAND Corporation is a nonprofit research organization providing objective analysis and effective solutions that address the challenges facing the public and private sectors around the world. RAND's publications do not necessarily reflect the opinions of its research clients and sponsors.

RAND® is a registered trademark.

Cover design by Stephen Bloodsworth

© Copyright 2005 RAND Corporation

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 2005 by the RAND Corporation

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

1200 South Hayes Street, Arlington, VA 22202-5050

201 North Craig Street, Suite 202, 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; Email: order@rand.org

Summary

The Problem

A number of U.S. analysts and policymakers have raised concerns about the potential for China to mount a serious strategic challenge to the United States in Asia, especially in the western Pacific, sometime in the course of the next two decades. These concerns are based on China's expanding economy: The rapid economic growth of the past three decades has dramatically increased the resources the Chinese government has available to devote to military spending. Recent double-digit percentage increases in officially reported defense budgets indicate the degree to which China's growing economic base has permitted the Chinese government to increase the resources it expends on the military.

For these concerns to become reality by 2025, a number of intervening events must take place. First, the economy will have to continue to grow. Second, the government will have to be able to extract revenues from the economy for military expenditures. Third, to increase military spending dramatically, the government will have to ward off competing pressures for higher expenditures on pensions, health care, and education, and more public investment in infrastructure. And fourth, China's defense industries will have to be able to produce the sophisticated weaponry that China would need to seriously challenge U.S. forces.

Approach

The purpose of this study is to assess future resource constraints on and potential domestic economic and industrial contributions to the ability of

the Chinese military to become a significant threat to U.S. forces by 2025. We conducted this assessment by answering the following questions:

1. What will be the likely shape and size of the Chinese economy over the next two decades?
2. What types of constraints will the Chinese government face in terms of drawing on increased economic output for spending on the military?
3. What problems will the military face and what possibilities will it have in terms of purchasing the goods and services it desires from the Chinese defense industry?
4. How will these constraints and opportunities shape the capabilities of the Chinese armed forces over the next two decades?

We developed answers to these questions using a variety of information sources and analytical techniques. Chinese statistical data, analyses of the Chinese economy, and a model of the Chinese economy were used to address the question of economic growth and size. The rich literature discussing tax, social, and fiscal policies in China was married with a statistical analysis of Chinese spending and the economic analysis to address the questions of budgetary constraints. To evaluate the health of China's defense industries, we engaged in an extensive analysis of open-source Chinese and English language information on these industries and interviews with knowledgeable industry specialists to conduct a thorough analysis of institutional reforms in China's defense industries, including contracting procedures. The results of this analysis are presented in Chapter Five, China's Defense Industry. Estimates of the current and future size of Chinese military expenditures drew on newly available Chinese language primary sources concerning defense budgeting and local expenditures, Chinese statistical material, including provincial statistical yearbooks, and a military spending forecasting model developed for this study.

Economic Growth Is Destined to Slow, but Output Still Will Triple by 2025

Measured at purchasing power parity (PPP) exchange rates, an exchange rate estimated by comparing the purchasing power of local cur-

rencies for the same basket of goods across countries, China's economy is already the second largest in the world, lagging behind only that of the United States. At market exchange rates, its economy is the sixth largest, lagging behind the United States, Japan, Germany, the United Kingdom, and France.

The Chinese economy is destined to become even larger. We project that China's economy will grow at an average annual rate of 5 percent through 2025, more than tripling in size (see pp. 44–45). The projected rates of growth, 7 percent per year through 2010, gradually declining to 3 percent per year in 2025, are substantially lower than the average annual rate of growth of 8.7 percent reported for the past quarter century. However, the average rate of 5 percent per year over the forecast period is more plausible than forecasts employing rates of growth from the recent past. First, the Organization for Economic Cooperation and Development (OECD), World Bank, and Chinese economic research institutes all argue persuasively that official growth rates have been exaggerated. Second, and more important, China faces a host of constraints that will serve to slow growth over the course of the next two decades: stagnation and eventual decline in the labor force, a fall in domestic savings as the population ages, a slowdown in growth in exports and industrial output because of market saturation, weaknesses in the financial sector, and problems in agriculture and rural areas.

