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The Military Balance in the Middle East: An Executive Summary

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PREFACE

The policy paper by Anthony Cordesman which follows is part of the "Arms Control and Security Improvement in the Middle East" workshop series, sponsored by the Institute on Global Conflict and Cooperation (IGCC) of the University of California. Meetings have been held in Washington, D.C. (November 1997), Cairo, Egypt (March 1998), and Amman, Jordan (September 1998). The fourth meeting of the series is scheduled to take place in Washington, D.C. in June 1999. The meetings are designed for senior military officials and/or retirees responsible for strategic planning for their countries' ministry of defense. This program engages active duty and retired military leaders responsible for regional security and arms control from Israel and the Arab states.

In order for constructive dialogue to occur on the broad range of issues dealing with Middle East security and to address the security concerns of each country, the project strives to secure participation from as many regional parties as possible. For past workshops, members of the militaries of most regional powers, in addition to the Palestinian Authority, have attended in their personal capacities, including those from Algeria, Egypt, Israel, Jordan, Kuwait, Oman, Qatar, Saudi Arabia, Tunisia, and the United Arab Emirates. Participants from many Western powers have also attended, including Canada, Germany, Switzerland, the United Kingdom, and the United States.

The project is a Track II (unofficial) activity which indirectly supports the Middle East peace process. It is also part of an ongoing effort by the IGCC to study the causes and dynamics of international conflict and help devise options for managing and resolving it through international cooperation.

The first workshop, held in Washington, D.C., focused on future security structures, threat perceptions, arms control and confidence-building measures with military strategy, and American military views on the security environment in the Middle East. The second meeting, co-hosted by the National Center for Middle East Studies in Cairo, Egypt, included briefings on military balances and net assessment, weapons effects, coordination in de-mining, and maritime confidence-building measures. The third meeting, co-hosted by the Jordanian Armed Forces, concentrated on regional security trends in military balances, weapons effects and doctrines, and the role of the military in improving regional security.

On the first formal day of the conference in Amman, Jordan, Dr. Anthony Cordesman presented Middle East military balances and arms transfer trends based on his analysis of the military training, professionalism, and equipment holdings of various Middle East states. Using the graphics and figures provided in this policy paper, he presented these trends for the last decade.

One of the important contributions of this work is Dr. Cordesman's focus on three key "sub-balances" in the Middle East strategic balance: 1) the Israel-Arab balance, especially Israel versus Syria, 2) North Africa, and 3) the Arabian Gulf. He speculates that arms control agreements in the Middle East will be made more difficult because of asymmetries between the powers. The entire database (over 350 pages) from which this summary is derived is broken down into several subsections. These provide an overview of 1) region-wide trends; 2) the balance and trends in Mauritania, Morocco, Algeria, Libya, and Tunisia; 3) the balance and trends in Egypt, Israel, Jordan, Lebanon, and Syria; 4) the balance and trends in the Gulf; 5) the balance and trends in the Northern Gulf; 6) the balance and trends in the Southern Gulf; and 7) trends in weapons of mass destruction throughout the Middle East. The entire volume will be published shortly.

Dr. Cordesman's work highlights several important trends in the Middle East. First, arms imports to the Middle East have dropped significantly since 1985, and Middle East countries are now spending about fifty percent less on military imports than they did a year ago.

Second, regional parties are not sustaining, equipping, and training their troops efficiently. This situation will become exacerbated as preparation for conventional warfare becomes increasingly difficult, expensive, and socially disruptive. Finally, these trends may increase the incentives for regional states to obtain nuclear, chemical, and biological weapons as a means to supplement their military power, which highlights the need to conclude arms control agreements in the region.

IGCC wishes to express its gratitude for past funding for the project from the U.S. Department of Energy and the Arms Control and Disarmament Agency. We are also grateful to Anthony Cordesman for his willingness to share the fruits of his knowledge with the workshop. We wish to thank Elizabeth Matthews and Jennifer Pournelle who made the production of this paper possible. We also give special thanks to Dr. Michael Yaffe of the State Department for his continuing efforts on behalf of this project.

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THE MILITARY BALANCE IN THE MIDDLE EAST: AN EXECUTIVE SUMMARY

Anthony H. Cordesman

➢

Introduction

This report on the Middle East military balance has been developed as part of the CSIS Middle East Net Assessment Project, and in cooperation with the U.S. Arms Control and Disarmament Agency (ACDA) and the Institute on Global Conflict and Cooperation (IGCC) of the University of California at San Diego. It uses unclassified data to provide a comprehensive database on military forces for the assessment of the military balance, understanding the flow of arms transfers and the burden of defense expenditures, and arms control analysis.

This executive summary provides an overview of that database. It provides an analysis of developments in the military balance in Middle East region, and of the trends in North Africa, the Arab-Israeli balance, and the Gulf. It examines the economic impact of defense spending, trends in defense spending and arms transfers, and military demographics, as well as force levels and force trends. A general analysis is made of the qualitative trends in military forces and of the strengths and weaknesses of the forces in the region.

The full, fourteen-part database can be found on the web page of the Center for Strategic and International Studies at www.csis.org. A hard-copy version of the entire database is being published by the Institute on Global Conflict and Cooperation (IGCC) of the University of California at San Diego. The full database covers detailed country-by-country developments, additional data on qualitative force trends in each country and subregion, and a comprehensive estimate of regional and national efforts to acquire long-range delivery systems and biological, chemical, and nuclear weapons.

Sources of Data

The data are drawn from a mixture of sources. The data on economic trends, defense spending, and arms imports are taken from declassified U.S. intelligence data provided by the Congressional Research Service of the U.S. Library of Congress and the Arms Control and Disarmament Agency. The military strength data are taken largely from the annual *Military Balance* issued by the International Institute for Strategic Studies. Both sets of data have been modified to reflect corrections and additions by representatives of the countries involved. These data have been provided as the result of several conferences on regional arms control held by

The U.S. Arms Control and Disarmament Agency (ACDA) and the Institute on Global Conflict and Cooperation (IGCC) of the University of California at San Diego. The qualitative assessments made in this executive summary, and in much more detail, in the entire database, are largely those of the author. They have been reviewed in detail by experts in the region, however, and many have been modified to reflect their judgments and advice.

Methodology

Summary data are provided for the entire Middle East, but discussions with officials, senior military officers, and experts in the region have indicated that region-wide comparisons have little practical value for either net assessment or arms control purposes. The Middle East is divided up into a wide range of different kinds of "military balance," ranging from balances involving border disputes and local conflicts to balances involving much larger conflicts or arms races.

In broad terms, the Middle East also divides up into three different military regions: North Africa, the Arab-Israeli confrontation states, and the Gulf and Red Sea:

North Africa includes Algeria, Libya, Morocco, and Tunisia. The military planning in these states currently concentrates more on internal security and the risk of low-level border conflicts, than on major wars between regional powers. The database does make comparisons for the entire sub-region, but concentrates primarily on the individual military and force trends in each country.

The Arab-Israeli states include Egypt, Israel, Jordan, Lebanon, the Palestinian Authority in Gaza and the West Bank, and Syria. Israel has peace treaties with Egypt, Israel, Jordan, and the Palestinian Authority. There is an ongoing low-level conflict between Israel and the Hezbollah in Lebanon, and the major risk of war is between Israel and Syria. The database makes detailed comparisons for the entire subregion, but concentrates primarily on a series of scenario-like balances that examine the risk of an Israeli-Syrian conflict, trends in the conflict between Israeli and the Hezbollah, and the balances that might emerge if the peace process should break down between Israel and any of its neighbors.

The Gulf states include Iran and Iraq, the two north Gulf states, and Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates in the southern Gulf. These six southern Gulf states are the members of the Gulf Cooperation Council (GCC). In practice, there are four sets of sub-balances in this region: first, the Iran-Iraq balance; second, the upper Gulf balance between Iraq in the north and Kuwait and Saudi Arabia to the south; third, the lower Gulf balance involving Iran in the north and Oman, Qatar, Saudi Arabia, and the UAE in the south; and finally, the Red Sea balance involving Yemen and Saudi Arabia and possibly Oman.

These balances are complicated by four major factors that affect both arms control and war fighting. First, there are many forms of internal conflict, terrorism, and revolutionary warfare in the region that can take the form of asymmetric warfare. Second, there are many tensions and risks of conflict that involve nations of the Middle East and nations on their borders, but outside the region. More than half of the states in the region have border disputes or tensions outside the Middle East. Third, wars can easily expand to cover forces from other subregions. For example, Iraqi forces might reinforce those of Syria in an Arab-Israeli conflict that excluded Egypt and Jordan. Finally, there is the problem of proliferation.

The database covering long-range missiles and weapons of mass destruction discusses proliferation as a region-wide problem and by major proliferator. It relies heavily on inputs from various experts and much of it must be speculative. It also provides a country-by-country analysis in the full database on developments in Algeria, Egypt, Iran, Iraq, Israeli, Libya, and Syria. The report on weapons of mass destruction also analyzes the risk of terrorists using weapons of mass destruction. A fuller analysis of the issue of terrorism is available in the author's report for the U.S. Army War College, *Transnational Threats in the Middle East* (available in hard copy from the War College or in summary form at www.csis.org).

This executive summary—and all sections of the full database—report on military forces by sub-region and country and analyze current trends in force levels, military spending and arms sales, U.S. military assistance, military manpower, land forces, air forces, naval forces, conventional contingency capabilities, and current developments in acquiring biological, chemical, and nuclear weapons and long-range ballistic missiles.

Counting Forces for Analysis

The analysis that follows is based on the thesis that a meaningful assessment of the military balance must look far beyond simple quantitative comparisons of total force size. It examines the Arab-Israel balance in a wide range of ways. These include a detailed look at the level of resources available to each country and the flow of arms into the region over a period of decades. These comparisons show that various countries have grossly different total military expenditures and access to modern arms, and that the forces of some countries have benefited far more from recent arms transfers than those of Jordan, Lebanon, and Syria.

The analysis examines different ways to count conventional forces and possible ways of relating force numbers to force quality. It examines the quality of manpower and weapons by country and service and the impact of changes in military technology. It then integrates such analysis with an examination of the kinds of contingencies and scenarios most likely to happen in the future and how changes in both force quantity and force quality are likely to affect future wars.

It should be stressed, however, that there is no "right" way to count military forces. There are many different comparisons of Middle Eastern forces that can represent valid pictures of possible scenarios for war fighting or arms control purposes. These can range from counts of the forces that might be involved in a relatively low-intensity conflict to counts estimating the forces in a theater-wide conflict in a "worst case" scenario. Even contingency-oriented counts have their limitations. Counts of total national forces do not reflect the portion of the total force that a given country can actually deploy and sustain in combat, and also ignore many aspects of force quality.

Total manpower numbers do provide a rough picture of the level of effort given nations devote to their military forces and of the war fighting capabilities of armies. At the same time, training and experience are as important as manpower numbers. The quality of a given force's NCOs, technicians, and junior officers shape its ability use modern combat equipment effectively. The value of conscript forces depends heavily on their funding and training. For example, Egypt and Syria grossly underfund conscript training. Consequently, most of their conscripts have too little experience and training, and never realistically train in complex war fighting scenarios and exercises.

Active manpower is hard to compare to reserve manpower. Much of the reserve manpower in the Middle East has limited value due to a lack of training, modern equipment, sustainability, and adequate C^4I/BM/SR (command, control, communications, computers/battle management/strategic reconnaissance) capability. The Israeli reserve system is under acute strain to main a capability for advanced maneuver warfare, and most Arab reserve manpower has little training, second- or third-rate equipment and low value. Money presents a major problem: given nations cannot afford to use their total manpower pool because they cannot fund suitable equipment, training, and sustainability. Internal security and low-intensity operations degrade training for war fighting, and this presents a serious manpower quality problem for over half of the countries in this database.

Equipment numbers have similar strengths and weaknesses. Past Arab-Israeli conflicts, the Iran–Iraq War, and the Gulf War have all shown that equipment quality is often more important than force numbers. For example, the current Arab and Israeli forces are the result of a major build-up in Middle Eastern land forces since 1984. Holdings of armored forces and artillery have increased significantly. However, much of the increase in the total inventory of Arab land weapons is the result of the fact that some Arab states continue to retain older and low-quality systems that have only limited capability. The value of much of this equipment is uncertain, and so is the ability of Arab states to man it effectively.

Force quality can also improve even as force numbers drop. Israel has cut aircraft numbers to fund major improvements in the quality of its combat aircraft. Reductions have taken place in the size of some forces in response because of factors such as attrition and the rising cost of aircraft. At the same time, the combat aircraft counted in these totals have often improved strikingly in relative quality. Changes in force mix affect the meaning of equipment numbers as well as any counts of major combat unit strength. For example, the counts of fixed-wing aircraft do not reflect the fact that both sides now have significantly larger numbers of attack helicopters. Further, such totals overstate the strength of some air forces by counting some aircraft in storage or training units.

It may be useful in this regard to note that several tests were run of simple computer simulations using these data, and of various scoring systems for individual weapons designed to make them directly comparable in terms of military effectiveness. These methodologies were rejected for the following reasons:

- War gaming and simulations can be very useful when the entire model, related databases, and process of operation is open and transparent, and there is clear agreement on the contingency involved. Summary results take on the character of a "black box" where no one can either understand or trust the summary results.
- Attempts to rank or score given weapons to provide a total score for a large group of different types or weapons, entire combat units, mixes of different kinds of forces, and forces from different services proved to be progressively more dubious as they became more complex. Even if only given types of weapons such as main battle tanks are counted, it is far from clear that any present scoring system provides a useful way of counting equipment in the Middle East. There are too many different types, subtypes, and modifications used in too many different force mixes of other equipment, by units with very different tactics and training. Scoring systems involving mixes of short-range direct-fire, anti-armor, long-range direct-fire, precision-guided weapons, area-fire weapons, and beyond-visual-range use of artillery proved to be so controversial and uncertain as to have no value unless all sides explicitly agree upon them. Systems attempting to score land and air weapons by one scoring method could not survive examination by simple statistical validation techniques.
- Middle Eastern forces are not comparable in terms of training, organization, unit structure, sustainability, readiness, infrastructure, and C^4I/BM/SR capability. Scoring systems (as well as most simulation techniques) must either tacitly assume that all of the aspects of the force structure that are not quantified are more or less directly comparable, or ignore critical aspects of war fighting capability.

Counting Forces for Arms Control and War Fighting Purposes

This database is not designed to support any given approach to arms control or analysis of the risks of war fighting in the region. It is intended to be "neutral" and to reflect a range of different views and ways of counting, including any major variations in approach suggested by the military experts of the region.

It is also important to stress that any approach to using this database for arms control or war fighting purposes must consider the following tests of its validity:

- It must be simple and explicit enough so there is some chance of agreeing on the numbers to be used and the way in which forces are counted. The data, the model, and the results must be open and explicit.
- It must consider the fact that no country will compromise its security beyond certain limits by revealing all of its secrets. An open database and analysis must consider the fact that the nations involved will have their own data and ways of counting, and it may never be possible to achieve more than moderate levels of transparency and agreement on either data or methodology.
- It must consider several different views of possible scenarios and perspectives, even if it does not model all of them. These views include the different perceptions of risks and war fighting cases held by each country considered in the analysis. They include the broader range of cases necessary to test a given arms control or contingency model, which may require an independent third party to add or modify given scenarios. They also include test cases to make sure that some kind of verification and monitoring will be feasible, and that minor to moderate shifts in definitions, the ways forces are counted, readiness, and technology will not produce unexpected changes in the outcome or assessment of the balance.
- It must be valid for all of the major types of warfare that can be involved. Increasingly, this

means it must look beyond conventional war fighting and consider asymmetric and revolutionary warfare and the possible use of weapons of mass destruction.

- It must at least tacitly consider the impact of technological change, factors such as terrain and weather, and the many qualitative factors listed throughout this database that cannot be quantified.
- If an arms control model is involved, the analysis must consider the war fighting potential and scenarios of the forces left after an arms reduction, limitation, or control regime is imposed. It is important to stress that smaller forces do not always bring added stability, and reductions in high-technology weapons do not reduce killing and war fighting potential. The vast majority of combat deaths and wounds in recent regional conflicts have been produced by "traditional" weapons such as small arms and artillery.

Comments and Suggestions

Comments and suggestions are welcomed and should be addressed to:

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Please be aware, however, that the project is not staffed to reply to or acknowledge all correspondence, or to support special requests for data or supporting analysis. The project's use of e-mail has been discontinued because it proved impossible to handle the number of requests involved.

What Is the Middle East Military Balance?

Defining the Middle East Military Balance

Data summarizing the trends in twenty-three different countries explain virtually nothing. There are several key regional sub-balances:

- The individual trends in North Africa, where there is no meaningful balance.
- The trends affecting the Arab-Israeli conflict, dominated by Israel versus Syria.
- The Gulf military balance, now divided into states who view their primary threat as Iran and those who see the threat as Iraq.

Two sub-balances are particularly critical:

- Israel versus Syria.
- Kuwait and Saudi Arabia versus Iraq.
- Iran versus Iraq?

Internal civil conflicts increasingly dominate regional tensions:

- Mauritania, Algeria, Libya, Egypt, Sudan, Bahrain, Saudi Arabia, Iraq, Yemen.
- Morocco's war with Polisario?

Low-level border conflicts and tensions affect other areas of the military balance:

- Mauritania versus Senegal, Israel versus Hezbollah, Bahrain versus Qatar, Saudi Arabia versus Yemen.
- Every state has some complaint about its neighbor(s): "My neighbor is my enemy."

The "greater Middle East" is more a matter of rhetoric than military reality.

The Qualitative Paradigm Shift in the Middle East Military Balance

No Middle Eastern state is currently spending the resources necessary to fully sustain the modernization of its existing force structure. Numbers still count, but:

- The "revolution in military affairs" often makes quality far more important than quantity.
- Maintenance, manpower quality, and sustainability are often more critical than force size.

The qualitative shifts in equipment exacerbate long-standing manpower quality problems:

- The value of conscripts in operating advanced military equipment is uncertain.
- Joint and combined arms training become far more important.
- Technical cadres, NCOs, "hands on" officers, and leadership also become critical.

Proliferation is changing the balance and the potential nature of war.

- Iran, Iraq, Israel and Syria are major proliferators.
- Algeria, Egypt, and Libya show indications of being proliferators.

Political and internal struggles often present more of an immediate security threat than outside invasion: Algeria, Egypt, Israel, Bahrain, Saudi Arabia, Iraq, and so on.

Arms Control Issues Affecting the Middle East Military Balance

Arms control and the Arab-Israeli peace process are, and will remain, an extension of war by other means.

The differences between North African, Arab-Israeli, and Gulf forces preclude a common approach.

Only the Arab-Israeli balance lends itself to a CFE-like approach, and time-distance problems and qualitative differences may preclude such solutions.

Manpower and equipment numbers are no longer dominant issues, and even equipment quality has secondary importance relative to the creation of balanced, sustainable, well-trained forces with advanced C^4I/battle management capabilities.

The recapitalization problem does create an incentive for some forms of force reduction, but reductions eliminating older and lower-quality forces will have little impact on war fighting capability.

Recapitalization is also an incentive to proliferate.

At the same time, most countries have historically spent twice their present percentages of GNP on military forces. Middle East states have tremendous "surge" capability to make major, unpredictable new equipment purchases.

Proliferation cannot be seen in terms of one type of weapon, that is, nuclear. In fact, the inability to acquire nuclear weapons creates an incentive to acquire biological and chemical weapons.

Delivery systems for proliferation are not ballistic missile driven: They may involve terrorism, unconventional, and proxy systems as well as cruise missiles and aircraft

Regional Trends in Military Effort: "The Most Militarized Area in the World"

The Global Context: Military Efforts

The Middle East remains the most militarized region in the world by virtually every measure of effort.

This statement, however, disguises important downward trends in regional military spending and the burden of military expenditures and arms efforts. Military expenditures only place about half the burden on the GNP they did during the Cold War-Gulf War era. Military expenditures have steadily dropped as a percent of total government expenditures since the Gulf War. Arms imports are sharply down as a percent of total imports.

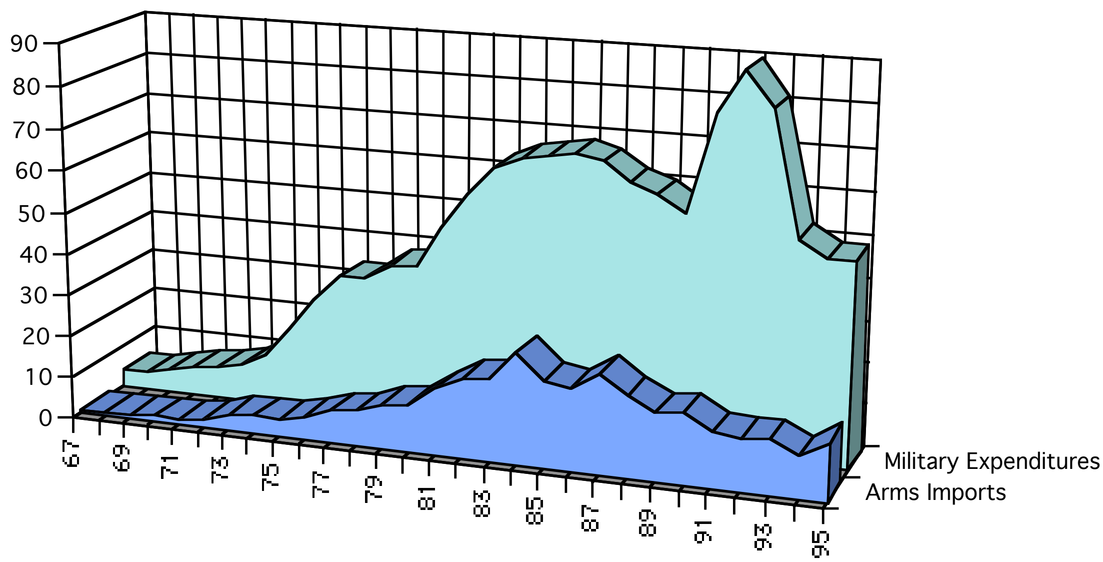
Trends, however, are cyclical. Wars lead to major increases and then decreases. Major acquisitions often lead to short-term increases in arms orders followed by cuts as nations pay for previous orders.

A steady drop has taken place in the percent of the total population under arms.

Government domination of regional economies and the massive mismanagement of civil spending—statism"—is the key problem.

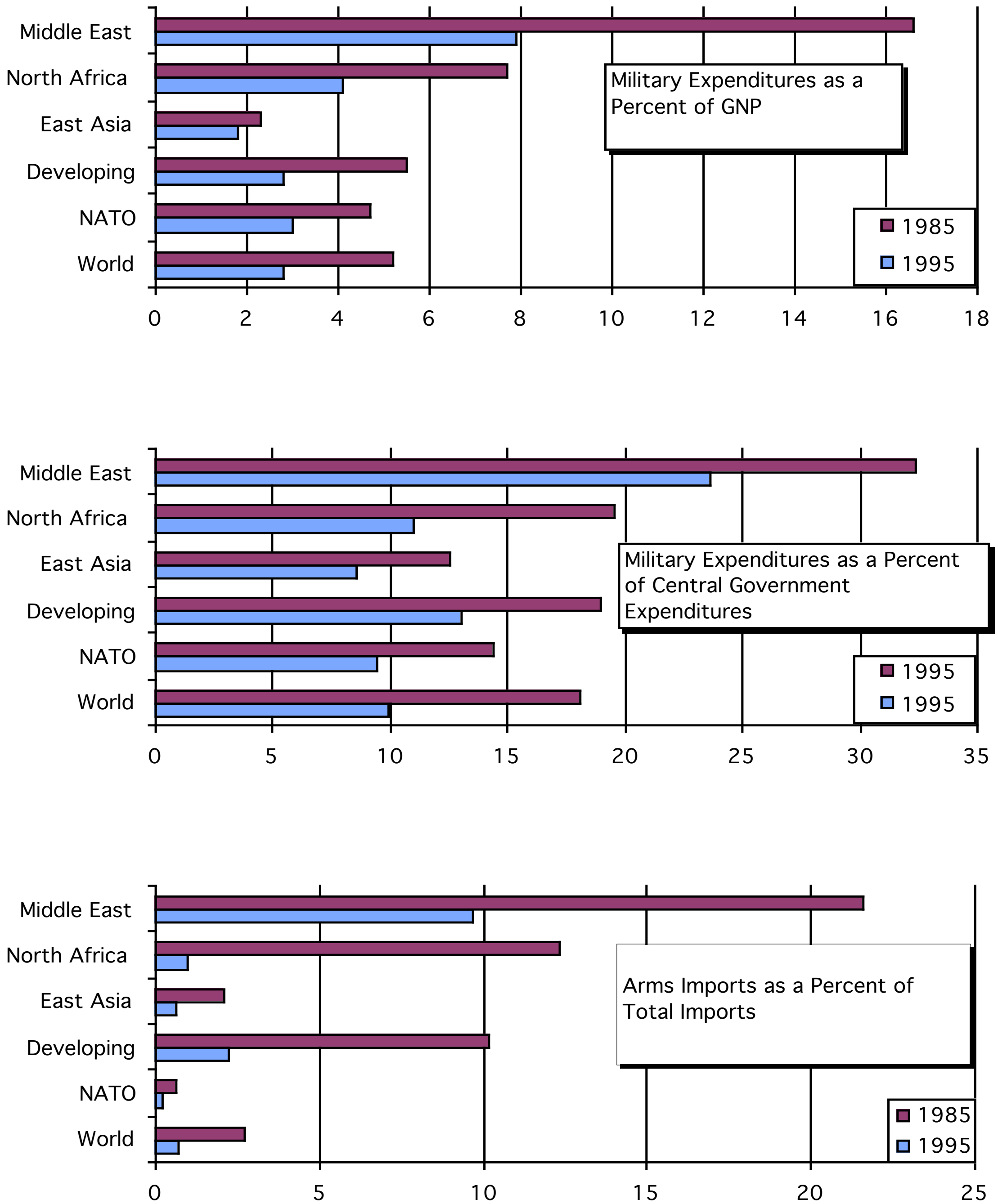
Figures 1 through 4 illustrate trends in Middle East military expenditures.

Figure 1. *The trend in Middle Eastern military expenditures and arms transfers since the October War, 1967–1995 (in $current billions)*



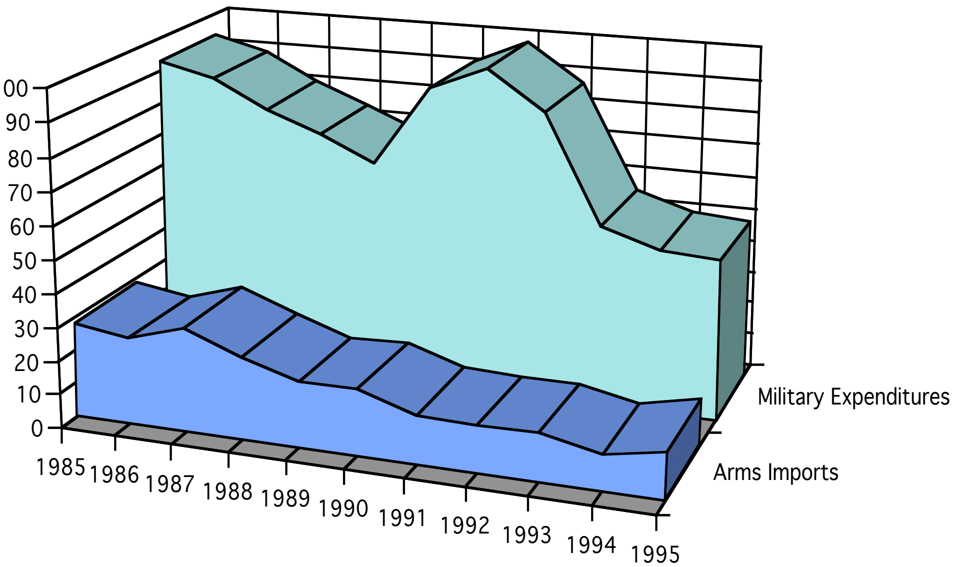
Source: Adapted by Anthony H. Cordesman from ACDA, *World Military Expenditures and Arms Transfers* (Washington, D.C.: GPO), various editions. Middle East does not include North African states other than Egypt.

Figure 2. *Military expenditures and arms imports as an economic burden in the Middle East relative to other regions*



Source: Adapted by Anthony H. Cordesman from ACDA, *World Military Expenditures and Arms Transfers* (Washington, D.C.: GPO), various editions

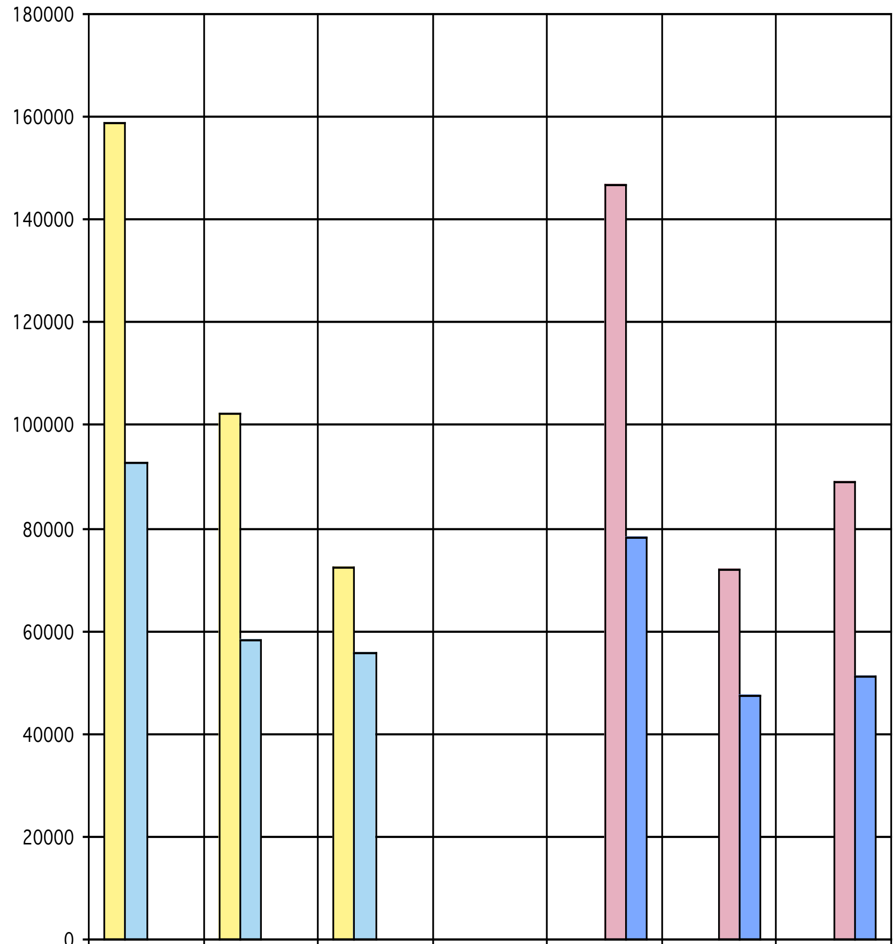
Figure 3. *The declining trend in Middle Eastern military expenditures and arms transfers, 1967–1995 (in constant dollars in $1994 billions)*



	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Arms Imports	27.95	25.96	30.9	24.5	19.2	19.5	14.5	13.5	13.8	10.2	13.8
Military Expenditures	93.0	88.7	80.6	74.8	66.9	91.4	98.7	87.4	55	49.7	48.6

Source: Adapted by Anthony H. Cordesman from ACDA, *World Military Expenditures and Arms Transfers* (Washington, D.C.: GPO), various editions. Middle East does not include North African states other than Egypt.

Figure 4. *Arms agreements and deliveries to the developing world versus total sales to the Middle East, 1987–1997 (in $current millions)*



	Agreements: 87-90	Agreements: 91-94	Agreements: 94-97	.	Deliveries: 87-90	Deliveries: 91-94	Deliveries: 94-97
Developing Nations	158877	102103	72497		-	-	-
Near East	92696	58112	55849		-	-	-
Developing Nations	-	-	-		146659	71718	88953
Near East	-	-	-		78118	47270	51283

Includes Gulf states, Arab-Israeli states, North Africa, and Yemen

0 = less than $50 million or nil, and all data rounded to the nearest $100 million.

Source: Richard F. Grimmett, *Conventional Arms Transfers to the Developing Nations*, Congressional Research Service, various editions.

North Africa: National Powers without Clear External Threats

Military Forces in Mauritania, Morocco, Algeria, Libya, and Tunisia

A regional military build-up has been replaced by decline.

Most nations are now far more concerned with internal security than regional ambitions:

- Low-level race war in Mauritania
- Morocco's "internal" struggle for control over Western Sahara.
- Algeria's civil war.
- Libya's low-level civil war.
- Tunisia's traditional focus on self-defense.

Only Morocco and Tunisia still exhibit any cohesive pattern of force improvement.

Algeria's military forces are becoming obsolete. Investment is a fraction of the requirement for recapitalization, and new arms imports go to internal security efforts.

Libya is the world's largest military parking lot. Most equipment is obsolescent and deadlined. Investment is less than 10 percent of requirement for recapitalization.

Friction does continue between some neighboring states:

- Morocco and Algeria
- Mauritania and Senegal

The key regional conflict is Morocco versus the Polisario. This is a conflict Morocco has largely won and where the Polisario is getting almost no new arms or outside support.

The "wild card" is Libyan proliferation. This has been so badly managed that it only poses a petty threat.

Europe's fear of immigration wars is a much more serious regional development than any aspect of the regional military balance.

Table 1 details the North African balance in 1999.

The Modernization Problem in Morocco, Algeria, Libya, and Tunisia

Morocco has a reasonably modern force tailored to its needs, with a reasonable manpower to equipment ratio :

- 524 tanks, with 240 M-60A3s.
- Over 800 OAFVs.
- Adequate self-propelled artillery.
- No modern fighters, but attack capabilities adequate for COIN missions. 24 adequate armed helicopters.

Algeria has:

- 124,000 men, 70,000 of whom are low-grade conscripts:
- 890 tanks, with 285 early model T-72s.
- 1,445 OAFVs, with 225 BMP-2s.
- Inadequate self-propelled artillery.
- 10 SU-24 fighters out of 181 combat aircraft. 65 armed helicopters, with 35 Mi-24s.
- Obsolete air defense command with SA-3/6/8s and weak C^4I/BM.

Libya is an obsolescent military nightmare, with a terrible manpower to equipment ratio (65,000 men, 35,000 in army):

- 1,200 tanks in storage, 985 active tanks with 145 early model T-72s.
- 2,620 OAFVs, with more than 80 percent deadlined or not fully manned.
- 450 self-propelled artillery weapons with few qualified crews.
- 420 fighters, 51 of which are early SU-20s/24s. 52 old armed helicopters. Very low crew rates and sortie rates.
- Obsolete air defense command with SA-2/3/5/6s and weak C^4I/BM.

Tunisia has small military forces with limited defense capabilities:

- 35,000 men
- 84 tanks, with 54 M-60A3s.
- Over 800 OAFVs.
- No self-propelled artillery.
- No modern fighters: 15 F-5s, 5 COIN, 5 armed helicopters.

Figures 5 through 12 summarize military expenditures, arms transfers, and weapons in North Africa.

Table 1. *The North African balance in 1999*

Category/Weapon	Morocco	Algeria	Libya	Tunisia	Egypt
Defense Budget (in 1998, $Current Billions)	1.4	1.9	1.3	0.340	2.8
Arms Imports, 1994–1997 ($M)					
New Orders	400	1,000	100	–50	4,900
Deliveries	100	700	30	200	5,900
Mobilization Base					
Men Ages 13–17	1,690,000	1,891,000	350,000	514,000	3,486,000
Men Ages 18–22	1,526,000	1,693,000	291,000	478,000	3,026,000
Manpower					
Total Active	196,300	122,000	65,000	35,000	450,000
(Conscript)	100,000	75,000	—	23,400	320,000
Total Reserve	150,000	150,000	40,000	–	254,000
Total	346,300	272,000	105,000	–	704,000
Paramilitary	42,000	146,200	—	12,000	230,000
Land Forces					
Active Manpower	175,000	105,000	35,000	27,000	320,000
(Conscripts)	100,000	75,000	25,000	22,000	250,000+
Reserve Manpower	—	—	—	—	150,000
Total Manpower	—	—	—	—	470,000
Main Battle Tanks	524	951	985 (1,040)	84	3,700
AIFVs/Armored Cars/Lt. Tanks	559	1,000	1,630*	114	982 (220)
APCs/Recce/Scouts/Half–Tracks	785	680+	990*	268	2,664 (1,075)
ATGM Launchers	720	—	3,000*	565	2,660
SP Artillery	167	185	450*	0	276
Towed Artillery	190	416	720*	117	971
MRLs	39	126	700*	0	296
Mortars	1,700	330	—	161	2,400
SSM Launchers	0	—	120	0	21
AA Guns	425	895	600+*	115	1,677
Lt. SAM Launchers	107	1,000+	2,500+*	73	2,046
Air & Air Defense Forces					
Active Manpower	13,500	10,000	22,000	3,500	110,000
(Air Defense Only)	NA	NA	?		(80,000)
Reserve Manpower	—	—	—	—	90,000
(Air Defense Only)	NA	NA	?	—	(70,000)
Aircraft					
Total Fighter/FGA/Recce	89	181	420	44	585
Bomber	0	0	6	0	0
Fighter	15	110	212	0	375
FGA/Fighter	0	0	0	15	0
FGA	47	50	194	5	135
Recce	6	10	11	0	20
Airborne Early Warning (AEW)	0	0	0	0	5

(continued)

(**Table 1.** *continued*)

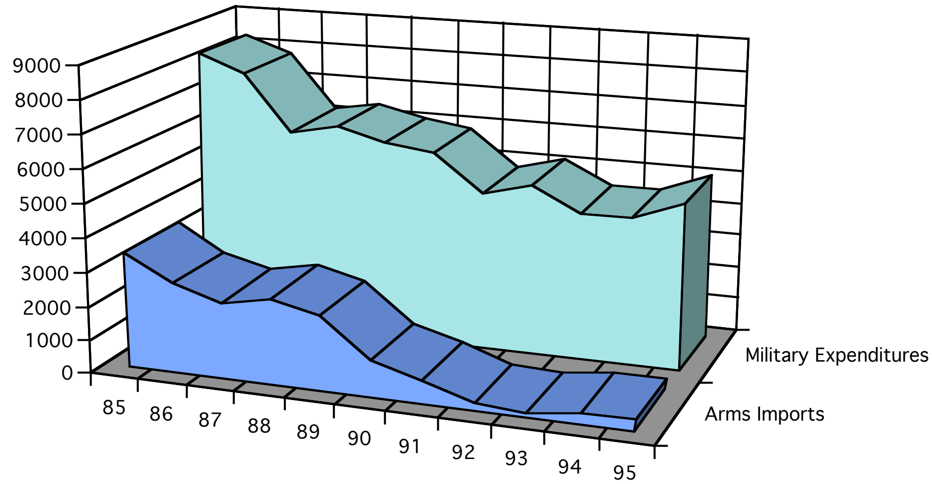
Category/Weapon	Morocco	Algeria	Libya	Tunisia	Egypt
Electronic Warfare (EW)	3	0	0	0	10
Fixed Wing	3	—	—		6
Helicopter	—	—	—		4
Maritime Reconnaissance (MR)	0	15	0	0	2
Combat Capable Trainer	23	8	21	24	93
Tanker	3	0	0	0	0
Transport	36	27	75	11	32
Helicopters					
Attack/Armed/ASW	24	65	52	7	125
Other	88	63	98	37	131
Total	112	138	150	44	256
SAM Forces					
Batteries	0	9	39	—	38+
Heavy Launchers	0	43	236	—	628
Landing Craft/Light Support	4	3	10	3	20
ASW/Combat Helicopter	0	0	32	0	24

*Extensive, but unknown amounts inoperable or in storage.

Note: Figures in parenthesis are additional equipment in storage. The use of a dash — can mean few or no men or equipment in a given area or that it is not possible to provide an accurate total. Many manpower totals are left with dashes because adequate reporting is not available or reserve or paramilitary forces. ASW helicopters are shown in both Air Force and Navy. In many cases, the Navy commands the same helicopters, but the air force operates them. The exact command relationships, however, are not clear.

Source: Adapted by Anthony H. Cordesman from data provided by U.S. experts and the IISS, *Military Balance*.

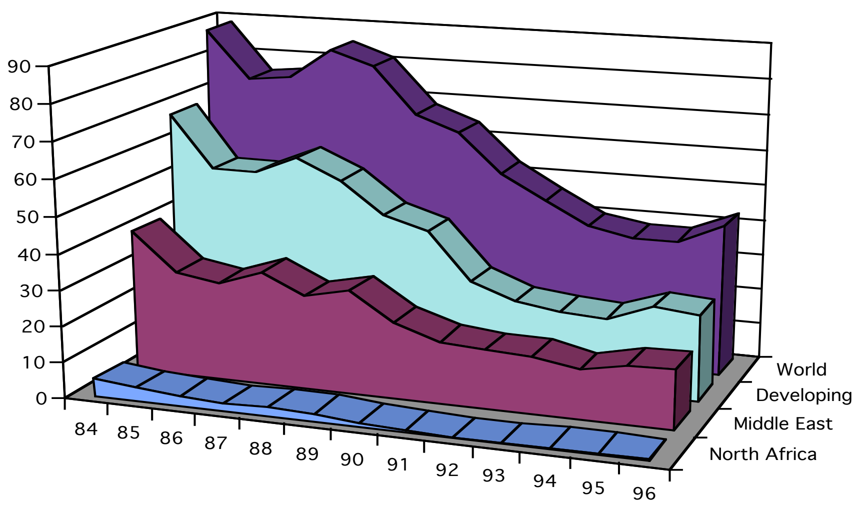
Figure 5. *North African military expenditures and arms transfers in constant dollars are now small by global standards: Algerian, Libyan, Moroccan, andTunisian spending (in $1995 billions)*



	85	86	87	88	89	90	91	92	93	94	95
Arms Imports	3467	2669	2278	2559	2247	1080	696	210	115	318	320
Military Expenditures	8300	7800	6100	6400	6000	5800	4700	5100	4400	4400	5000

Source: Adapted by Anthony H. Cordesman from ACDA, *World Military Expenditures and Arms Transfers* (Washington, D.C.: GPO), various editions.

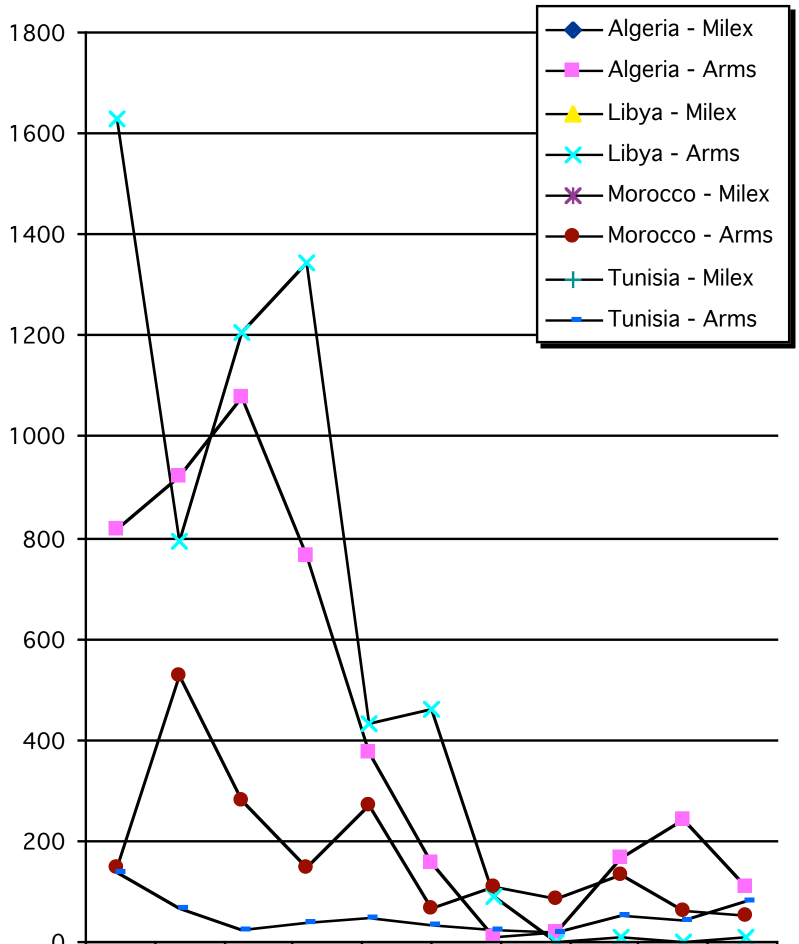
Figure 6. *Arms deliveries are declining, and are a minor portion of the total world market, 1984–1996 (in constant $96 billions)*



	84	85	86	88	89	90	91	92	93	95	96
North Africa	4.9	3.7	2.7	2.6	2.2	1.1	0.72	0.23	0.128	0.346	0.25
Middle East	39.9	29.4	27.4	26.1	28.8	21.3	17.3	16.2	15.8	15.9	16.2
Developing	68	53.2	53.1	52.7	44.1	40.5	27.4	23	21.2	24.9	23.7
World	88.1	74.5	75.9	80.6	67.7	63.4	52.5	45.5	39.5	37	42.6

Source: Adapted by Anthony H. Cordesman from ACDA, *World Military Expenditures and Arms Transfers* (Washington, D.C.: GPO), various editions. Middle East does not include North African states other than Egypt.