To compare economic output and hence potential resources available for military expenditures with that of other countries, China's GDP must be converted from renminbi, the domestic currency, into a common denominator such as dollars. Economists use two types of exchange rates to make these conversions: the market exchange rate and the PPP exchange rate. Neither of these exchange rates is altogether satisfactory for converting China's GDP into dollars over time. On the one hand, the Chinese government keeps the market exchange rate undervalued by fixing or pegging the renminbi against the dollar, thereby imparting a downward bias to GDP converted at the market exchange rate. If, as forecast, China's economy continues to grow rapidly, its market exchange rate will appreciate in real effective terms over the next two decades, increasing the value of China's GDP in dollar terms above and beyond increases in output measured in constant prices in renminbi. On the other hand, the PPP exchange rate is heavily influenced

by the low cost of goods and services produced with local labor, such as housing, personal services, and basic foodstuffs. As incomes and wages rise, so will relative prices of these goods and services. Furthermore, as Chinese households become wealthier, they are likely to shift their consumption toward consumer durables and other tradable goods and services, the prices of which are determined by international markets, not local factors intrinsic to China. These changes will lead to the real effective *depreciation* of the PPP exchange rate. This depreciation will serve to reduce China's rate of growth in dollar GDP below that of renminbi GDP.

Because of the deficiencies of both exchange rates for comparing economic output and because of these two contrary trends in exchange rates, we chose to measure future Chinese output in dollars using a combination of both exchange rates. We explicitly projected likely future changes in both the market and purchasing power parity exchange rates. We used the projected market exchange rates to convert tradable goods and services into 2001 dollars and the projected PPP exchange rates to convert nontraded goods and services into 2001 dollars. Employing this technique, we project that China's GDP will be \$9.45 trillion in 2001 dollars by 2025. At that time, China's economy will be slightly smaller than the U.S. economy was in 2003. Assuming the U.S. economy grows at an average annual rate of 3 percent over the next two decades, China's economy would be about half the size of the U.S. economy in 2025 (see pp. 46–48).

China's Government Faces Increasing Pressures to Increase Social Spending

Since economic reform began in the late 1970s, China has been undergoing a series of dramatic changes in its systems of taxation and provision of public services. Public expenditures and revenues as a share of GDP dropped sharply between 1979 and the mid-1990s as the Chinese government stopped financing investments by state-owned enterprises and the government struggled to replace tax revenues from state-owned enterprises with revenues from taxes on the market-oriented

non-state sector. Simultaneously, the central government attempted to control tax revenues and expenditures at the provincial level. During this period of change, the central government's share of taxes and expenditures fell sharply: Tax revenues as a share of GDP reached a low of 10.7 percent in 1995, an extraordinarily small share of output. Pressures to increase government expenditures on education, research and development, and the military led to a reversal of this trend in the mid-1990s as the central government instituted tax reforms that raised collections. As of 2002, central government revenues had risen to 18.5 percent of GDP, a substantial increase.

Political pressures for increased public services are so strong and the current provision of education, health care, and pensions so inequitable and dysfunctional that the Chinese government will be compelled to continue to increase the share of output spent on these government services and transfers in the coming decades. In addition, the Chinese government has a number of latent liabilities, such as unfunded commitments for pensions and the continued need to recapitalize state-owned banks as they write off the very large bad debts of state-owned enterprises. When these liabilities are recognized, they will boost government debt substantially, imposing substantial future debt servicing costs on the government. Financing these increased expenditures will be difficult. Taxes and government expenditures as a share of GDP are already above the average in medium-income developing countries. Further increases in tax rates threaten to incite political unrest—tax revolts are already common in rural areas.

Despite the difficulty in raising government revenues as a share of GDP, we project that political pressures will drive future Chinese government spending on pensions, health care, education, and interest payments on rising government debt from 7.5 percent of GDP in 2000 to 15.5 percent in 2025, an increase of 8.0 percentage points (see p. 89).

Deconstructing China's Defense Budgets

The official Chinese defense budget includes only a portion of the total defense budget. Although it includes most personnel, operations and maintenance, and equipment costs, the following items are excluded:

- Foreign weapons procurement
- Expenses for paramilitaries (People's Armed Police)
- Nuclear weapons and strategic rocket programs
- State subsidies for the defense-industrial complex
- Some defense-related research and development
- Extra-budget revenue that goes to the military (*yusuanwai*).