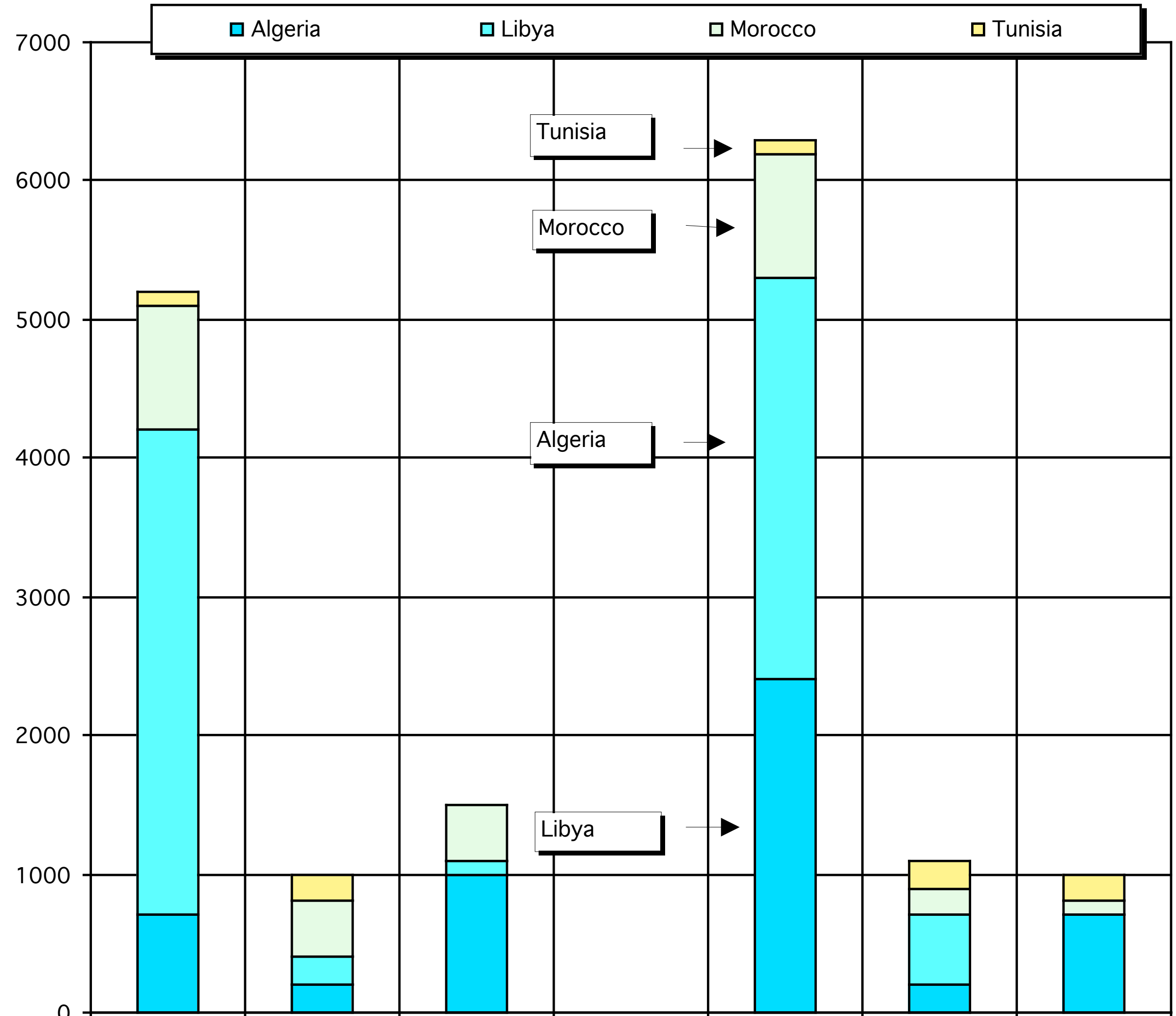
Figure 7. *Inadequate arms imports relative to military expenditures, 1986–1996 (in constant $US 1996 billions)*



	1986	1987	1988	1989	1990	1992	1993	1994	1995	1996
Algeria - Milex										
Algeria - Arms	815	922	1080	763	374	11	21	167	244	110
Libya - Milex										
Libya - Arms	1630	791	1207	1342	433	88	0	10	0	10
Morocco - Milex										
Morocco - Arms	149	527	280	146	269	109	85	135	61	50
Tunisia - Milex										
Tunisia - Arms	136	66	25	37	47	22	21	52	41	80

Sources: World Bank, *The World Bank Atlas, 1996*; CIA, *World Factbook, 1995*; and ACDA, *World Military Expenditures and Arms Transfers.*

Figure 8. *North African agreements and deliveries by major country, 1987–1997 ($current millions)*

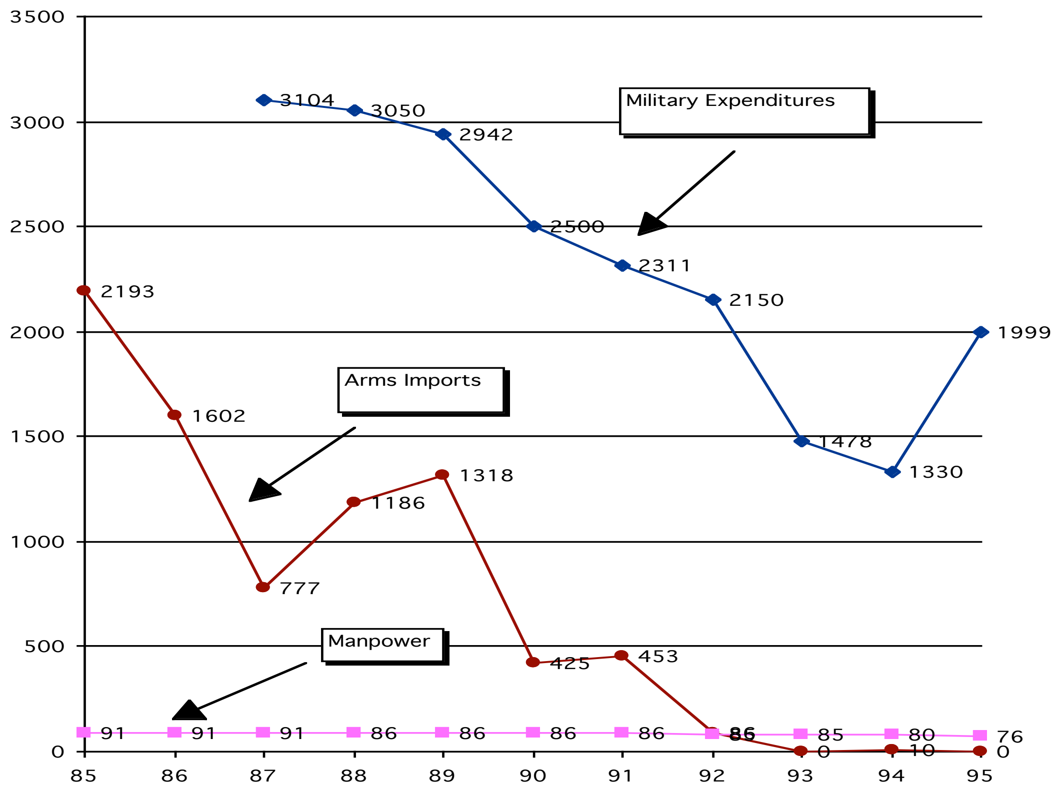


	Agreements: 87-90	Agreements: 91-94	Agreements: 94-97		Deliveries: 87-90	Deliveries: 91-94	Deliveries: 94-97
Tunisia	100	200	0		100	200	200
Morocco	900	400	400		900	200	100
Libya	3500	200	100		2900	500	0
Algeria	700	200	1,000		2400	200	700

0 = less than $50 million or nil, and all data rounded to the nearest $100 million.

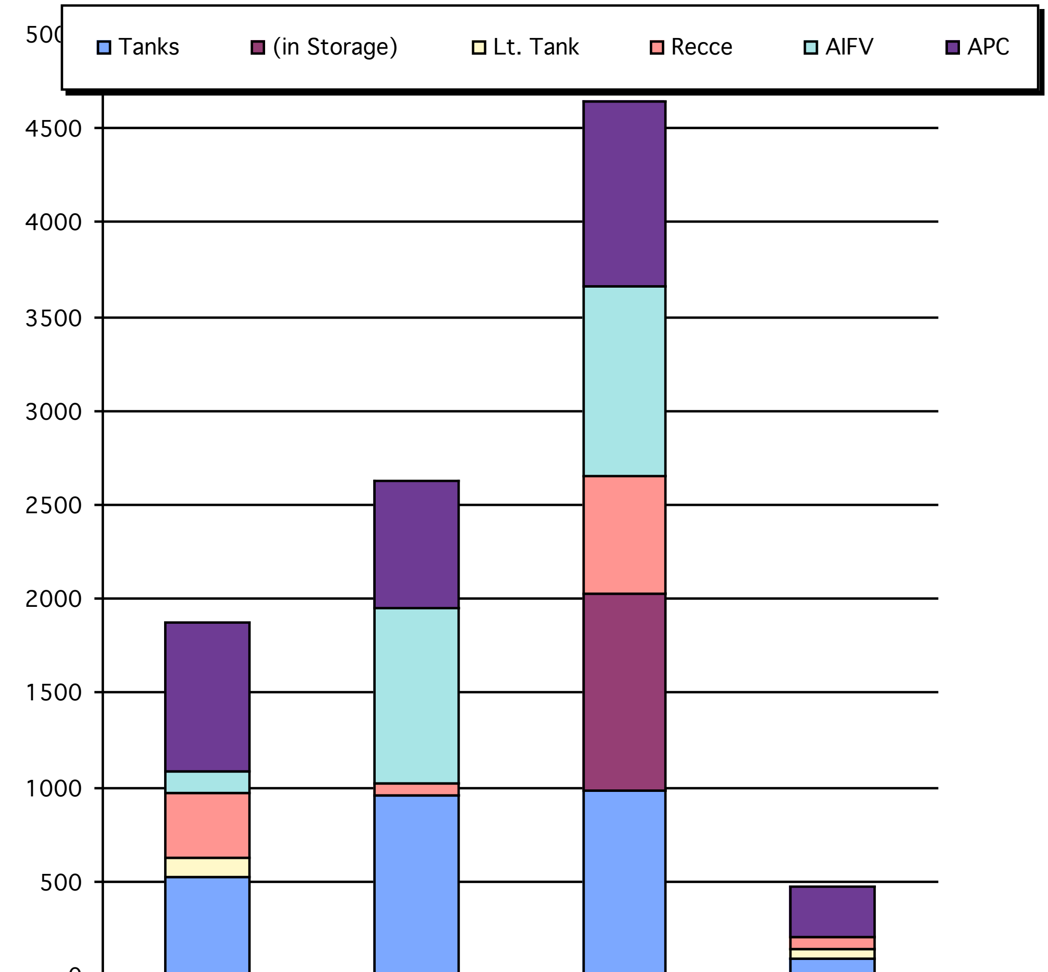
Source: Richard F. Grimmett, *Conventional Arms Transfers to the Developing Nations*, Congressional Research Service, various editions.

Figure 9. *North Africa's military parking lot:The decline in Libyan spending and arms imports, 1984–1995 ($95 constant millions)*



Source: Adapted by Anthony H. Cordesman from ACDA, *World Military Expenditures and Arms Transfers* (Washington, D.C.: GPO), various editions.

Figure 10. *Total North African armor, 1999*

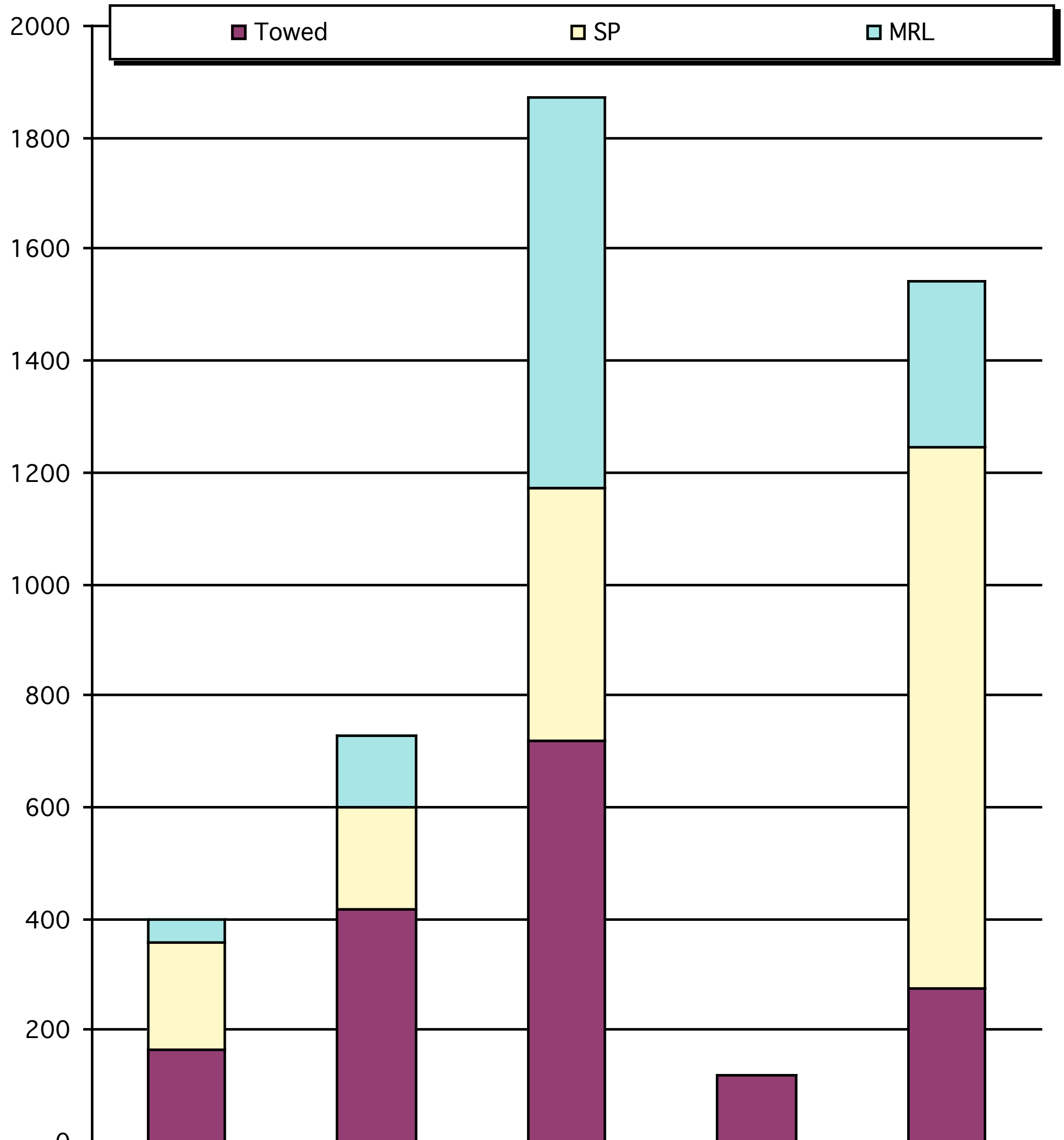


	Morocco	Algeria	Libya	Tunisia
APC	785	680	990	268
AIFV	115	925	1000	-
Recce	345	75	630	59
Lt. Tank	100	-	-	55
(in Storage)	-	-	1040	-
Tanks	524	951	985	84

Tanks	524	890	985	84
(in Storage)	—	—	1225	—
Lt. Tank/Recce	444	75	630	114
AIFV	115	915	1000	-
APC	785	530	990	268

Sources: Adapted by Anthony H. Cordesman from the IISS, *Military Balance, 1996–1997*, and JCSS, *Military Balance in the Middle East, 1993–1994*

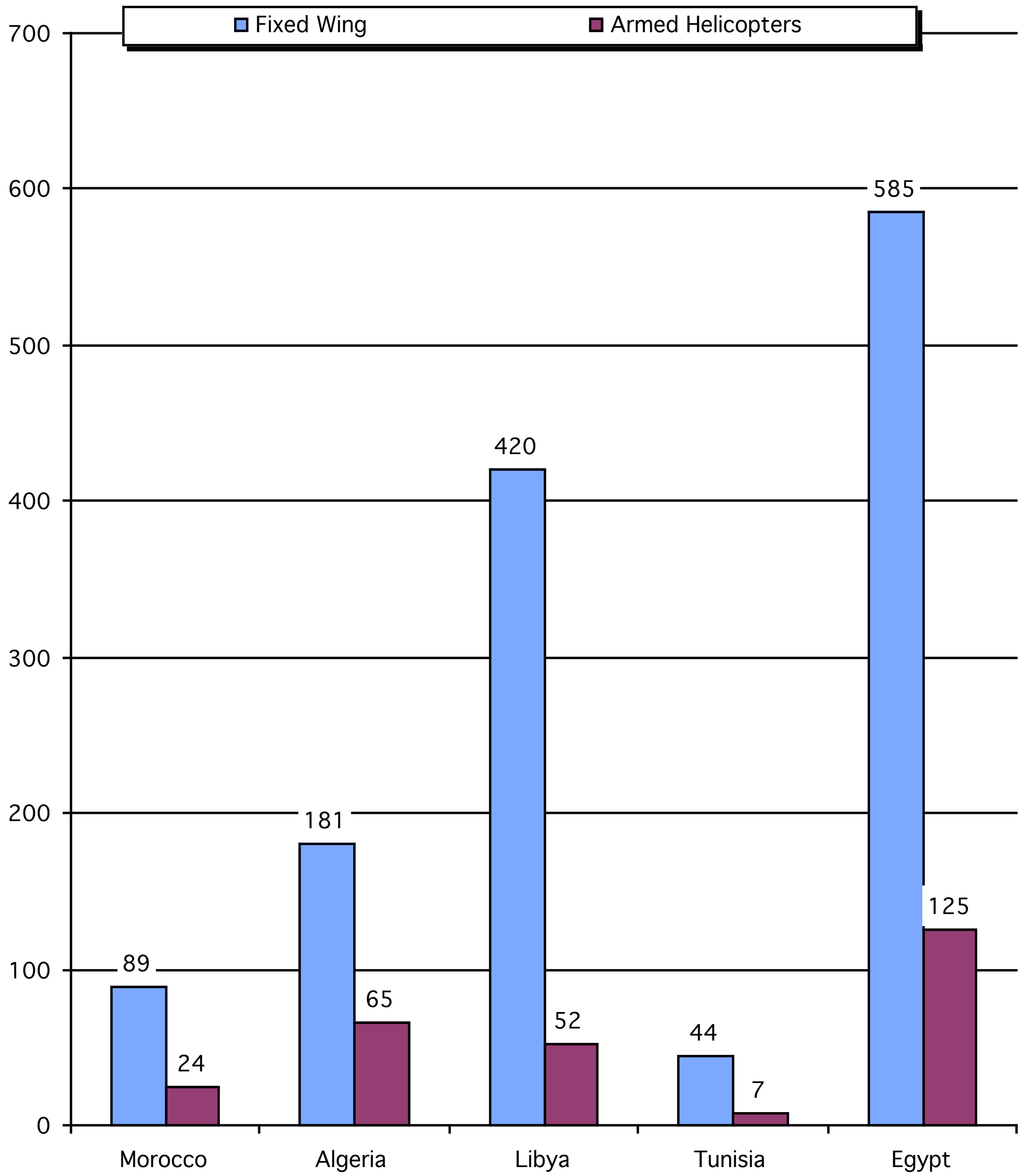
Figure 11. *Total North African artillery, 1999*



	Morocco	Algeria	Libya	Tunisia	Egypt
MRL	39	126	700	-	296
SP	190	185	450	-	971
Towed	167	416	720	117	276

Source: Adapted by Anthony H. Cordesman from IISS, *Military Balance*.

Figure 12. *North Africa: Total fixed combat aircraft and armed helicopters, 1999*



Source: Adapted by Anthony H. Cordesman from IISS, *Military Balance*.

The Arab-Israeli Balance

Arab-Israeli Military Spending

Total spending levels are sharply lower in constant dollars than in the 1980s. Military burden is also much lower as a percent of GDP, as arms imports are as a percent of trade.

The region is deeply divided, however, into "haves" and "have nots."

- Israel is the only state to sustain high enough overall expenditures to maintain most force levels and improve quality.
- Egypt is well off in terms of arms and technology imports but has not funded manpower quality or the other aspects of force quality.
- Syria has lost the Soviet Bloc as a patron and has massive capitalization and force modernization problems and has not funded manpower quality or the other aspects of force quality.
- Jordan reflects the loss of aid after the Gulf War. It too has massive capitalization and force modernization problems and has not funded manpower quality or the other aspects of force quality.
- Lebanon reflects the impact of years of civil war. It too has massive capitalization and force modernization problems and has not funded manpower quality or the other aspects of force quality.

These problems are compounded by:

- Preserving force size even though the money is lacking to maintain force quality.
- Internal political problems.
- Keeping too many types of equipment in service, often with low-grade modifications—compounding cost, sustainability, interoperability, and operations and maintenance problems.

Trends in military spending are summarized in Figures 13 and 14.

Arab-Israeli Arms Transfers

Only Israel and Egypt approach the levels necessary to recapitalize and modernize their forces.

Israel is still unable to fund full modernization of armored mobility and naval modernization

Egypt overfunds weapons at the expense of other aspects of military technology; preserves far too much obsolete Soviet-bloc and low grade European weaponry.

Syria is crippling itself by maintaining large force size and funding 5–10 percent of the level of arms imports needed for modernization and recapitalization.

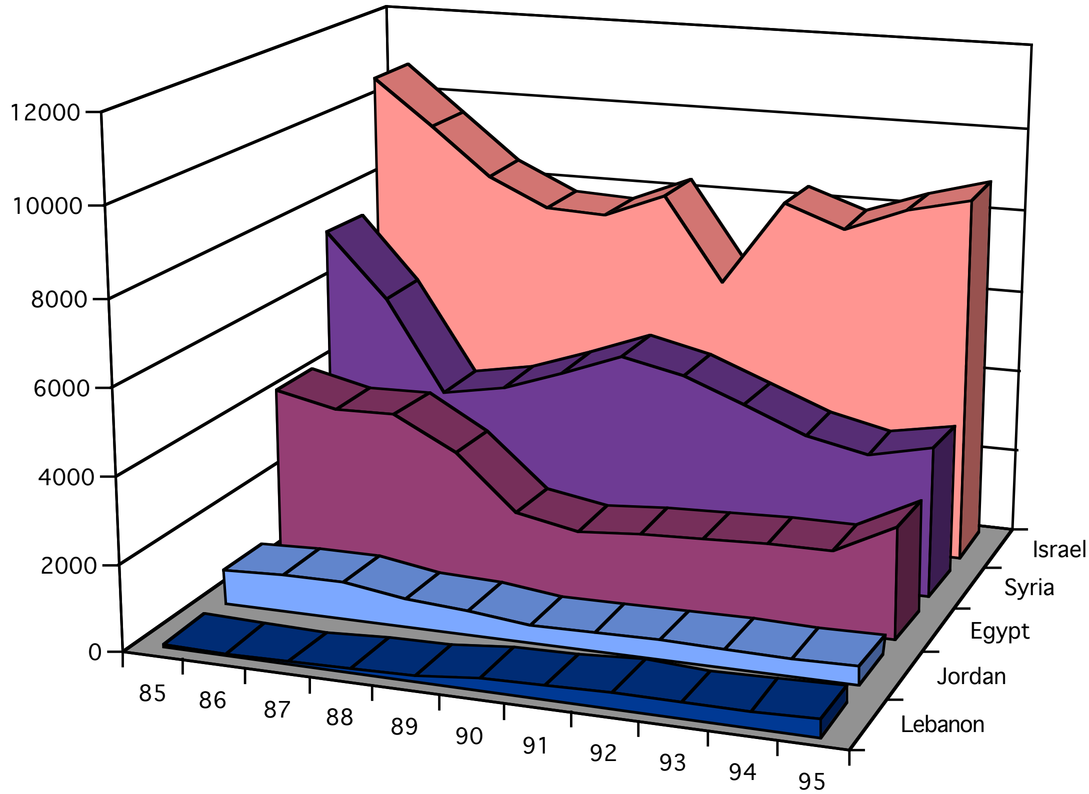
Jordan has made some compromises by withdrawing equipment from active service, but its air force and much of its land-based air defense system is obsolescent, and it cannot fund army modernization.

Lebanon is funding more of an internal security force than a real army. It has no meaningful air and naval equipment and no plans to fund them.

No state has succeeded in creating a viable military industry, although Egypt can produce small arms and some heavy weapons, and Israel's problem is over-capacity, not quality and efficiency in meeting internal needs.

Arms transfer data exaggerates the size of Egyptian imports relative to Israel because Israel's imports of the components for its arms industry are not counted as arms. Israel actually has larger military imports than Egypt.

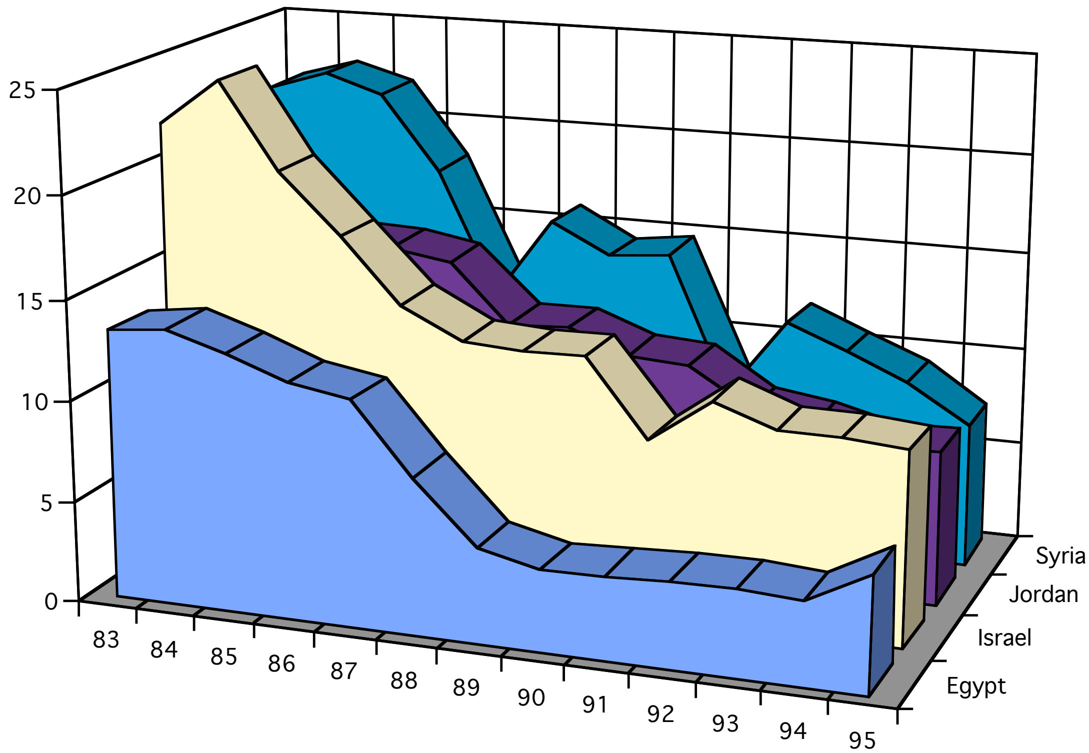
Figure 13. *Trends in Arab-Israeli military spending, 1984–1995: Only Israel spends enough to maintain high-quality forces (in constant $95 millions)*



	85	86	87	88	89	90	91	92	93	94	95
Lebanon	100	75	75	120	150	301	319	373	344	340	410
Jordan	849	899	894	673	597	456	466	461	469	448	481
Egypt	4289	3981	3980	3208	1953	1687	1767	1840	1904	1881	2653
Syria	7445	5878	3727	4000	4491	5045	4730	4150	3580	3270	3563
Israel	10650	9554	8421	7740	7693	8237	6233	8320	7812	8376	8734

Source: Adapted by Anthony H. Cordesman from ACDA, *World Military Expenditures and Arms Transfers, 1995* (Washington, D.C.: GPO, 1996), Table I.

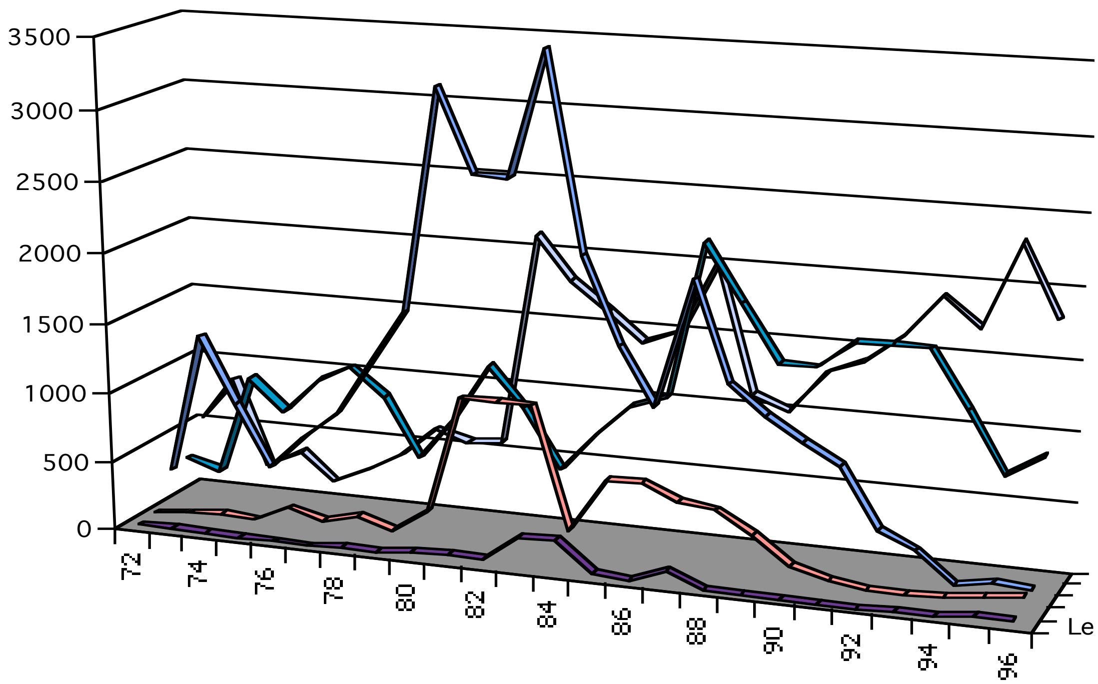
Figure 14. *Trend in percent of GNP spent on military forces, 1983–1995: Half the burden of the early 1980s*



	83	84	85	86	87	88	89	90	91	92	93	94	95
Egypt	13.4	13.7	12.8	11.7	11.2	7.8	4.7	4	4.1	4.2	4.3	4.1	5.7
Israel	22.2	24.5	20.3	17.3	14.2	12.7	12.5	12.6	8.8	11	9.9	9.9	9.6
Jordan	15.6	14.9	15.5	15.4	14.9	12	12.1	11	10.8	8.9	8.4	7.6	7.7
Syria	21.8	22.7	21.8	18	11.7	15.8	14.3	14.6	7.7	11.6	10.4	9.2	7.2

Source: Adapted by Anthony H. Cordesman from ACDA, *World Military Expenditures and Arms Transfers, 1996* (Washington, D.C.: GPO, 1997), Table I.

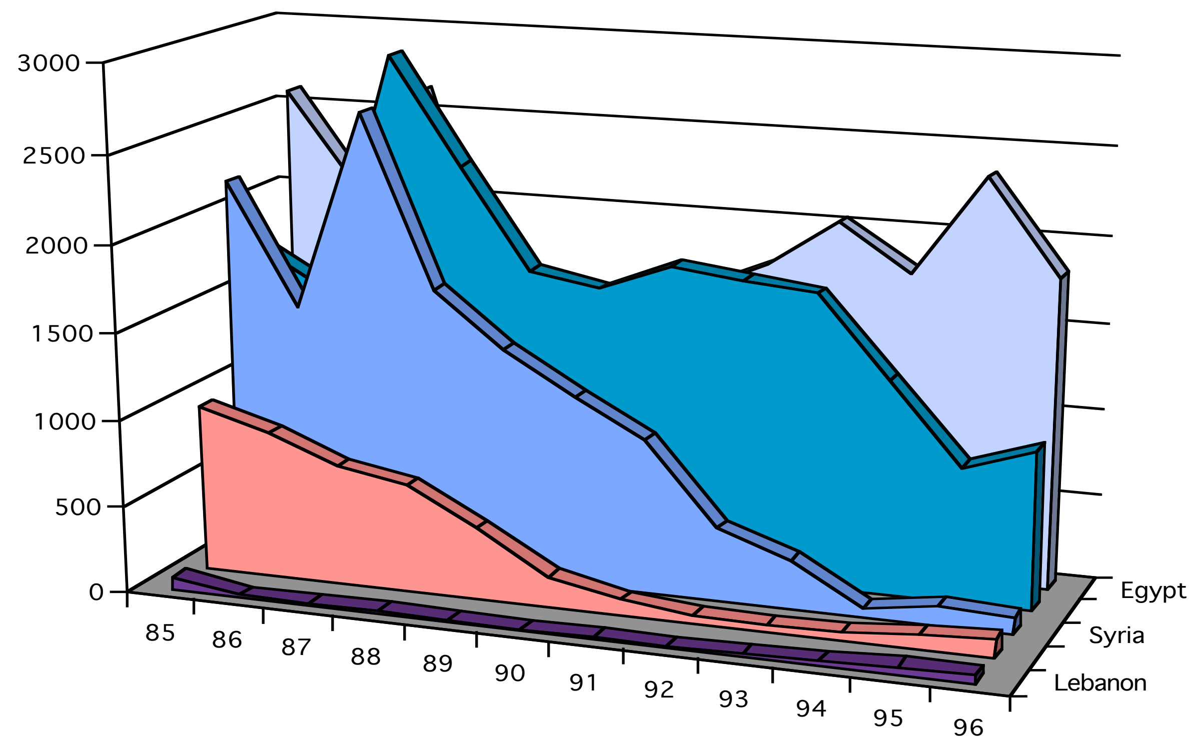
Figure 15. *Comparative trend in Arab-Israeli deliveries, 1972–1996 ($US current millions)*



	72	73	75	76	78	79	80	82	83	85	86	87	89	90	91	93	9
Lebanon	20	20	10	10	20	20	40	50	240	40	10	110	5	1	5	10	
Jordan	30	60	60	180	170	100	260	110	110	625	625	525	340	150	80	40	
Syria	280	130	380	625	120	160	320	260	350	150	110	200	110	950	800	270	
Israel	300	230	725	975	900	480	800	925	500	100	110	220	140	140	160	160	1
Egypt	550	850	350	150	400	625	550	210	180	140	150	200	100	130	140	190	1

Source: Adapted by Anthony H. Cordesman from ACDA, *World Military Expenditures and Arms Transfers* (Washington, D.C.: GPO), various editions.

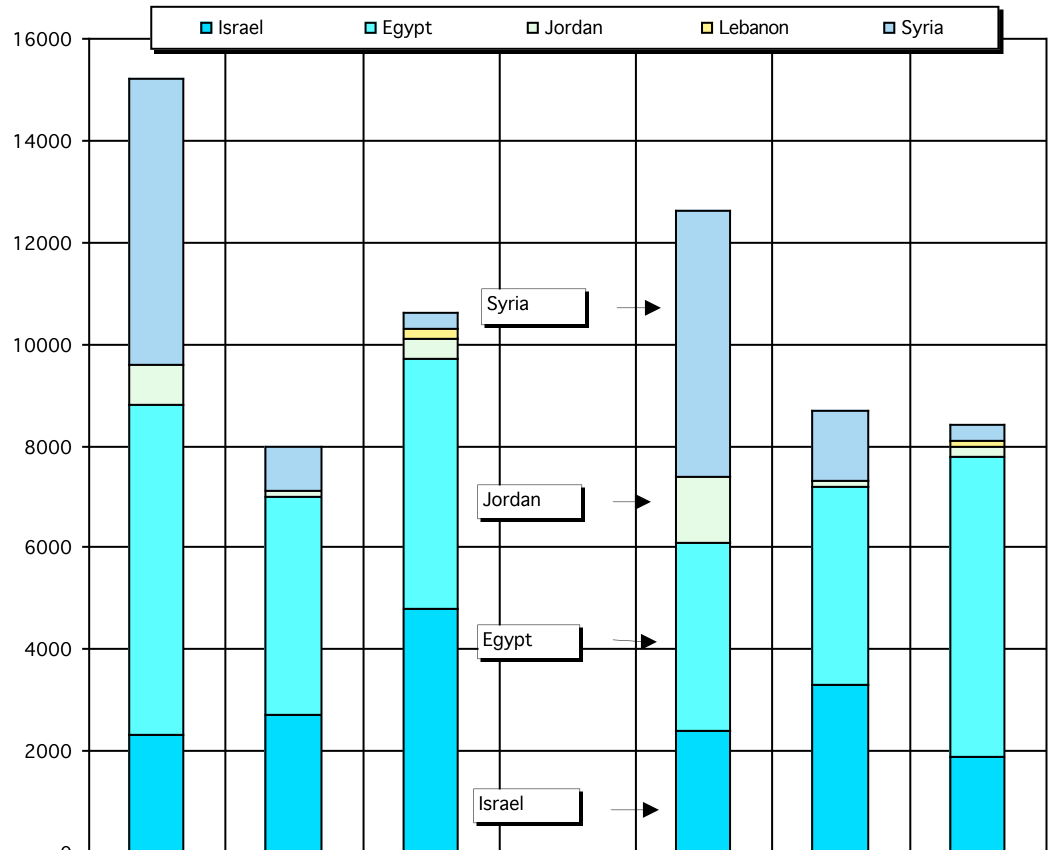
Figure 16. *Comparative trend in Arab-Israeli Deliveries, 1985–1996 ($96 constant millions)*



	85	86	87	88	89	90	91	92	93	94	95	96
Lebanon	74	14	13	13	6	2	6	3	11	19	41	49
Jordan	963	849	692	623	415	175	90	44	43	52	81	110
Syria	2196	1495	2635	1652	1342	1111	900	427	288	52	112	90
Israel	1720	1495	2899	2288	1708	1637	1800	1752	1707	1250	789	925
Egypt	2580	2038	2635	1398	1220	1520	1575	1752	2027	1771	2343	1800

Source: Adapted by Anthony H. Cordesman from ACDA, *World Military Expenditures and Arms Transfers* (Washington, D.C: GPO), various editions.

Figure 17. *Arab-Israeli new arms agreements and deliveries by major country, 1987–1997 ($current millions)*

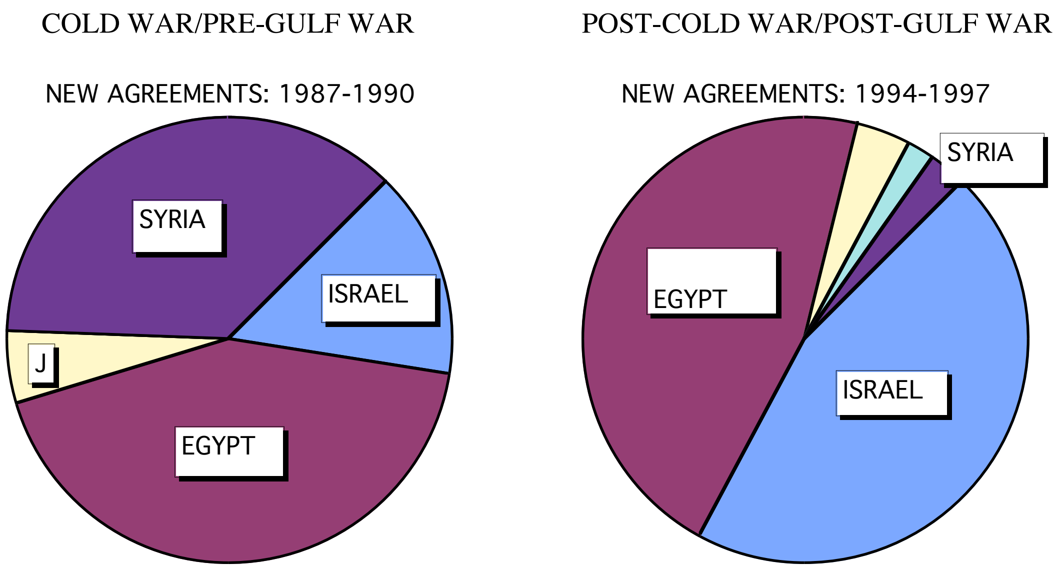


	Agreements: 87-90	Agreements: 91-94	Agreements: 94-97		Deliveries: 87-90	Deliveries: 91-94	Deliveries: 94-97
Syria	5600	900	300		5200	1400	300
Lebanon	0	0	200		0	0	100
Jordan	800	100	400		1300	100	200
Egypt	6500	4300	4900		3700	3900	5900
Israel	2300	2700	4800		2400	3300	1900
Total	15,200	8,000	10,600		12,600	8,700	8,400

0 = less than $50 million or nil, and all data rounded to the nearest $100 million.

Source: Richard F. Grimmett, *Conventional Arms Transfers to the Developing Nations*, Congressional Research Service, various editions.

Figure 18. *Country share of new Arab-Israeli arms agreements and deliveries, pre- and post-Cold and Gulf Wars ($current millions)*



Sources: Adapted by Anthony H. Cordesman, CSIS, from Richard F. Grimmett, *Conventional Arms Transfers to Developing Nations*, Congressional Research Service, various editions.

Total Arab-Israeli Forces

There is no easy way to count force numbers. Greater Arab world counts seem meaningless even to Israel, except as a way of justifying aid

Egypt and Jordan seem committed to the peace process. They retain significant war fighting capability against Israel, but no longer train, deploy, and create support structures tailored to such operations.

Syria must be counted as the key component in an “Arab-Israeli balance.”

Lebanon is not a real military force in the sense of meaningful capability for joint, armored, or combined arms warfare.

Mass does tell, however, and the Arab states retain a major cumulative numerical advantage.

A summary of Arab-Israeli force balance is given in Table 2.

Table 2. *The Arab-Israeli balance: Forces in the Arab-Israeli "ring" states, 1999*

Category/Weapon	Israel	Syria	Jordan	Egypt	Lebanon
Defense Budget, 1998 (in $current billions)	$3.0	$1.7	$0.548	$2.8	$0.592
Arms Imports, 1994–1997 ($M)					
New Orders	4,800	300	400	4,900	200
Deliveries	1,900	300	200	5,900	100
Mobilization Base					
Men Ages 13–17	275,000	973,000	263,000	3,486,000	207,000
Men Ages 18–22	267,000	793,000	240,000	3,026,000	196,000
Manpower					
Total Active	175,000	320,000	104,500	450,000	55,100
(Conscript)	138,500	—	—	320,000	—
Total Reserve	430,000	500,000	30,000	254,000	—
Total	605,000	820,000	134,500	704,000	—
Paramilitary	6,050	8,000+	10,000	230,000	13,000
Land Forces					
Active Manpower	134,000	215,000	90,000	320,000	53,300
(Conscripts)	114,700	—		250,000+	—
Reserve Manpower	365,000	400,000	30,000	150,000	—
Total Manpower	499,000	615,000	120,000	470,000	53,300
Main Battle Tanks	4,300	4,600	1,217	3,700	315
(Fixed & Storage)	0	(1,200)	—	—	—
AIFVs/Armored Cars/Lt. Tanks	400	3,010	224	982(220)	185
APCs/Recce/Scouts	5,980	1,500	1,100	2,664(1,07	895
WWII Half–Tracks	3,500	0	0	0	0
ATGM Launchers	1005	3,390	640	2,660	250
SP Artillery	1,150	450	406	276	0
Towed Artillery	400	1,630	115	971	150
MRLs	160	480	0	296	30
Mortars	2,740–5,000	4,500+	800	2,400	280+
SSM Launchers	48	62	0	21	0
AA Guns	850	2,060	360	1,677	220
Lt. SAM Launchers	945	4,055	965+	2,046	—
Air & Air Defense Forces					
Active Air Force Manpower	32,000	40,000	13,500	30,000	800
Active Air Defense Command	0	60,000	0	80,000	0
Air Force Reserve Manpower	55,000	92,000	—	90,000	—
Air Defense Command Reserve Manpower	0	—	0	70,000	0
Aircraft					
Total Fighter/FGA/Recce	481	589	93	585	3
Fighter	0	310	41	375	0
FGA/Fighter	384 (120)	0	0	0	0
FGA	50 (130)	154	50	135	3
Recce	22	14	0	20	0
Airborne Early Warning (AEW)	2	0	0	5	0

(continued)

(Table 2. *continued)*

	Israel	Syria	Jordan	Egypt	Lebanon
Category/Weapon					
Electronic Warfare (EW)	36	10	0	10	0
Fixed Wing	36	0	0	6	
Helicopter	0	10	0	4	
Maritime Reconnaissance (MR)	3	0	0	2	0
Combat Capable Trainer	23	121	2	93	0
Tanker	8	0	0	0	0
Transport	48	29	14	32	2
Helicopters					
Attack/Armed	129	72	16	125	4
SAR/ASW	9	—	—	—	—
Transport & Other	158	110	49	131	28
Total	296	182	65	236	32
SAM Forces					
Batteries	20	130	14	38+	0
Heavy Launchers	79	650	80	628	0
Medium Launchers	0	108	0	36–54	0
AA Guns	0	—	—	72	—
Naval Forces					
Active Manpower	9,000	5,000	480	20,000	1,100
Reserve Manpower	1,000–3,000	8,000	–	14,000	0
Total Manpower	10,000–12,000	14,000	480	34,000	1,100
Submarines	3	3	0	4	0
Destroyers/Frigates/Corvettes	3	4	0	9	0
Missile	3	2	0	9	0
Other	0	2	0	0	0
Missile Patrol	18	16	0	24	0
Coastal/Inshore Patrol	30	11	3	18	14
Mine	0	7	0	13	0
Amphibious Ships	1	3	0	12	0
Landing Craft/Light Support	4	5	3	20	2
Fixed Wing Combat Aircraft	0	0	0	0	0
MR/MPA	0	0	0	0	0
ASW/Combat Helicopter	0	24	0	24	0
Other Helicopters	—	—	—	—	—

Note: Figures in parenthesis are additional equipment in storage. The use of a dash — can mean few or no men or equipment in a given area or that it is not possible to provide an accurate total. Many manpower totals are left with dashes because adequate reporting is not available or reserve or paramilitary forces. ASW helicopters are shown in both Air Force and Navy. In many cases, the Navy commands the same helicopters, but the air force operates them. The exact command relationships, however, are not clear.

Sources: Adapted by Anthony H. Cordesman from data provided by U.S. experts, and the IISS, *Military Balance*.

Arab-Israeli Manpower

Manpower numbers have little military meaning in today's world. Training quality and experience are far more important than numbers.

The intangible aspects of NCO, technician, and junior officer quality dominate the ability to use modern combat equipment effectively.

The value of conscript forces is increasingly uncertain, even when properly funded and trained. This is the result of too little experience, training, and cohesion within the period of conscription.

Egypt and Syria grossly underfund conscript training.

Most reserve manpower has little value due to a lack of training, modern equipment, sustainability, and adequate C^4I/BM capability. Even the Israeli reserve system is under acute strain to maintain a capability for advanced maneuver warfare. Most Arab reserve manpower has low value.

Nations cannot afford to use their total manpower pool because they cannot fund suitable equipment, training, and sustainability.

Internal security and low-intensity operations degrade other aspects of military capability and present a serious problem for Israel, Egypt, and Syria.

Arab-Israeli Land Forces

Arab manpower problems are especially acute in land forces. NCO and technical training lack priority and funding. Junior officers are not allowed sufficient initiative. Conscript manpower often is not taken seriously or given minimal funding and training, and pay rates are not competitive.

Israeli manpower, however, has growing morale and training problems.

Equipment quality increasingly is as important as quantity, but there is no easy way to reflect such differences in force counts.

Quality does offset much of the tank and artillery balance.

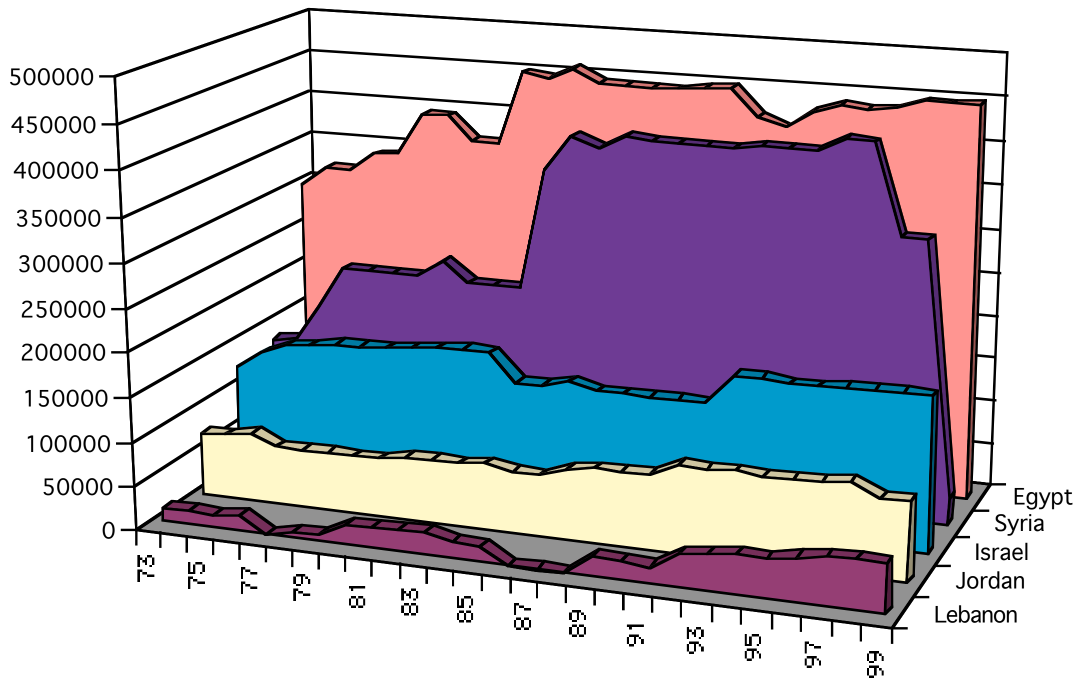
Israel and Egypt now have to only modernize air and land-based air defense forces.

Syria has superior quality in other armored fighting vehicles.

Mass does tell, however, and the Arab states retain a major cumulative numerical advantage.

Figures 19–25 summarize Arab and Israeli land forces by manpower, equipment, and other factors.

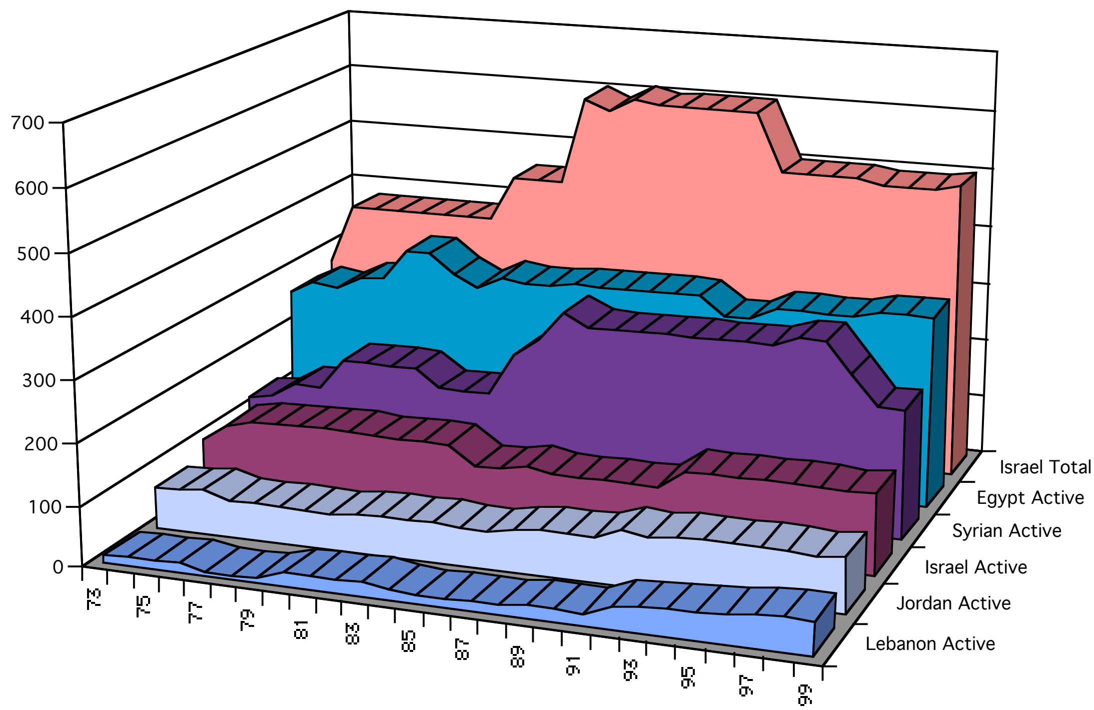
Figure 19. *Total Arab-Israeli active military manpower, 1973–1999*



	73	75	78	80	83	85	88	90	93	95	98
Lebanon	15250	15300	7800	23000	27000	17400		21800	41300	44300	55,100
Jordan	72,850	80,250	67,200	67,500	72,800	70300	85250	85250	100600	98600	90,000
Israel	125000	156000	164000	169600	172000	142000	141000	141000	176000	172000	175000
Syria	132,00	177,50	227,50	247,50	222,50	402,50	404,00	404,00	408000	423000	320000
Egypt	298000	322500	395000	367000	447000	445000	445000	450000	430000	436000	450000

Source: Adapted by Anthony H. Cordesman from IISS, *Military Balance*, various years. Some data adjusted or estimated by the author.

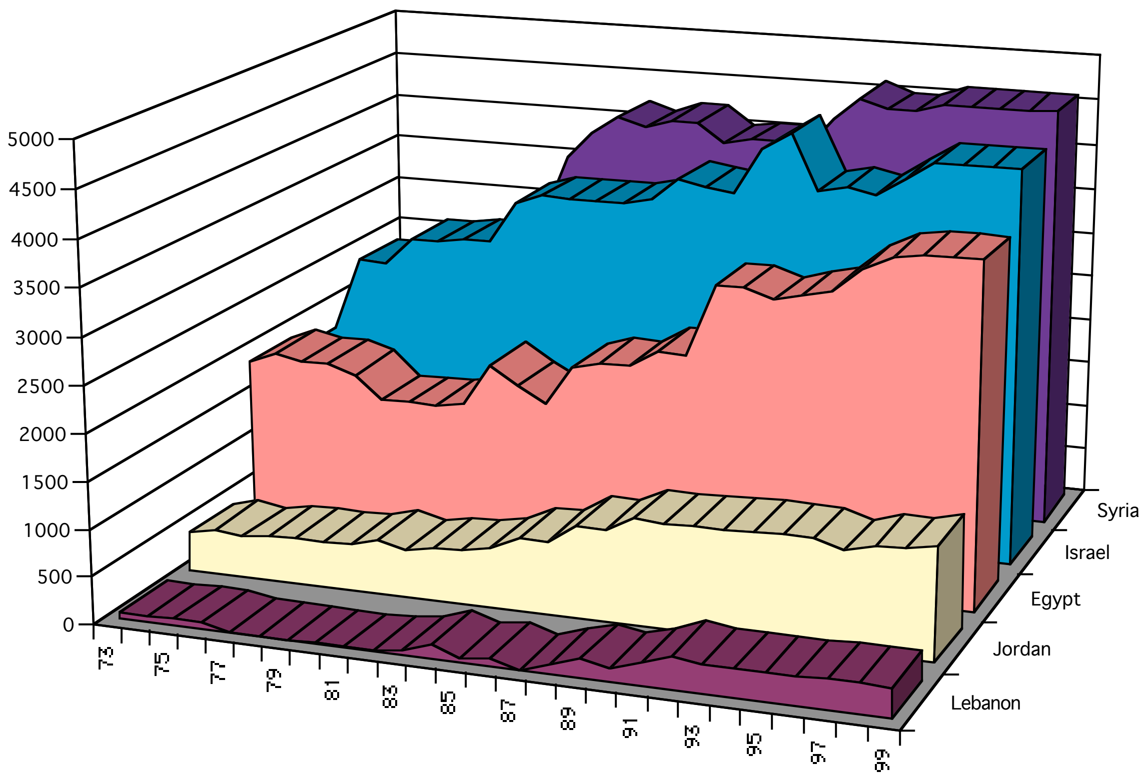
Figure 20. *Arab active versus Israeli mobilized army manpower, 1973–1999*



	73	74	76	77	78	80	81	82	84	85	87	88	89	91	92	93	95	96	97	99
Lebanon Active	14	14	17	8	7	22.3	22.3	22.3	19	15	15	15	21	17.5	35.7	40	43	47.4	53.3	53.3
Jordan Active	68	70	61	61	61	60	65	65	68	63.8	70	74	74	90	85	90	90	90	90	90
Israel Active	94.5	125	135	138	138	135	135	135	104	104	104	104	104	104	134	134	134	134	134	134
Syrian Active	120	125	150	200	200	200	170	170	240	270	300	300	300	300	300	300	315	315	265	215
Egypt Active	260	280	295	300	350	320	300	320	315	320	320	320	320	290	290	310	310	310	320	320
Israel Total	275	375	375	375	375	375	450	450	600	584	598	598	598	598	499	499	499	490	490	499

Source: Adapted by Anthony H. Cordesman from IISS, *Military Balance*, various years. Some data adjusted or estimated by the author.

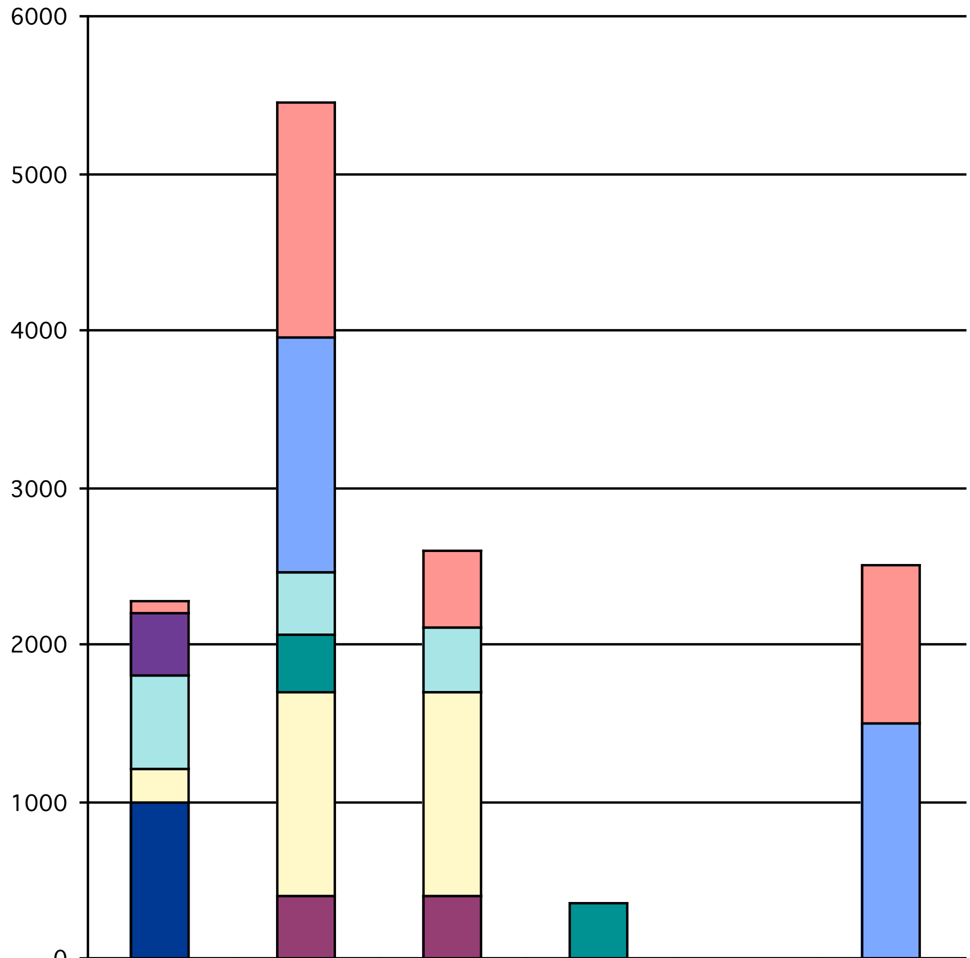
Figure 21. *Arab-Israeli main battle tanks, 1973–1999*



	73	74	75	76	78	79	80	81	82	83	84	85	87	88	89	90	91	92	93	94	96	97	98	99
Lebanon	60	60	60	60						54	142	50		105	200	145	240	350	300	300	300	315	315	315
Jordan	420	490	440	490	500	500	595	516	569	580	640	795	986	979	113	112	113	113	114	114	105	114	114	121
Egypt	188	200	194	194	160	160	160	166	210	191	175	215	225	242	242	319	319	309	316	323	365	370	370	370
Israel	170	190	270	270	300	305	305	350	360	360	360	360	390	385	379	429	448	389	396	389	430	430	430	430
Syria	117	160	210	230	250	260	292	370	399	420	410	420	400	405	405	400	435	460	450	450	460	460	460	460

Source: Adapted from IISS, *Military Balance,* various years. Some data adjusted or estimated by the author. Data differ significantly from estimated by US experts.

Figure 22. *Israel versus Egypt, Syria, Jordan, and Lebanon: High-quality tanks, 1999*

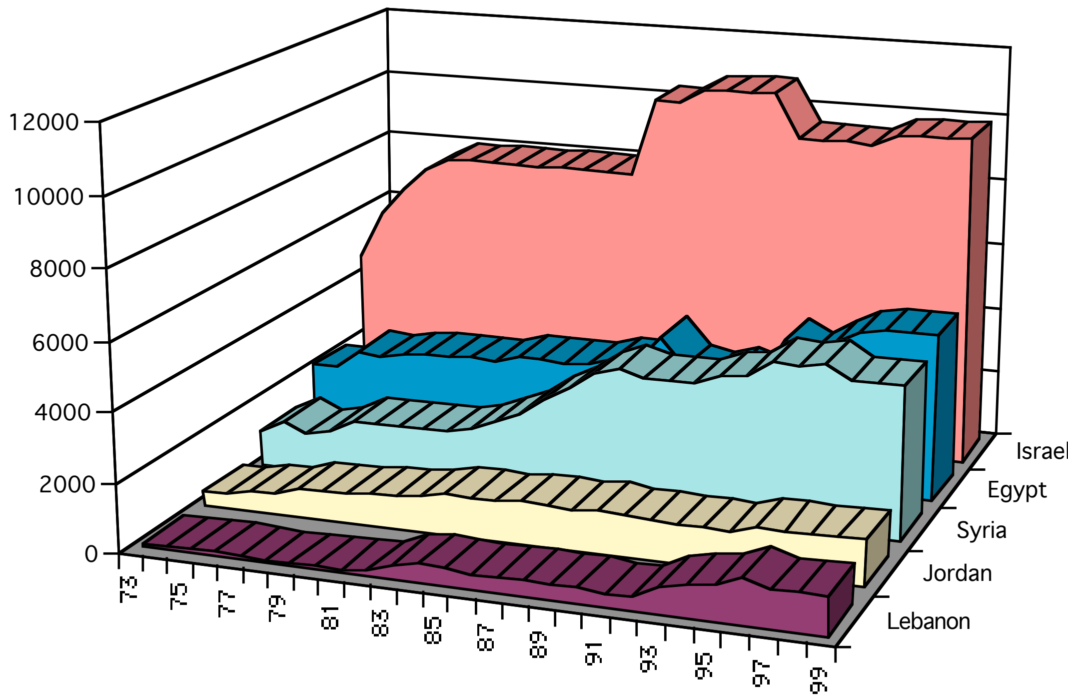


	Israel	Total Arab	Egypt	Jordan	Lebanon	Syria
T-62	70	1500	500			1000
M-60	400					
T-72		1500				1500
M-60A1	600	400	400			
M-60A1/A-3		354		354		
M-60A3	200	1300	1300			
Merkava	1000					
M-1		400	400			

Note: High-quality tanks include include T-62s, T-72s, M-60s, M-1s, and Merkavas.

Source: Adapted from IISS, *Military Balance*, various years. Some data adjusted or estimated by the author. Data differ significantly from estimated by U.S. experts.

Figure 23. *Arab-Israeli other armored fighting vehicles, 1973–1997*

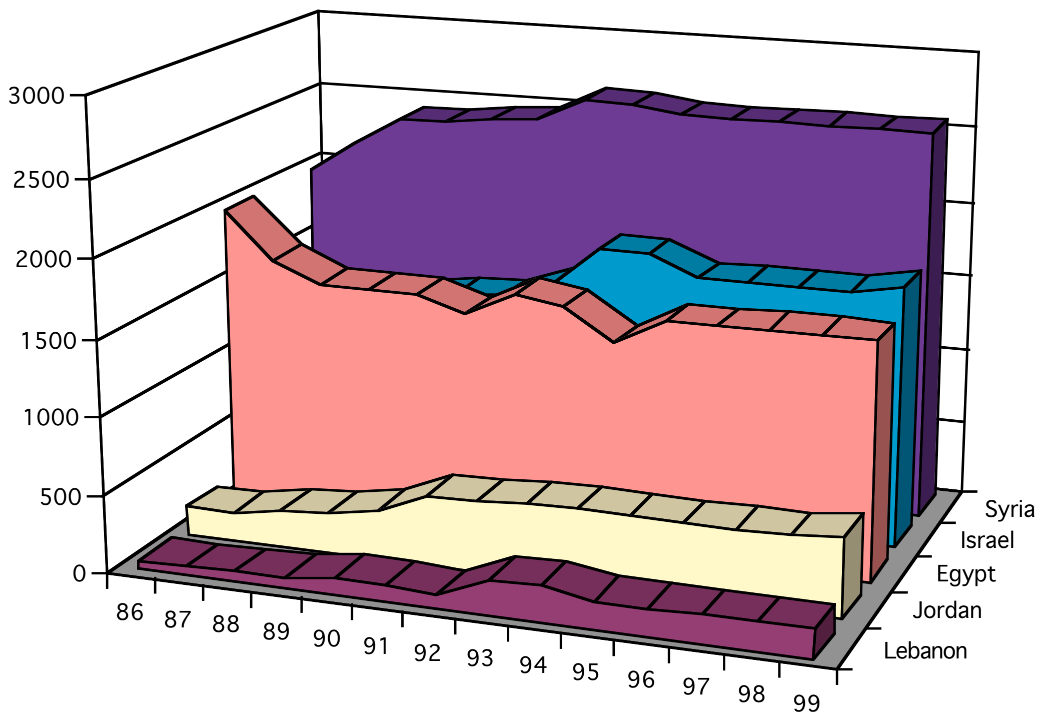


	73	75	77	79	81	83	85	87	88	90	92	94	96	98
Lebanon	80	139	111	80	80	418	490	470	470	442	382	890	1307	1080
Jordan	400	580	860	870	952	1182	1182	1230	1200	1194	1100	1100	1305	1324
Syria	1100	1170	1700	1700	1700	2200	3000	3900	4150	3950	4250	4800	4890	4510
Egypt	2075	2630	2700	2780	2780	3030	3000	3230	4060	3045	3060	4004	4777	4941
Israel	4600	6965	8000	8000	8000	8000	8000	1030	1070	1078	9480	9480	9800	9800

Note: Includes APCs, scouts cars, half-tracks, mechanized infantry fighting vehicles, reconnaissance vehicles and other armored vehicles other than tanks

Source: Adapted by Anthony H. Cordesman from IISS, *Military Balance*, various years. Some data adjusted or estimated by the author

Figure 24. *Arab-Israeli total artillery strength, 1986–1999*

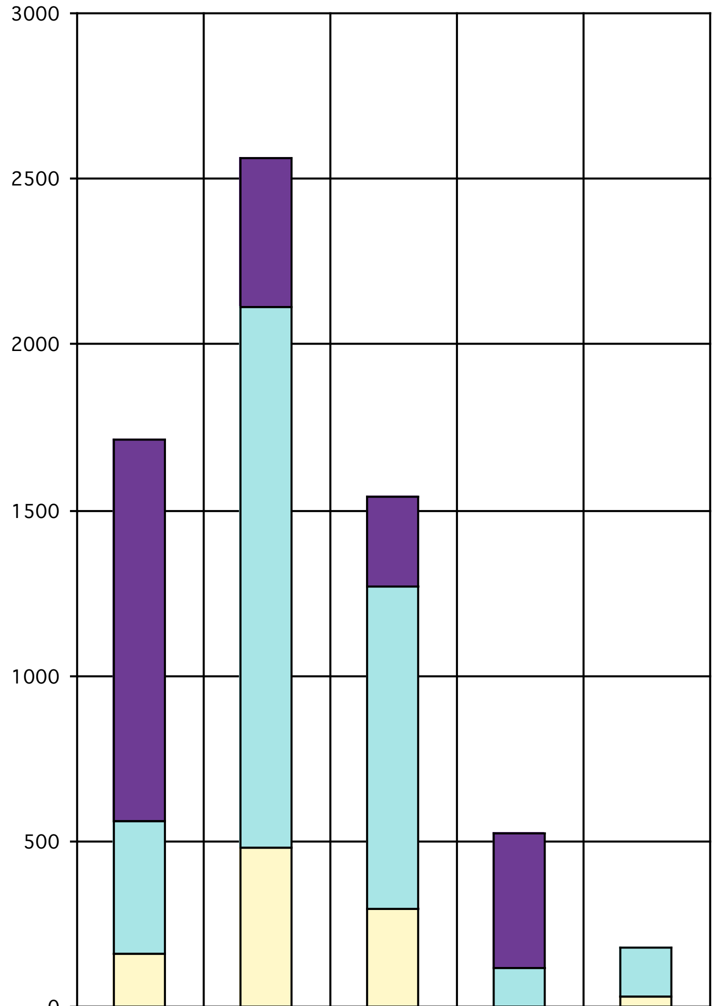


	86	87	88	89	90	91	92	93	94	95	96	97	98	99
Lebanon	58	58	69	69	112	112	90	220	230	180	180	180	180	180
Jordan	194	194	247	274	326	462	468	493	493	485	485	485	485	521
Egypt	2000	1700	1560	1560	1560	1458	1618	1574	1371	1543	1543	1543	1543	1543
Israel	1281	1281	1361	1360	1395	1420	1520	1784	1784	1650	1650	1650	1650	1710
Syria	2000	2200	2400	2400	2436	2466	2616	2600	2560	2560	2560	2560	2560	2560

Note: Includes towed and self-propelled tube artillery of 100 mm+ and multiple rocket launchers.

Source: Adapted by Anthony H. Cordesman from the IISS, *Military Balance*, various years. Some data adjusted or estimated by the author.

Figure 25. *Arab-Israeli artillery forces by country, 1999*



	Israel	Syria	Egypt	Jordan	Lebanon
SP Artillery	1150	450	276	406	0
Towed Artillery	400	1630	971	115	150
Multiple Rocket Launchers	160	480	296	0	30

Source: Prepared by Anthony H. Cordesman, based on discussions with U.S. experts.

Arab-Israeli Air and Air Defense Forces

Israel is the only Middle Eastern state to fund the mix of training, technology, readiness, C^4I/BM/AEW/EW/SR (Command, control, communications and computers/battle management/airborne early warning/electronic warfare/strategic reconnaissance) capability, and sustainability necessary to exploit the revolution in military affairs. Israel now has the most advanced mix of land-based air and ATBM defenses in the region.

Egypt has many of the elements of a modern air force but lacks overall force quality and cohesion and emphasizes aircraft numbers over balanced force quality.

Egypt's land-based air defenses have weak C^4I/BM capability and mix 78 modern I-Hawk launchers with 282 SA-2, 212 SA-3, and 56 SA-6 launchers supplied before 1975.

Jordan's air force will remain obsolete until its F-16s are fully in service. Jordan's "fixed" I-Hawk units actually have some mobility, and its C^4I/BM system has some modernization, but the overall system is weak.

Syria's air force is obsolete in concept, organization, training and equipment. It has only a token strength of first-generation export versions of the MiG-29 and Su-24 and proficiency training is poor. It has not modernized attack helicopter training while Israel does not use modern tailored tactics.

Syria's land-based air defense systems are obsolete in terms of deployment C^4I/BM, and most fire units.

Figures 26 through 29 summarize Arab and Israeli air defense equipment. Table 3 summarizes land-based air defense systems by country.

Arab-Israeli Naval Forces

It is unclear if the balance really matters. Most key combat issues will be decided by air-land combat.

Naval forces are most important in limited power projection and sea control operations.

Egypt is the only regional power seeking to create a major naval forces. Israel is probably still strong enough to dominate its waters and those of Lebanon and Syria.

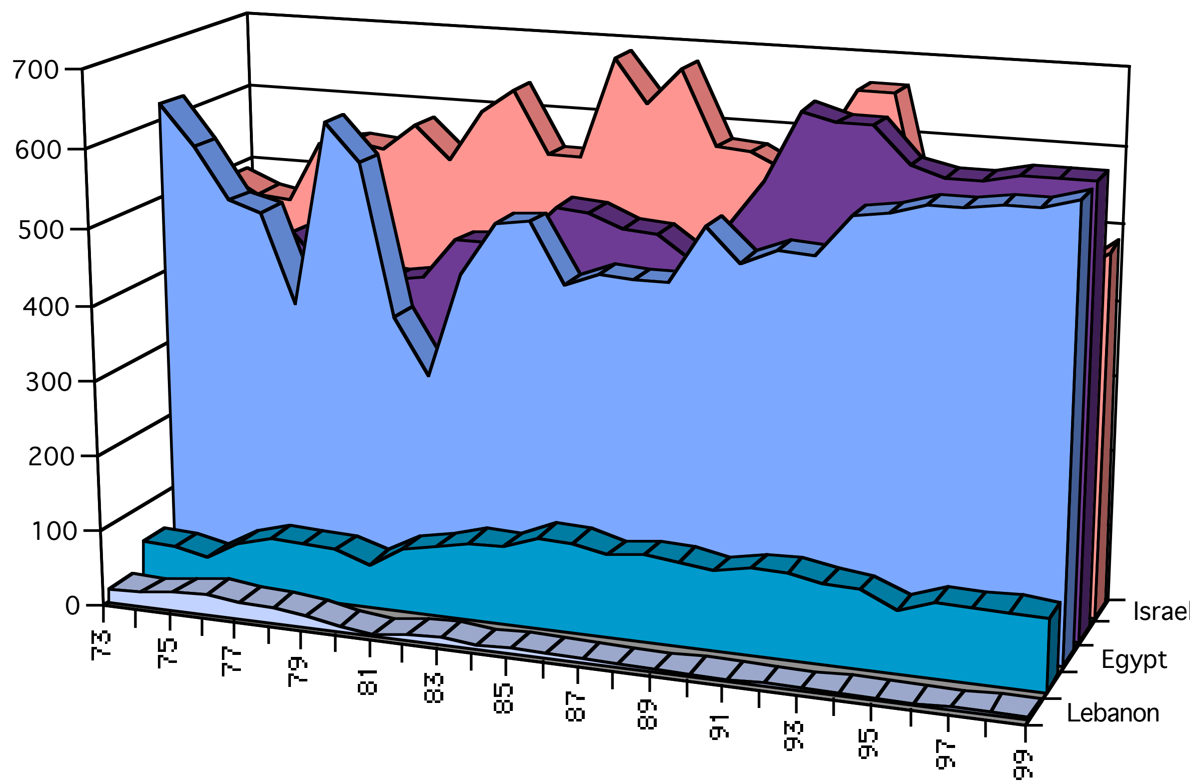
Key issues like relative skill in surface-to-surface missile warfare may be dominated by airborne systems; air power may be the real key to naval power.

Submarines seem more like prestige toys than real war fighting capabilities, although Israeli is reported to be considering using its new submarines as a secure launch platform for nuclear armed missiles.

Mine warfare presents a major threat in some scenarios. Real-world mine detection and sweeping capabilities may be low.

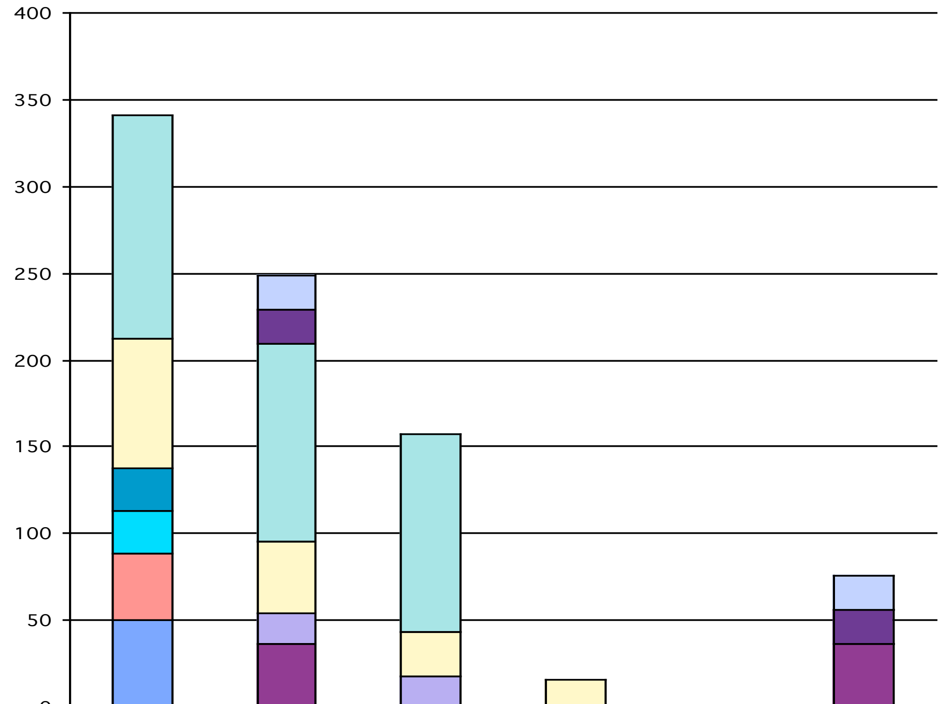
Figure 30 summarizes total combat ships by category.

Figure 26. *Total Arab-Israeli combat aircraft, 1973–1999*



Source: Adapted from IISS, *Military Balance*, various years. Some data adjusted or estimated by the author.

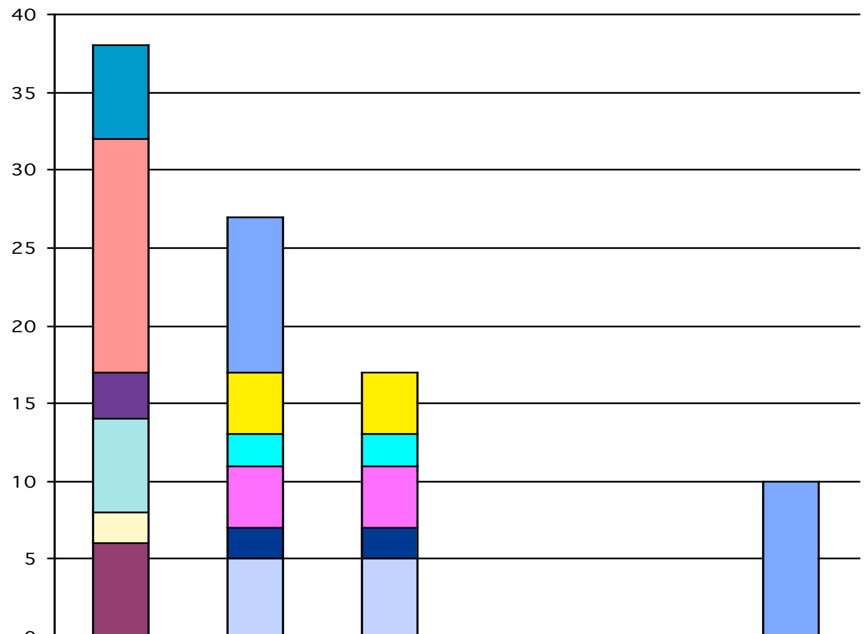
Figure 27. *High-quality operational Arab-Israeli combat fighter, attack, bomber, FGA, and reconnaissance aircraft, 1999*



	Israel	Total Arab	Egypt	Jordan	Lebanon	Syria
MiG-29		20				20
Su-24		20				20
F-16C/D	129	114	114			
F-16A/B	74	41	25	16		
F-15I	25					
F-15C/D	25					
F-15A/B	38					
Mirage 2000		18	18			
F-4/2000	50					
MiG-25		36				36

Note: Does not include stored, unarmed electronic warfare and AC&W, and armored transport aircraft.
Source: Adapted from IISS, *Military Balance*, various years. Some data adjusted or estimated by the author.

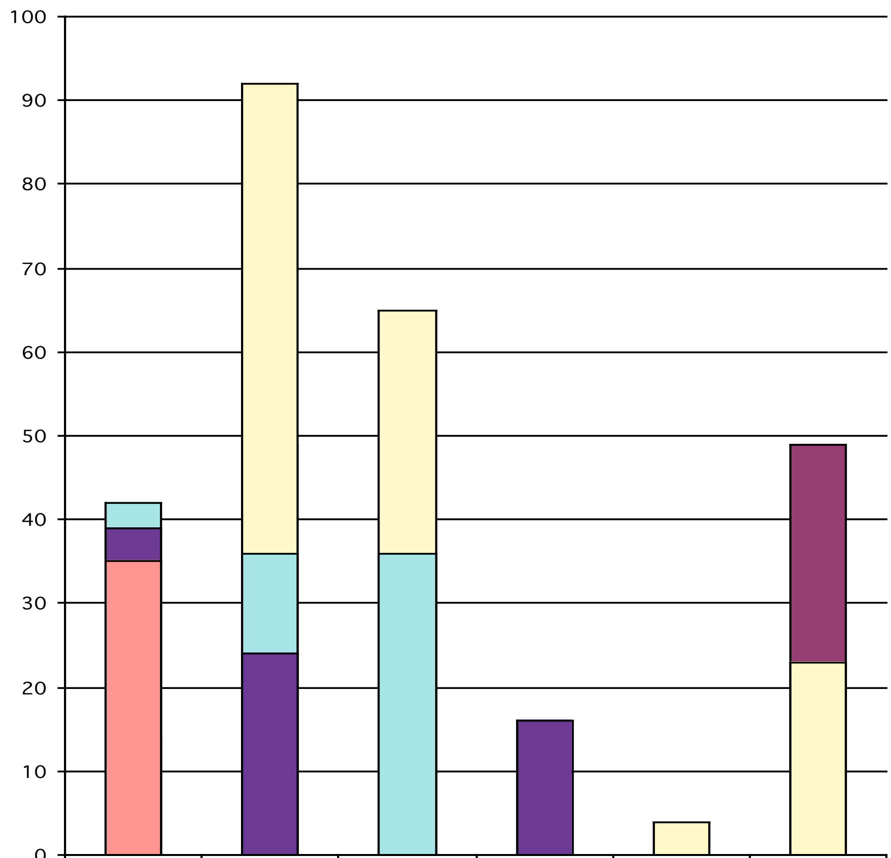
Figure 28. *Unarmed fixed and rotary wing electronic warfare and intelligence aircraft, 1999*



	Israel	Total Arab	Egypt	Jordan	Lebanon	Syria
Mi-8 J/K EW		10				10
Commando 2E ECM		4	4			
Beech 1900 MR		2	2			
Beech 1900 Elint		4	4			
C-130H Elint		2	2			
E-2C AEW		5	5			
King Air 2000 EW	6					
D0-28 EW	15					
IAI-200 Elint	3					
RC-12D Elint	6					
B-707 Phalcon AEW	2					
B-707 EW/Elint	6					

Source: Adapted from IISS, *Military Balance,* various years. Some data adjusted or estimated by the author.

Figure 29. *Operational Arab-Israeli attack and armed helicopters, 1999*



	Israel	Total Arab	Egypt	Jordan	Lebanon	Syria
Mi-25		49				49
SA-342K/L		92	65		4	23
AH-64A	42	36	36			
AH-1F/S	39	24		16		
AH-1E	14					
Hughes 500D	35					

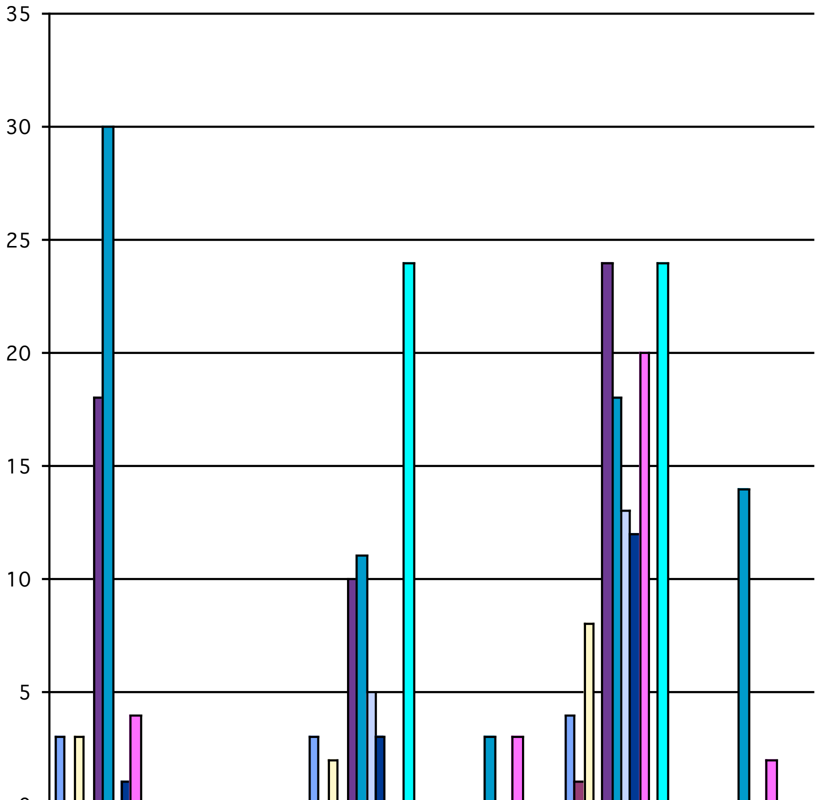
Source: Adapted from IISS, *Military Balance*, various years. Some data adjusted or estimated by the author.

Table 3. *Arab-Israeli land-based air defense systems, 1999*

Country	Major SAM	Light SAM	AA Guns
Egypt	664 launchers 40/282 SA-2 53/212 SA-3 14/56 SA-6 12/78 I Hawk 14/36 Crotale (4 Div./100 Btn.)	2,000 SA-7 Ayn as Saqr 20 SA-9 **26 M-54 Chaparral SP** 18 Amoun Skyguard/ RIM-7F 36 quad SAM Ayn as Saqr	475 ZPU-2/4 14.5-mm 550 ZU-23-2 23-mm 117 ZSu-23-4 SP 23-mm 45 Sinai SP 23-mm 150 M-1939 37-mm 300 S-60 57-mm **40 ZSu-57-2 SP 57-mm** 2000 20-mm, 23-mm, 37-mm, 57-mm, 85-mm, 100-mm 36 twin radar guided 35-mm guns Sinai radar-guided 23-mm guns
Israel	3/18 Patriot Bty. 17/102 I Hawk Bty.	Stinger 900 Redeye **45 Chaparral** 8 Chaparral Bty. (IAF)	850: including 20-mm, Vulcan, TCM-20, M-167 35 M-163 Vulcan/ Chaparral 100 ZU-23 23-mm 60 ZSu-23-4 SP M-39 37-mm L-70 40-mm
Jordan	2/14/80 I Hawk	SA-7B2 50 SA-8 50 SA-13 300 SA-14 240 SA-16 250 Redeye	360 Guns 100 M-163 SP 20-mm 44 ZSu-23-4 SP 216 M-42 SP 40-mm
Lebanon	None	SA-7 SA-14	20-mm ZU-23 23-mm 10 M-42A1 40-mm
Syria	25 Ad Brigades 130 SAM Bty. 11/60/450 SA-2/3 11/27/200 SA-6 1/248 SA-5	35 SA-13 20 SA-9 **4,000 SA-7** 60 SA-8	2,060 Guns 650 ZU-23-2 400 ZSu-23-4 SP 300 M-1938 37-mm 675 S-60 57-mm 10 ZSu-5-2 SP 25 KS-19 100-mm

Note: Light surface-to-air missile systems and anti-aircraft guns are normally operated by the land forces. The systems below the line are operated by the air force or air defense command.
Source: Adapted by Anthony H. Cordesman from the IISS, *Military Balance*. Light SAMs and AA guns Weapons below line for Egypt, and Israel are weapons operated by air force.