We have reestimated China's defense budget by including estimates of these omitted items. To the official budget of 185.3 billion renminbi in 2003 (\$22.4 billion), we have added estimates of Chinese imports of military equipment (\$3.6 billion), provincial support to national defense (\$1.18 billion), and paramilitary expenses (\$3 billion). Finally, we have assumed that defense-industrial subsidies and R&D funding are bounded by the totals listed in the national budget, and could not exceed \$3.1 billion and \$4.3 billion, respectively. Using this combination of data and assumptions, we estimate that China's total defense expenditures ran between \$31 to \$38 billion in 2003, or 1.4 to 1.7 times the official number (see p. 133).

Reforms Hold Promise of Improving Weak Performance of China's Defense Industries

Although China's resources are substantial, the People's Liberation Army (PLA) has frequently not been able to purchase the weapon systems it desires from domestic manufacturers. Over the past 20 years, China's defense industrial base has had great difficulty in producing technologically sophisticated, high-quality weapons systems. This state of affairs appears to be changing. Beginning in spring 1998 during the 9th Meeting of the National People's Congress, the Chinese government

initiated a “grand strategy” for improving the technological capabilities of China’s defense industries. This strategy has three main elements. The first is selective modernization. China’s leaders hope to exploit China’s strengths in electronics technology and missiles by concentrating on command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR), and accurate strike weapons. The second element of the strategy is civil-military integration. The government has attempted to provide incentives and make organizational changes to capture for military enterprises improvements in efficiency and technological sophistication that state-owned enterprises in computing, shipbuilding, and electronics have made in production for civilian clients. As part of this process, the Chinese government is reforming defense procurement, introducing bidding for some contracts. It has also restructured the defense industries at the enterprise level, breaking the defense industry “companies” into semiautonomous enterprises that are to compete with one another and foreign suppliers. The third element of the grand strategy is to exploit advanced foreign technology. The government has embarked on a program of substantial imports of weapons, equipment, and military technologies from Russia, Israel, and other suppliers.

These strategies appear to have had some success in improving the sophistication and quality of military equipment produced by the information technology, shipbuilding, and aerospace industries. On the civilian side, these industries are manufacturing globally competitive products. A number of new weapons systems, including Chinese destroyers, missiles, and C4ISR systems, have shown marked improvements over past production because they incorporate more sophisticated technologies acquired from production for civilian clients. In contrast, China’s military aviation industry continues to underperform China’s other defense industrial sectors. Its diversification into commercial production of aviation and non-aviation products has not significantly contributed to the modernization of the industry. The People’s Liberation Army Air Force (PLAAF) has had to rely on imports to acquire aircraft that are even somewhat competitive with those flown by the United States.

Many of the weaknesses of China's defense industrial sector could be overcome in the short to medium term, assuming it does not deviate from the present course of reform and continues to invest in defense production. If the government continues to push for open contracting and takes a tough line on cost overruns, the rate of innovation and quality of weapons systems should continue to improve. However, improvements in efficiency will not happen overnight. It will take time to change management behavior and stimulate innovation, even after new management incentive systems are implemented (see p. 190).

PLA Leadership Perceives United States as Greatest Threat

Threat perceptions and the desire to project power are key drivers of the acquisition of military capabilities. PLA military strategists perceive the United States as posing both an immediate and long-term challenge to Chinese national security interests. Thus, by far the most immediately relevant driver of the PLA's current planning and procurement is the goal of the Chinese leadership and the PLA to reassert control over Taiwan and their concerns about possible U.S. intervention if conflict with Taiwan should ensue. Since the end of the 1990s, PLA reform, modernization, procurement, and training has been heavily—almost totally—focused on preparing for a conflict over Taiwan. Beyond the narrow Taiwan contingency, Chinese military planners and political leaders are decidedly uncomfortable with the U.S. military presence in the world; they fear that the United States can and will use military force whenever and wherever it wants, including in scenarios involving Chinese security interests. A related security concern for Chinese military planners is Japan. Although Chinese political leaders continue to value Sino-Japanese economic relations for their contribution to domestic economic growth, Chinese military strategists remain concerned about the possible rebirth of Japanese militarism and about Japan's military alliance with the United States. Finally, protecting Chinese territorial waters and airspace has long been a primary mission for the Chinese military. Over the past two decades, this mission has been expanded to protecting Chinese claims to parts of the South China Sea.