Figure 30. *Arab-Israeli total naval combat ships by category, 1999*



	Israel	Total Arab	Syria	Jordan	Egypt	Lebanon
Submarines	3		3		4	
Destroyers					1	
Frigates	3		2		8	
Corvettes					0	
Missile Patrol	18		10		24	
Other Patrol	30		11	3	18	14
Mine			5		13	
Amph	1		3		12	
Landing Craft/Support	4			3	20	2
MR/MPA						
ASW/Combat Helicopter			24		24	
Other Helicopter						

Sources: Adapted by Anthony H. Cordesman from IISS, *Military Balance* and *Jane's Fighting Ships*, various editions.

Qualitative Advantages of Exploiting Advanced Technology, Joint Warfare, Advanced Training Systems, C^4I/Battle Management, and the "Revolution in Military Affairs"

Some of the qualitative advantages of exploiting new military technologies and practices in the Middle East include:

- Professional military forces—unity of command
- Combined operations, combined arms, and the "AirLand Battle"
- Emphasis on maneuver and on strategic/ tactical innovation
- Realistic combat training and use of technology and simulation
- Emphasis on forward leadership and delegation.
- Heavy reliance on well-trained NCOs and enlisted personnel
- High degree of overall readiness
- Technological superiority in many critical areas of weaponry; superior access to resupply
- Capacity for "24 hour war"—Superior night, all-weather, and beyond visual range warfare
- Near real-time integration of C^4I/BM/T/BDA
- Integration of space warfare
- New tempo of operations and new levels of sustainability
- Exploitation of beyond-visual-range air combat, air defense suppression, air base attacks, and airborne C^4I/BM.
- Focused and effective interdiction bombing
- Expansion of the battlefield: "Deep Strike"
- Integration of precision-guided weapons into tactics and force structures

Political/Strategic Advantages in Reinforcing Israeli "Edge"

The following are political and strategic advantages allowing reinforcement of the Israeli military edge in the Middle East:

- U.S. aid, transfers of arms and technology, and resupply
- Lack of any outside "patron" to provide major aid and arms transfers to Syria
- Israeli-Palestinian-Jordanian peace process
- Egyptian commitment to peace
- Gulf hostility to Palestinians as a result of Gulf War
- Nuclear monopoly; long-range missile capability

Political/Strategic Weaknesses in Arab Military Forces

The following are political/strategic weaknesses exhibited by present Arab military forces:

- End of Cold War, lack of FSU support and aid
- Continuing political divisions within Arab world
- Egypt's commitment to peace process, divided front
- Egyptian reliance on U.S. aid (See Figure 35)
- Jordan's severe economic problems, and lack of military modernization and investment (See Figures 33 and 34)
- Lack of recent investment in new arms, critical new military technologies for Syria (See Figures 31 and 32)
- Lebanon's long-standing military weakness
- Iraq's defeat in Gulf War, impact of six years of no military resupply, and efforts of UNSCOM and IAEA
- Lack of any meaningful commitment by other Arab powers
- Political leadership in most confrontation states that has highly politicized military forces; this undercuts much of the military effort to modernize and create professional military forces

Qualitative Weaknesses in Arab Military Forces

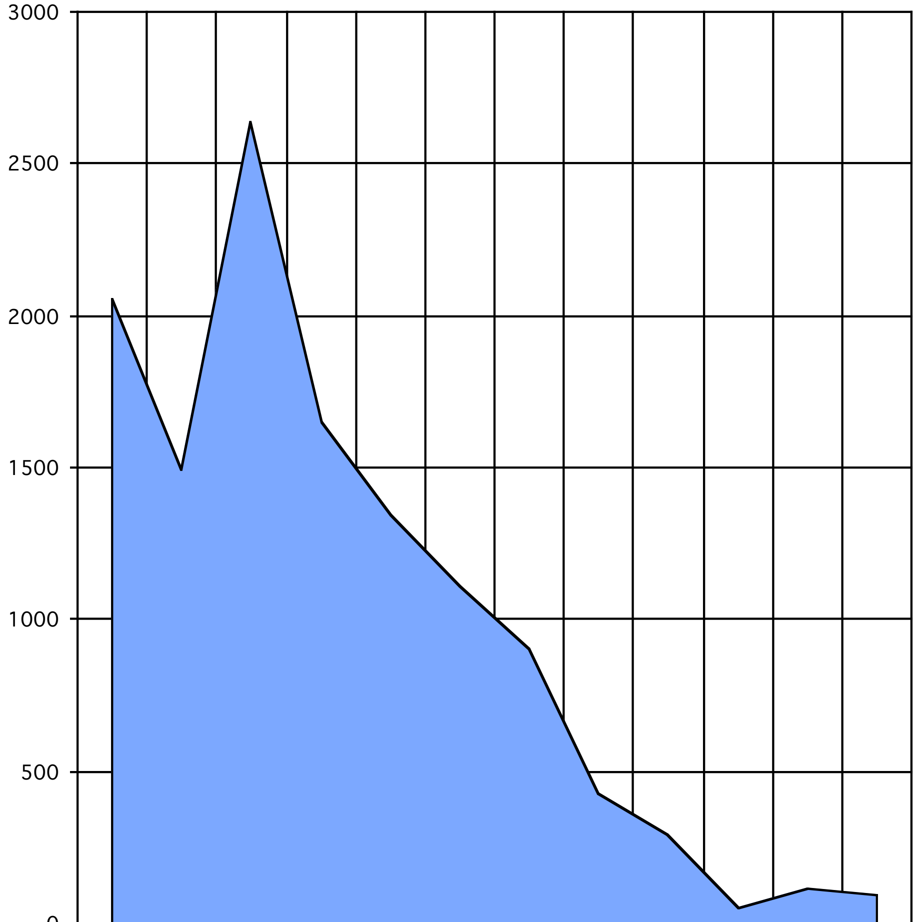
The following are qualitative weaknesses in current Arab military forces:

- Over-centralization and politization of the command structure
- Lack of strategic assessment capability
- Weaknesses in battle management, command, control, communications,

intelligence, targeting, and battle damage assessment

- Lack of standardization and interoperability
- Lack of cohesive force structure and quality
- Inadequate emphasis on combined (joint) operations, combined arms, and the AirLand Battle
- Poor manpower quality and career development
- Failure to properly train leadership and allow it initiative
- Lack of strong NCO, technician cadres
- Weak combat training; failure to create aggressor squadrons and conduct realistic large-scale exercises
- Slow tempo of operations
- Lack of adequate sustainability, recovery, and repair; failure to create realistic standards of readiness and methods of achieving them
- Inability to fight modern night and all-weather warfare
- Shallow defensive and offensive battlefield
- Misuse and maldeployment of reserves
- Small unit-oriented, static infantry operations
- Limited ability to exploit rough terrain warfare
- Static pre-planned armored operations; technical limitations in armor, fire control, long-range engagement capability, night warfare
- Slow, area-fire oriented artillery operations. Lack of mobility and effective BVR targeting systems. Over-emphasis on area fire versus precision fire
- Inability to prevent Israeli air superiority; lack of key aspects of modern air combat technology
- Problems in air-to-air combat training and endurance
- Problems in integrating land-based air defense; poor overall technology
- Lack of effective survivable long range strike systems
- Insufficient conventional air and missile power to conduct intensive interdiction and strategic bombing

Figure 31. *The Syrian recapitalization crisis: Arms deliveries, 1985–1996 ($96 constant millions)*

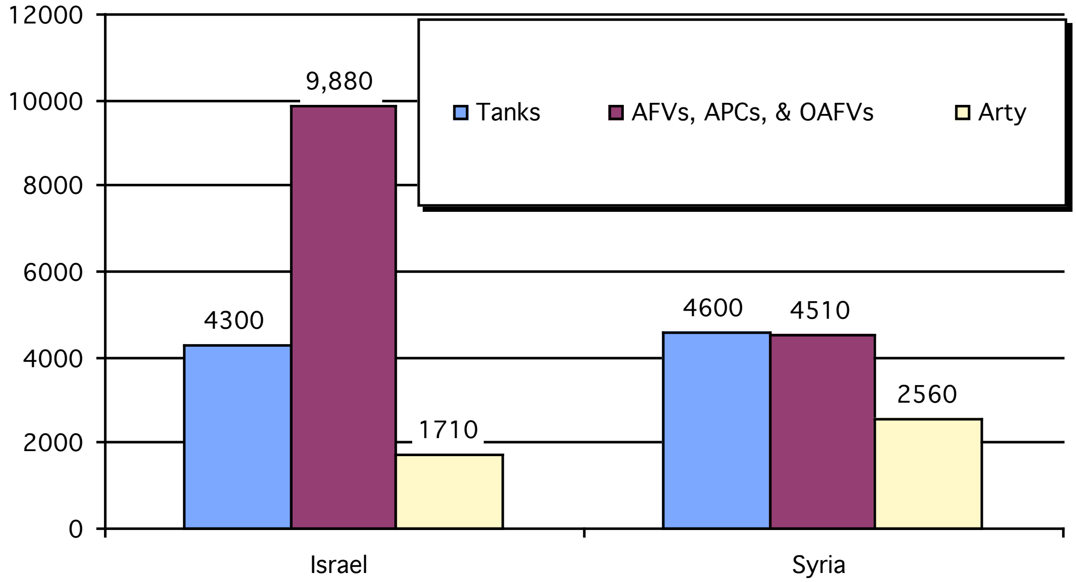


	85	86	87	88	89	90	91	92	93	94	95	96
Syria	2056	1495	2635	1652	1342	1111	900	427	288	52	112	90

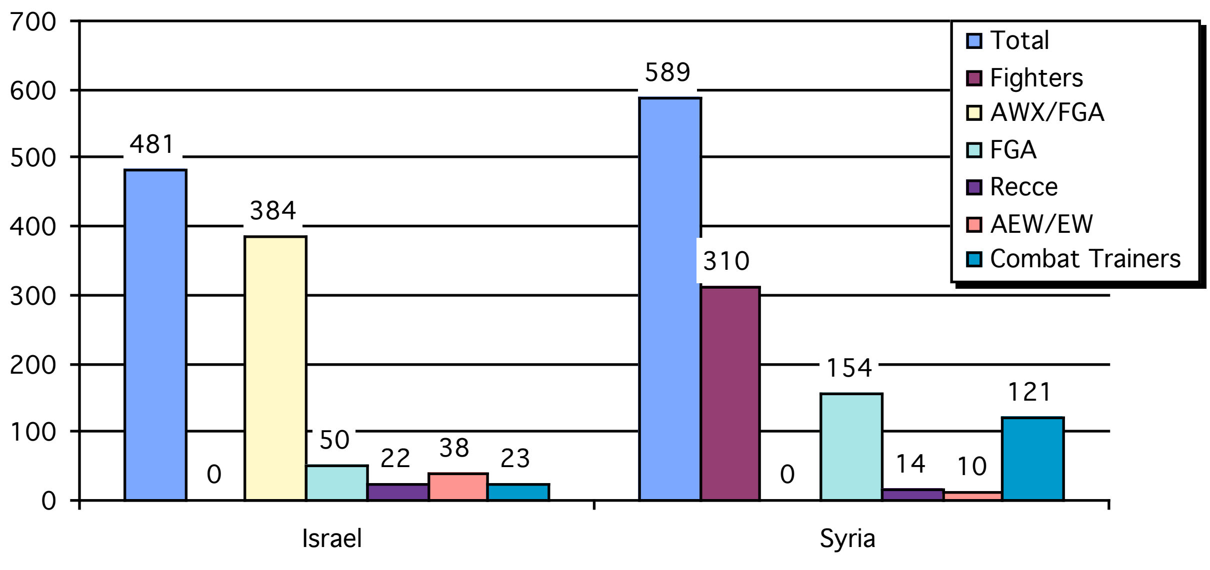
Source: Adapted by Anthony H. Cordesman from ACDA, *World Military Expenditures and Arms Transfers* (Washington, D.C.: GPO), Table II, various editions.

Figure 32. *Israel versus Syria, 1999*

Land Weapons

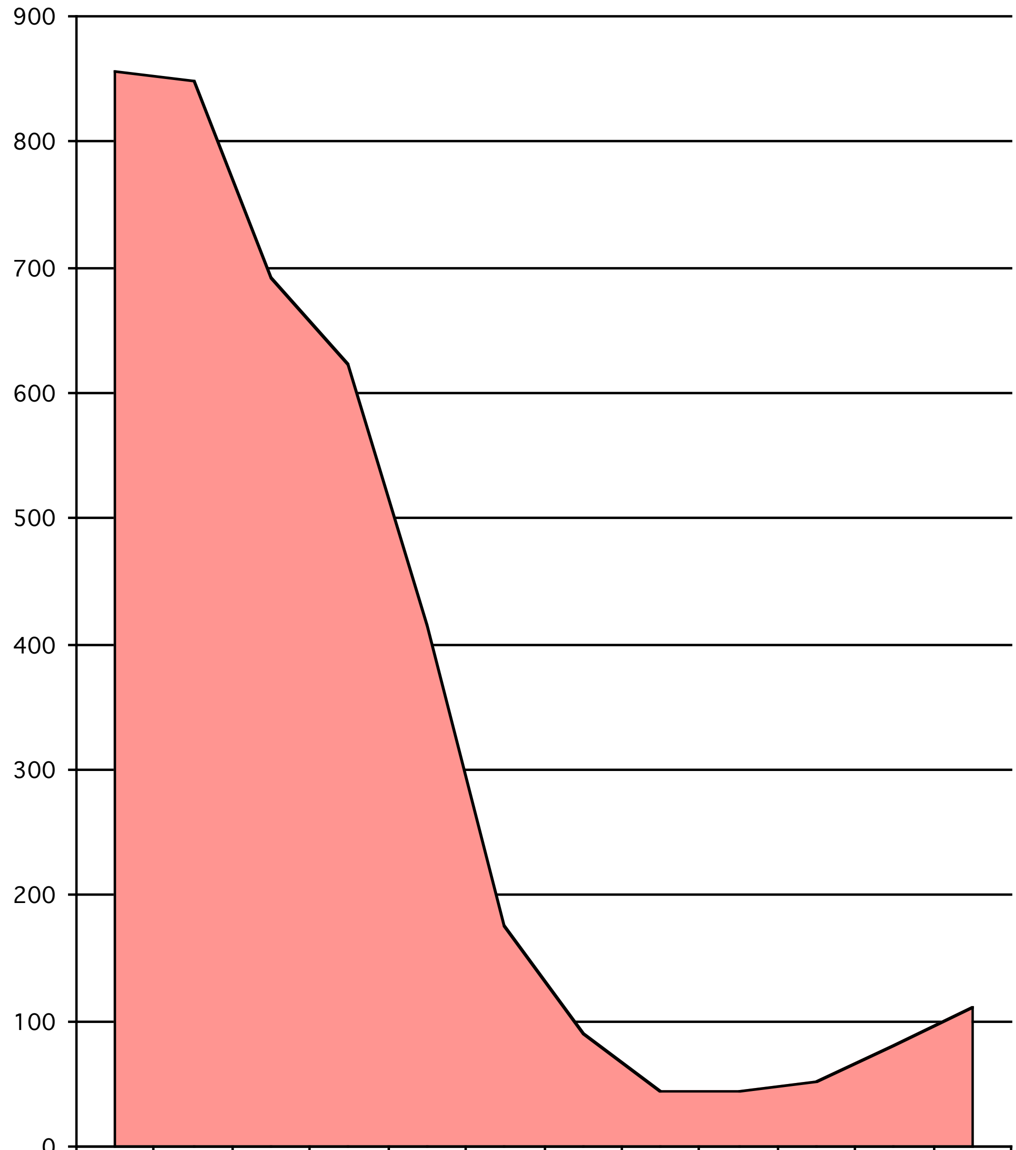


Air Forces



Note: Total artillery includes towed and self-propelled tube artillery and multiple rocket launchers. Total air forces include only operational fixed wing fighter, fighter-attack, and reconnaissance aircraft in combat units, less aircraft in combat training units.

Figure 33. *The Jordanian recapitalization crisis: Arms deliveries, 1985–1996 ($96 constant millions)*

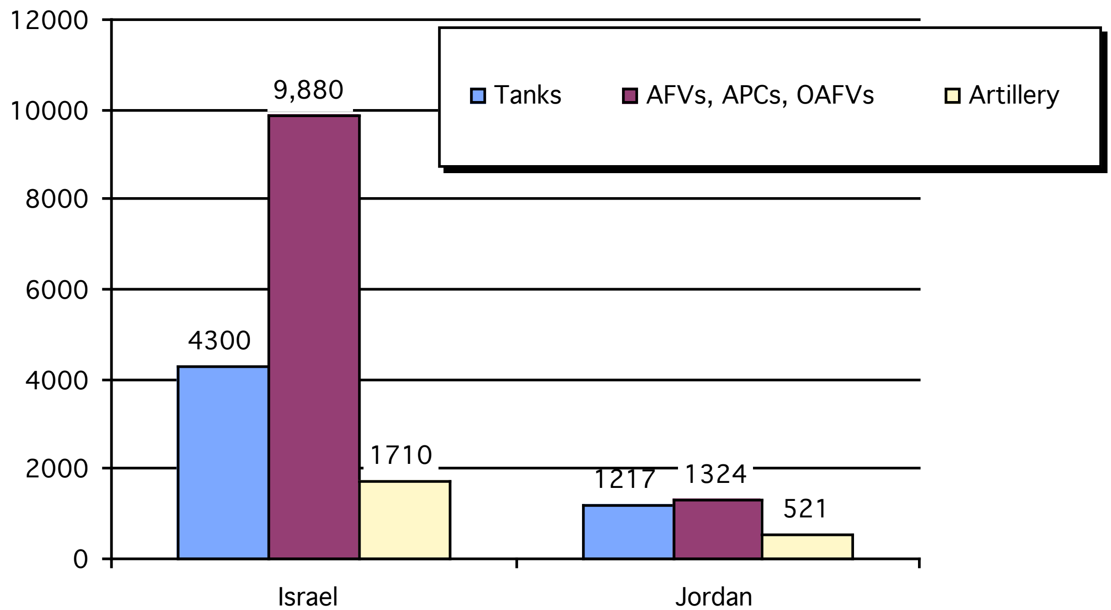


	85	86	87	88	89	90	91	92	93	94	95	96
Jordan	857	849	692	623	415	175	90	44	43	52	81	110

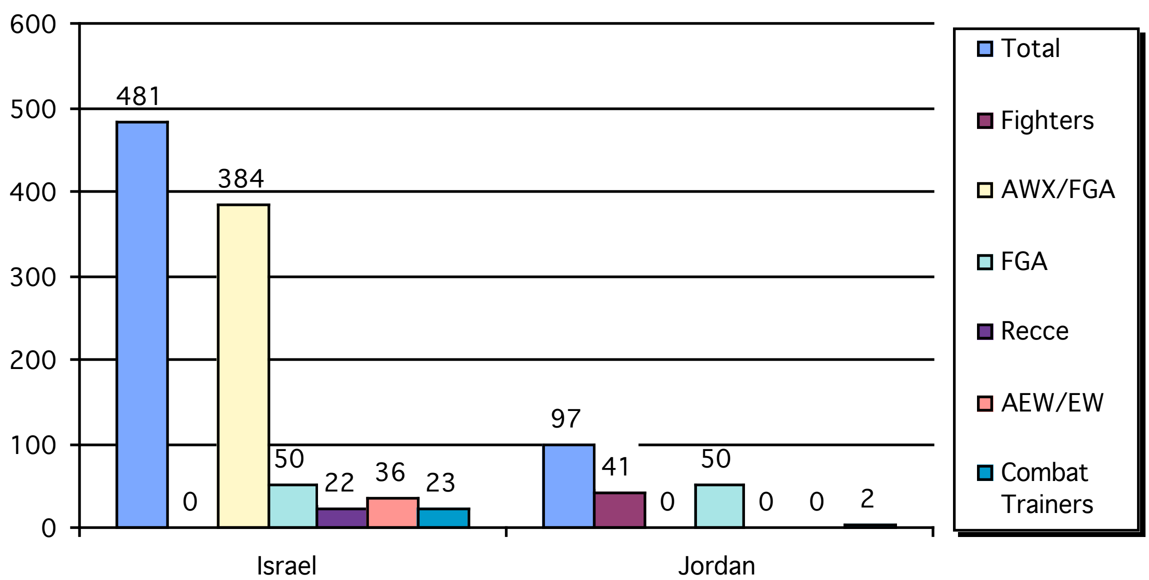
Source: Adapted by Anthony H. Cordesman from ACDA, *World Military Expenditures and Arms Transfers* (Washington, D.C.: GPO), Table II, various editions.

Figure 34. *Israel versus Jordan, 1999*

Land Weapons



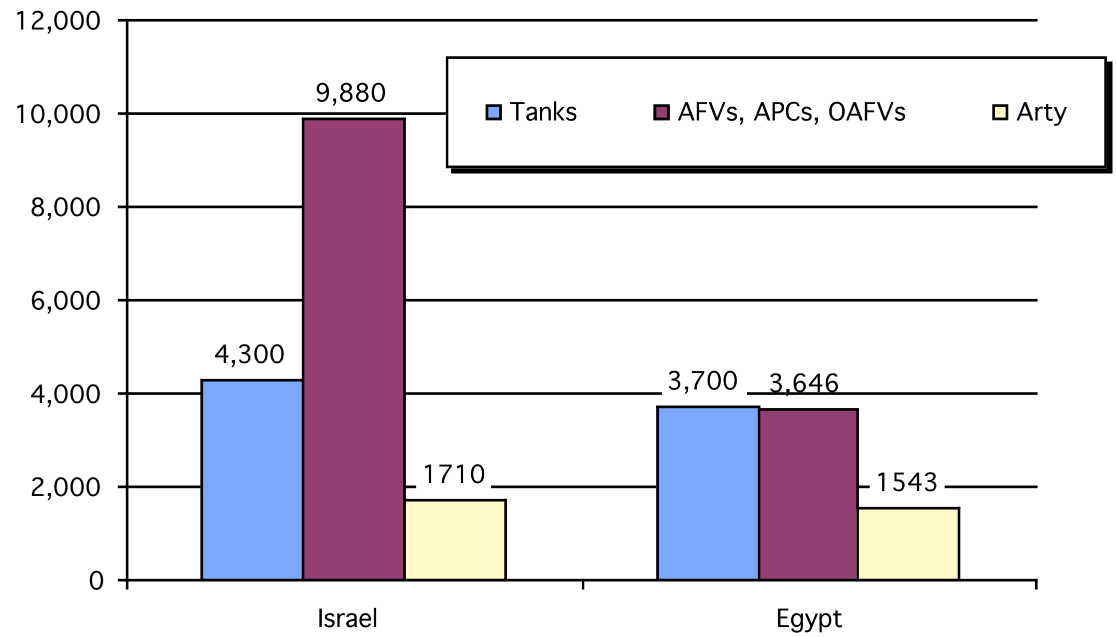
Air Forces



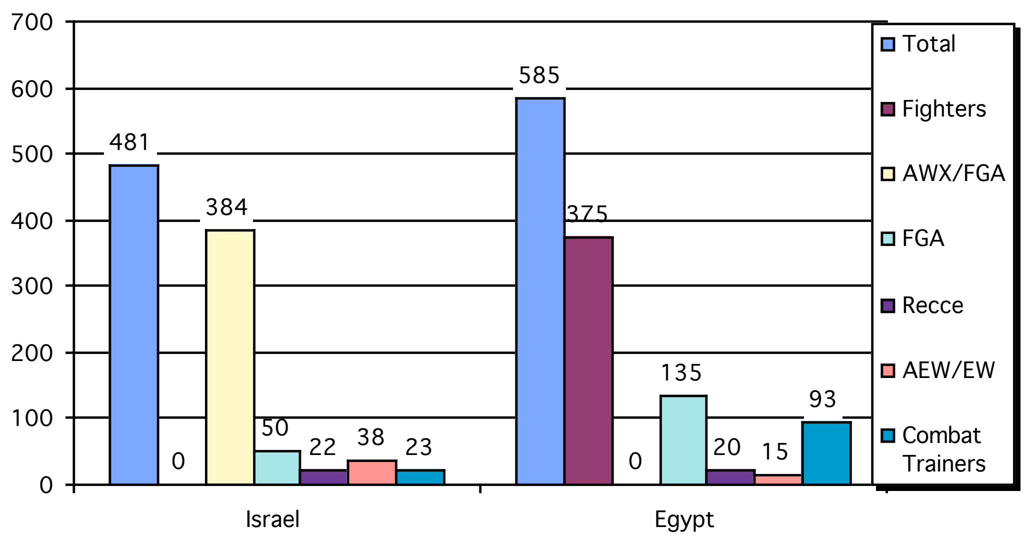
Note: Total artillery includes towed and self-propelled tube artillery and multiple rocket launchers. Total air forces include only operational fixed wing fighter, fighter-attack, and reconnaissance aircraft in combat units, less aircraft in combat training units.

Figure 35. *Israel versus Egypt, 1999*

Land Weapons



Air Forces



Note: Total artillery includes towed and self-propelled tube artillery and multiple rocket launchers. Total air forces include only operational fixed wing fighter, fighter-attack, and reconnaissance aircraft in combat units, less aircraft in combat training units.

The Changing Trends in the Gulf Military Balance

Trends in the Gulf Military Balance—An Overview

Iraq

Despite the Gulf War, and the loss of 40–60 percent of its operational inventory of major weapons, Iraq remains the most effective military power in the Gulf.

At the same time, Iraq's ability to fund the consolidation of its forces and their further recovery from the impact of the Gulf War declined sharply during 1994. Since that time, Iraq has lacked the funds, spare parts, and production capabilities to sustain the quality of its consolidated forces.

Iraq has not been able to restructure its overall force structure to compensate as effectively as possible for its prior dependence on an average of $3 billion a year in arms deliveries. It has not been able to recapitalize any aspect of its force structure, and about two-thirds of its remaining inventory of armor and aircraft is obsolescent by Western standards.

Iraq has not been able to fund and/or import any major new conventional warfare technology to react to the lessons of the Gulf War, or to produce any major equipment, with the possible exception of limited numbers of Magic "dogfight" air-to-air missiles.

Iran

Iran lost 40–60 percent of its major land force equipment during the climactic battles of the Iran–Iraq War in 1988. It has, however, largely recovered from its defeat by Iraq and now has comparatively large forces.

Iran has been able to make major improvements in its ability to threaten maritime traffic through the Gulf and to conduct unconventional warfare.

Iran has also begun to acquire modern Soviet combat aircraft and has significant numbers of the export version of the T-72 and BMP.

Iran has not, however, been able to offset the obsolescence and wear of its overall inventory of armor, ships, and aircraft.

Iran has not been able to modernize key aspects of its military capabilities such as airborne sensors and C^4I/BM, electronic warfare, land-based air defense integration, beyond-visual-range air-to-air combat, night warfare capabilities, stand-off attack capability, armored sensors and fire control systems, artillery mobility and battle management, and combat ship systems integration.

The Southern Gulf States

In contrast, no southern Gulf state has built up significant ground forces since the Gulf War, and only Saudi Arabia has built up a significant air force.

There has been no progress in standardization and interoperability. Advances in some areas, such as ammunition, have been offset by the failure to integrate increasingly advanced weapons systems.

Rivalries among the Southern Gulf states are at their worst since the late 1970s.

Showpiece exercises and purchases disguise an essentially static approach to force improvement that is heavily weapons oriented, and usually shows little real-world appreciation of the lessons of the Gulf War, the "revolution in military affairs," and the need for sustainability.

Current arms deliveries are making only token progress in correcting the qualitative defects in Southern Gulf forces, and no meaningful progress in being made towards integrating the Southern Gulf countries under the Gulf Cooperation Council (GCC).

Figures 36 through 49 graphically summarize the balance of powers in the Gulf area. Table 4 summarizes Gulf forces in 1999, while Table 5 summarizes land-based air defense systems in the region.

Sources of Instability in the Gulf

The following are sources of instability in the Gulf:

- Iranian and Iraqi-political-military threat
- Repressive authoritarian, one-party, and or military-controlled governments
- Lack of rule of law
- Human rights violations
- High population growth rate
- Religious divisions: for example, Islamic extremism

Sunni versus Shi'ite
- Tribalism/clans/family nepotism
- Displacement and alienation
- Regionalism
- Breakdown of social contract
- Over-reliance on foreign labor
- Labor migration
- Breakdown of infrastructure/inadequate infrastructure
- Breakdown of educational system/ inadequate educational infrastructure
- Over-urbanization/concentration in capital
- Excessive state sector/government control of economy
- Over-reliance on oil and gas sectors
- Over-reliance on non-productive service sectors
- Excessive government employment/false jobs
- Structural and disguised unemployment
- Mismanagement of agricultural sector
- Desertification
- Water issues and problems
- Excessive military spending
- Excessive arms imports
- Proliferation
- Transfer of advanced conventional weapons and technologies
- Border disputes

Qualitative Weaknesses in Gulf Military Forces

The following are qualitative weaknesses in the Gulf military forces:

- Over-centralization of the effective command structure
- Lack of strategic assessment capability
- Weaknesses in battle management, command, control, communications, intelligence, targeting, and battle damage assessment
- Lack of cohesive force quality
- Shallow offensive battlefields
- Manpower quality and manpower career development
- Leadership
- Lack of strong NCO, technician cadres
- Slow tempo of operations
- Lack of sustainability, recovery, and repair
- Inability to prevent air superiority
- Problems in air-to-air combat training and endurance
- Problems in integrating land-based air defense
- Lack of effective survivable long range strike systems
- Inadequate emphasis on combined (joint) operations, combined arms, and the air-land battle
- Limited ability to exploit rough/special terrain warfare
- Inability to fight modern night and all-weather warfare
- Shallow defensive battlefield
- Misuse and maldeployment of reserves
- Small unit-oriented, static infantry operations
- Static pre-planed armored operations

The Potential Qualitative Advantages of the "Revolution in Military Affairs"

The following are potential advantages of the "revolution in military affairs"

- Decoupling of political and military responsibility—unity of command
- Decisive force
- Combined operations, combined arms, and the ""'AirLand Battle"
- Emphasis on maneuvers
- Emphasis on deception and strategic/tactical innovation
- "24 hour war"—Superior night, all-weather, and beyond visual range warfare
- Near real-time integration of C^4I/BM/T/BDA
- Integration of space warfare
- A new tempo of operations
- A new tempo of sustainability
- Beyond-visual-range air combat, air defense suppression, air base attacks, and airborne C^4I/BM

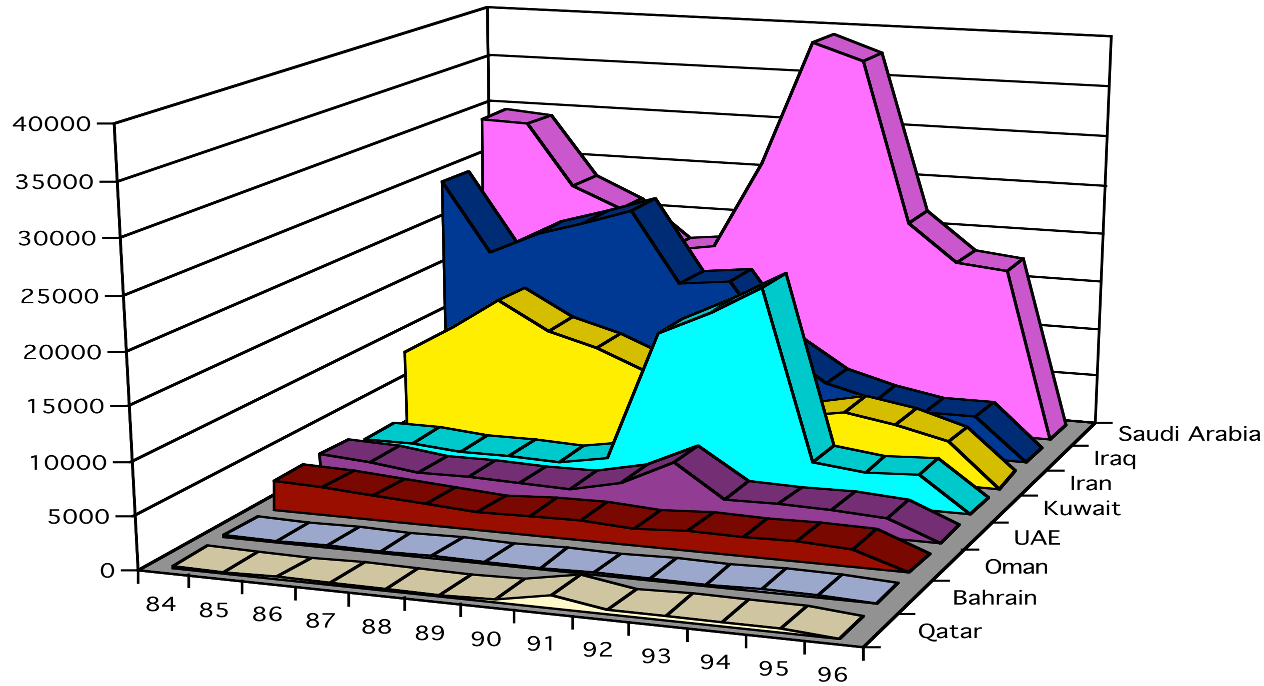
  - Focused and effective interdiction bombing
  - Expansion of the battle field: "Deep Strike”
- Technological superiority in many critical areas of weaponry
- Integration of precision-guided weapons into tactics and force structures
- Realistic combat training and use of technology and simulation
- All volunteer military/higher entry and career standards
- Emphasis on forward leadership and delegation
- Heavy reliance on NCOs and enlisted personnel
- High degree of overall readiness
- Clear doctrine for collateral damage
- Management of media relations

The Potential Weaknesses in Western Power Projection Forces

Some of the potential weaknesses in Western Power projection forces are:

- Accepting the true politics of war
- Low-intensity realism
- Taking casualties
- Inflicting casualties
- Collateral damage
- Urban and built-up area warfare
- Mountain warfare and warfare in forested or jungle areas
- Hostage taking and terrorism
- Sudden attack
- Extended deterrence and battles of intimidation
- Ecological and environmental warfare
- Limits of UN/cooperative/coalition warfare
- Extended conflict and occupation warfare
- Weapons of mass destruction
- Willingness to sustain large military effort, maintain forces and presence

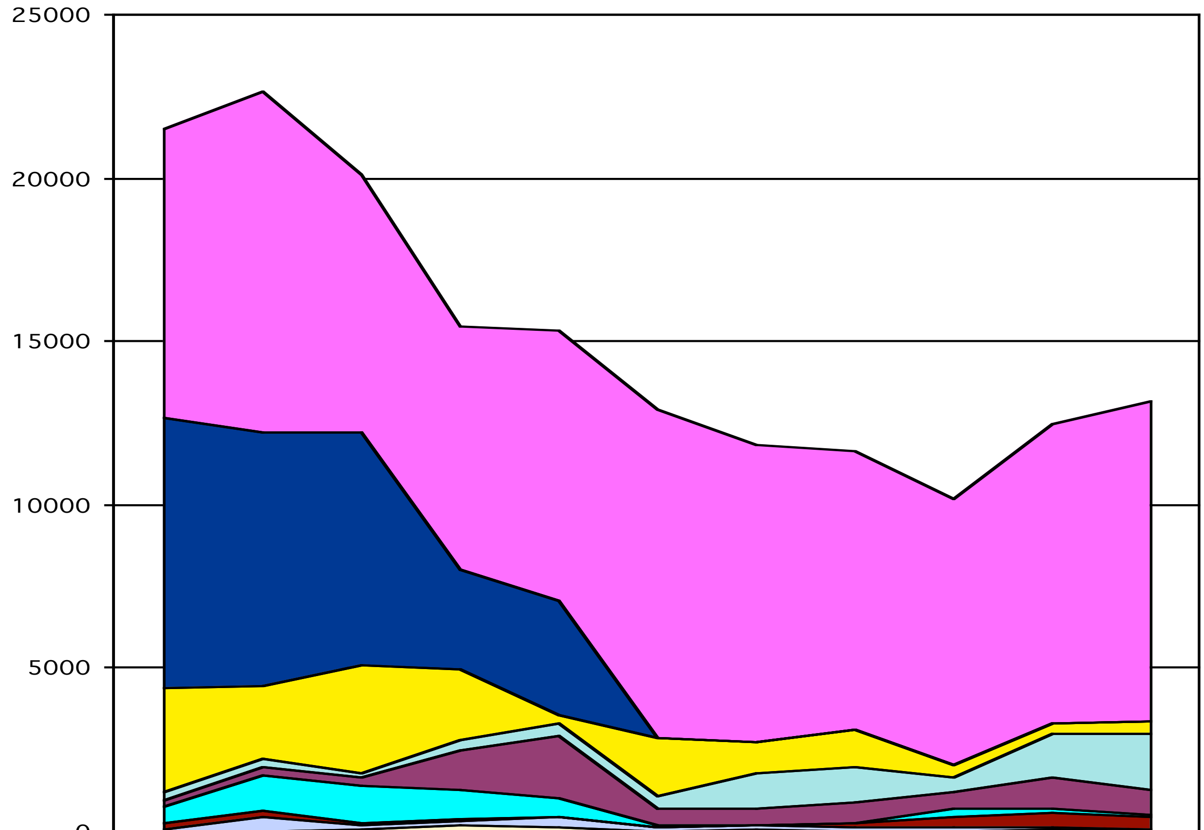
Figure 36. *Comparative military expenditures of the Gulf powers, 1983–1995 ($95 constant millions)*



	84	85	86	87	88	89	90	91	92	93	94	95	96
Qatar	100	107	110	145	119	111	209	1032	284	346	310	330	
Bahrain	220	206	214	208	234	235	248	262	271	263	263	273	
Oman	2771	2655	2310	1965	1685	1859	1961	1602	1901	1773	1864	1735	
UAE	2915	2606	2109	2055	1982	1902	2977	5415	2256	2228	2178	1880	
Kuwait	2088	2057	1708	1609	1565	2316	15130	17620	20430	3759	3146	3488	
Iran	8686	11680	14840	12190	10860	8893	9307	8654	5410	6333	5586	4191	
Iraq	24560	17430	19850	21290	22890	15740	16210	9698	6430	5280	4380	4380	
Saudi Arabia	29530	29240	23080	20980	16980	17600	26620	39240	37650	21470	17630	17210	

Source: Adapted by Anthony H. Cordesman from US Arms Control and Disarmament Agency, *World Military Expenditures and Arms Transfers* (Washington, D.C.: GPO), various editions.

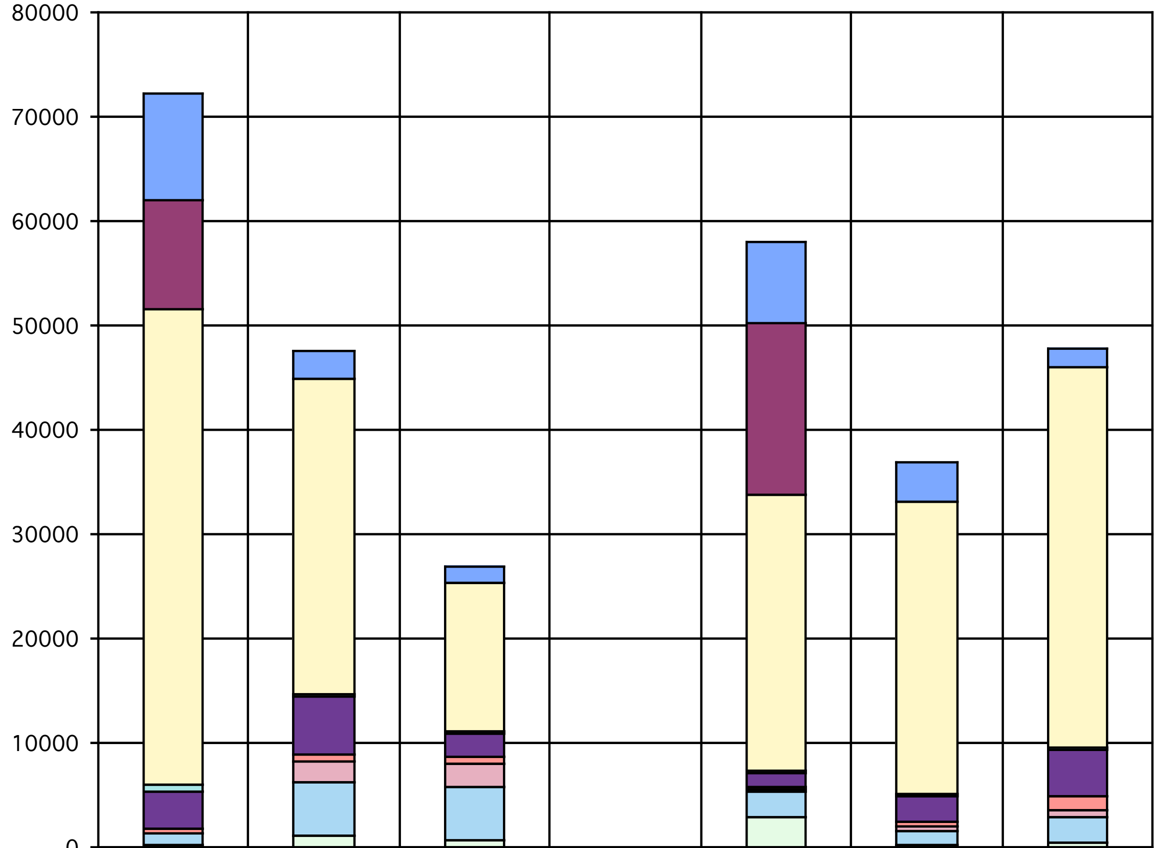
Figure 37. *Total arms imports of the Gulf powers, 1986–1996 ($96 constant millions)*



	86	87	88	89	90	91	92	93	94	95	96
Saudi Arabia	8832	10410	7880	7442	8303	10010	9088	8535	8128	9168	9800
Iraq	8288	7774	7117	3050	3508	0	0	0	0	0	0
Iran	3125	2240	3304	2196	222	1800	931	1174	406	306	350
Kuwait	258	250	153	329	409	349	1095	1067	406	1324	1700
UAE	217	264	241	1190	1871	529	526	613	547	968	775
Yemen	513	1054	1150	885	573	45	5	21	261	143	80
Oman	163	211	76	73	12	56	11	139	302	438	380
Bahrain	82	422	127	98	327	79	120	96	104	71	50
Qatar	7	0	38	220	117	22	44	11	10	51	5

Source: Adapted by Anthony H. Cordesman from US Arms Control and Disarmament Agency, *World Military Expenditures and Arms Transfers* (Washington, D.C: GPO), various editions.

Figure 38. *Gulf arms agreements and deliveries, 1987–1997 ($current millions)*



	Agreements: 87-90	Agreements: 91-94	Agreements: 94-97		Deliveries: 87-90	Deliveries: 91-94	Deliveries: 94-97
Iran	10,200	2,700	1,600		7,800	3,900	1,900
Iraq	10,500	0	0		16,600	0	0
Saudi Arabia	45,700	30,200	14,100		26,300	27,900	36,400
Bahrain	600	200	300		300	300	200
Kuwait	3500	5700	2300		1300	2500	4500
Oman	400	600	600		200	300	1200
Qatar	100	2000	2200		300	500	700
UAE	1000	5000	5100		2500	1300	2400
Yemen	300	1200	700		2800	300	500

0 = less than $50 million or nil, and all data rounded to the nearest $100 million.

Source: Richard F. Grimmett, *Conventional Arms Transfers to the Developing Nations*, Congressional Research Service, various editions.

Table 4. *Gulf military forces, 1999*

	Iran	Iraq	Bahrain	Kuwait	Oman	Qatar	Saudi	UAE Arabia[1]	Yemen
Manpower									
Total Active	545,600	429,000	11,000	15,300	43,500	11,800	162,500	64,500	66,300
Regular	420,600	429,000	11,000	15,300	37,000	11,800	105,500	64,500	66,300
National Guard & Other	125,000	0	0	0	6,500	0	57,000	0	0
Reserve	350,000	650,000	0	23,700	0	0	20,000	0	40,000
Paramilitary	40,000	55,400	9,850	5,000	4,400	0	15,500	2,700	70,000
Army and Guard									
Manpower	450,000[1]	375,000	8,500	11,000	31,500	8,500	127,000	59,000	61,000
Regular Army Manpower	350,000	375,000	8,500	11,000	25,000	8,500	70,000	59,000	61,000
Reserve	350,000	450,000	0	0	0	0	20,000	0	40,000
Active Main Battle Tanks	1,390	1,900	106	249	117	34	710	231	1,030
Total Main Battle Tanks[3]	1,410	2,700	106	341	141	34	1,055	231	1,320
Active AIFV/Recce, Lt. Tanks	555	1,600	71	355	46	84	1,655	558–578	650
Active APCs	550	1,800	340	100	96	172	2,580	570	540
Total APCs	550	2,200	340	140	96	172	3,380	570	540
ATGM Launchers	420+	480+	15	118	68	124+	480+	275	71
Self Propelled Artillery	290	150	13	41 (59)	18	28	200	175	30
Towed Artillery	2,170	1,800	36	0	91	12	260-338	46	452
MRLs	764+	150	9	27	0	4	60	42–66	220
Mortars	6,500	2,000+	18	50+	89	39	510+	135	600
SSM Launchers	46	36?	0	0	0	0	10	6	30
Light SAM Launchers	700	1,100	70+	48?	62	58	650	100	700
AA Guns	1,700	5,500	24	0	16	12	10	72	362
Air Force Manpower	28,000	35,000	1,500	2,500	4,100	1,500	18,000	4,000	3,500
Air Defense Manpower	18,000	17,000	0	0	0	0	4,000	0	0
Total Combat Aircraft	307	353	24	76	40	18	432	99	49–89
Bombers	0	6?	0	0	0	0	0	0	0
Fighter/Attack	150	130	12	40	12	18	160	43	27
Fighter/Interceptor	114	180	12	8	0	0	191	22	16
Recce/FGA Recce	8	8	0	0	12	0	10	8	0
AEW C4I/BM	0	0	0	0	0	0	5	0	
MR/MPA[2]	5	0	0	0	0	0	0	0	0
OCU/COIN/CCT	0	18	0	28	16	0	21	26	0
Other Combat Trainers	25	155	0	0	0	0	50	0	6
Transport Aircraft[4]	74	34	3	4	21	6	72	22	16
Tanker Aircraft	5	2	0	0	0	0	15	0	0

(continued)

(**Table 4**. *continued)*

	Iran	Iraq	Bahrain	Kuwait	Oman	Qatar	Saudi	UAE Arabia[1]	Yemen
Total Helicopters	602	500	33	28	31	24	157	97	25
Armed Helicopters[4]	100	120	24	16	0	18	12	49	8
Other Helicopters[4]	502	380	7	12	31	6	145	47	17
Major SAM Launchers	204	340	8	40	0	0	128	36	87
Light SAM Launchers	45	200	0	12	28	9	181	31	200
AA Guns	—	—	—	60	—	—	270–420	—	—
Total Naval Manpower	45,600[1]	2,000	1,000	1,800	4,200	1,800	13,500	1,500	1,800
Regular Navy	20,600	2,000	1,000	1,800	4,200	1,800	10,500	1,500	1,800
Naval Guards	20,000	0	0	0	0	0	0	0	0
Marines	5,000	—	—	—	—	—	3,000	—	—
Major Surface Combatants									
Missile	3	0	3	0	2	0	8	4	0
Other	2	1-2	0	0	0	0	0	0	0
Patrol Craft									
Missile	21	1	4	6	4	3	9	8	7
(Revolutionary Guards)	5	—	—	—	—	—	—	—	—
Other	42	5	6	5	7	4	21	9	8
Revolutionary Guards (Boats)	40	—	—	—	—	—	—	—	—
Submarines	3	0	0	0	0	0	0	0	0
Mine Vessels	7	4	0	0	0	0	6	0	6
Amphibious Ships	9	0	1	0	2	0	0	0	3
Landing Craft	17	—	4	2	4	1	8	5	—
Support Ships	25	3	5	4	5	—	7	3	—
Naval Air Manpower	2,000	—	—	—	—	—	—	—	—
Naval Aircraft									
Fixed Wing Combat	0	0	0	0	0	0	0	0	0
MR/MPA	8	0	0	0	(7)	0	0	0	0
Armed Heli-copters	9	(6)	0	0	0	0	21	(5)	0
SAR Helicopters		0	0	0	0	0	4	(6)	0
Mine Warfare Helicopters	2	0	0	0	0	0	0	0	0
Other Helicopters	—	—	2	—	—	—	6	—	—

Note: Equipment in storage shown in the higher figure in parentheses or in range. The use of a dash — can mean few or no men or equipment in a given area or that it is not possible to provide an accurate total. Many manpower totals are left with dashes because adequate reporting is not available or reserve or paramilitary forces. Air Force totals include all helicopters, including army operated weapons, and all heavy surface-to-air missile launchers.

[1]Iranian total manpower includes roughly 100,000 Revolutionary Guard actives in land forces and 20,000 in naval forces.

[2]Saudi totals for reserve include National Guard tribal levies. The total for land forces includes active National Guard equipment. These additions total 450 AIFVs, 730 (1,540) APCs, and 70 towed artillery weapons.

[3]Total tanks include tanks in storage or conversion.

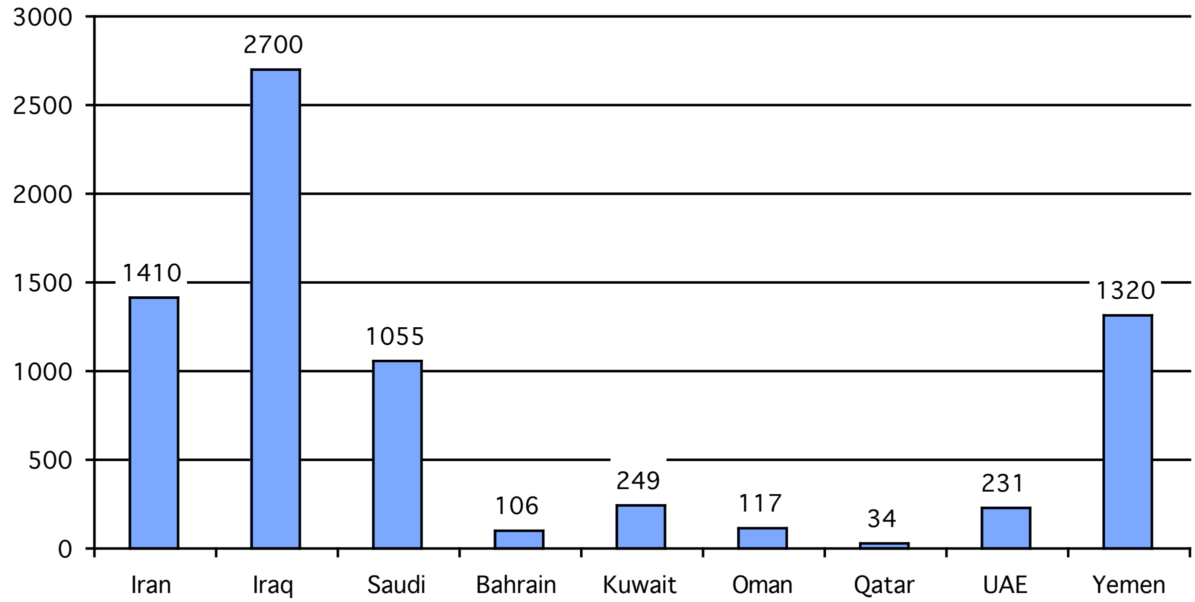
[4]Includes navy, army, national guard, and royal flights, but not paramilitary.

[5]Includes in Air Defense Command

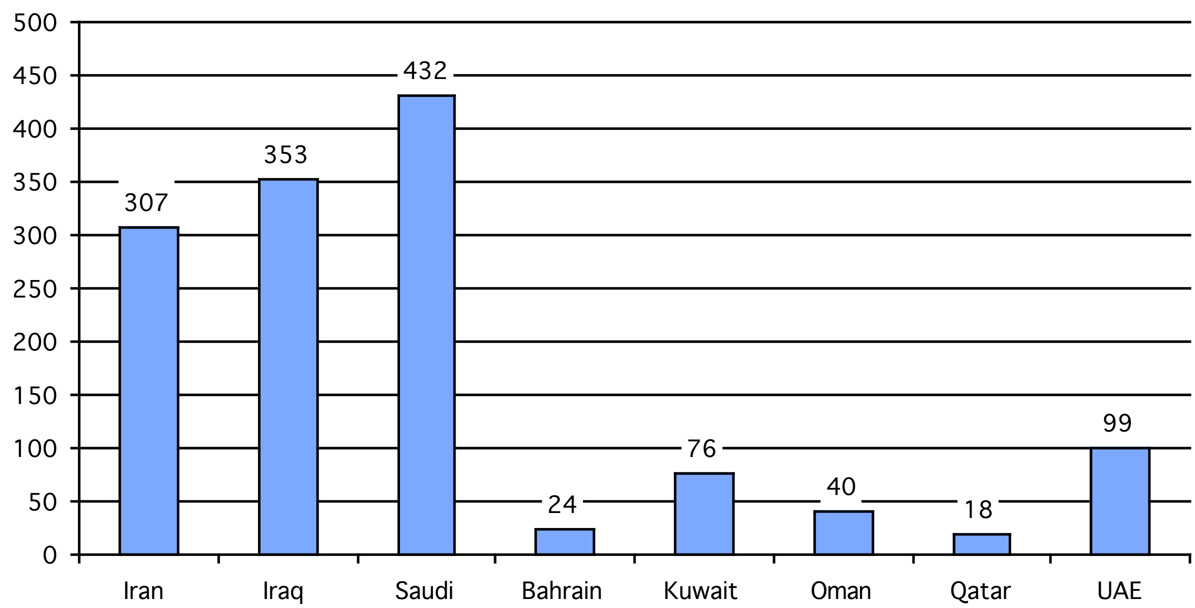
Sources: Adapted by Anthony H. Cordesman from interviews; IISS, *Military Balance*; *Jane's Sentinel, Military Technology, World Defense Almanac*; and JCSS, *The Military Balance in the Middle East.*

Figure 39. *Major measures of combat equipment strength, 1999*

Total Main Battle Tanks in Inventory

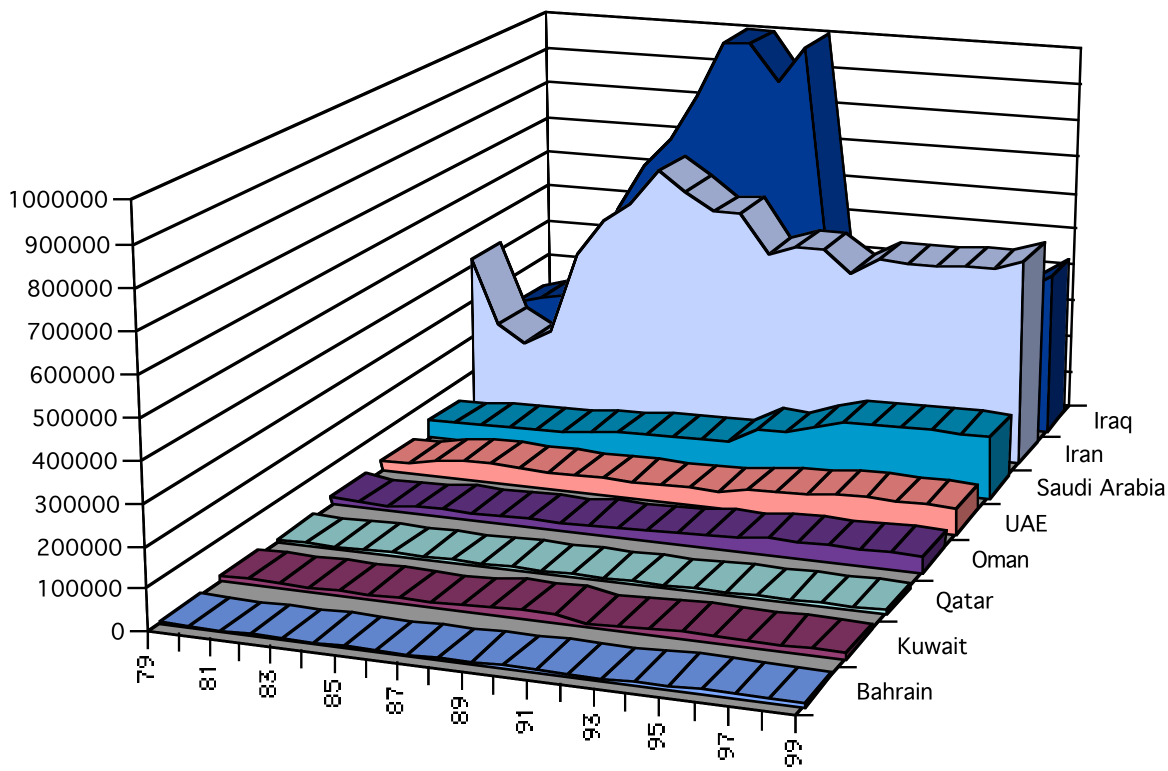


Total Fixed Wing Combat Aircraft



Sources: Adapted by Anthony H. Cordesman from IISS, *Military Balance* and various sources.

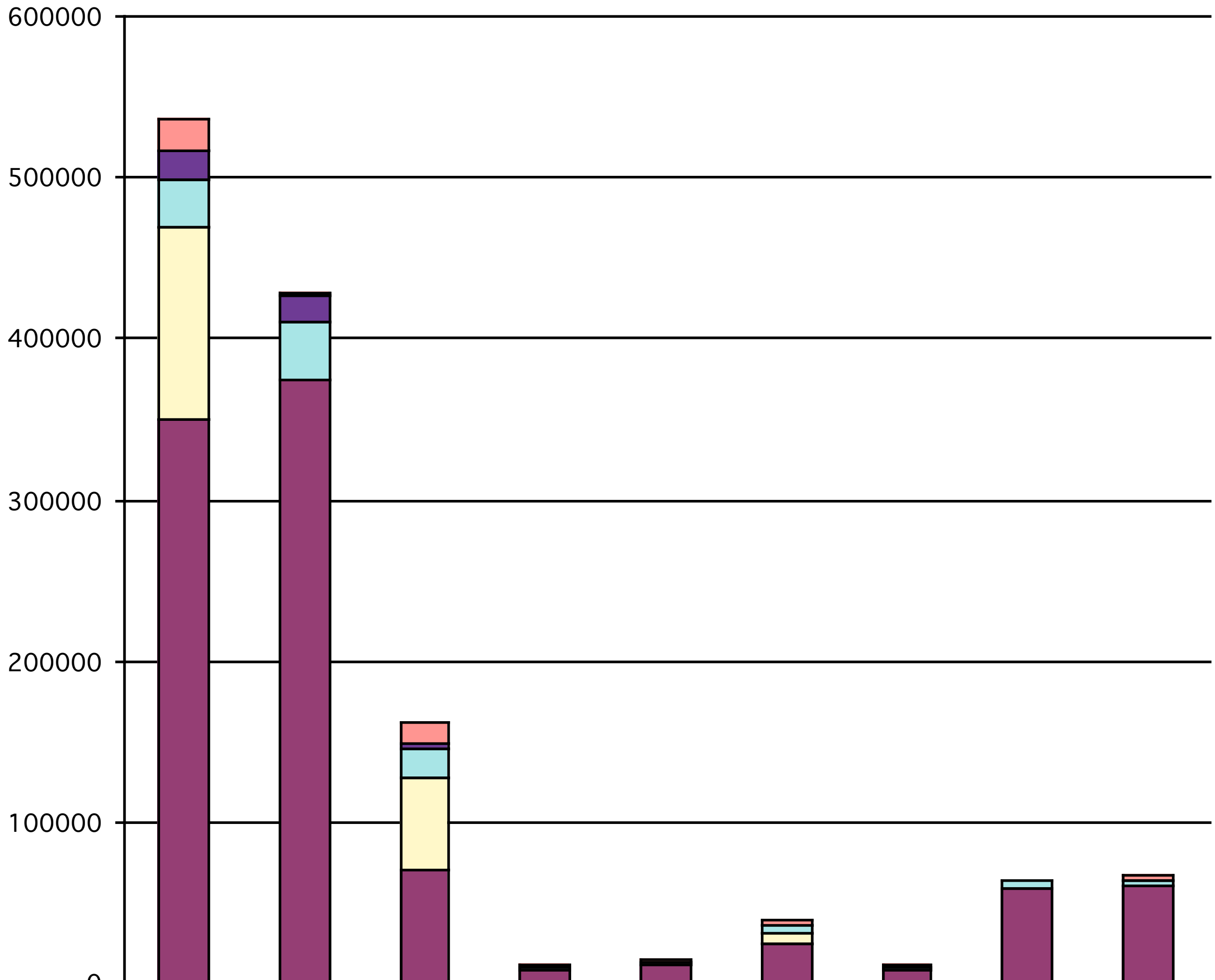
Figure 40. *Comparative trends in Gulf total active military manpower, 1979–1999*



Note: Saudi includes full-time active National Guard, Oman includes Royal Guard, Iran includes Revolutionary Guards, and Iraq includes Republican Guards and Special Republican Guards.

Source: Estimated by Anthony H. Cordesman using data from various editions of IISS *Military Balance*, Jane's *Sentinel*, and *Military Technology*.

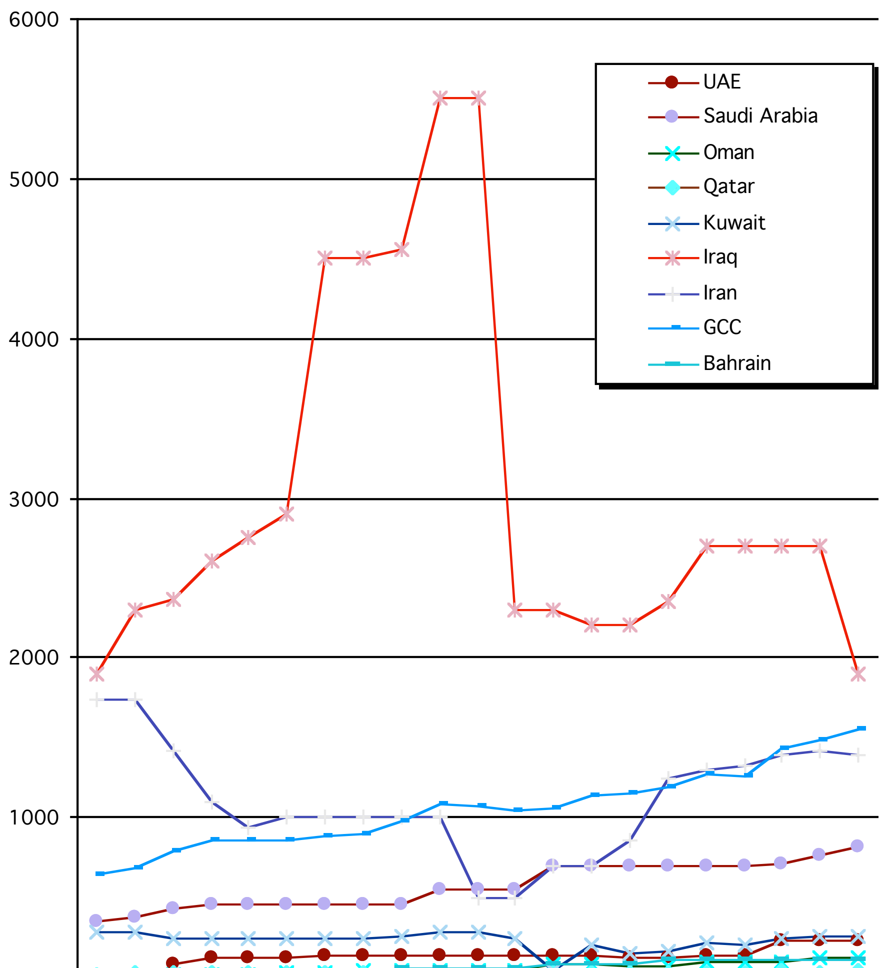
Figure 41. *Total Gulf military manpower by service, 1999*



	Iran	Iraq	Saudi	Bahrain	Kuwait	Oman	Qatar	UAE	Yemen
Navy	20600	2000	13500	1000	1800	4200	1800	1500	1800
Air Def	18000	17000	4000	-	-	-	-		
Air	28000	35000	18000	1500	2500	4100	1500	4000	3500
Guard	120000	-	57000	-	-	6500	-		
Army	350000	375000	70000	8500	11000	25000	8500	59000	61000

Source: Estimated by Anthony H. Cordesman using data from IISS, *Military Balance*.

Figure 42. *Total operational main battle tanks in all Gulf forces, 1979–1999*

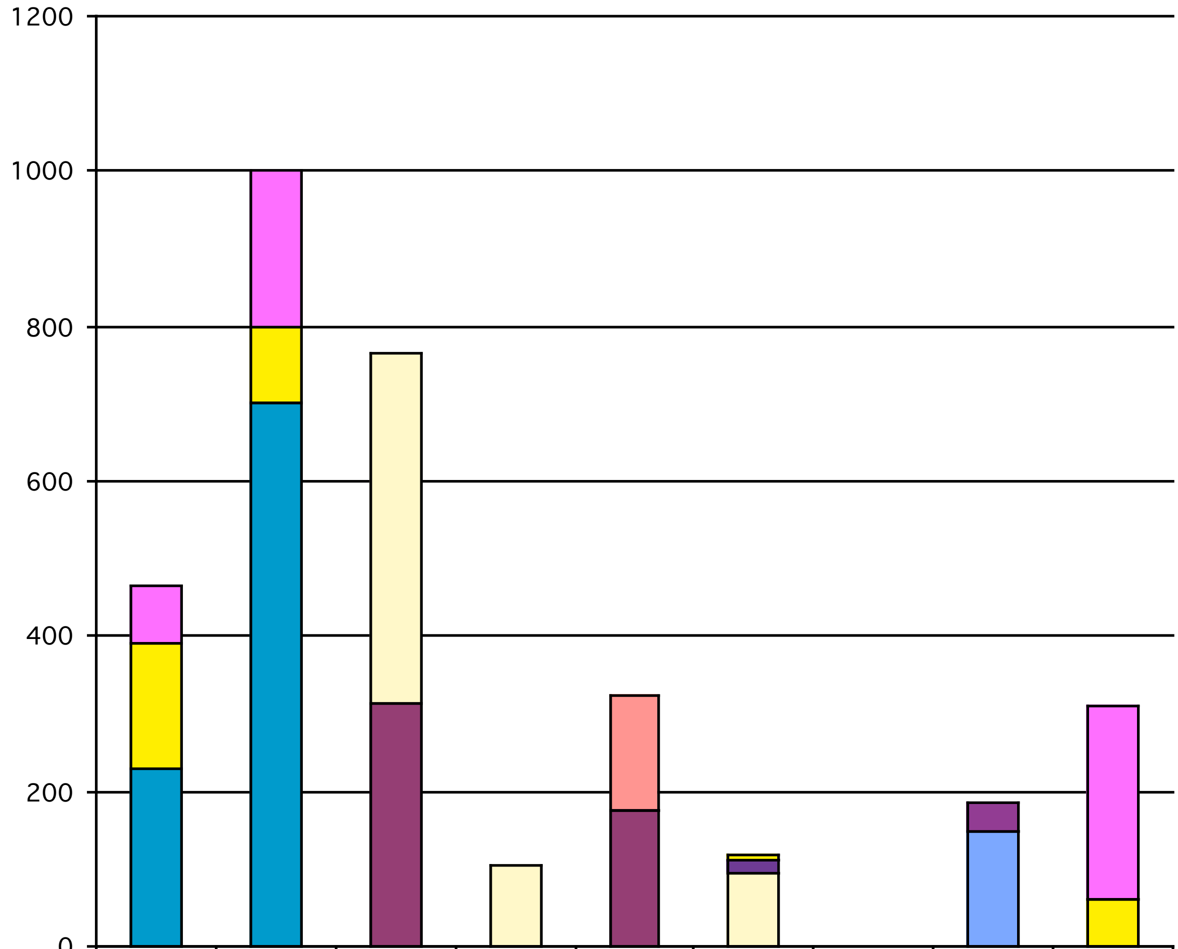


	79	80	81	83	84	85	86	88	89	90	91	93	94	95	96	98	99
UAE			75	118	118	136	136	136	131	131	131	125	125	133	133	231	231
Saudi Arabia	350	380	430	450	450	450	450	550	550	550	700	696	700	700	700	760	810
Oman			18	18	26	33	39	39	39	39	82	73	73	91	91	117	117
Qatar	12	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	34
Kuwait	280	280	240	240	240	240	240	275	275	245	36	150	164	220	198	249	249
Iraq	190	230	236	275	290	450	450	550	550	230	230	220	235	270	270	270	190
Iran	173	173	141	940	100	100	100	100	500	500	700	850	124	130	132	141	139
GCC	642	684	787	850	858	883	889	108	107	104	105	114	119	127	125	148	154
Bahrain								60	54	54	81	81	106	106	106	106	106

Note: Iran includes active forces in the Revolutionary Guards. Saudi Arabia includes active National Guard.

Source: Adapted by Anthony H. Cordesman from various sources and IISS, *Military Balance*, various editions.

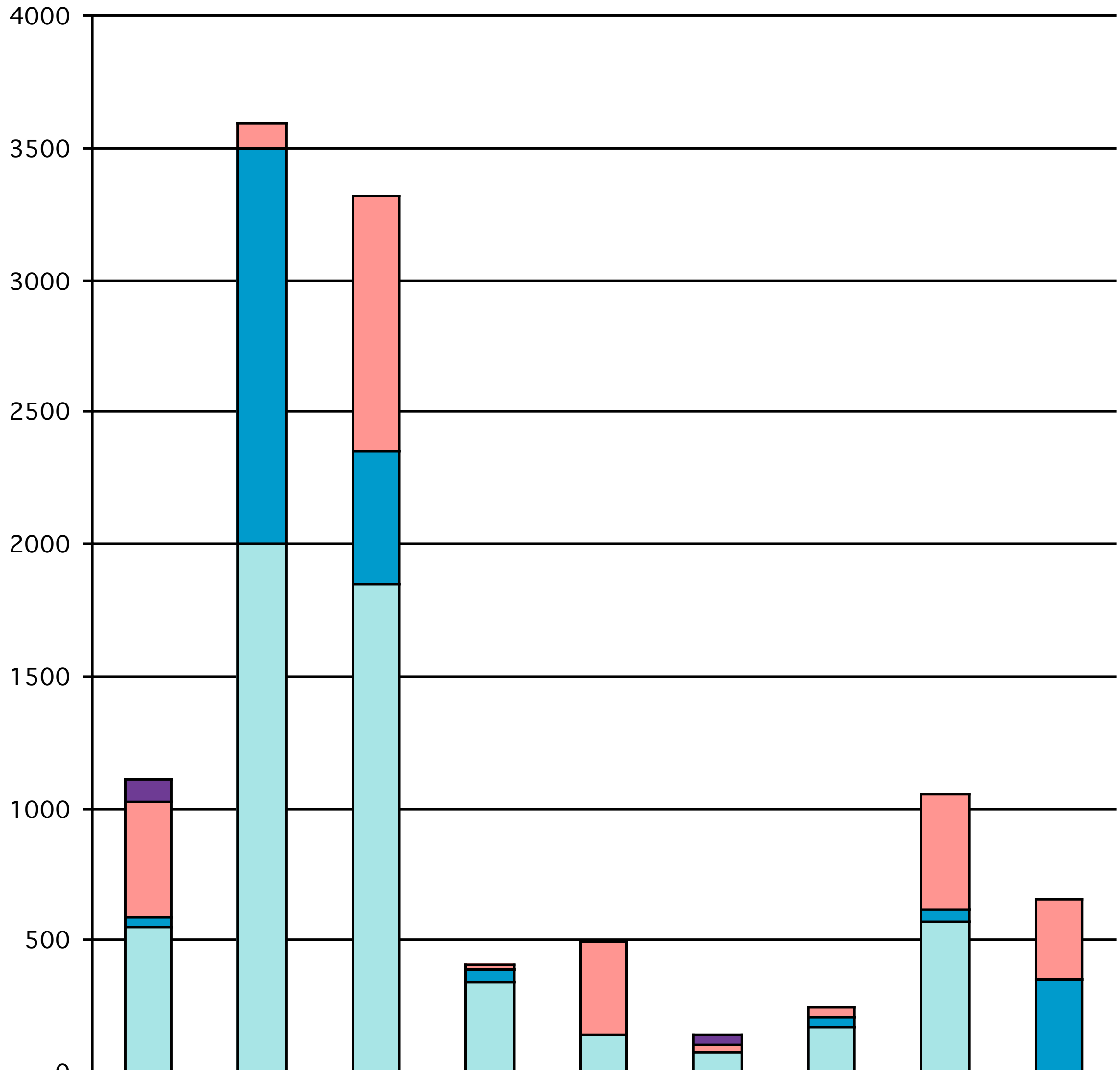
Figure 43. *Medium- to high-quality main battle tanks by type, 1999*



	Iran	Iraq	Saudi	Bahrain	Kuwait	Oman	Qatar	UAE	Yemen
T-62	75	200	-	-	-	-	-	-	250
M-60A1	160	100	-	-	-	6	-	-	60
OF-40	-	-	-	-	-	-	-	36	-
T-72	230	700		-	-	-	-	-	-
M-84	-	-	-	-	150	-	-	-	-
Le Clerc	-	-	-	-	-	-	-	150	-
Challenger	-	-	-	-	-	18	-	-	-
M-60A2	-	-	-	-	-	-	-	-	-
M-60A3	-	-	450	106	-	93	-	-	-
M-1A2	-	-	315	-	174	-	-	-	

Source: Adapted by Anthony H. Cordesman from IISS, *Military Balance*.

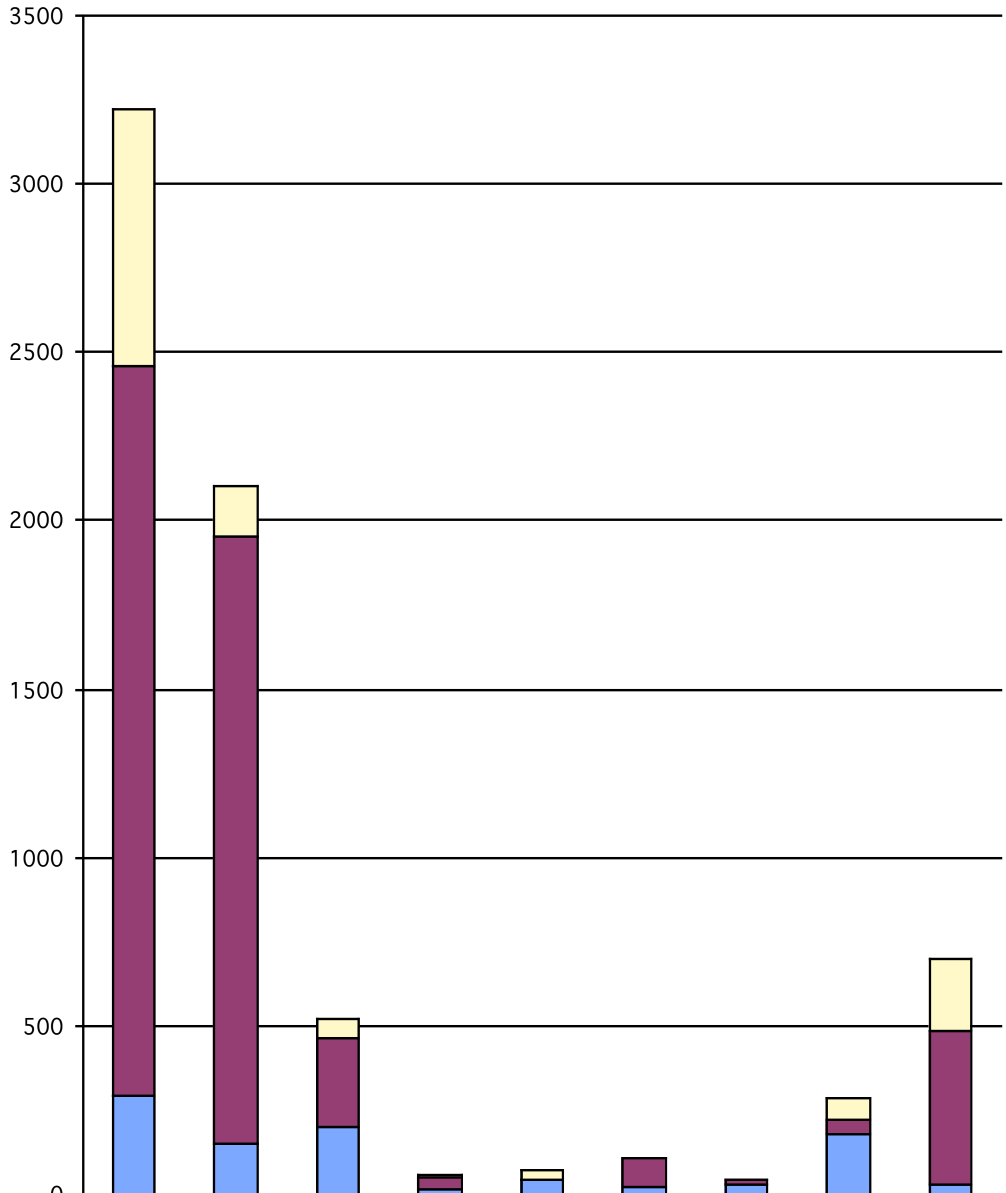
Figure 44. *Gulf other armored fighting vehicles (OAFVs) by category, 1999*



	Iran	Iraq	Saudi	Bahrain	Kuwait	Oman	Qatar	UAE	Yemen
Lt. Tank	80	-	-	-	-	37	-	-	
AIFV	440	90	970	25	355	32	39	433	300
Recce	35	1500	497	46	-	-	40	49	350
APC	550	2000	1850	340	140	73	172	570	-

Source: Estimated by Anthony H. Cordesman from various sources and IISS, *Military Balance*.

Figure 45. *Total operational Gulf artillery weapons, 1999*

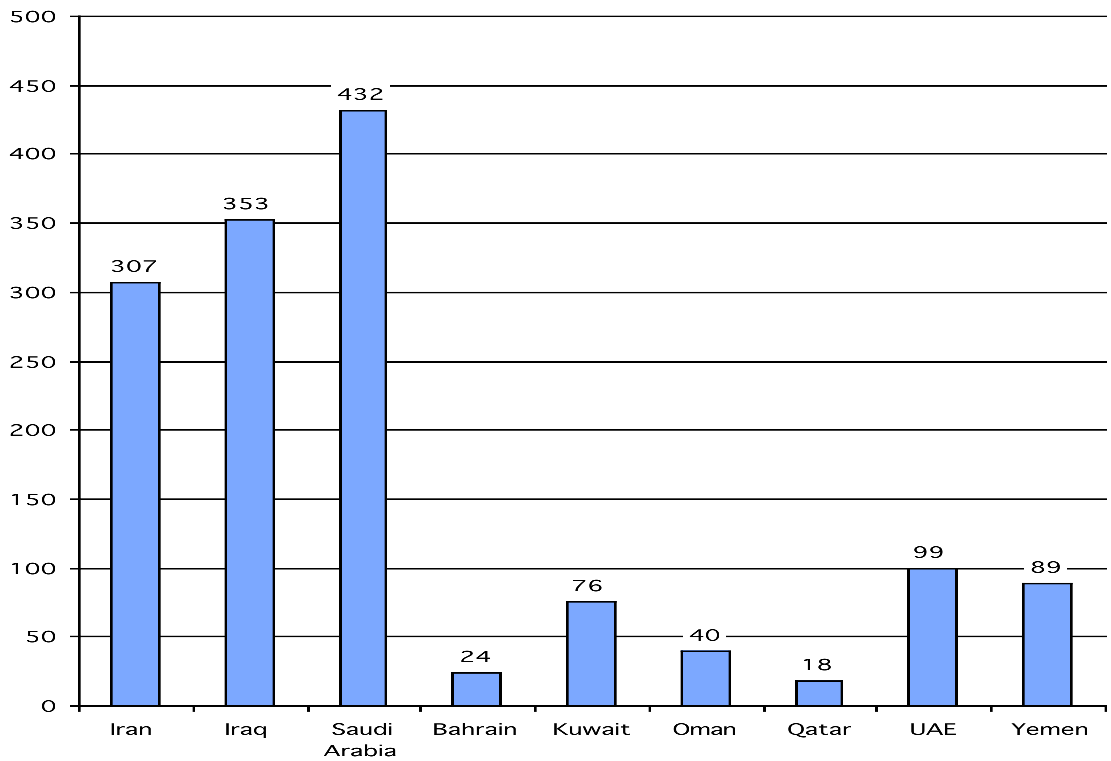


	Iran	Iraq	Saudi	Bahrain	Kuwait	Oman	Qatar	UAE	Yemen
Multiple Rocket Launcher	764	150	60	9	27	0	4	66	220
Towed Tube	2170	1800	260	36	0	91	12	46	452
Self-Propelled Tube	290	150	200	13	41	18	28	175	30

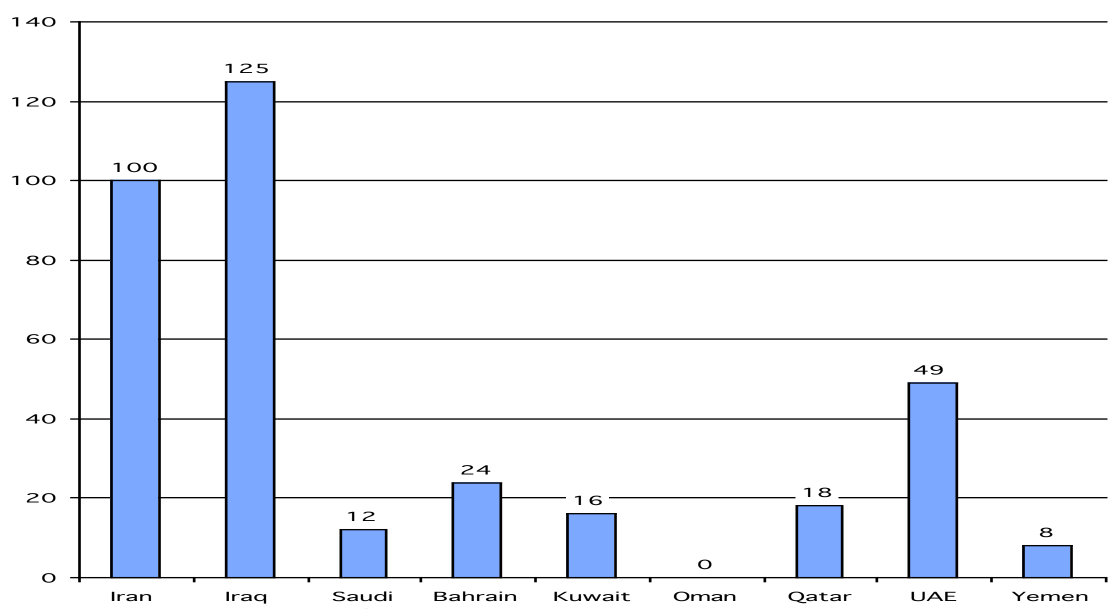
Source: Estimated by Anthony H. Cordesman from various sources and IISS, *Military Balance*.

Figure 46. *Total Gulf holdings of combat aircraft, 1999*

Fixed Wing Combat Aircraft

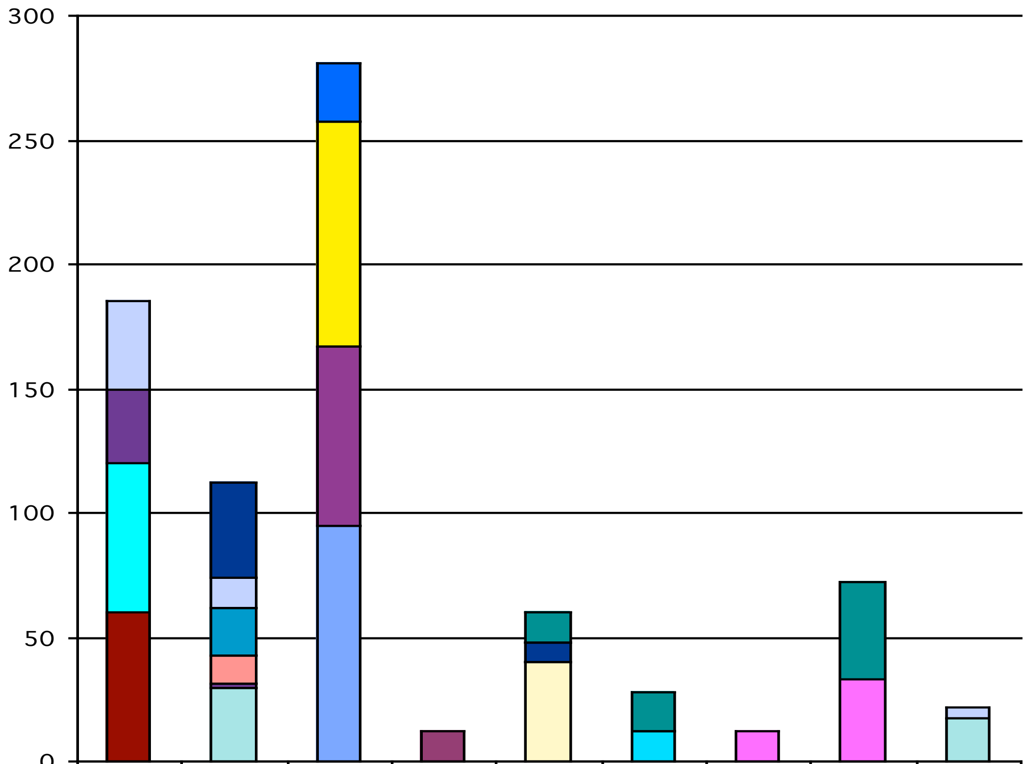


Armed and Attack Helicopters



Source: Adapted by Anthony H. Cordesman from IISS, *Military Balance*.

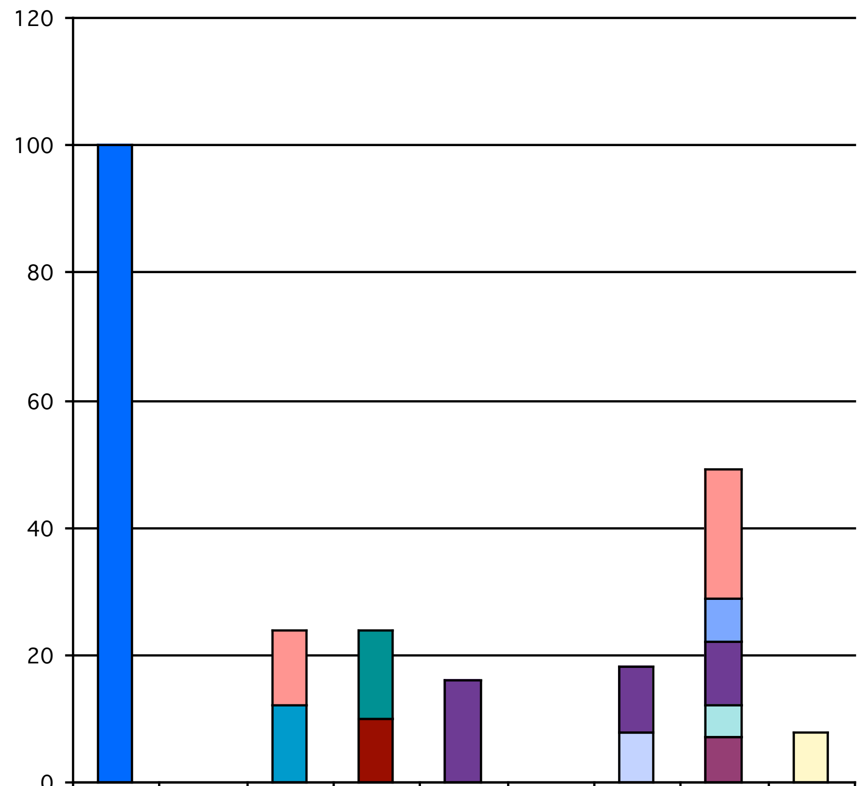
Figure 47. *Gulf high- and medium-quality fixed-wing fighter, fighter attack, attack, strike, and multi-role combat aircraft by type, 1998*



	Iran	Iraq	Saudi Arabia	Bahrain	Kuwait	Oman	Qatar	UAE	Yemen
Tornado ADV	-	-	24	-	-	-	-	-	-
Tornado IDS	-	-	90	-	-	-	-	-	-
Hawk	-	-		-	12	16	-	39	-
Jaguar	-	-	-	-	-	12	-	-	-
Mirage 2000	-	-	-	-	-	-	12	33	-
Mirage F-1	-	38	-	-	8	-	-	-	-
MiG-29	35	12	-	-	-	-	-	-	5
M-25/25R	-	19	-	-	-	-	-	-	-
Su-25	-	12	-	-	-	-	-	-	-
Su-24D	30	1	-	-	-	-	-	-	-
Su-20/22	-	30	-	-	-	-	-	-	17
F-18	-	-	-	-	40	-	-	-	-
F-16	-	-	-	12	-	-	-	-	-
F-15S	-	-	72	-	-	-	-	-	-
F-15C/D	-	-	95	-	-	-	-	-	-
F-14	60	-	-	-	-	-	-	-	-
F-4E	60	-	-	-	-	-	-	-	-

Source: Estimated by Anthony H. Cordesman from various sources and IISS, *Military Balance*.