The PLA seeks to modernize its force structure to provide it with the capabilities to meet these threats and challenges. It has placed particular emphasis on acquiring four categories of capabilities (see pp. 202–203):

1. The capability to respond to both internal and external threats by quickly taking the initiative, preventing escalation, attaining superiority, and resolving the conflict on China's terms
2. The eventual development of a limited power projection capability which would facilitate a sustained sea presence and an area denial capability, although area control is not a high priority for the PLA
3. The ability to conduct short-range preemptive strikes using conventional missiles and air force assets
4. The development of a credible strategic nuclear capability to deter other nuclear powers from using nuclear threats to coerce China or to limit its strategic options, especially during a crisis.

Chinese Military Spending Is Likely to Rise to \$185 Billion by 2025

In light of prospective rates of economic growth, pressures for increasing government spending on categories other than defense, and Chinese threat perceptions, what are the possible and likely levels of future military spending? To answer this question, we generated two sets of projections of potential Chinese military expenditures through 2025 in 2001 dollars (Table S.1). Our high-end forecast was based on our assumption that the maximum share of output the Chinese government would be able to spend on defense in the context of current threat perceptions would be 5.0 percent of GDP. This assumption is based on the considerable demands for expenditures on health care and pensions, in particular, that China's rapidly aging population is placing on the government. It also reflects the upper bound of what middle income developing countries have been willing to spend on defense over the past two decades, and our evaluation of the PLA's assessments of threats to

Table S.1
RAND Projections of Chinese Military Spending Through 2025: Combined Market and PPP Exchange Rates (billions of 2001 dollars)

| | 2003 | 2010 | 2015 | 2020 | 2025 |
|---|------|-------|-------|-------|-------|
| Mid-range projection | 68.6 | 91.2 | 113.7 | 143.9 | 185.2 |
| Personnel | 48.9 | 57.8 | 65.0 | 73.1 | 82.2 |
| Operations and maintenance | 8.6 | 15.3 | 23.0 | 34.6 | 51.9 |
| Procurement and R&D | 11.1 | 18.1 | 25.6 | 36.2 | 51.1 |
| Maximum projection | 75.6 | 145.0 | 207.4 | 287.3 | 403.4 |
| Personnel | 48.9 | 84.7 | 111.5 | 141.0 | 178.9 |
| Operations and maintenance | 8.3 | 22.3 | 39.6 | 67.1 | 113.0 |
| Procurement and R&D | 18.5 | 38.0 | 56.2 | 79.3 | 111.4 |
| Ratio between maximum and mid-range projections | 1.10 | 1.59 | 1.82 | 2.00 | 2.18 |

China at this point in time. Our mid-range projection is based on the assumption that military spending will not rise above our current lower bound estimate of military spending of 2.3 percent of GDP.

Projections were made by major expenditure category in renminbi and then converted into 2001 dollars using projected market or PPP exchange rates, whichever was more appropriate. For example, personnel costs were converted into 2001 dollars using PPP exchange rates while procurement costs were converted at market exchange rates. We argue that this composite approach provides the most accurate comparison between Chinese and U.S. military expenditures.

Both projections yield very substantial sums (see Table S.1). By 2025, our mid-range projection yields spending of \$185 billion, a little over 60 percent of the United States' 2003 defense budget. However, 44 percent of these projected expenditures consist of personnel costs; compared to only a quarter of the total budget in the United States. The projection of military spending under the maximum expenditure scenario results in considerably higher numbers: Military spending rises from an estimated \$76 billion in 2003 to \$403 billion in 2025, at which time Chinese military spending would be a third greater than the 2003 U.S. defense budget (measured in 2001 dollars). However, this projection is truly a maximum in terms of what China is likely to be able to afford. It is based on an assumption that

the Chinese leadership would be willing to raise military expenditures to 5 percent of its GDP during a period when political pressures to increase spending on health, education, and pensions—not to mention infrastructure, the environment, and unemployment assistance—will be very strong (see p. 232).

We also projected the potential resources that China may devote to purchasing military assets in the coming two decades. To provide a better sense of the cumulative impact on force structure of the projected defense expenditures on procurement, we compared the projected cumulative totals spent on procurement and research, development, testing, and evaluation (RDT&E) through 2025 with U.S. expenditures on these items in 2001 dollars over the past 22 years (see Table S.2). Military capabilities, especially stocks of weaponry, are the result of cumulative spending over time, not just current spending. This exercise provides a measure of what China may spend on procurement cumulatively over the course of the next two decades.

Table S.2
Potential Future Chinese Military Expenditures on Procurement Compared with U.S. Expenditures

| Category | Expenditures (billions of 2001 dollars) | China as a Percent of U.S.* |
|---|---|-----------------------------------|
| Cumulative U.S. expenditures on RDT&E and procurement 1981–2003 | 2,712.4 | |
| Maximum cumulative projections of Chinese expenditures on RDT&E and procurement 2003–2025 | 1,279.7 | 47.2 |
| Mid-range cumulative projections of Chinese expenditures on R&D and procurement 2003–2025 | 597.8 | 22.0 |
| Cumulative USAF expenditures on R&D and procurement 1981–2003 | 1,039.4 | |
| Maximum cumulative projections of Chinese expenditures on PLAAF procurement 2003–2025 | 490.4 | 47.2 |
| Mid-range cumulative projections of Chinese expenditures on PLAAF procurement 2003–2025 | 229.1 | 22.0 |

*Because the share of total procurement by the PLAAF is assumed to be the same as that of the USAF, the ratios between total Chinese procurement and PLAAF procurement and the U.S. budget and USAF procurement are the same.

Procurement was appreciable in the high-end case. The cumulative total would be close to half of what the United States spent on military procurement and RDT&E between 1981 and 2003. Under this scenario, no other country outside the United States would rival China in terms of weapons stocks. In the mid-range projection, procurement spending is still appreciable, but in this case, even after 22 years, China's cumulative expenditures on procurement would be only 22.0 percent of what the United States spent between 1981 and 2003 (see p. 235).

As noted above, the PLA is intent on creating a limited power protection capability and being able to respond quickly to threats to Chinese territory. Air assets would play a key role in creating these capabilities. To provide the U.S. Air Force a more tangible measure of what potential future Chinese expenditures might be on air assets, we also provide notional projections of future Chinese spending on research and development and procurement of air assets and compare them to past USAF expenditures in the same categories. The magnitudes are revealing. In our view, the maximum likely expenditures that China would make on RDT&E and procuring weapons and equipment for the PLAAF between 2003 and 2025 would be on the order of \$490 billion. That is a very large sum of money. However, the cost in 2001 dollars of the current USAF inventory of weapons and equipment and the associated RDT&E to develop those systems is more than twice this number. Using our mid-range projection of military expenditures, PLAAF expenditures on procurement and RDT&E would run \$229 billion in 2001 dollars, 22.0 percent of cumulative USAF expenditures over the past 22 years on the same categories (see p. 237).

How Can We Tell If China Is Straying from the Projected Course?

Throughout our research for this study, we identified and utilized a variety of indicators to assess current and project likely future trends in Chinese military spending and defense industries. We have culled a subset of these indicators that we believe are most salient for tracking likely future changes. By following these indicators, analysts should be

able to spot changes in trends that might herald substantial changes in resources allocated to defense. They should also be able to determine whether future military expenditures and capabilities are likely to diverge substantially, up or down, from those projected here.

Key indicators include the following (see pp. 251–253):

- Rates of growth in GDP
- Shares of GDP taken in revenues and expenditures by the government
- Introduction of a national pension program
- Loss of major contracts by traditional military equipment manufacturers through a competitive bidding process
- Closure of poorly performing plants in defense industries
- Changes in official budgetary expenditures in real terms deflated by the GDP deflator
- Changes in the share of GDP accounted for by official military spending
- Changes in the total government budget for research and development.