Figure 48. *Gulf attack helicopters, 1999*



	Iran	Iraq	Saudi	Bahrain	Kuwait	Oman	Qatar	UAE	Yemen
AH-64			12					20	
AS-565 Panther								7	
SA-342K HOT					16		10	10	
AH-1E				14					
AH-1J	100								
S-342		X							
Commando Exocet							8		
AS-332 Exocet								5	
SA-321 Exocet		X							
S-70A1			12						
Mi-35									8
Mi-24		X							
AB-212				10					
SA-315 AS-12		X							
SA-316/319 SS11/12		X						7	
BO-105 AS-11/HOT									

Total	100	120	12–24	24	16	0	18	49	8

X = Some systems, number unknown.

Source: Adapted by Anthony H. Cordesman from IISS, *Military Balance*.

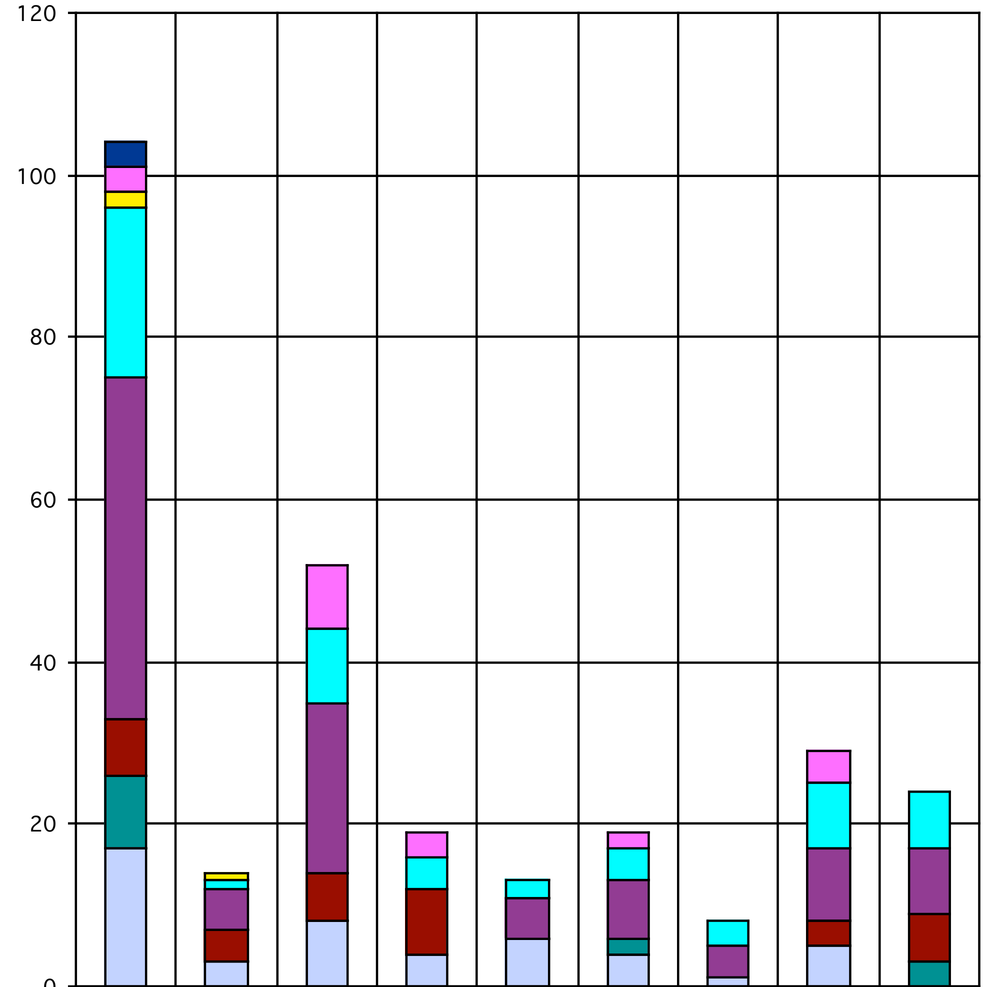
Table 5. *Gulf land-based air defense systems, 1999*

Country	Major SAM	Light SAM	AA Guns
Bahrain	8 IHawk	40+ RBS-70 15 Stinger 7 Crotale	12 Oerlikon 35 mm 12 L/70 40 mm
Iran	12/150 I Hawk 3/? SA-5 45 HQ-2J (SA-2) ? SA-2	SA-7 HN-5 30 Rapier FM-80 (Ch Crotale) 15 Tigercat	1,700 Guns ZU-23, ZSu-23-4, ZSu-57-2, KS-19 ZPU-2/4, M-1939, Type 55
Iraq	SA-2 SA-3 SA-6	Roland SA-7 SA-8 SA-9 SA-13 SA-14, SA-16	5,500 Guns ZSu-23-4 23 mm, M-1939 37 mm, ZSu-57-2 SP, 57 mm 85 mm, 100 mm, 130 mm
Kuwait	4/24 I Hawk 4/16 Patriot	6/12 Aspede 48 Starburst	6/2X35mm Oerlikon
Oman	None	Blowpipe 34 SA-7 28 Javelin 28 Rapier	2 VAB/VD 20 mm 4 ZU-23-2 23 mm 12 L-60 40 mm
Qatar	None	Blowpipe 12 Stinger 9 Roland Stinger, SA-7, Mistral	?
Saudi Arabia	16/128 I Hawk ? Patriot	Crotale Stinger 500 Redeye 17/68 Shahine mobile *40 Crotale* 73 Shahine static	92 M-163 Vulcan 20 mm 128 35 mm guns 150 L-70 40 mm (in store) 50 AMX-30SA 30 mm
UAE	5 I Hawk Bty.	20+ Blowpipe Mistral 12 Rapier *9 Crotale* 13 RBS-70 100 Mistral	42 M-3VDA 20 mm SP 20 GCF-BM2 30 mm
Yemen	SA-2, SA3, SA-6	SA-7, SA-9, SA13, SA-14	52 M-167 20mm 20 M-163 Vulcan 20mm 100 ZSu-23-4 23 mm 150 M-1939 23 mm 120 S-60 37 mm KS-12 85 mm

Note: Light surface-to-air missile systems and anti-aircraft guns are normally operated by the land forces. The systems below the line are operated by the air force or air defense command.

Source: Adapted from IISS, *Military Balance*, various years. Some data adjusted or estimated by the author.

Figure 49. *Gulf naval ships by category*



	Iran	Iraq	Saudi	Bahrain	Kuwait	Oman	Qatar	UAE	Yemen
Submarines	3	0	-	-	0	-	0	0	-
Major Missile Combat	3	0	8	3	0	2	0	4	-
Major Other Combat	2	1		0	0	0	0	0	-
Missile Patrol	21	1	9	4	2	4	3	8	7
Other Patrol	42	5	21	0	5	7	4	9	8
Mine	7	4	6	8	0	0	0	3	6
Amphibious	9		-	-	0	2	0	0	3
Landing Craft	17	3	8	4	6	4	1	5	-

Sources: Adapted by Anthony H. Cordesman from IISS, *Military Balance*, and material provided by U.S. experts.

Key Iranian Equipment Developments

Land

Belarus is reported have signed an agreement with Iran to upgrade Soviet-built aircraft and tanks at plants in Belarus and to provide training for Iranian military personnel. Belarus also plans to sell Russian-made arms and equipment, including spare parts for MBTs (*JDW* 18 March 1998: 19)

Iran has developed low-drag 155-mm high explosive base-bleed projectiles. The 155BB HE-TNT incorporates a 16kg TNT and has a range of 35 km when fired with an M11 top charge from a 45-caliber gun. Range is 17 km without base bleed. A new low-drag HE projectile for 120-mm smoothbore mortars with a range of 13.2 km. (*JIDR* 6/1998: 22)

Reports indicate Iran has procured about 120 T-72Ss from Russia and 100 T-72M1s from Poland since 1990. It had an inventory of about 220 T-72s of various types in late 1998.

In addition, Iran:

- Claims to be producing the Iranian-made Zolfaqar MBT, an M-48/M-60-like tank.
- Has upgraded to T-54/T-54 called "Safir-74.
- Claims to have upgraded Iraqi T-54s captured in Iran-Iraq War.
- Has purchased Russian BMPs. It had an inventory of 300 BMP-1s and 100 BMP-2s in late 1998.

Russia may be licensing Iranian production of T-72 and BMP-2. There is domestic production of a Chinese version of the BMP called the Boragh and of an APC called the BMT-2 or Cobra.

Iran may have purchased 100 M-46 and 300 D-30 artillery weapons from Russia.

Iran is testing a prototype of a 122-mm self-propelled gun called Thunder in 1996 and a 155-mm self-propelled gun called Thunder 2 in 1997. It has shown a modified heavy equipment transporter called the "Babr 400."

Iran's holdings include Russian and Asian AT-2s, AT-3s, and AT-4s but do not seem to include 100 Chinese Red Arrows. It has Chinese and 15+ North Korean 146-mm self-propelled weapons It also has 60 Russian 2S1 122-mm self-propelled howitzers in inventory and growing numbers of BM-24 240-mm, BM-21 122-mm and Chinese Type 63 107-mm MRLs as well as Iranian Hadid 122-mm 40-round MRLs.

In addition, Iran is thought to be manufacturing:

- Iranian Arash and Noor rockets (variants of Chinese and Russian 122-mm rockets)
- Iranian Haseb rockets (variants of Chinese 107-mm rocket)
- Iranian Fajr-4 ballistic missiles, new version of the Fajr-3 that has a range of 28 miles (45 km.) (Reuters, 10 December 1998)
- Iranian Shahin 1 and 2, Oghab, Nazeat 5 and 10 (may be additional versions), and Fajr battlefield rockets.

Air/Air Defense

Iran is keeping up to 115 combat aircraft that Iraq sent to Iran during Gulf War. These seem to include 24 Su-4s and four MiG-29s. It has 30 MiG-29s with refueling in inventory and may be receiving 15–20 more from Russia.

Iran has 30 Su-24s in inventory (probably Su-24D version) and may be receiving 6–9 more from Russia. Iran may be negotiating purchase of AS-10, AS-11, AS-12, AS-14/16s from Russia.

Iran has Su-25s (formerly Iraqi), although it has not deployed them. It may be trying to purchase more Su-25s, as well as MiG-31s, Su-27s and TU-22Ms.

Iran is considering imports of the Chinese F-8 fighter and Jian Hong bomber. It already has 25 Chinese F-7M fighters with PL-2, PL2A, and PL-7 AAMs.

In addition, Iran has purchased:

- 25 Brazilian Tucano trainers
- 25 Pakistani MiG-17 trainers
- 12 Italian AB-212
- 20 German BK-117A-3
- 12 Russian Mi-17 support and utility helicopters.

An uncertain report has has Iran buying 12 MiG-29UB trainers from Russia.

Iran claims to have fitted F-14s with I-Hawk missiles adapted to the air-to-air role. It also claims to have deployed an air-to-air adapted variant of the SM1 Standard missile for its fleet of F-4D/E Phantom II fighter bombers. (*JDW* 29 April 1998: 17). It claims to produce advanced electronic warfare systems, and IRGC claims to be ready to mass-produce gliders.

Land-Based Air Defense

Iran may be negotiating the purchase of SA-10, SA-12, SA-14/16s from Russia.

Reports state that Iran has acquired four HQ-23/2B (CSA-1) launchers and 45–48 missiles, plus 25 SA-6, and 10–15 SA-5 launchers.

It has acquired Chinese FM-80 launchers and a few RBS-70s; more SA-7s and HN-5s man-portable missiles; and may have acquired 100–200 Strelas.

There are reports that Iran seeks to modernize its Rapier and 10–15 Tigercat fire units.

Iran may be modifying and/or producing ZSu-23–4 radar-guided anti-aircraft guns. It claims to produce advanced electronic warfare systems.

Sea

Iran claims it will soon start production of 6 multi-purpose destroyers. It has taken delivery on three Russian Type 877EKM Kilo-class submarines, possibly with 1,000 modern magnetic, acoustic, and pressure sensitive mines. Reports that Iran has North Korean midget submarines have never been confirmed

Iran has obtained 10 Hudong-class Chinese missile patrol boats and U.S. Mark 65 and Russian AND 500, AMAG-1, KRAB anti-ship mines.

There are reports that Iran is negotiating to buy Chinese EM-52 rocket-propelled mines.

Iran claims to be developing non-magnetic, acoustic, free-floating and remote-controlled mines. It may have also acquired non-magnetic mines, influence mines and mines with sophisticated timing devices.

Iran has wake-homing and wire-guided Russian torpedoes.

Iran has Seersucker (HY-2) sites with 50–60 missiles and is working to extend range to 400 km.

Iran has 60–100 Chinese CS-801(Ying Jai-1 SY-2) and CS-802 (YF-6) SSMs. it is developing the FL-10 anti-ship cruise missile, which is a copy of Chinese FL-2 or FL-7. It has Boghammer fast interceptor craft.

Missiles

Iran has obtained up to 250-300 Scud Bs with 8–15 launchers and up to 150 Chinese CSS-8 surface-to-surface missiles with 25–30 launchers.

There are reports that China is giving Iran the technology to produce long-range solid fuel missile.

Iran-130 missile (?)

Iran has bought North Korean Scud Cs with 5–14 launchers. South Korea reports Iran has bought a total of 100 Scud Bs and 100 Scud Cs from North Korea.

Iran is testing the Shahab 3 missile. It has Shahab 4 and possibly Shahab 5 under development.

Iran may be planning to purchase North Korean No Dong 1/2s. Iran is also interested in North Korea's developmental Tapeo Dong 1 or Tapeo Dong 2. It claims will launch its first experimental satellite by 2000 with Russian aid.

There are reports of tunnels for hardened deployment of Scuds and SAMs.

Chemical and Biological Weapons

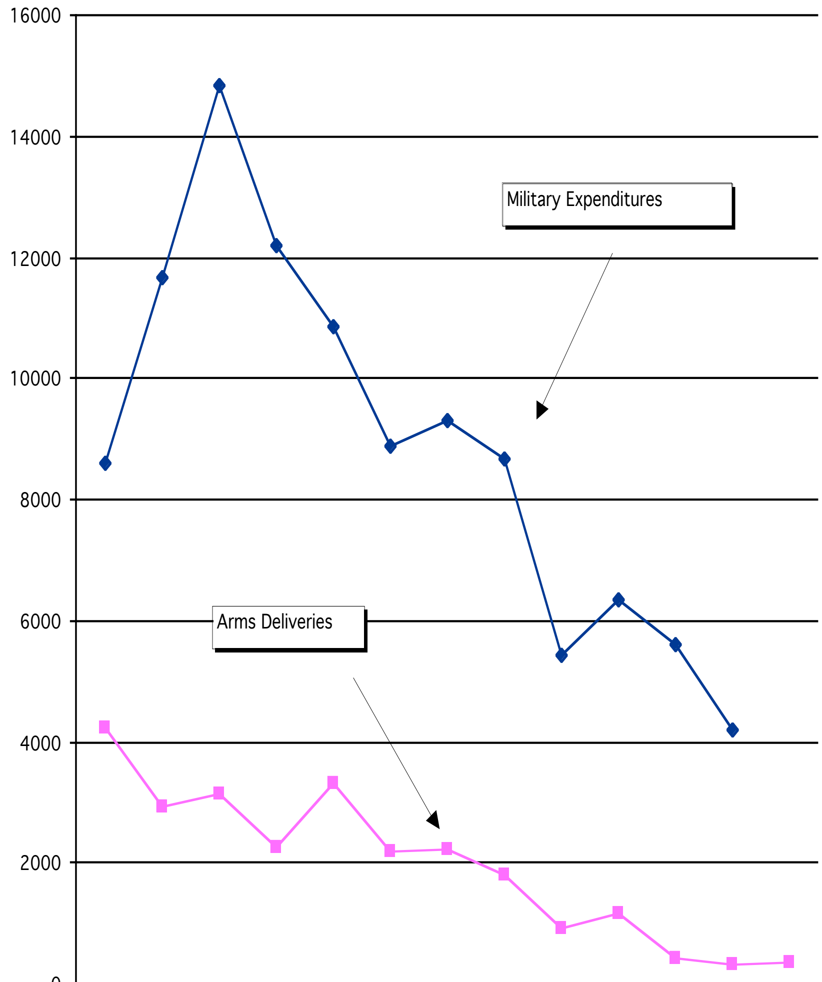
Iran has chemical weapons (sulfur mustard gas, hydrogen cyanide, phosgene and/or chlorine; possibly Sarin and Tabun) and biological weapons (possibly anthrax, hoof and mouth disease, and other biotoxins).

It seeks to develop nuclear weapons (using Russian and Chinese technology).

Figure 50 and Table 6 give additional information about Iran's expenditures and equipment holdings.

Sources: Based on interviews, reporting in various defense journals, and IISS, *Military Balance*, various editions.

Figure 50. *Iranian military expenditures and arms transfers (constant $96 millions)*



	84	85	86	87	88	89	91	92	93	94	95	96
Military Expenditures	8586	11680	14840	12190	10860	8893	8654	5410	6333	5586	4191	
Arms Deliveries	4237	2941	3125	2240	3304	2196	1800	931	1174	406	306	350

Source: Adapted by Anthony H. Cordesman from ACDA, *World Military Expenditures and Arms Transfers*, various editions.

Table 6. *Iranian dependence on decaying Western-supplied major weapons*

Military Service	Weapon Type	Number	Comments
Land Forces	Chieftain tank	240–260	Worn, under-armored, underarmed, and underpowered. Fire control and sighting system now obsolete. Cooling problems.
	M-47/M-48	150–260	Worn, under-armored, underarmed, and underpowered. Fire control and sighting system now obsolete.
	M-60A1	150–160	Worn, under-armored, underarmed, and underpowered. Fire control and sighting system now obsolete.
	Scorpion AFV	70–80	Worn, light armor, underarmed, and underpowered.
	M-114s	70-80	Worn, light armor, and underarmed, and underpowered
	M-109 155-mm SP	150–160	Worn, fire control system now obsolete. Growing reliability problems due to lack of updates and parts.
	M-107 175-mm SP	20–30	Worn, fire control system now obsolete. Growing reliability problems due to lack of parts.
	M-110 203-mm SP	25–35	Worn, fire control system now obsolete. Growing reliability problems due to lack of parts.
	AH-1J attack heli.	100	Worn, avionics and weapons suite now obsolete. Growing reliability problems due to lack of updates and parts.
	CH-47 trans. heli.	35–45	Worn, avionics now obsolete. Growing reliability problems due to lack of updates and parts.
	Bell, Hughes, Boeing, Agusta, Sikorsky helis.	350–445	Worn, growing reliability problems due to lack of updates and parts.
Air Force			
	F-4D/E FGA	55–60	Worn, avionics now obsolete. Critical problems due to lack of updates and parts.
	60 F-5E/FII FGA	60	Worn, avionics now obsolete. Serious problems due to lack of updates and parts.
	F-5A/B	10	Worn, avionics now obsolete. Serious problems due to lack of updates and parts.
	RF-4E	8	Worn, avionics now obsolete. Serious problems due to lack of updates and parts.
	RF-5E	5–10	Worn, avionics now obsolete. Serious problems due to lack of updates and parts. (May be in storage)
	F-14 AWX	60	Worn, avionics now obsolete. Critical problems due to lack of updates and parts. Cannot operate some radars at long ranges. Phoenix missile capability cannot be used.

(continued)

(**Table 6**. *continued)*

Military Service	Weapon Type	Number	Comments
Air Force			
	P-3F MPA	5	Worn, avionics and sensors now obsolete. Many sensors and weapons cannot be used. Critical problems due to lack of updates and parts.
	Key PGMs	—	Remaining Mavericks, Aim-7s, Aim-9s, Aim-54s are all long past rated shelf life. Many or most are unreliable or inoperable.
	I-Hawk SAM	150–175	Worn. Electronics, software, and some aspects of sensors now obsolete. Critical problems due to lack of updates and parts.
	Rapier SAM	30	Worn. Electronics, software, and some aspects of sensors now obsolete. Critical problems due to lack of updates and parts.
Navy			
	Babar DE	1	Worn, weapons and electronics suite obsolete, many systems inoperable or partly dysfunctional due to lack of updates and parts.
	Samavand DDG	5	Worn, weapons and electronics suite obsolete, many systems inoperable or partly dysfunctional due to lack of updates and parts.
	Alvand FFG	3	Worn, weapons and electronics suite obsolete, many systems inoperable or partly dysfunctional due to lack of updates and parts.
	Bytander FF	2	Obsolete. Critical problems due to lack of updates and parts.
	Hengeman LST	4	Worn. needs full scale refit.

Sources: Estimate made by Anthony H. Cordesman based on the equipment counts in IISS, *Military Balance, 1995–1996*, “Iran,” and discussions with U.S. experts. Note that different equipment estimates are used later in the text. The IISS figures are used throughout this chart to preserve statistical consistency.

Iraq—An Overview

The broad trends in Iraqi central government expenditures, military expenditures, and arms spending reflect the virtual collapse of Iraq's economy, and a near cut-off of military imports since 1991.

Iraq's military effort placed a massive burden on its economy throughout the Iran–Iraq War and during August 1980 through July 1988. Its efforts to rebuild its forces since the Gulf War have involved such high military expenditures relative to Iraq's GDP that they have reached the crisis level and have been a critical factor in the decline in living standards in Iraq.

The trends in terms of military expenditure per capita versus GDP per capita are even worse than the trend in gross military expenditures versus total GDP. Iraq clearly has a government which cares little for the welfare of its people, and which emphasizes guns over butter even at the cost of a devastating cut in per-capita income.

A detailed comparison of the trends in the Iraqi economy versus the Iraqi military and arms import effort reveals that Iraq began to encounter critical problems in funding its military efforts as early as 1985. It also reveals that Iraq has chosen guns over butter since the Gulf War at an immense cost in terms of the resulting share of GDP.

As a result, Iraq began to experience a crisis in recapitalizing its military forces as early as 1985, and the Gulf War turned this crisis into a virtual catastrophe. Iraq's military machine may retain a massive order of battle, but Iraq's lack of arms imports means that its military readiness and sustainability is only a fraction of what it was in 1990.

Iraqi purchases matched Saudi purchases during the mid-1980s, but Iraqi deliveries in current U.S. dollars dropped from $11 billion annually during 1988–1991 to below $200 million annually in 1992–1995.

Comparisons of Iraqi new agreements and arms deliveries by supplier country reveal a drastic decline in new agreements before the Gulf War that would have seriously compromised Iraq's import-dependent forces even without the Gulf War.

New agreements with Russia dropped from $11.8 billion in 1983–1986 to $4.1 billion in 1987–1990, before dropping to zero after 1991. New agreements with China dropped from $1.7 billion in 1983–1986 to $0.6 billion in 1987–1990, before dropping to zero after 1991. New agreements with Eastern Europe dropped from $4.0 billion in 1983–1986 to $1.0 billion in 1987–1990, before dropping to zero after 1991.

In contrast, new agreements with the major West European states rose from $1.0 billion in 1983–1986 to $2.7 billion in 1987–1990, before dropping to zero after 1991, reflecting Iraq's growing interest in advanced military technology before the cutoff of arms imports.

In spite of various claims, Iraq's domestic production capability can only play a major role in allowing Iraq to sustain its modern weapons and ability to use advanced military technology. Iraq remains an import-dependent country.

Iraq's past pattern of arms imports makes it highly dependent on access to a wide range of suppliers—particularly Western Europe and Russia. Even if one nation should resume supply, Iraq could not rebuild its military machine without broad access to such suppliers and would be forced to convert a substantial amount of its order of battle to whatever supplier(s) were willing to sell.

In spite of some smuggling, Iraq has had negligible export earnings since 1990, and faces significant long-term limits on its ability to import even when sanctions are lifted.

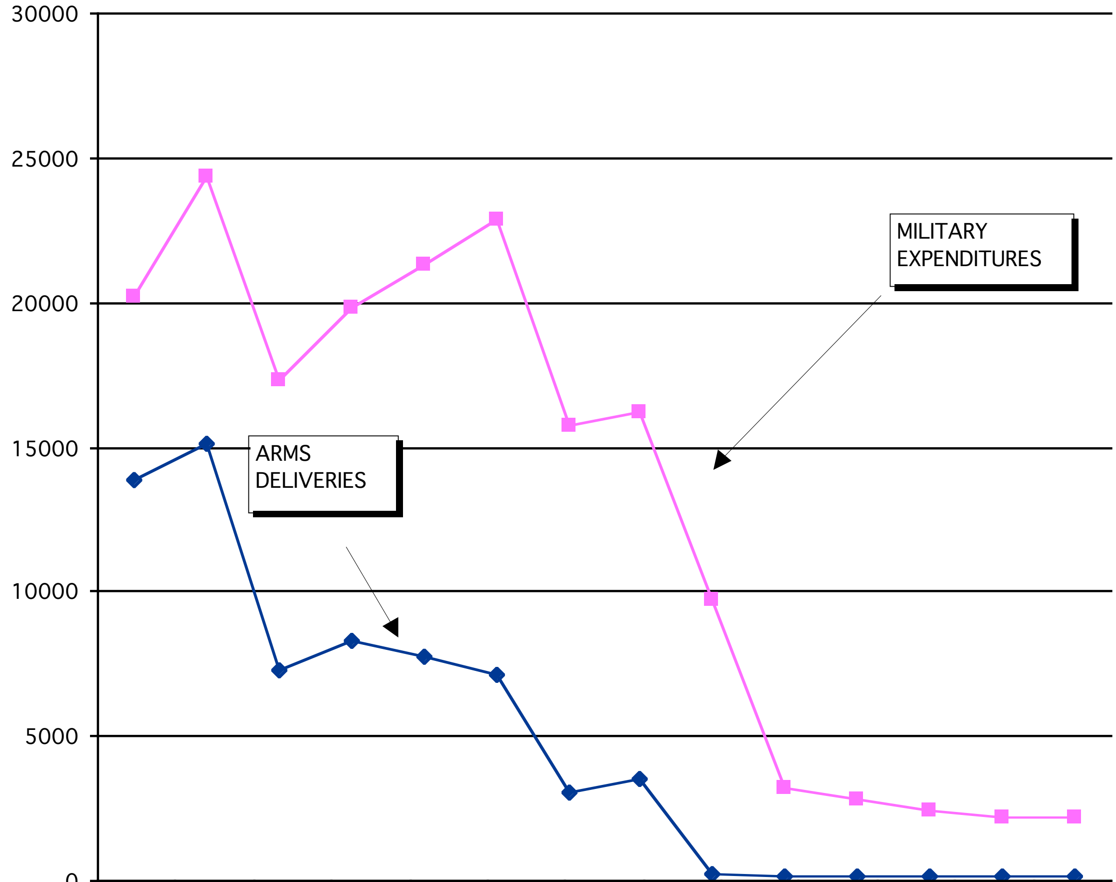
Iraq will encounter severe problems after UN sanctions are lifted because of the inability of the FSU to provide efficient deliveries of spares and cost-effective upgrade and modernization packages.

No accurate data are available on Iraqi military spending and arms imports since 1991, but estimates of trends in constant dollars, using adjusted U.S. government data, strongly indicate that Iraq would need to spend sums approaching $20 billion to recapitalize its force structure.

Major modernization efforts to counter U.S. standards of capability could add $10 billion each to key modernization efforts like land-based air defense, air defense, air and missile strike capabilities, armored modernization, modernization of other land weapons, and reconstitution of the Iraqi Navy. Modernization to match Saudi levels of capability would be about half these totals.

Figure 51 summarizes Iraqi expenditures.

Figure 51. *Iraqi military expenditures and arms transfers (constant $96 millions)*



	83	84	85	86	87	88	89	91	92	93	94	95	96
Milex	20240	24360	17340	19850	21290	22890	15740	9698	3200	2800	2400	2200	2200
Arms Imports	13846	15120	7248	8288	7774	7117	3050	217	190	163	124	120	170

Note: Does not include most equipment for weapons of mass destruction.

Source: Adapted by Anthony H. Cordesman from ACDA, *World Military Expenditures and Arms Transfers* (Washington, D.C.: GPO), various editions. Estimates after 1991 made by author.

Iraqi Dependence on Decaying, Obsolete, or Obsolescent Major Weapons

Land Forces

Iraqi land forces are dependent on the following decaying, obsolete, or obsolescent weapons:

- 600–700 M-48s, M-60s, AMX-30s, Centurions, and Chieftains captured from Iran or which it obtained in small numbers from other countries.
- 1,000 T-54, T-55, T-77 and Chinese T-59 and T-69 tanks
- 200 T-62s.
- 1,500-2,100 BTR-50, BTR-60, BTR-152, OT-62, OT-64, etc.
- 1,600 BDRM-2, EE-3, EE-9, AML-60, AML-90
- 800–1,200 towed artillery weapons (105-mm, 122-mm, 130-mm, and 155-mm).
- Unknown number of AS-11, AS-1, AT-1, crew-portable anti-tank-guided missiles.
- More than 1,000 heavy, low-quality anti-aircraft guns.
- Over 1,500 SA-7 and other low-quality surface-to-air guided missile launchers & fire units.
- 20 PAH-1 (Bo-105); attack helicopters with AS-11 and AS-12, 30 Mi-24s and Mi-25s with AT-2 missiles, SA-342s with AS-12s, Allouettes with AS-11s and AS-12s.
- 100–180 worn or obsolete transport helicopters.

Air Force

The Iraqi air force has the following decaying, obsolete, or obsolescent weapons:

- 6–7 HD-6 (BD-6), 1-2 Tu-16, and 6 Tu-22 bombers.
- 100 J-6, MiG-23BN, MiG-27, Su-7 and Su-20.
- 140 J-7, MiG-21, MiG-25air defense fighters.
- MiG-21 and MiG-25 reconnaissance fighters.
- 15 Hawker Hunters.
- Il-76 Adnan AEW aircraft.
- AA-6, AA-7Matra 530air-to-air missiles.
- AS-11, AS-12, AS-6, AS-14; air-to-surface missiles.
- 25 PC-7, 30 PC-9, 40 L-29 trainers.
- An-2, An-12, and Il-76 transport aircraft.

Air Defense

Iraqi air defense is dependent on the following decaying, obsolete, or obsolescent weapons:

- 20–30 operational SA-2 batteries with 160 launch units.
- 25–50 SA-3 batteries with 140 launch units.
- 36–55 SA-6 batteries with over 100 fire units.
- 6,500 SA-7s.
- 400 SA-9s.
- 192 SA-13s

Navy

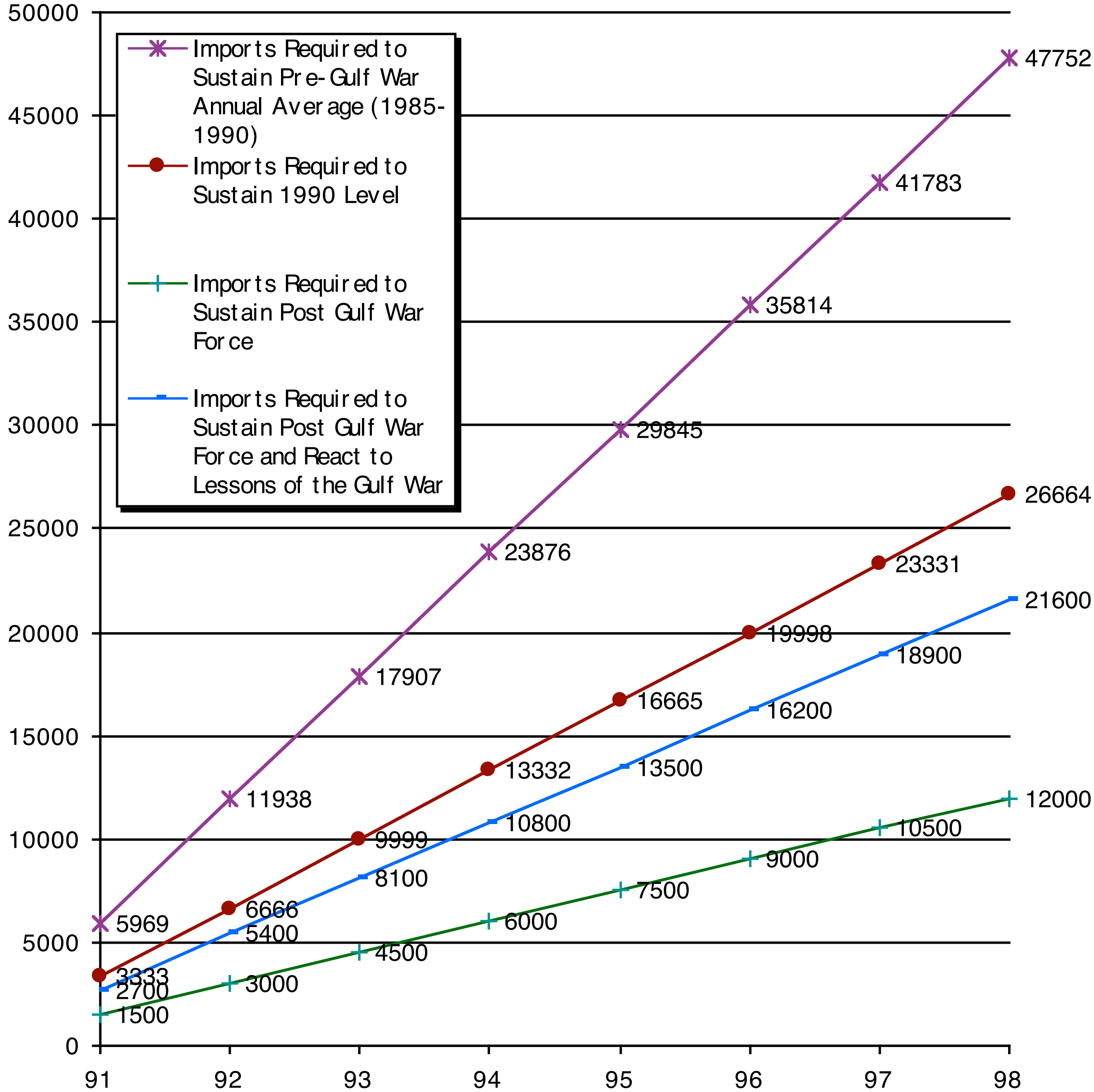
The Iraqi navy is dependent on the following decaying, obsolete, or obsolescent weapons:

- *Ibn Khaldun*.
- Osa-class missile boat.
- 13 light combat vessels.
- 5–8 landing craft.
- *Agnadeen*.
- 1 Yugoslav Spasilac-class transport.
- Polnocny-class LST.

Figure 52 summarizes the Iraqi arms import deficit.

Source: Estimate made by Anthony H. Cordesman based on discussions with U.S. experts.

Figure 52. *The Iraqi cumulative arms import deficit enforced by UN sanctions (measured in $U.S. 97 constant millions)*



Source: Adapted by Anthony H. Cordesman from ACDA, *World Military Expenditures and Arms Transfers, 1995* (Washington, D.C.: GPO), 1996.

The Problem of Iraqi Military Production

Iraq developed significant ammunition, small and light arms, and gun-barrel production facilities before the Gulf War, and many of these survive and function. However, it focused most resources on weapons of mass destruction.

Iraq left even high-tech service (for example, on French and Russian aircraft) to foreign technical support teams. It did not attempt to develop major in-house capabilities.

Pre-1991 production was heavily prototype-oriented and largely prestige-oriented in nature.

Iraq did import T-72 kits, in theory as a transition to production facilities. However, it is far from clear that Iraq has the industrial base for such manufactures. Iraqi modifications sometimes succeeded, but many failed and had an "impress the maximum leader character." for example, its T-72 upgrades.

Historically, assembly of major weapons does not lead to technology transfer or effective reverse engineering capability without extensive foreign support. The net impact is to create over-specialized facilities and waste resources. No developing state, including India and China, has yet demonstrated that it can successfully mass manufacture an advanced fighter plane or tank, even on a turn-key basis.

Few nations have made useful major equipment upgrades of armor and aircraft. Jordan, South Korea, and Turkey are among few successes. Egypt, India, Pakistan are more typical.

Iraq has effectively been cut off from all major imports of parts and specialized equipment since the 1990s, although dual use items, civilian electronics and sensors, and computer gear are not effectively controlled. Black-market imports, substitution, and local manufactures can only provide an erratic and inefficient substitute for large-scale resources.

There are some indications that Iraq is giving priority to importing equipment for weapons of mass destruction.

The Problem of Iraqi Wartime Losses

Estimates of Iraq's losses were sharply reduced as a result of reappraisal after the COW study.

Iraq does have the capability to repair or renovate much of its damaged land force equipment.

Iraq had massive stocks of ammunition and major supplies before 1990. No major reappraisal seems to have been made of USCENTCOM damage estimates after the war.

Iraq succeeded in reconstituting much of its ground force structure between 1992–1995. Air force cannibalization and restructuring far more uncertain.

Most of SAM/ground-based air defense system survived or seems to have been recoverable.

Iraq has restructured and consolidated its ground forces with an emphasis on the Republican Guard. It has reconstituted much of its surface-to-air missile defense system, and is increasing sortie rates for its remaining aircraft.

There are, however, severe limits to its recovery capability, and Iraqi spending on such activity seems to have decline steadily since late 1994.

The quality and sustainability of many Iraqi efforts will also be highly uncertain. Life spans of complex missiles and electronics are very difficult to estimate. LRU-type losses are difficult to calculate, and the NSA has a miserable history of analysis in this area.

Past experience indicates that Iraq will be highly inefficient in dealing with the management of the recapitalization and technological restructuring of its forces. Most resources may well be allocated to weapons of mass destruction. Force numbers may be kept too large to allow efficient consolidation and recovery.

The Southern Gulf Military Balance

The Gulf Cooperation Council is a myth in war fighting and force development terms. Current arms orders and inventories preclude standardization and many aspects of standardization for a decade, and there is no focus on common missions. An air defense integration contract offers some hope for future.

All Southern Gulf states have closer defense cooperation with the U.S. than with each other.

The Southern Gulf states divide into those seeing Iran as a primary threat and those seeing Iraq as a primary threat. The lower Gulf states focus on the naval, air, and subversion threats from Iran, while Kuwait and Saudi Arabia focus on Iraq.

Table 7. *Key missions and potential liabilities—The Gulf*

Country	Key Mission	Liability
Bahrain	Self defense against Iran, Iraq and subversion	Shi'ite issue Economic problems Feud with Qatar
Kuwait	Land-air defense against Iraq	Internal consensus
Oman	Sea-air defense against Iran	Economic problems
Qatar	Sea-air defense against Iran	Feud with Bahrain
Saudi Arabia	Land-air defense against Iraq Sea-air defense against Iran	Economic problems Tensions with neighbors
UAE	Sea-air defense against Iran	Internal divisions

The Undefined Mission: Counter-Proliferation!

The GCC rapid deployment force is a hollow token, and cooperation between Kuwait and Saudi Arabia is poor.

All Southern Gulf states also fear their neighbors. Bahrain and Qatar do not get along. There is a fear of Saudi dominance, especially in Qatar and Oman. The UAE faces internal divisions and has a fear of Oman. Kuwaitis have concerns with Saudi border issues. Finally, Saudi Arabia sees Yemen as a military threat as serious as Iraq.

Key Mission-Related Force Improvement Priorities

Key force improvement priorities include:

- Creating an effective planning system for collective defense, and truly standardized and/or interoperable forces.
- Integrating C^4I and sensor nets for air and naval combat, including BVR and night warfare.
- Creating joint air defense and air attack capabilities.
- Establishing effective cross reinforcement and tactical mobility capabilities.
- Setting up joint training, support, and infrastructure facilities.
- Creating joint air and naval strike forces.
- Deploying joint land defenses of the Kuwaiti/Northwestern Saudi borders.
- Preparing for outside or over-the-horizon reinforcement.
- Creating common advanced training systems.
- Improved urban and area security for unconventional warfare and low-intensity combat.

Procurement

Key Priorities

Key procurement priorities for Gulf defense include:

- Heavy armor, artillery, attack helicopters, and mobile air defense equipment for defense of upper Gulf.
- Interoperability and standardization with U.S. power projection forces.
- Interoperable offensive air capability with stand-off, all-weather precision weapons and anti-armor/anti-ship capability.
- Interoperable air defense equipment, including heavy surface-to-air missiles, BVR/AWX fighters, AEW and surveillance capability, ARM and ECM capability. Growth to ATBM and cruise missile defense capability.
- Maritime surveillance systems, and equipment for defense against maritime surveillance and unconventional warfare.
- Mine detection and clearing systems.

- Improved urban, area, and border security equipment for unconventional warfare and low intensity conflict.
- Advanced training aids.
- Support and sustainment equipment.

Key Non-Priorities

Procurements of the types listed below should be avoided:

- Unique equipment types and one-of-a-kind modifications.
- "Glitter factor" weapons; developmental equipment and technology.
- Non-interoperable weapons and systems.
- Submarines and ASW systems.
- Major surface warfare ships.
- Major equipment for divided or "dual" forces.
- New types of equipment which increase maintenance, sustainability, and training problems, or layer new types over old.

Weapons of Mass Destruction

Reasons for Proliferation and War Fighting Options

Incentives for proliferation outweigh disincentives, and motivation is growing. Arms control regimes harass proliferators without stopping them and fail to offer nonproliferators security.

War fighting concepts are likely to lack clear structure and be highly volatile in terms of enemy, targets, and crisis behavior.

Only a few leadership and military elites—such as Egypt and Israel—have shown a concern with highly structured strategic planning in the past.

The Iran-Iraq and Gulf Wars have demonstrated missiles and weapons of mass destruction will be used.

Israeli actions in 1967 and attack on Osirak and the Egyptian and Syrian attack on Israel in 1973 demonstrate regional focus on surprise and preemption.

Iraq has already demonstrated regional concern with launch on warning and launch under attack options. Syria probably has some option of this kind.

Concentration of population and leadership in single or a few urban areas makes existential attacks possible.

Reasons for Proliferation

Following are some reasons that states seek weapons of mass destruction:

- Prestige
- Deterrence
- War fighting
- Lessons of Iran-Iraq War and Gulf War: Missiles and weapons of mass destruction have been used against military and civilian targets.
- Arms race with neighbors: Algeria-Libya-Morocco, Egypt-Israel-Syria, Iran-Iraq-Southern Gulf.
- The "greater Middle East"—growing overlap of arms races listed above, plus impact of North Korea and India-Pakistan arms race.
- Deterrence and safeguards: No way to know the scale of the efforts of key threats and other major regional actors.
- Intimidation
- Limit or attack United States and other outside power projection options
- Compensate for conventional weakness and cost of conventional weapons.
- "Glitter Factor"
- Alternative to expensive conventional investments
- Create existential threat
- Force arms control; react to absence of meaningful arms control regimes.
- Momentum of arms race/respond to proliferation elsewhere
- State, proxy, or private terrorism.
- Exploit lack of effective civil and critical facility defense and anti-tactical ballistic missile defense capabilities.

War Fighting Options

A list of war fighting options follows:

- Covert: indirect, unconventional warfare, "terrorism"
- Surprise attack to support conventional war fighting
- Avoid conventional defeat
- Pose political threat—intimidation
- Regional deterrence—threatened or illustrative use
- Attack power projection facilities
- Counterproliferation
- Extended deterrence
- Controlled escalation ladder
- Asymmetric escalation/escalation dominance
- "Firebreaks"
- Launch on warning/launch under attack
- Seek to force conflict termination
- Destroy enemy as state
- Martyrdom
- Alter strategic nature of conflict

Strategy, Tactics, and Operations

There are likely to be radical differences in every aspect of strategy, tactics, operations, and capability between Middle Eastern states.

Israel is likely to be only state to develop detailed war plans and tactical employment concepts, and its grand strategy precludes communicating any detailed doctrine of employment and deterrence before a war. Weapons of mass destruction are likely to be used only to prevent the military conquest of Israel after a conventional defeat or in response to major attacks on Israeli population centers.

Many countries may not articulate detailed war plans and employment doctrine beyond the prestige of acquiring such weapons, broad threats, and efforts to intimidate their neighbors and the West.

Even where nations appear to articulate a strategy of deterrence or employment, this may often consist more of words than detailed war fighting capabilities

Most (all?) nations will engage in concealment, denial, and compartmentalization—focusing more on the acquisition and development effort than employment. Targeting plans, test and evaluation, and understanding of lethality will be limited. Joint warfare concepts will rarely be articulated, and doctrine will not be practiced.

WMD forces will often be covert or compartmented from other forces, and under the direct control of ruling elites with little real military experience. Separate lines of C^4I/BM reporting directly to the leadership will be common. Actual weapons may be held separately from delivery systems and by special units chosen more for loyalty than capability.

Any actual employment will be crisis driven, and utilization and escalation will be more a product of the attitudes and decisions of a narrow ruling political elite than any part of the military command chain. Risk taking will often be leader-specific and based on perceptions of a crisis shaped more by internal political attitudes than an objective understanding of the military situation.

Employment is unlikely to be irrational or reckless, but restraint in attacking civilian targets or mass employment against armed forces may be limited. Regimes may also take existential risks in escalating if they feel they are likely to lose power.

The use of proxies and unconventional delivery means may well be improvised without warning.

Proliferating nations will pay highly detailed attention to U.S. counterproliferation and ATBM efforts at the technical level, and the lessons of previous wars. They will seek to steadily improve concealment, denial, and countermeasures.

Arms control will be seen as an extension of conflict and rivalry by other means, not as a valid security option.

Major Uncertainties

Major uncertainties at this time include:

- Uncertain weapons accuracy, reliability, and effectiveness: The CEP problem, the weapons effect problem
- Probable lack of full operational testing of all weapons used: The "Heisenberg factor."
- Acquisition does not mean war planning
- C^4I/BM breakdowns, lack of accurate battle damage assessment by both attacker and attacks.

- Uncertainties coming from use of different types of WMDs and delivery systems.
- Unattributable attacks/proxy attacks.
- Unconventional warfare, mass terrorism, covert delivery, delayed effects
- Impact of "cocktails"—mixes of different agents or types of weapons of mass destruction.
- Reliance on authoritarian leaders or elites who will never take the time to fully understand the technology and effects of weapons of mass destruction for sudden crisis decisions.
- Coupling effects—U.S. linkages to allies
- Different perceptions of values/escalation ladder
- Risk of escalation to "total war"; willingness to risk use of infectious agents.
- Instability of preemption, launch on warning, launch under attack options.
- The risk of martyrdom and nothing to lose: Unplanned "doomsday machines"
- Unexpected collateral damage
- Uncertain impact on conventional conflict
- Uncertain capabilities for NBC defense/counterproliferation
- Impact on peripheral states
- Long-term damage effects
- Next generation arms race

One-Half Cheer for Arms Control

Although many of the states in the Middle East have signed arms control agreements (see Table 8), the process is still a difficult one.

The Egyptian-Israeli dispute has paralyzed ACRS and all near-term progress.

NNPT aids in early to middle phases of proliferation. Transfer of technology for fuel cycle.

IAEA inspection and "visits" to declared facilities help, but can also be manipulated to disguise proliferation.

The strengthened safeguards regime the IAEA has recently agreed upon will strengthen the NPT and IAEA by strengthening inspection at declared facilities and allowing the use of more advanced methods such as environmental sampling. It offers some help in dealing with undeclared facilities.

The 93+2 regime could further strengthen the NNPT and IAEA.

Dual use technology now allows states to carry out virtually all aspects of weapons design and manufacture—including simulated tests.

In spite of Iraq's grandiose effort, the ability to carry out all aspects of nuclear proliferation except acquiring fissile materials is becoming steadily cheaper, smaller in scale, and easier to conceal.

The CWC only affects signer countries and large efforts or those disclosed through SIGINT. It cannot prevent development and assembly of up to several hundred weapons and warheads.

The steady expansion of petrochemical, industrial process plants, and insecticide plants will make it progressively easier to produce chemical weapons without extensive imports of tell-tale feedstocks.

The need to purify and stabilize mustard and nerve agents is now well known, as is the need for more lethal warhead technology. All major proliferators have nerve gas technology.

The BWC has no enforcement provisions and no near- to mid-term prospects of acquiring them.

Advances in biotechnology, food processing systems, and pharmaceuticals mean all regional states will soon be able to covertly mass produce dry storage biological weapons in optimal aerosol form.

The MTCR slows things down and is very valuable, but it has not prevented any determined regional actor from getting missiles.

All credible regional proliferators already have long-range strike aircraft and a wide range of unconventional delivery options.

Only a broadly based UNSCOM/IAEA effort of the kind going on in Iraq—supported by even more intrusive inspection and higher levels of technology—can really enforce arms control, and it might not work for biological weapons.

Table 8. *Middle East signatories and parties to international arms control and non-proliferation treaties*

Country	NNPT	IAEA Full-Scope Safeguards	CWC	BWC	CTBT	African NWFZ
Algeria	A	C	X/R	—	X	X
Bahrain	A	—	X/R	X/WR	X	NA
Comoros	A	—	X	—	X	X
Djibouti	A	—	X	—	X	NA
Egypt	X/R	C	—	X	X	X
Iran	X/R	C	X/R	X/R	X	NA
Iraq	X/R	C	—	X/R	—	NA
Israel	—	—	X	—	X	NA
Jordan	X/R	C	X/R	X/R	X/R	NA
Kuwait	X/R	—	X/R	X/R	X	NA
Lebanon	X/R	C	—	X/R	—	NA
Libya	X/R	C	—	—	—	X
Mauritania	A	—	X/R	—	X	X
Morocco	X/R	C	X/R	X	X	X
Oman	A	—	X/R	X/R	—	NA
Qatar	A	—	X/R	X/R	X/R	NA
Saudi Arabia	A	—	X/R	X/R	—	NA
Somolia	X/R	—	—	X	—	X
Sudan	X/R	C	—	—	—	X
Syria	X/R	C	—	X	—	NA
Tunisia	X/R	C	X/R	X/R	X	X
UAE	A	—	X		X	NA
Yemen	X/R	—	X	X/R	X	NA

X/R = signatory and ratified
A = acceded to treaty
WR = acceded with reservations
X = signatory only
NA= not applicable
ANFWZ = Treaty of Pelindba
C = completed

Source: U.S. Arms Control and Disarmament Agency, August 1998

Proliferation is Already Here: Middle Eastern Case Studies in Creeping Proliferation

Table 9 summarizes the nuclear capabilities of the Middle Eastern states.

Israel relies on nuclear weapons, deterrence, and "soft strike" preemption.

Iran has chemical and probably biological weapons, nuclear effort continues.

Iraq's massive pre-Gulf War efforts will give it a major "break-out" effort the moment UNSCOM/IAEA efforts cease and may give it a major biological break-out capability even with such efforts.

Syria has significant chemical warfare capabilities and will soon acquire significant biological capabilities—if it does not have them already.

The Libyan chemical effort continues.

Algerian and Egyptian efforts are the most uncertain.

Terrorists, extremists, and "proxies" may also acquire such capabilities.

Table 9. *Creeping proliferation affects many key countries*

Country	Weapons of Mass Destruction			Long Range Strike Systems	
	Nuclear	Chemical	Biological	Missiles	Aircraft
Algeria	Research	?	?	No	MiG-23
Libya	Research	Deployed	Research	Scud B	Su-24
Egypt	Research	Stockpile	Research	Scud B	F-16C
Israel	100–200	Developed	Developed	Jericho II	F-15C
Syria	No	Deployed	Developed	Scud C	Su-24
Iran	Developing	Deployed	Deployed	Scud C	Su-24
Iraq	Research	Covert	Covert	Covert	Su-24
Yemen	No	Stockpiled*	No	SS-21*	Su-22

*Probably no longer usable.

The Search for Weapons of Mass Destruction by Middle Eastern Country

Algeria

Delivery Systems

Algeria currently has:

- 10 Su-24 long range strike aircraft
- 40 MiG-23BN fighter ground attack aircraft
- Tube artillery and multiple rocket launchers
- Possible modification of Soviet SS-N-2B Styx

Chemical Weapons

It is possbile that Algeria has developed chemical weapons, but there is no evidence of deployed systems.

Biological Weapons

There has been some early research activity, but no evidence of production capability.

Nuclear Weapons

Algeria secretly built a research reactor (Es Salam) at the Ain Oussera nuclear research facility. This was announced to be a 10–15 megawatt reactor using heavy water and low enriched uranium. The size of its cooling towers, however, indicated it might be as large as 60 megawatts. It was also located far from population centers, had no visible electric generating facilities and was defended by SA-5s. There were also indications Algeria might be constructing a facility to separate out weapons-grade plutonium.

In May 1991, following the exposure of the reactor by U.S. intelligence, Algeria agreed to place it under IAEA safeguards. As early as December 1993, Algerian officials pledged adherence to the NPT, and on 12 January 1995, Algeria formally acceded to the Treaty. On 30March 1996, Algeria signed a comprehensive IAEA safeguards agreement providing for IAEA inspections of all of Algeria's nuclear facilities and IAEA technical assistance to Algeria. The agreement entered into force on 7January 1997.

Algeria signed a "second stage" agreement of nuclear cooperation with China on 1 June 1996. According to an October 1996 "letter of intent," China was to assist Algeria with the construction of facilities for research and the production of radioactive isotopes for use in the medical, industrial, and agricultural sectors. China and Algeria intend to move into a third phase of cooperation under which China will share the know-how to enable Algeria to operate hot cells in the facility (mentioned previously) at the Es Salam compound. These hot cells would give Algeria the capability to separate plutonium from spent fuel. Algeria claims that the hot cells are intended for the purpose of producing medical isotopes, and the United States is reportedly "satisfied" that the hot cells will be operated under IAEA safeguards.

Libya

Delivery Systems

Libya has developed a liquid-fueled missile with a range of 200 kilometers. There is no evidence of deployment.

An Al-Fatih solid-fueled missile with a 300–450 mile range is reported to have been under development with the aid of German technical experts, but there are no signs of successful development.

Libya has FROG-7 rocket launchers with a 40-kilometer range. It deployed 80 Scud B launchers with 190-mile range in 1976, but could not successfully operate the system. Many of the launchers and missiles were sold to Iran.

Libya fired Scud missiles against the Italian island of Lampadusa in 1987.

It purchased SS-N-2C and SSC-3 cruise missiles, but has little operational capability. It has pursued other missile development programs with little success. There are unconfirmed reports of some Libyan interest in the Iranian Shahab 3 program.

Libya also has:

- Tu-22 bombers with minimal operational capability.
- Su-24 long range strike fighters. These are operational and have limited refueling capability using C-130s.
- Operational Mirage 5D/DE and 10 Mirage 5DD fighter ground attack aircraft.
- Mirage F-1AD fighter ground attack aircraft.
- MiG-23BM Flogger F and 14 MiG-23U fighter ground attack.
- Su-20 and Su-22 Fitter E, J. F fighter ground attack aircraft.
- Tube artillery and multiple rocket launchers.

Chemical Weapons

Libya claims it will not sign CWC as long as other states have nuclear weapons. It may have used mustard gas delivered in bombs by AN-26 aircraft in final phases of war against Chad in September 1987.

A pilot plant near Tripoli has been producing small amounts of chemical weapons since early 1980s. There are probably two other small research/batch production facilities.

Libya's main nerve and mustard gas production facilities are in an industrial park at the chemical weapons plant at Rabta. This plant can produce both the poison gas and the bombs, shells, and warheads to contain it. There are probably two other research facilities.

The Rabta plant seems to have started test runs in mid-1988. It is a 30-building facility defended by SAM batteries and special troops. It has sheltered underground areas.

Libya has acquired large stocks of feed-stocks for mustard gas like thiodiglycol and precursors for nerve gas, and extensive amounts have been sent to Rabta. At least 100 metric tons of blister and nerve agents have been produced at Rabta since the late 1980s, but the production rate has been very low. The plant is either not successful or is not being utilized because of fear of attack. The plant would have a capacity of 100 metric tons per year if operated at full capacity. Libya fabricated a fire at Rabta in 1990 to try to disguise the function of plant and fact that it was operating.

German courts convicted a German national in October 1996 for selling Libya a computer designed for use in chemical weapons programs, and helping it import equipment to clean the waste emissions from poison gas production from India, using an Irish dummy corporation.

An additional major chemical weapons plant was in construction in an extensive underground site near Tarhunah, a mountainous area 65 kilometers southeast of Tripoli, but there are few recent signs of activity. Tarhunah has been designed to minimize its vulnerability to air attack and has twin tunnels 200–450 feet long, protected by 100 feet of sandstone above the tunnels and a lining of reinforced concrete. This is far beyond the penetration capabilities of the U.S. GBU-27B and GBU-28 penetration bombs. The GBU-28 can penetrate a maximum of 25–30 meters of earth or 6 meters of concrete.

There are reports of construction of another sheltered major facility near Sabha, 460 miles south of Tripoli.

There are reports of Chinese, North Korean, German, Swiss, and other European technical support and advisors.

Reports of shipments of chemical weapons to Syria and Iran do not seem valid. Weapons designs are of low quality, with poor fusing and lethality.

Biological Weapons

Libya has carried out some early research activity, but there is no evidence of production capability.

Nuclear Weapons

Libya has sought to create a development and production capability, but there is no evidence of any real progress or success. Qadhafi called for Libyan production of nuclear weapons on 29 April 1990.

It unsuccessfully attempted to buy nuclear weapons from China in the 1970s.

It has explored for uranium, but there are no active mines or uranium mills.

Libya acquired a 10-megawatt nuclear research reactor at Tajura from the USSR in the 1970s. It operates under IAEA safeguards.

It had plans to build at 440-megawatt, Soviet-supplied reactor near the Gulf of Sidra in the 1970s, but it canceled the project.

Libya ratified the NPT in 1975, and declares that all facilities are under IAEA safeguards. It continues to train nuclear scientists and technicians abroad.

Egypt

Delivery Systems

Egypt began three major design programs based on the V-2 missile in the 1950s with help from German scientists. It had tested two missiles by 1965: A 350-kilometer range al-Zafir and a 600-kilometer range Al Kahir. A 1,500-kilometer range Ar-Ra'id was designed but never tested. These missiles were liquid fueled aging designs, and development ceased around 1967.

Egypt cooperated with Iraq in paying for development and production of "Badar 2000" missile with a 750–1,000 km range. This missile is reported to be a version of the Argentine Condor II or Vector missile. Ranges were reported from 820–980 km, with the possible use of an FAE warhead.

Egyptian officers were arrested for trying to smuggle carbon materials for a missile out of the United States in June 1988. Covert U.S. efforts seem to have blocked this development effort.

The Condor program seems to have terminated in 1989–1990.

Egypt has Scud B TELs and missiles with approximately 100 missiles with 300-km range.

There are reports that Egypt has developed plant to produce an improved version of the Scud B, and possibly Scud C, with North Korean cooperation. North Korean transfers include equipment for building Scud body, special gyroscope measuring equipment, and pulse-code modulation equipment for missile assembly and testing.

There are reports that in June 1996 Egypt made a major missile purchase from North Korea, and will soon be able to assemble such missiles in country. Seven shipments from North Korea reported in March and April.

Another liquid-fueled missile under development, known as "Project T", has an estimated range of 450 kilometers. It is believed to be an extended-range Scud designed with North Korean assistance.

Media reports that U.S. satellites detected shipments of Scud C missile parts to Egypt in February-May 1996—including rocket motors and guidance devices—do not seem correct. The Scud C has a range of roughly 480 kilometers. The CIA reported in June 1997 that Egypt had acquired Scud B parts from Russia and North Korea during 1996.

The United States suspects that Egypt is developing a liquid-fueled missile, the Vector, with an estimated range of 600–1200 km.

Egypt has cooperated with Iraq and North Korea in developing the Saqr 80 missile This rocket is 6.5 meters long and 210 mm in diameter, and weighs 660 kg. It has a maximum range of 50 miles (80 km) and a 440 lb. (200 km) warhead. Longer-range versions may be available. Egypt also has:

- FROG 7 rocket launch units with 40-km range
- AS-15, SS-N-2, and CSS-N-1 cruise missiles
- F-4E fighter ground attack aircraft
- Mirage 5E2 fighter ground attack
- Mirage 2000EM fighters
- F-16A and 80 F-16C fighters
- Multiple rocket launcher weapons
- Tube artillery

Chemical Weapons

Egypt produced and used mustard gas in the Yemeni civil war in the 1960s, but agents may have been stocks British abandoned in Egypt after World War II. The effort was tightly controlled by Nasser and was unknown to many Egyptian military serving in Yemen. It completed research and designs for production of nerve and cyanide gas before 1973.

Former Egyptian Minister of War, General Abdel Ranny Gamassay stated in 1975 that "if Israel should decide to use a nuclear weapon in the battlefield, we shall use the weapons of mass destruction that are at our disposal."

Egypt seems to have several production facilities for mustard and nerve gas. It may have limited stocks of bombs, rockets, and shells. There are unconfirmed reports of recent efforts to acquire feed stocks for nerve gas. There are some efforts to obtain feed stocks from Canada, and Egypt may now be building its own feed stock plants.

Egypt has the necessary industrial infrastructure for rapid production of cyanide gas.

Biological Weapons

Egypt has the research and technical base, but there is no evidence of major organized research activity.

Nuclear Weapons

Egypt has the research and technical base, but there is no evidence of major organized research activity.

President Mubarak did say in October 1998 that Egypt could acquire nuclear weapons to match Israel's capability if this proves necessary: "If the time comes when we need nuclear weapons, we will not hesitate. I say 'if' we have to because this is the last thing we think about. We do not think of joining the nuclear club." This speech was more an effort to push Israel towards disarmament talks, however, than any kind of threat.

Mubarak also said that Israel "enhances its military expenditure and develops its missile systems that are used for military purposes. It knows very well that this will not benefit it or spare it from harm. Its efforts to use the help of foreign countries will plunge the region ban into a new arms race which serves nobody's interests." Egypt has supported the indefinite extension of the NNPT, has long been officially committed to creating a nuclear weapons-free zone in the Middle East, and had advocated an agreement that would ban all weapons of mass destruction from the region.

Israel

Delivery Systems

As part of its first long-range missile force, Israel deployed up to 50 "Jericho I" (YA-1) missiles in shelters on mobile launchers with up to 400 miles range and a 2,200-lb. payload, and with possible nuclear warhead storage nearby. The missiles were near copies of the two-stage, solid-fueled, French MD-620 missile. Some reports claim the first 14 were built in France. (Some reports give the range as 500 km.)

There are convincing indications that Israel has deployed nuclear armed missiles on mobile launchers. Most outside sources call the first of these missiles the "Jericho I," but Israel has never publicly named its long-range missile systems. These missiles were near-copies of the two-stage, solid-fueled, French MD-620 missile. Some reports claim the first 14 were built in France.

A number of sources indicate that Israel deployed up to 50 "Jericho I" (YA-1) missiles on mobile launchers in shelters in the hills southwest of Jerusalem, with up to 400 miles range and a 2,200-lb. payload, and with possible nuclear warhead storage nearby.

Israel has since gone far beyond the Jericho I in developing long-range missile systems. It has developed and deployed the "Jericho II" (YA-2), which began development in the mid-1970s, and had its first tests in 1986. Israeli carried out a launch in mid-1986 over the Mediterranean that reached a range of 288 miles (460 km). It seems to have been tested in May 1987. A flight across the Mediterranean reached a range of some 510 miles (820 km), landing south of Crete. Another test occurred on 14 September 1989.

Israel launched a missile across the Mediterranean that landed about 250 miles north of Benghazi, Libya. The missile flew over 800 miles, and U.S. experts felt it had a maximum range of up to 900–940 miles (1,450 km)—which would allow the "Jericho II" to cover virtually all of the Arab world and even the Southern USSR.

The most recent version seems to be a two-stage, solid-fueled missile which has a range of up to 900 miles (1,500 km) with a 2,200-lb. payload.

Commercial satellite imaging indicates the "Jericho II" missile may be 14 meters long and 1.5 meters wide. Its deployment configuration hints that it may have radar area guidance similar to the terminal guidance in the Pershing II and probably has deployed these systems.

Some "Jericho IIs" may have been brought to readiness for firing during the Gulf War.

Israel began work on an updated version of the "Jericho II" no later than 1995 in an effort to stretch its range to 2,000 km. At least part of this work may have begun earlier in cooperation with South Africa. Israel is also seeking technology to improve its accuracy, particularly with gyroscopes for the inertial guidance system and associated systems software.

Israel is actively examining ways to lower the vulnerability of its ballistic missiles and nuclear weapons. These include improved hardening, dispersal, use of air-launched weapons, and possible sea-basing.

There are also reports that Israel is developing a "Jericho III" missile, based on a booster it developed with South Africa in the 1980s. The tests of a longer-range missile seem to have begun in the mid-1980s. A major test of such a booster seems to have taken place on 14 September 1989, and resulted in extensive reporting on such cooperation in the press on 25–26 October 1989.

It is possible that that both the booster and any Israeli-South African cooperation may have focused on satellite launches. Since 1994, however, there have been numerous reports among experts that Israel is seeking a missile with a range of at least 4,800 km, and which could fully cover Iran and any other probable threat.

Jane's estimates that the missile has a range of up to 5,000 km and a 1,000-kg warhead. This estimate is based largely on a declassifed DIA estimate of the launch capability of the Shavit booster that Israel tested on 19 September 1988.

Reports of how Israel deploys its missiles differ. Initial reports indicated that 30–50 "Jericho I" missiles were deployed on mobile launchers in shelters in the cases southwest of Tel Aviv. A source claimed in 1985 that Israel had 50 missiles deployed on mobile erector launchers in the Golan on launchers on flat cars that could be wheeled out of sheltered cases in the Negev. (This latter report may confuse the rail transporter used to move missiles from a production facility near Be'er Yaakov to a base at Kefar Zeharya, about 15 kilometers south of Be'er Yaakov.)

More recent reports indicate that Jericho II missiles are located in 50 underground bunkers carved into the limestone hills near a base near Kefar Zeharya. The number that are on alert, command and control and targeting arrangements and the method of giving them nuclear warheads has never been convincingly reported.

Jane's Intelligence Review published satellite photos of what it said was a "Jericho II" missile base at Zachariah ("God remembers with a vengeance") several miles southeast of Tel Aviv in September 1997. According to this report, the transport-erector-launcher (TEL) for the "Jericho II" measures about 16 meters long by 4 meters wide and 3 meters high. The actual missile is about 14 meters long and 1.5 meters wide. The TEL is supported by three support vehicles, including a guidance and power vehicle. The other two vehicles include a communications vehicle and a firing control vehicle. This configuration is somewhat similar to that used in the U.S. Pershing II IRBM system, although there are few physical similarities.

The photos in the article show numerous bunkers near the TEL and launch pad, and the article estimates a force of 50 missiles on the site. It also concludes that the lightly armored TEL would be vulnerable to a first strike, but that the missiles are held in limestone caves behind heavy blast-resistant doors. It estimates that a nuclear-armed M-9 or Scud C could destroy the launch capability of the site.

The same article refers to nuclear weapons bunkers at the Tel Nof airbase, a few kilometers to the northwest. The author concludes that the large number of bunkers indicates that Israel may have substantially more nuclear bombers than is normally estimated—perhaps up to 400 weapons with a total yield of 50 megatons.

Israel has F-15, F-16, F-4E, and Phantom 2000 fighter-bombers capable of long-range refueling and of carrying nuclear and chemical bombs.

Israel bought some Lance missile launchers and 160 Lance missiles with 130-km range, from the United States in the 1970s. The United States removed Lance missiles from active duty during 1991–1994. The status of the Israeli missiles is unknown.

There are reports of the development of a long-range, nuclear armed version of Popeye with GPS guidance, and of studies of possible cruise missile designs that could be both surface-ship and submarine based. A variant of the Popeye air-to-surface missile is believed to have nuclear warhead.

The MAR-290 rocket with a 30-km range is believed to be deployed The MAR-350 surface-to-surface missile with range of 56 miles and 735-lb. payload is believed to have completed development or to be in early deployment.

Israel is seeking super computers for Technion Institute (designing ballistic missile RVs), Hebrew University (may be engaged in hydrogen bomb research), and Israeli Military Industries (maker of "Jericho II" and Shavit booster).

A current review of Israel's military doctrine seems to include a review of its missile basing options and the study of possible hardening and dispersal systems. There are also reports that Israel will solve its survivability problems by deploying some form of nuclear-armed missile on its new submarines.

Chemical Weapons

Reports of mustard and nerve gas production facility established in 1982 in the restricted area in the Sinai near Dimona seem incorrect. Israel may have additional facilities and the capacity to produce other gases. It has probable stocks of bombs, rockets, and artillery. There has been extensive laboratory research into gas warfare and defense.

An El Al 747-200 cargo plane crashed in southern Amsterdam on 4 October 1992, killing 43 people in the apartment complex it hit. This led to extensive examination of the crash, and the plane was found to be carrying 50 gallons of dimethyl methylphosphonate, a chemical used to make Sarin nerve gas. The chemical had been purchased from Solkatronic Chemicals in the United States and was being shipped to the Israel Institute for Biological Research. It was part of an order of 480 pounds of the chemical. Two of the three other chemicals used in making Sarin were shipped on the same flight. Israel at first denied this and then claimed it was only being imported to test gas masks.

Israel may have the contingency capability to produce at least two types of chemical weapons and has certainly studied biological weapons as well as chemical ones. According to one interview with an Israeli source of unknown reliability, Israel has mustard gas, persistent and non-persistent nerve gas, and may have at least one additional agent.

Development of defensive systems includes Shalon Chemical Industries protection gear, Elbit Computer gas detectors, and Bezal R&D air-crew protection systems.

Israel has conducted extensive field exercises in chemical defense. It has gas mask stockpiles, and distributed them to its population with other civil defense instructions during the Gulf War.

Israel has warhead delivery capability for bombs, rockets, and missiles, but none now believed to be equipped with chemical agents.

Biological Weapons

Israel has made extensive research into weapons and defense. It is ready to quickly produce biological weapons, but there are no reports of active production effort.

According to some reports, Israel revitalized its chemical warfare facilities south of Dimona in the mid-1980s, after Syria deployed chemical weapons and Iraq began to use these weapons in the Iran-Iraq War.

Israel has at least one major research facility with sufficient security and capacity to produce both chemical and biological weapons. There are extensive reports that Israel has a biological weapons research facility at the Israel Institute for Biological Research at Nes Tona, about 12 miles south of Tel Aviv, and that this same facility also has worked on the development and testing of nerve gas. This facility has created enough public concern in Israel that the mayor of Nes Tona has asked that it be moved away from populated areas. The facility is reported to have stockpiled anthrax and to have provided toxins to Israeli intelligence for use in covert operations and assassinations such as the attempt on a Hamas leader in Jordan in 1997.

The Israel Institute for Biological Research is located in a 14-acre compound with high walls and exceptional security, and is believed to have a staff of around 300, including 120 scientists. A former deputy head, Marcus Kingberg, served 16 years in prison for spying for the FSU.

U.S. experts privately state that Israel is one of the nations included on U.S. lists of nations with biological and chemical weapons. They believe that Israel has at least some stocks of weaponized nerve gas, although they may be stored in forms that require binary agents to be loaded into binary weapons.

They believe that Israel has fully developed bombs and warheads capable of effectively disseminating dry, storable biological agents in micropowder form and has agents considerably more advanced than anthrax. Opinion differs over whether such weapons are actively loaded and deployed. Unconfirmed reports by the British *Sunday Times* claimed that IAF F-16s are equipped for strikes using both these weapons and chemical weapons.

Nuclear Weapons

The director of CIA indicated in May 1989 that Israel may be seeking to construct a thermonuclear weapon.

Israel has two significant reactor projects: the 5-megawatt HEU light-water IRR I reactor at Nahal Soreq, and the 40–150-megawatt heavy water IRR-2 natural uranium reactor used for the production of fissile material at Dimona. Only the IRR-1 is under IAEA safeguards.

Dimona has conducted experiments in pilot scale laser and centrifuge enrichment, purifies UO2, converts UF6, and fabricates fuel for weapons purpose.

There is uranium phosphate mining in Negev, near Beersheba, and yellow cake is produced at two plants in the Haifa area and one in southern Israel. There is a pilot-scale heavy water plant operating at Rehovot.

Jane's Intelligence Review published an article in September 1997 which refers to nuclear weapons bunkers at the "Jericho II" missile base at Zachariah, several miles southeast of Tel Aviv, and at Tel Nof airbase, a few kilometers to the northwest. The author concludes that the large number of bunkers indicates that Israel may have substantially more nuclear bombers than is normally estimated: perhaps up to 400 weapons with a total yield of 50 megatons.

Estimates of numbers and types of weapons differ sharply. There is a stockpile of at least 60–80 plutonium weapons, and Israel may have well over 100 nuclear weapons assemblies, with some weapons with yields over 100 kilotons.

U.S. experts believe Israel has highly advanced implosion weapons. Israel is known to have produced Lithium-6, allowing production of both tritium and lithium deuteride at Dimona, although the facility is no longer believed to be operating.

Some weapons may be ER variants or have variable yields. A stockpile of up to 200–300 weapons is possible.

Major weapons facilities include production of weapons-grade plutonium at Dimona, a nuclear weapons design facility at Nahal Soreq (south of Tel Aviv), a missile test facility at Palmikim, a nuclear armed missile storage facility at Kefar Zekharya, a nuclear weapons assembly facility at Yodefat, and a tactical nuclear weapons storage facility at Eilabun in eastern Galilee.

Missile Defenses

Israel has Patriot missiles with a future PAC-3 upgrade to reflect lessons of the Gulf War.

Israel has Arrow 2 two-stage ATBM with slant intercept ranges at altitudes of 8–10 and 50 km and speeds of up to Mach 9, and is possibly developing the Rafael AB-10 close-in defense missile with ranges of 10–20 km and speeds of up to Mach 4.5. Taas rocket motor, Rafael warhead, and Tadiran BM/C^4I system and "Music" phased array radar.

Israel plans to deploy three batteries of the Arrow to cover Israel, each with four launchers. This will protect up to 85 percent of its population. It seeks to deploy the system early in the 2000s.

The Arrow program has three phases:

Phase I: Validate defense concept and demonstrate pre-prototype missile
Fixed-price contract: $158 million
United States pays 80 percent, Israel pays 20 percent.
Completed in December 1982.

Phase II: Demonstrate lethality, develop and demonstrate tactical interceptor and launcher
Fixed-price contract: $330 million.
United States pays 72 percent, Israel pays 28 percent.
Began in July 1991.
Successfully completed.

Phase III: Develop and integrate tactical system, conduct weapon system tests, and develop and implement interoperability
Program cost estimated at $616 million.
United States pays 48 percent, Israel pays 52 percent.
Began in March 1996.
System integration in progress.

The Arrow will be deployed in batteries as a wide-area defense system with intercepts normally at reentry or exoatmospheric altitudes. It is capable of multi-target tracking and multiple intercepts.

Israel has designed the Nautilus laser system for rocket defense in a joint project with the United States. It has developed into the Theater High Energy Laser (THEL). The project has recently been expanded to include interception of not only short-range rockets and artillery, but also medium-range Scuds and longer-range missiles such as Iran's Shahab series.

Israel is also examining the possibility of boost-phase defenses. The Rafael Moab UAV forms part of the Israeli Boost-phase Intercept System. This is intended to engage TBMs soon after launch, using weapons fired from a UAV. Moab would launch an improved Rafael Python 4 air-to-air missile. Range is stated as 80–100km depending on altitude of release.

Advanced Intelligence Systems

The Shavit I launched Israel's satellite payload on 19 September 1989. It used a three-stage booster system capable of launching a 4,000-lb. payload over 1,200 miles or a 2,000-lb. payload over 1,800 miles. It is doubtful that it had a payload capable of intelligence missions and seems to have been launched, in part, to offset the psychological impact of Iraq's missile launches.

Ofeq 2 was launched in April 1990—one day after Saddam Hussein threatened to destroy Israel with chemical weapons if it should attack Baghdad.

Israel launched its first intelligence satellite on 5 April 1995, covering Syria, Iran, and Iraq in orbit every 90 minutes. The Ofeq 3 satellite is a 495-lb. system launched using the Shavit launch rocket, and is believed to carry an imagery system. Its orbit passes over or near Damascus, Tehran, and Baghdad.

An agreement signed with the United States in April 1996 will provide Israel with missile early warning, launch point, vector, and point of impact data.

Syria

Delivery Systems

Syria has four SSM brigades: 1 with FROG, 1 with Scud Bs, 1 with Scud Cs, and 1 with SS-21s.

It has 18 SS-21 launchers and at least 36 SS-21 missiles with 80–100 km range. It may be developing chemical warheads.

Some experts believe some Syrian surface-to-surface missiles armed with chemical weapons began to be stored in concrete shelters in the mountains near Damascus and in the Palmyra region no later than 1986, and that plans have existed to deploy them forward in an emergency since that date.

Syria has up to 12 Scud B launchers and 200 Scud B missiles with 310-km range. It is believed to have chemical warheads. A Scud B warhead weighs 985 kilograms.

Syria has new long-range North Korean Scud Cs deployed. Two brigades of 18 launchers each are said to be deployed in a horseshoe shaped valley. This estimate of 36 launchers is based on the fact there are 36 tunnels into the hillside. The launchers must be for the Scud C since the older Scud Bs would not be within range of most of Israel. Up to 50 missiles are stored in bunkers to north as possible reloads. There is a maintenance building and barracks.

Estimates indicate that Syria has 24–36 Scud launchers for a total of 260–300 missiles of all types. The normal ratio of launchers to missiles is 10:1, but Syria is focusing on both survivability and the capability to launch a large preemptive strike.

The Scud Cs have ranges of up to 550–600 km and a CEP of 1,000–2,600 meters. Nerve gas warheads using VX with cluster bomblets seem to have begun production in early 1997. Syria is believed to have 50–80 Scud C missiles.

A training site exists about 6 km south of Hama, with an underground facility where TELs and missiles are stored.

Syria can now build both the entire Scud B and Scud C. Sheltered and/or underground missile production/assembly facilities at Aleppo, Hama, and near Damascus have been built with aid from Chinese, Iranian, and North Korean technicians. There is possibly some Russian technical aid as well.

A missile test site exists 15 km south of Homs, where Syria has tested missile modifications and new chemical warheads. It has heavy perimeter defenses, a storage area and bunkers, heavily sheltered bunkers, and a missile storage area just west of the site. According to some reports, Syria has built two missile plants near Hama, about 110 miles north of Damascus.

One is for solid fueled rockets and the other is for liquid fueled systems. North Korea may have provided the equipment for the liquid fuel plant, and Syria may now be able to produce the missile.

There are reports of Chinese deliveries of missiles but little hard evidence. There are reports of PRC deliveries of missile components by China Precision Machinery Company, maker of the M-11, in July 1996. The M-11 has a 186-mile (280 km) range with a warhead of 1,100 pounds.

Some sources believe M-9 missile components, or M-9-like components have been delivered to Syria. Missile is reported to have a CEP as low as 300 meters.

Jane's reported in March 1999 that Syria had created a production facility to build both the M-11 (CSS-7/DF-11) and M-9 missiles with ranges of 280 and 600–800 km respectively. It reports that production of the booster stage of the M-11 began in 1996, and that missile production is expected to start "soon."

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Syria has shorter-range systems as well. Short-range M-1B missiles (up to 60 miles range) seem to be in delivery from PRC.

Syria may be converting some long-range surface-to-air and naval cruise missiles to use chemical warheads. It seems to be negotiating for PRC-made M-9 missile (185 to 375-mile range)

In addition, Syria has:

- SS-N-3, and SSC-1b cruise missiles
- 20 Su-24 long range strike fighters
- 30–60 operational MiG-23BM Flogger F fighter ground attack aircraft
- 20 Su-20 fighter ground attack aircraft
- 60–70 Su-22 fighter ground attack aircraft
- 18 FROG-7 launchers and rockets
- Multiple rocket launchers and tube artillery.

Syria has improved its targeting capability in recent years by making extensive direct and indirect use of commercial satellite imagery, much of which now offers 3-meter levels of resolution and comes with coordinate data with near GPS-like levels of accuracy. One-meter levels of resolution will become commercially available.

Chemical Weapons

Syria first acquired small amounts of chemical weapons from Egypt in 1973. It began production of non-persistent nerve gas in 1984, and may have had chemical warheads for missiles as early as 1985.

Experts believe Syria has stockpiled 500 to 1,000 metric tons of chemical agents. It is believed to have begun deploying VX in late 1996 or early 1997.

The CIA reported in June 1997 that Syria had acquired new chemical weapons technology from Russia and Eastern Europe in 1996.

There are unconfirmed reports of sheltered Scud missiles with unitary Sarin or Tabun nerve gas warheads (now being replaced by cluster warheads with VX bomblets) deployed in caves and shelters near Damascus.

Syria tested Scuds in a manner indicating possible chemical warheads in 1996 and seems to have cluster warheads and bombs. It may have VX and Sarin in modified Soviet ZAB-incendiary bombs and PTAB-500 cluster bombs. It acquired a design for a Soviet Scud warhead using VX in the 1970s.

Major nerve gas and possible other chemical agent production facilities are located north of Damascus. There are two to three plants. One facility is located near Homs and is next to a major petrochemical plant. It reportedly produces several hundred tons of nerve gas a year. There are reports that it is building a major new plant near Aleppo.

There are reports that a facility co-located with the Center d'Etdues et de Recherche Scientifique (CERS) is developing a warhead with chemical bomblets for the Scud C. Many parts of the program are dispersed and compartmented. Missiles, rockets, bombs, and artillery shells are produced/modified and loaded in other facilities. Many may be modified to use VX bomblets.

Syria has a wide range of delivery systems. It has conducted extensive testing of chemical warheads for Scud Bs and may have tested chemical warheads for Scud Cs. It has shells, bombs, and nerve gas warheads for multiple rocket launchers. FROG warheads may be under development.

Reports of SS-21 capability to deliver chemical weapons are not believed by U.S. or Israeli experts, but Israeli sources believe Syria has binary weapons and cluster bomb technology suitable for delivering chemical weapons.

Biological Weapons

Syria signed, but did not ratify the 1972 Biological and Toxin Weapons Convention. It has made an extensive research effort.

An ACDA report in August 1996 indicated that, "it is highly probably that Syria is developing an offensive biological capability."

There are reports of one underground facility and one near the coast. There is probable production capability for anthrax and botulism, and possibly other agents.

Israeli sources claim Syria weaponized Botulin and Ricin toxin in early 1990s, and probably anthrax. There are limited indications that Syria may be developing or testing biological variations on ZAB-incendiary bombs and PTAB-500 cluster bombs and Scud warheads.

Major questions exist regarding Syria's strike capabilities. Older types of biological weapons using wet agents, and placed in older bomb and warhead designs with limited dissemination capability, can achieve only a small fraction of the potential effectiveness of biological weapons. Dry micropowders using advanced agents—such as the most lethal forms of anthrax—can have the effectiveness of small theater nuclear weapons. It is difficult to design adequate missile warheads to disseminate such agents, but this is not beyond Syrian capabilities, particularly since much of the technology needed to make effective cluster munitions and bomblets for VX gas can be adapted to the delivery of biological weapons.

The design of biological bombs and missile warheads with the lethality of small nuclear weapons may now be within Syrian capabilities, as is the design of UAV, helicopter, cruise missile, or aircraft-borne systems to deliver the agent slowly over a long line of flight, taking maximum advantage of wind and weather conditions. U.S. and Soviet tests proved that this kind of "line source" delivery could achieve lethalities as high as 50–100 kiloton weapons by the late 1950s, and the technology is well within Syria's grasp. So is the use of proxy or covert delivery.

Nuclear Weapons

Syria has an ongoing research effort, but there is no evidence of major progress in its development effort. It announced nuclear reactor purchase plans, including a 10-megawatt research reactor and six power reactors in 1980s, but this was never implemented. It has a miniature 30-kilowatt neutron-source reactor, but this is unsuitable for weapons production.

Missile Defenses

Syria is seeking a Russian S-300 or S-400 surface-to-air missile system with limited anti-tactical ballistic missile capability.

Iran

Delivery Systems

The Soviet-designed Scud B (17E) guided missile currently forms the core of Iran's ballistic missile forces—largely as a result of the Iran-Iraq War.

The Scud B is a relatively old Soviet design which first became operational in 1967, designated as the R-17E or R-300E. The Scud B has a range of 290–300 km with its normal conventional payload. The export version of the missile is about 11 meters long, 85–90 cm in diameter, and weighs 6,300 kg. It has a nominal CEP of 1,000 meters. The Russian versions can be equipped with conventional high explosive, fuel air explosive, runway penetrator, submunition, chemical, and nuclear warheads.

The export version of the Scud B comes with a conventional high explosive warhead weighing about 1,000 kg, of which 800 kg are the high explosive payload and 200 are the warhead structure and fusing system. It has a single-stage storable liquid rocket engine and is usually deployed on the MAZ-543 eight wheel transporter-erector-launcher (TEL). It has a strap-down inertial guidance, using three gyros to correct its ballistic trajectory, and uses internal graphite jet vane steering. The warhead hits at a velocity above Mach 1.5.

Most estimates indicate that Iran now has 6–12 Scud launchers and up to 200 Scud B (R-17E) missiles with a 230–310 km range. Some estimates give higher figures. They estimate Iran bought 200–300 Scud Bs from North Korea between 1987 and 1992, and may have continued to buy such missiles after that time. Israeli experts estimate that Iran had at least 250–300 Scud B missiles and at least 8–15 launchers on hand in 1997.

U.S. experts also believe that Iran can now manufacture virtually all of the Scud B, with the possible exception of the most sophisticated components of its guidance system and rocket motors. This makes it difficult to estimate how many missiles Iran has in inventory and can acquire over time, as well as to estimate the precise performance characteristics of Iran's missiles, since it can alter the weight of the warhead and adjust the burn time and improve the efficiency of the rocket motors

Iran has new long-range North Korean Scuds with ranges near 500 km. The North Korean missile system is often referred to as a "Scud C."

Typically, Iran formally denied the fact it had such systems long after the transfer of these missiles became a reality. Hassan Taherian, an Iranian foreign ministry official, stated in February 1995 that "There is no missile cooperation between Iran and North Korea whatsoever. We deny this." In fact, a senior North Korean delegation traveled to Tehran to close the deal on 29 November 1990, and met with Mohsen Rezaei, the former commander of the IRGC. Iran either bought the missile then or placed its order shortly thereafter. North Korea then exported the missile through its Lyongaksan Import Corporation. Iran imported some of these North Korean missile assemblies using its B-747s, and seems to have used ships to import others.

Iran probably had more than 60 of the longer-range North Korean missiles by 1998, although other sources report 100, and one source reports 170.

Iran may have 5–10 Scud C launchers, each with several missiles. This total seems likely to include four new North Korean TELs received in 1995.

Iran seems to want enough missiles and launchers to make its missile force highly dispersible.

Iran has begun to test its new North Korean missiles. There are reports it has fired them from mobile launchers at a test site near Qom about 310 miles (500 km) to a target area south of Shahroud. There are also reports that units equipped with such missiles have been deployed as part of Iranian exercises like the Saeqer-3 (Thunderbolt 3) exercise in late October 1993.

The missile is more advanced than the Scud B, although many aspects of its performance are unclear. North Korea seems to have completed development of the missile in 1987, after obtaining technical support from the People's Republic of China. While it is often called a "Scud C," it seems to differ substantially in detail from the original Soviet Scud B. It seems to be based more on the Chinese-made DF-61 than on a direct copy of the Soviet weapon.

Experts estimate that the North Korean missiles have a range of around 310 miles (500 km), a warhead with a high explosive payload of 700 kkg, and relatively good accuracy and reliability. While this payload is a bit limited for the effective delivery of chemical agents, Iran might modify the warhead to increase payload at the expense of range and restrict the using of chemical munitions to the most lethal agents such as persistent nerve gas. It might also concentrate its development efforts on arming its Scud C forces with more lethal biological agents. In any case, such missiles are likely to have enough range-payload to give Iran the ability to strike all targets on the southern coast of the Gulf and all of the populated areas in Iraq, although not the West. Iran could also reach targets in part of eastern Syria and the eastern third of Turkey and cover targets in the border area of the former Soviet Union, western Afghanistan, and western Pakistan

Accuracy and reliability remain major uncertainties, as does operational CEP. Much would also depend on the precise level of technology Iran deployed in the warhead. Neither Russia nor the People's Republic of China seem to have transferred the warhead technology for biological and chemical weapons to Iran or Iraq when they sold them the Scud B missile and CSS-8. However, North Korea may have sold Iran such technology as part of the Scud C deal. If it did so, such a technology transfer would save Iran years of development and testing in obtaining highly lethal biological and chemical warheads. In fact, Iran would probably be able to deploy far more effective biological and chemical warheads than Iraq had at the time of the Gulf War.

Iran may be working with Syria in such development efforts, although Middle Eastern nations rarely cooperate in such sensitive areas. Iran served as a transshipment point for North

Korean missile deliveries during 1992 and 1993. Some of this transshipment took place using the same Iranian B-747s that brought missile parts to Iran. Others moved by sea. For example, the *Des Hung Ho*, a North Korean vessel bringing missile parts for Syria, docked at Bandar Abbas in May 1992. Iran then flew the parts to Syria. An Iranian ship coming from North Korea and a second North Korean ship followed, carrying missiles and machine tools for both Syria and Iran. At least 20 of the North Korean missiles have gone to Syria from Iran, and production equipment seems to have been transferred to Iran and to Syrian plants near Hama and Aleppo.

Iran has created shelters and tunnels in its coastal areas which it could use to store Scud and other missiles in hardened sites, reducing their vulnerability to air attack.

Iran can now assemble Scud and Scud C missiles using foreign-made components. It may soon be able to make entire missile systems and warhead packages in Iran.

Iran is developing an indigenous missile production capability with both solid and liquid fueled missiles. It seems to be seeking the capability to produce MRBMs.

The present scale of Iran's production and assembly efforts is unclear. Iran seems to have a design center, at least two rocket and missile assembly plants, a missile test range and monitoring complex, and a wide range of smaller design and refit facilities.

The design center is said to located at the Defense Technology and Science Research Center, which is a branch of Iran's Defense Industry Organization, outside Karaj near Tehran. This center directs a number of other research efforts. Some experts believe it has support from Russian and Chinese scientists.

Iran's largest missile assembly and production plant is said to be a North Korean–built facility near Isfahan, although this plant may use Chinese equipment and technology. There are no confirmations of these reports, but this region is the center of much of Iran's advanced defense industry, including plants for munitions, tank overhaul, and helicopter and fixed wing aircraft maintenance. Some reports say the local industrial complex can produce liquid fuels and missile parts from a local steel mill.

A second missile plant is said to be located 175 km east of Tehran, near Semnan. Some sources indicate this plant is Chinese-built and began rocket production as early as 1987. It is supposed to be able to build 600–1,000 Oghab rockets per year, if Iran can import key ingredients for solid fuel motors like ammonium perchlorate. The plant is also supposed to produce the Iran-130.

Another facility may exist near Bandar Abbas for the assembly of the Seersucker. China is said to have built this facility in 1987, and is believed to be helping the naval branch of the Guards to modify the Seersucker to extend its range to 400 km. It is possible that China is also helping Iran develop solid fuel rocket motors and produce or assemble missiles like the CS-801 and CS-802. There have, however, been reports that Iran is developing extended-range Scuds with the support of Russian experts, and of a missile called the Tondar 68, with a range of 700 km.

Still other reports claim that Iran has split its manufacturing facilities into plants near Pairzan, Seman, Shiraz, Maghdad, and Islaker. These reports indicate that the companies involved in building the Scuds are also involved in Iran's production of poison gas and include Defense Industries, Shahid, Bagheri Industrial Group, and Shahid Hemat Industrial Group.

Iran's main missile test range is said to be further east, near Shahroud along the Tehran-Mashhad railway. A telemetry station is supposed to be 350 km to the south at Taba, along the Mashhad-Isfahan road. All of these facilities are reportedly under the control of the Islamic Revolutionary Guards Corps.

Recent reports and tests have provided more detail on the Shahab system. Some U.S. experts believe that Iran tested booster engines capable of driving a missile ranges of 1,500 km in 1997. Virtually all U.S. experts believe that Iran is rapidly approaching the point where it will be able to manufacture missiles with much longer ranges than the Scud B.

It is less clear when Iran will be able to bring such programs to the final development stage, carry out suitable test firings, develop effective warheads, and deploy actual units. Much may still depend on the level of foreign assistance.

Eitan Ben Eliyahu, the commander of the Israeli Air Force, reported on 14 April 1997 that Iran had tested a missile capable of reaching Israel. The background briefings to his statement implied that Russia was assisting Iran in developing two missiles with ranges of 620 and

780 miles. Follow-on intelligence briefings provided by Israel in September 1997 indicated that Russia was helping Iran develop four missiles. U.S. intelligence reports indicate that China has also been helping Iran with some aspects of these missile efforts.

These missiles include the Shahab ("meteor") missiles, with performance similar to those previously identified with Iranian missiles adapted from North Korean designs.

The Israeli reports indicated that the Shahab 3 was a liquid-fueled missile with a range of 810 miles (1,200–1,500 km) and a payload of 1550 pounds (700 kg). Israel claimed the Shahab might be ready for deployment as early as 1999**.**

Iran tested the Sahab 3 on 21 July 1998, claiming that it was a defensive action to deal with potential threats from Israel. The missile flew for a distance of up to 620 miles, before it exploded about 100 seconds after launch. U.S. intelligence sources could not confirm whether the explosion was deliberate, but indicated that the final system might have a range of 800–940 miles (a maximum of 1,240 km), depending on its payload. The test confirmed the fact that the missile was a liquid-fueled system.

General Mohammad Bagher Qalibaf, head of the Islamic Revolutionary Guards Corps' air wing, publicly reported on 2 August 1998 that the Shahab-3 is 53-foot-long ballistic missile that can travel at 4,300 mph and carry a one-ton warhead at an altitude of nearly 82,000 feet. He claimed that the weapon was guided by an Iranian-made system that gives it great accuracy: "The final test of every weapon is in a real war situation but, given its warhead and size, the Shahab-3 is a very accurate weapon."

Other Iranian sources reported that the missile had a range of 800 miles. On 1 August 1998, President Mohammad Khatami stated that Iran was determined to continue to strengthen its armed forces, regardless of international concerns: "Iran will not seek permission from anyone for strengthening its defense capability."

Martin Indyck, the U.S. Assistant Secretary for Near East Affairs testified on 28 July that the United States estimated that the system needed further refinement but might be deployed in its initial operational form between September 1998 and March 1999.

Iran publicly displayed the Shahab 3 on its launcher during a parade on 25 September 1998. The missile carrier bore signs saying, "The U.S. can do nothing" and "Israel will be wiped from the map."

There are some reports of a Shahab-3B missile with extended range and a larger booster. The resulting system seems to be close to both the No-Dong and Pakistani Ghauri or Haff-5 missile, first tested in April 1998, raising questions about Iranian–North Korean–Pakistani cooperation.

There have been growing reports that Iran might be using Russian technology to develop a long-range missile with ranges from 2,000–6,250 km.

Israeli and U.S. intelligence sources have reported that that Iran is developing the Shahab 4, with a range of 2,000 km (1,250 miles), a payload of around 2,000 pounds, and a CEP of around 2,400 meters. Some estimates indicate that this system could be operational in 2–5 years. The U.S. Assistant Secretary for Near East Affairs testified on 28 July 1998 that the United States estimated that the system still needed added foreign assistance to improve its motors and guidance system.

Some reports indicate that the Shahab 4 is based on the Soviet SS-4 missile, others that there is a longer range Shahab 5, based on the SS-4 or Tapeo Dong missile. Reports saying the Shahab is based on the SS-4 say it has a range of up to 4,000 km and a payload in excess of one ton.

Iran may have two other missile programs that include longer-range systems, variously reported as having maximum ranges of 3,650, 4,500–5,000, 6,250, or 10,000 km.

It seems clear that Iran has obtained some of the technology and design details of the Russian SS-4. The SS-4 (also known as the R-12 or "Sandal") is an aging Russian liquid fuel design that first went into service in 1959, and which was supposedly destroyed as part of the IRBM Treaty. It is a very large missile, with technology dating back to the early 1950s, although it was evidently updated at least twice during the period between 1959 and 1980. It has a CEP of 2–4 km and a maximum range of 2,000 km, which means it can only be lethal with a nuclear warhead or a biological weapon with near-nuclear lethality.

At the same time, the SS-4's overall technology is relatively simple and it has a throw weight of nearly 1,400 kg (3,000 pounds). It is one of the few missile designs that a nation with a limited technology base could hope to manufacture or adapt, and its throw weight and range would allow Iran to use a relatively unsophisticated nuclear device or biological warhead. As a result, an updated version of the SS-4 might be a suitable design for a developing country.

Iran is reported to have carried out the test of a sea-launched ballistic missile in 1998.

A U.S. examination of Iran's dispersal, sheltering, and hardening programs for its anti-ship missiles and other missile systems indicate that Iran has developed effective programs to ensure that they would survive a limited number of air strikes. It also found that Iran had reason to believe that the limited number of preemptive strikes Israel could conduct against targets in the lower Gulf could not be effective in denying Iran the capability to deploy its missiles.

Iran has shorter missile range systems as well. In 1990, it bought CSS-8 surface-to-surface missiles (converted SA-2s) from China with ranges of 130–150 km. It has Chinese sea and land-based anti-ship cruise missiles. Iran fired 10 such missiles at Kuwait during Iran-Iraq War, hitting one US-flagged tanker.

Iran has acquired much of the technology necessary to build long-range cruise missile systems from China.

Iran also has Su-24 long-range strike fighters with range-payloads roughly equivalent to US F-111 and superior to older Soviet medium bombers, and F-4D/E fighter bombers with capability to carry extensive payloads to ranges of 450 miles. It can modify HY-2 Silkworm missiles and SA-2 surface-to-air missiles to deliver weapons of mass destruction.

Iran has made several indigenous long-range rockets. The Iran-130, or Nazeat, has been developed since the end of the Iran-Iraq War. The full details of this system remain unclear, but it seems to use commercially available components, a solid fuel rocket, and a simple inertial guidance system to reach ranges of about 90–120 km. It is 355 mm in diameter, 5.9 meters long, weighs 950 kg, and has a 150-kg warhead. It seems to have poor reliability and accuracy, and its payload only seems to be several hundred kilograms.

The Shahin 2 is another indigenous long-range rocket. It too has a 355-mm diameter, but is only 3.87 meters long, and weighs only 580 kg. It evidently can be equipped with three types of warheads: A 180-kg high explosive warhead, another warhead using high explosive submunitions, and a warhead that uses chemical weapons.

Iran also has the Iranian Oghab (Eagle) rocket with a 40+ km range. A new SSM with 125-mile range may be in production, but could be modified FROG. Iran has large numbers of multiple rocket launchers and tube artillery for short-range delivery of chemical weapons.

Chemical Weapons

Iran purchased large amounts of chemical defense gear from the mid-1980s onwards. Iran also obtained stocks of non-lethal CS gas, although it quickly found such agents had very limited military impact since they could only be used effectively in closed areas or very small open areas.

Acquiring poisonous chemical agents was more difficult. Iran did not have any internal capacity to manufacture poisonous chemical agents when Iraq first launched its attacks with such weapons. While Iran seems to have made limited use of chemical mortar and artillery rounds as early as 1985—and possibly as early as 1984—these rounds were almost certainly captured from Iraq.

Iran had to covertly import the necessary equipment and supplies, and it took several years to get substantial amounts of production equipment and the necessary feedstocks. Iran sought aid from European firms such as Lurgi to produce large "pesticide" plants, and began to try to obtain the needed feedstock from a wide range of sources, relying heavily on its Embassy in Bonn to manage the necessary deals. While Lurgi did not provide the pesticide plant Iran sought, Iran did obtain substantial support from other European firms and feedstocks from many other Western sources.

By 1986–1987, Iran had developed the capability to produce enough lethal agents to load its own weapons. The director of the CIA and informed observers in the Gulf made it clear that Iran could produce blood agents like hydrogen cyanide, phosgene gas, and/or chlorine gas. Iran was also able to weaponize limited quantities of blister (sulfur mustard) and blood (cyanide) agents beginning in 1987, and had some capability to weaponize phosgene gas and/or chlorine gas. These chemical agents were produced in small batches, and evidently under laboratory-scale conditions, which enabled Iran to load small numbers of weapons before any of its new major production plants went into full operation. These gas agents were loaded into bombs and artillery shells, and were used sporadically against Iraq in 1987 and 1988.

Reports regarding Iran's production and research facilities are highly uncertain. Iran seems to have completed a major poison gas plant at Qazvin, about 150 km west of Tehran. This plant was reportedly completed between November 1987 and January 1988. While supposedly a pesticide plant, the facility's true purpose seems to have been poison gas production using organo-phosphorous compounds.

It is impossible to trace all the sources of the major components and technology Iran used in its chemical weapons program during this period. Mujahideen sources claim Iran also set up a chemical bomb and warhead plant operated by the Zakaria Al-Razi chemical company near Mahshar in southern Iran, but it is unclear whether these reports are true. Reports that Iran had chemical weapons plants at Damghan and Parchin in operation as early as March 1988, and may have begun to test fire Scuds with chemical warheads as early as 1988–1989, are equally uncertain.

Iran established at least one large research and development center under the control of the Engineering Research Centre of the Construction Crusade (Jahad e-Sazandegi), and had established a significant chemical weapons production capability by mid-1989.

Debates took place in the Iranian parliament or Majlis in late 1988 over the safety of Pasdaran gas plants located near Iranian towns, and Rafsanjani described chemical weapons as follows: "Chemical and biological weapons are poor man's atomic bombs and can easily be produced. We should at least consider them for our defense. Although the use of such weapons is inhuman, the war taught us that international laws are only scraps of paper."

Post Iran-Iraq War estimates of Iran chemical weapons production are extremely uncertain. U.S. experts believe Iran was beginning to produce significant mustard gas and nerve gas by the time of the August 1988 cease-fire in the Iran-Iraq War, although its use of chemical weapons remained limited and had little impact on the fighting

Iran's efforts to equip plants to produce V-agent nerve gases seem to have been delayed by U.S., British, and German efforts to limit technology transfers to it, but Iran may have acquired the capability to produce persistent nerve gas during the mid-1990s. Production of nerve-gas weapons started no later than 1994.

Iran began to stockpile cyanide (cyanogen chloride), phosgene, and mustard gas weapons after 1985. Recent CIA testimony indicates that production capacity may approach 1,000 tons annually.

Weapons include bombs and artillery. Shells include 155-mm artillery and mortar rounds. Iran also has chemical bombs and mines. It may have developmental chemical warheads for its Scuds, and may have a chemical package for its 22006 RPV, although this is doubtful.

There are reports that Iran has deployed chemical weapons on some of its ships.

Iran has increased chemical defensive and offensive warfare training since 1993. It is seeking to buy more advanced chemical defense equipment, and has sought to buy specialized equipment on the world market to develop indigenous capability to produce advanced feedstocks for nerve weapons.

The United States imposed sanctions on seven Chinese firms in May 1997 for selling precursors for nerve gas and equipment for making nerve gas, although the United States made it clear that it had, "no evidence that the Chinese government was involved." The Chinese firms were the Nanjing Chemical Industries Group and Jiangsu Yongli Chemical Engineering and Import/Export Corporation. Cheong Yee Ltd., a Hong Kong firm, was also involved. The precursors included tionyl chloride, dimethylamine, and ethylene chlorohydril. The equipment included special glass-lined vessels, and Nanjing Chemical and Industrial Group completed construction of a production plant to manufacture such vessels in Iran in June 1997.

Iran sought to obtain impregnated alumina, which is used to make phosphorous-oxychloride—a major component of VX and GB—from the United States.

It has obtained some equipment from Israelis. Nahum Manbar, an Israeli national living in France, was convicted in an Israeli court in May 1997 for providing Iran with $16 million worth of production equipment for mustard and nerve gas during the period from 1990 to 1995.

The CIA reported in June 1997 that Iran had obtained new chemical weapons equipment technology from China and India in 1996.

India is assisting in the construction of a major new plant at Qazvim, near Tehran, to manufacture phosphorous pentasulfide, a major precursor for nerve gas. The plant is fronted by Meli Agrochemicals, and the program was negotiated by Dr. Mejid Tehrani Abbaspour, a chief security advisor to Rafsanjani.

A recent report by German intelligence indicates that Iran has made major efforts to acquire the equipment necessary to produce Sarin and Tabun, using the same cover of purchasing equipment for pesticide plants that Iraq used for its Sa'ad 16 plant in the 1980s. German sources note that three Indian companies—Tata Consulting Engineering, Transpek, and Rallis India—have approached German pharmaceutical and engineering concerns for such equipment and technology under conditions where German intelligence was able to trace the end user to Iran.

Iran ratified the Chemical Weapons Convention in June 1997. It submitted a statement in Farsi to the CWC secretariat in 1998, but this consisted only of questions in Farsi as to the nature of the required compliance. It has not provided the CWC with any data on its chemical weapons program.

Biological Weapons

Iran has extensive laboratory and research capability. A Weapons effort is documented as early as 1982. Reports surfaced that Iran had imported suitable type cultures from Europe and was working on the production of mycotoxins—a relatively simple family of biological agents that require only limited laboratory facilities for small-scale production.

U.S. intelligence sources reported in August 1989 that Iran was trying to buy two new strains of fungus from Canada and the Netherlands that can be used to produce mycotoxins. German sources indicated that Iran had successfully purchased such cultures several years earlier.

The Imam Reza Medical Center at Mashhad Medical Sciences University and the Iranian Research Organization for Science and Technology were identified as the end users for this purchasing effort, but it is likely that the true end user was an Iranian government agency specializing in biological warfare.

Many experts believe that the Iranian biological weapons effort was placed under the control of the Islamic Revolutionary Guards Corps, which is known to have tried to purchase suitable production equipment for such weapons.

Since the Iran-Iraq War, Iran has conducted research on more lethal active agents like anthrax, hoof and mouth disease, and biotoxins. In addition, Iranian groups have repeatedly approached various European firms for the equipment and technology necessary to work with these diseases and toxins.

Unclassified sources of uncertain reliability have identified a facility at Damghan as working on both biological and chemical weapons research and production, and it is believed that Iran may be producing biological weapons at a pesticide facility near Tehran. Some universities and research centers may be linked to the biological weapons program.

Reports surfaced in the spring of 1993 that Iran had succeeded in obtaining advanced biological weapons technology in Switzerland and containment equipment and technology from Germany. According to these reports, this led to serious damage to computer facilities in a Swiss biological research facility by unidentified agents. Similar reports indicated that agents had destroyed German bio-containment equipment destined for Iran.

More credible reports by U.S. experts indicate that Iran has begun to stockpile anthrax and botulinum in a facility near Tabriz, can now mass manufacture such agents, and has them in an aerosol form. None of these reports, however, can be verified.

The CIA has reported that Iran has "sought dual-use biotech equipment from Europe and Asia, ostensibly for civilian use." It also reported in 1996 that Iran might be ready to deploy biological weapons. Beyond this point, little unclassified information exists regarding the details of Iran's effort to "weaponize" and produce biological weapons.

Iran may have the production technology to make dry storable and aerosol weapons. This would allow it to develop suitable missile warheads and bombs and covert devices.

Iran may have begun active weapons production in 1996, but probably only at limited scale suitable for advanced testing and development.

CIA testimony indicates that Iran is believed to have weaponized both live agents and toxins for artillery and bombs and may be pursuing biological warheads for its missiles. The CIA reported in 1996 that, "We believe that Iran holds some stocks of biological agents and weapons. Tehran probably has investigated both toxins and live organisms as biological warfare agents. Iran has the technical infrastructure to support a significant biological weapons program with little foreign assistance.

The CIA reported in June 1997 that Iran had obtained new dual use technology from China and India during 1996.

Iran announced in June 1997 that it would not produce or employ chemical weapons including toxins.

Nuclear Weapons

The Shah established the Atomic Energy Organization of Iran in 1974, and rapidly began to negotiate for nuclear power plants. The Shah also started a nuclear weapons program in the early- to mid-1970s, building upon his major reactor projects, investment in URENCO, and smuggling of nuclear enrichment and weapons related technology from the United States and Europe.

There is a 5-megawatt light-water research reactor operating in Tehran and a 27-kilowatt neutron-source reactor operating in Isfahan.

Iran started two massive 1300-megawatt reactor complexes, and the Shah attempted to covertly import controlled technology from the United States.

In 1984, Khomeini revived nuclear weapons program begun under the Shah.

Iran received significant West German and Argentine corporate support in some aspects of nuclear technology during the Iran-Iraq War. There have been limited transfers of centrifuge and other weapons-related technology from the PRC, and possibly from Pakistan. Iran has a Chinese-supplied heavy-water, zero-power research reactor at Isfahan Nuclear Research Center, and two-Chinese supplied sub-critical assemblies—a light water and graphite design.

Iran has stockpiles of uranium and mines in Yazd area. It may have had a uranium-ore concentration facility at University of Tehran, but its status is unclear.

Some experts feel that the IRGC moved experts and equipment from the Amirabad Nuclear Research Center to a new nuclear weapons research facility near Isfahan in the mid-1980s, and formed a new nuclear research center at the University of Isfahan in 1984—with French assistance. Unlike many Iranian facilities, the center at Isfahan was not declared to the IAEA until February 1992, when the IAEA was allowed to make a cursory inspection of six sites that various reports had claimed were the location of Iran's nuclear weapons efforts.

Bushehr I & II, on the Gulf Coast just southwest of Isfahan, were partially completed at the time of the Shah's fall. Iran attempted to revive the program and sought German and Argentine support, but the reactors were damaged by Iraqi air strikes in 1987 and 1988.

Iran may also have opened a new uranium-ore processing plant close to its Shagand uranium mine in March 1990, and it seems to have extended its search for uranium ore into three additional areas. Iran may have also begun to exploit stocks of yellow cake that the Shah had obtained from South Africa in the late 1970s, while obtaining uranium dioxide from Argentina by purchasing it through Algeria.

Iran began to show a renewed interest in laser isotope separation (LIS) in the mid-1980s, and held a conference on LIS in September 1987.

Iran opened a new nuclear research center in Isfahan in 1984, located about four km outside the city between the villages of Shahrida and Fulashans. This facility was built at a scale far beyond the needs of peaceful research, and Iran sought French and Pakistani help for a new research reactor for this center.

The Khomeini government may also have obtained several thousand pounds of uranium dioxide from Argentina by purchasing it through Algeria. Uranium dioxide is considerably more refined than yellow cake and is easier to use in irradiating material in a reactor to produce plutonium.

The status of Iran's nuclear program since the Iran-Iraq War is highly controversial, and Iran has denied the existence of such a program. The IAEA reports that Iran has fully complied with its present requirements and that it has found no indications of nuclear weapons effort, but IAEA only inspects Iran's small research reactors.

The IAEA visits to other Iranian sites are not inspections, and do not use instruments, cameras, seals, and so on. They are informal walk-throughs. The IAEA visited five suspect Iranian facilities in 1992 and 1993 in this manner, but did not conduct full inspections.

Iran has not had any 93+2 . Its position on improved inspections is that it will not be either the first or the last to have them.

Iranian officials have repeatedly complained that the West tolerated Iraqi use of chemical weapons and its nuclear and biological build-up during the Iran-Iraq War, and has a dual standard where it does not demand inspections of Israel or that Israel sign the NPT.

There are reasons to assume that Iran still has a nuclear program. Iran attempted to buy highly enriched fissile material from Khazakstan. The United States paid between $20 million and $30 million to buy 1,300 pounds of highly enriched uranium from the Ust-Kamenogorsk facility in Khazakstan that Iran may have sought to acquire in 1992. A total of 120 pounds of the material—enough for two bombs—cannot be fully accounted for.

Iran has imported maraging steel, sometimes used for centrifuges, by smuggling it in through dummy fronts. Britain intercepted a 110-pound (50-kilo) shipment in August 1996. Iran seems to have centrifuge research program at Sharif University of Technology in Tehran, although an IAEA "visit" did not confirm this.

Those aspects of Iran's program that are visible indicate that Iran has had only uncertain success. Argentina agreed to train Iranian technicians at its Jose Balaseiro Nuclear Institute, and sold Iran $5.5 million worth of uranium for its small Amirabad Nuclear Research Center reactor in May 1987. A CENA team visited Iran in late 1987 and early 1988, and seems to have discussed selling Iran the technology necessary to operate its reactor with 20 percent enriched uranium (a substitute for the highly enriched core provided by the United States) and possibly uranium enrichment and plutonium reprocessing technology. Changes in Argentina's government, however, made it much less willing to support proliferation. The Argentine government announced in February 1992, that it was canceling an $18 million nuclear technology sale to Iran because it had not signed a nuclear safeguards arrangement. Argentine press sources suggested, however, that Argentina was reacting to U.S. pressure.

In February 1990 a Spanish paper reported that Associated Enterprises of Spain was negotiating the completion of the two nuclear power plants at Bushehr. Another Spanish firm, ENUSA (National Uranium Enterprises), was to provide the fuel, and Kraftwerke Union (KWU) would be involved. Later reports indicated that a 10-man delegation from Iran's Ministry of Industry was in Madrid negotiating with the Director of Associated Enterprises, Adolofo Garcia Rodriguez.

Iran negotiated with Kraftwerke Union and CENA of Germany in the late 1980s and early 1990s. Iran attempted to import reactor parts from Siemens in Germany and Skoda in Czechoslovakia. None of these efforts solved Iran's problems in rebuilding its reactor program, but all demonstrate the depth of its interest.

Iran took other measures to strengthen its nuclear program during the early 1990s. It installed a cyclotron from Ion Beam Applications in Belgium at a facility in Karzaj in 1991.

Iran conducted experiments in uranium enrichment and centrifuge technology at its Sharif University of Technology in Tehran. Sharif University was also linked to efforts to import cylinders of fluorine suitable for processing enriched material and attempts to import specialized magnets that can be used for centrifuges from Thyssen in Germany in 1991. It is clear from Iran's imports that it has sought centrifuge technology ever since. Although many of Iran's efforts have never been made public, British customs officials seized 110 pounds of maraging steel being shipped to Iran in July 1996.

Iran seems to have conducted research into plutonium separation and Iranians published research on uses of tritium that had applications to nuclear weapons boosting. Iran also obtained a wide range of U.S. and other nuclear literature with applications for weapons designs. In 1993 Italian inspectors seized eight steam condensers bound for Iran that could be used in a covert reactor program, and high technology ultrasound equipment suitable for reactor testing was seized at the port of Bari in January 1994.

Other aspects of Iran's nuclear research effort had potential weapons applications. Iran continued to operate an Argentine-fueled 5-megawatt light water highly enriched uranium reactor at the University of Tehran. It is operated by a Chinese-supplied neutron source research reactor, and subcritical assemblies with 900 grams of highly enriched uranium, at its Isfahan

Nuclear Research Center. This Center has experimented with a heavy water zero-power reactor, a light water sub-critical reactor, and a graphite sub-critical reactor. In addition, it may have experimented with some aspects of nuclear weapons design.

The German Ministry of Economics has circulated a wide list of Iranian fronts that are known to have imported or attempted to import controlled items. These fronts include the Bonyad e-Mostazafan; Defense Industries Organization (Sazemane Sanaye Defa); Pars Garma Company, the Sadadja Industrial Group (Sadadja Sanaye Daryaee); Iran Telecommunications Industry (Sanaye Mokhaberet Iran); Shahid Hemat Industrial Group, the State Purchasing Organization, Education Research Institute (ERI); Iran Aircraft Manufacturing Industries (IAI); Iran Fair Deal Company, Iran Group of Surveyors; Iran Helicopter Support and Renewal Industries (IHI); Iran Navy Technical Supply Center; Iran Tehran Kohakd Daftar Nezarat, Industrial Development Group; and the Ministry of Defense (Vezerate Defa).

Iran claims it eventually needs to build enough nuclear reactors to provide 20 percent of its electric power. This Iranian nuclear power program presents serious problems in terms of proliferation. Although the reactors are not ideal for irradiating material to produce plutonium or cannibalizing the core, they do provide Iran with the technology base to make its own reactors, have involved other technology transfer helpful to Iran and can be used to produce weapons if Iran rejects IAEA safeguards.

Russia has agreed to build up to four reactors, beginning with a complex at Bushehr with two 1,000–1,200 megawatt reactors and two 465-megawatt reactors, and to provide significant nuclear technology.

Russia has consistently claimed the light water reactor designs for Bushehr cannot be used to produce weapons-grade plutonium and are similar to the reactors the United States is providing to North Korea. The United States has claimed, however, that Victor Mikhaliov, the head of Russia's Atomic Energy Ministry, proposed the sale of a centrifuge plant in April 1995. The United States also indicated that it had persuaded Russia not to sell Iran centrifuge technology as part of the reactor deal during the summit meeting between President's Clinton and Yeltsin in May 1995.

It was only after U.S. pressure that Russia publicly stated that it never planned to sell centrifuge and advanced enrichment technology to Iran, and Iran denied that it had ever been interested in such technology. For example, the statement of Mohammed Sadegh Ayatollahi, Iran's representative to the IAEA, stated that, "We've had contracts before for the Bushehr plant in which we agreed that the spent fuel would go back to the supplier. For our contract with the Russians and Chinese, it is the same." According to some reports, Russia was to reprocess the fuel at its Mayak plant near Chelyabinsk in the Urals, and could store it at an existing facility, at Krasnoyarsk-26 in southern Siberia.

Russian Nuclear Energy Minister Yevgeny Adamov and Russian Deputy Prime Minister Vladimir Bulgak visited in March 1998 and dismissed U.S. complaints about the risk the reactors would be used to proliferate.

Russia indicated that it would go ahead with selling two more reactors for construction at Bushehr within the next five years.

The first 1,000-megawatt reactor at Bushehr has experienced serious construction delays. In March 1998, Russia and Iran agreed to turn the construction project into a turn-key plant because the Iranian firms working on infrastructure had fallen well behind schedule. In February, Iran had agreed to fund improved safety systems. The reactor is reported to be on a 30-month completion cycle.

The United States persuaded the Ukraine not to sell Iran $45 million worth of turbines for its nuclear plant in early March 1998 and to strengthen its controls on Ukrainian missile technology under the MTCR.

U.S. estimates of Iran's progress in acquiring nuclear weapons have become more conservative with time. In 1992, the CIA estimated that Iran would have the bomb by the year 2000. In 1995, John Holum testified that Iran could have the bomb by 2003. In 1997, after two years in which Iran might have made progress, he testified that Iran could have the bomb by 2005–2007.

U.S. experts increasingly refer to Iran's efforts as "creeping proliferation," and there is no way to tell when or if Iranian current efforts will produce a weapon. Unclassified lists of potential facilities have little credibility.

Timing of weapons acquisition depends heavily on whether Iran can buy fissile material.

If so, it has the design capability and can produce weapons in 1–2 years. If it must develop the capability to process plutonium or enrich uranium it is likely to be 5–10 years.

The control of fissile material in the FSU remains a major problem. U.S. estimates indicate the FSU left a legacy of some 1,485 tons of nuclear material. This includes 770 tons in some 27,000 weapons, including 816 strategic bombs, 5,434 missile warheads, and about 20,000 theater and tactical weapons. In addition, there were 715 tons of fissile or near-fissile material in eight countries of the FSU in over 50 sites, enough to make 35,000–40,000 bombs. There are large numbers of experienced FSU technicians, including those at the Russian weapons design center at Arzamas, and at nuclear production complexes at Chelyabinsk, Krasnoyarsk, and Tomsk.

These factors led the United States to conduct Operation Sapphire in 1994, where the United States removed 600 kg of highly enriched uranium from the Ulba Metallurgy Plant in Kazakhstan at a time Iran was negotiating for the material.

The most detailed reports of Iran's nuclear weapons program are the least reliable, and come from the People's Mujahideen, a violent, anti-regime, terrorist group. Such claims are very doubtful, but the People's Mujahideen has reported the following:

- Iran's facilities include a weapons site called Ma'allem Kelayah, near Qazvin on the Caspian. This is said to be an IRGC-run facility established in 1987, which has involved an Iranian investment of $300 million. Supposedly, the site was to house the 10-megawatt reactor Iran tried to buy from India.
- Two Soviet reactors were to be installed at a large site at Gorgan on the Caspian, under the direction of Russian physicists.

The People's Republic of China provided uranium enrichment equipment and technicians for the site at Darkhouin, where Iran once planned to build a French reactor.

- A nuclear reactor was being constructed at Karaj; and another nuclear weapons facility exists in the south central part of Iran, near the Iraqi border.
- The ammonia and urea plant that the British firm M. W. Kellog was building at Borujerd in Khorassan province near the border with Turkestan, might be adapted to produce heavy water.
- The Amir Kabar Technical University, the Atomic Energy Organization of Iran (AEOI) (also known as the Organization for Atomic Energy of Iran or AEOI), Dor Argham Ltd., the Education and Research Institute, GAM Iranian Communications, Ghoods Research Center, Iran Argham Co., Iran Electronic Industries, Iranian Research Organization, Ministry of Sepah, Research and Development Group, Sezemane Sanaye Defa, the Sharif University of Technology, Taradis Iran Computer Company, and Zakaria Al-Razi Chemical Company are all participants in the Iranian nuclear weapons effort.

Other sources based on opposition data have listed the Atomic Energy Organization of Iran, the Laser Research Center and Ibn-e Heysam Research and Laboratory Complex, the Bonab Atomic Energy Research Center (East Azerbaijan), the Imam Hussein University of the Revolutionary Guards, the Jabit bin al-Hayyan Laboratory, the Khoshomi uranium mine (Yazd), a possible site at Moallem Kalayeh, the Nuclear Research Center at Tehran University, the Nuclear Research Center for Agriculture and Medicine (Karaj), the Nuclear Research Center of Technology (Isfahan), the Saghand Uranium mine (Yazd), the Sharif University (Tehran) and its Physics Research Center as participants.

Missile Defenses

Iran is seeking a Russian S-300 or S-400 surface-to-air missile system with limited anti-tactical ballistic missile capability.

Iraq

Delivery Systems

Prior to the Gulf War Iraq had extensive delivery systems incorporating long-range strike aircraft with refueling capabilities and several hundred regular and improved, longer-range Scud missiles, some with chemical warheads. These systems included:

- Tu-16 and Tu-22 bombers
- MiG-29 fighters

- Mirage F-1, MiG-23BM, and Su-22 fighter attack aircraft
- A Scud force with a minimum of 819 missiles.
- Extended-range Al Husayn Scud variants (600-km range) extensively deployed throughout Iraq and at three fixed sites in northern, western, and southern Iraq
- Development of Al-Abbas missiles (900-km range), which could reach targets in Iran, the Persian Gulf, Israel, Turkey, and Cyprus.
- Long-range super guns with ranges of up to 600 kilometers.

The UN estimates that it is able to account for 817 of the 819 long-range missiles that Iraq imported in the period ending in 1988:

Pre-1980 expenditures, such as training	8
Expenditures during the Iran-Iraq War (1980–1981), including the war of the cities in February–April 1988	516
Testing activities for the development of Iraq's modifications of imported missiles and other experimental activities (1985-1990)	69
Expenditures during the Gulf War (January–March 1991)	93
Destruction under the supervision of UNSCOM	48
Unilateral destruction by Iraq (mid-July and October 1991	83

UNSCOM's analysis has shown that Iraq had destroyed 83 of the 85 missiles it had claimed were destroyed. At the same time, it stated that Iraq had not given an adequate account of its proscribed missile assets, including launchers, warheads, and propellants. UNSCOM also reports that it supervised the destruction of 10 mobile launchers, 30 chemical warheads, and 18 conventional warheads.

Iraq maintains a significant delivery capability consisting of HY-2, SS-N-2, and C-601 cruise missiles, which are unaffected by UN cease-fire terms; FROG-7 rockets with 70-km ranges, also allowed under UN resolutions; multiple rocket launchers and tube artillery; and experimental conversions such as the SA-2.

Iraq claims to have manufactured only 80 missile assemblies, 53 of which were unusable. UNSCOM claims that 10 are unaccounted for. U.S. experts believe Iraq may still have components for several dozen extended-range Scud missiles.

In addition, Iraq has admitted to:

- Hiding its capability to manufacture its own Scuds.
- Developing an extended-range variant of the FROG-7 called the Laith. The UN claims to have tagged all existing FROG-7s to prevent any extension of their range beyond the UN imposed limit of 150 km for Iraqi missiles.
- Experimenting with cruise missile technology and ballistic missile designs with ranges up to 3,000 km.
- Flight testing Al Husayn missiles with chemical warheads in April 1990.
- Developing biological warheads for the Al Husayn missile as part of Project 144 at Taji.
- Initiating a research and development program for a nuclear warhead missile delivery system.
- Successfully developing and testing a warhead separation system.
- Indigenously developing, testing, and manufacturing advanced rocket engines to include liquid-propellant designs.
- Conducting research into the development of Remotely Piloted Vehicles (RPVs) for the dissemination of biological agents.
- Attempting to expand its Ababil-100 program designed to build surface-to-surface missiles with ranges beyond the permitted 100–150 km.
- Importing parts from Britain, Switzerland, and other countries for a 350-mm "super gun," as well as starting an indigenous 600-mm super gun design effort.

U.S. and UN officials conclude that Iraq is trying to rebuild its ballistic missile program using a clandestine network of front companies to obtain the necessary materials and technology from European and Russian firms. This equipment is then concealed and stockpiled for assembly concomitant with the end of the UN inspection regime.

The equipment sought by Iraq includes advanced missile guidance components such as accelerometers and gyroscopes, specialty metals, special machine tools, and a high-tech, French-made, million-dollar furnace designed to fabricate engine parts for missiles.

In November 1995, Iraq was found to have concealed an SS-21 missile it had smuggled in from Yemen. Jordan found that Iraq was smuggling missile components through Jordan in early December 1995. These included 115 gyroscopes in 10 crates, and material for making chemical weapons. The shipment was worth an estimated $25 million. Iraq claimed the gyroscopes were for oil exploration, but they are similar to those used in the Soviet SS-N-18 SLBM. UNSCOM also found some gyroscopes dumped in the Tigris.

Iraq retains the technology it acquired before the war, and evidence clearly indicates an ongoing research and development effort in spite of the UN sanctions regime. The fact that the agreement allows Iraq to continue producing and testing short-range missiles (less than 150-km range) means it can retain significant missile development effort.

The SA-2 is a possible test bed, but UNSCOM has tagged all missiles and monitors all high apogee tests. Iraq's Al-Samoud and Ababil-100 programs are similar test beds. The Al-Samoud is a scaled-down Scud that Iraq seems to have tested.

Iraq continues to expand its missile production facility at Ibn Al Haytham, which has two new buildings large enough to make much longer-range missiles. U.S. satellite photographs reveal that Iraq has rebuilt its Al-Kindi missile research facility.

Ekeus reported on 18 December 1996 that Iraq retained missiles, rocket launchers, fuel, and command systems to "make a missile force of significance". UNSCOM reporting as of October 1997 is more optimistic, but notes that Iraq "continued to conceal documents describing its missile propellants, and the material evidence relating to its claims to have destroyed its indigenous missile production capabilities indicated it might have destroyed less than a tenth of what it claimed"

Chemical Weapons

Iraq is the only major recent user of weapons of mass destruction. Table 10 summarizes the current status of Iraq's chemical weapons program. In revelations to the UN, Iraq admitted that, prior to the Gulf War, it:

- Procured more than 1,000 key pieces of specialized production and support equipment for its chemical warfare program.
- Maintained large stockpiles of mustard gas and the nerve agents Sarin and Tabun.
- Produced binary Sarin-filled artillery shells, 122-mm rockets, and aerial bombs.
- Manufactured enough precursors to produce 70 tons (70,000 kg) of the nerve agent VX. These precursors included 65 tons of choline and 200 tons of phosphorous pentasulfide and di-isopropylamine
- Tested Ricin, a deadly nerve agent, for use in artillery shells.
- Had three flight tests of long-range Scuds with chemical warheads.
- Had a large VX production effort underway at the time of the Gulf War.

The destruction of the related weapons and feedstocks has been claimed by Iraq, but not verified by UNSCOM. Iraq seems to have had at least 3,800 kg of V-agents by time the of the Gulf War, and 12–16 missile warheads.

The majority of Iraq's chemical agents were manufactured at a supposed pesticide plant located at Muthanna. Other production facilities were also used, including those at Salman Pak, Samara, and Habbiniyah. Though severely damaged during the war, the physical plant for many of these facilities has been rebuilt.

Iraq possessed the technology to produce a variety of other persistent and non-persistent agents.

The Gulf War and the subsequent UN inspection regime may have largely eliminated some of stockpiles and reduced production capability. As of February 1998, UNSCOM had supervised the destruction of a total of 40,000 munitions, 28,000 filled and 12,000 empty; 480,000 liters of chemical munitions; 1.8 million liters of chemical precursors; and eight types of delivery systems including missile warheads.

U.S. and UN experts believe Iraq has concealed significant stocks of precursors. Iraq also appears to retain significant amounts of production equipment dispersed before, or during, Desert Storm and not recovered by the UN. UNSCOM reports that Iraq has failed to account for the following: special missile warheads intended for filling with chemical or biological warfare agents; the material balance

Table 10. *Current status of the Iraqi chemical weapons program*

Agent	Declared	Potential unaccounted for	Comments
Chemical Agents	**(metric tons)**	**(metric tons)**	
VX Nerve Gas	3	300	Iraq lied about the program until 1995
G Agents (Sarin)	100–150	200	Figures include weaponized and bulk agents
Mustard Gas	500–600	200	Figures include weaponized and bulk agents
Delivery Systems	**(number)**	**(number)**	
Missile warheads	75–100	2–5	UNSCOM supervised destruction of 30
Rockets	100,000	15,000–25,000	UNSCOM supervised destruction of 40,000, 28,000 of which were filled.
Aerial bombs	16,000	2,000–8,000	High estimate reflects the data found in an Iraqi Air Force document in July, 1998.
Artillery shells	30,000	15,000	
Aerial spray tanks	?	?	

Note: According to U.S. intelligence as of 19 February 1998 and corrected by the National Intelligence Council on 16 November 1998.

of some 550 155-mm mustard gas shells, the extent of VX programs, and the rationale for the acquisition of various types of chemical weapons; 130 tons of chemical warfare agents; some 4,000 tons of declared precursors for chemical weapons; the production of several hundred tons of additional chemical warfare agents; the consumption of chemical precursors; 107,500 empty casings for chemical weapons; and whether several thousand additional chemical weapons were filled with agents. The unilateral destruction of 15,620 weapons, and the fate of 16,038 additional weapons Iraq claimed it had discarded is also in question. "The margin of error" in the accounting presented by Iraq is in the neighborhood of 200 munitions."

Iraq systematically lied about the existence of its production facilities for VX gas until 1995 and made "significant efforts" to conceal its production capabilities after that date. Uncertainties affecting the destruction of its VX gas still affect some 750 tons of imported precursor chemicals and 55 tons of domestically produced precursors. Iraq has made unverifiable claims that 460 tons were destroyed by Coalition air attacks, and that it unilaterally destroyed 212 tons. UNSCOM has only been able to verify the destruction of 155 tons and to destroy a further 36 tons on its own.

Iraq has developed basic chemical warhead designs for Scud missiles, rockets, bombs, and shells. Iraq also has spray dispersal systems. It maintains extensive stocks of defensive equipment.

The UN feels that Iraq is not currently producing chemical agents, but Iraq has offered no evidence that it has destroyed its VX production capability and/or stockpile. Further, Iraq retains the technology it acquired before the war, and evidence clearly indicates an ongoing research and development effort in spite of the UN sanctions regime.

Recent UNSCOM work confirms that Iraq did deploy gas-filled 155-mm artillery and 122-mm multiple rocket rounds into the rear areas of the KTO during the Gulf War.

Iraq's chemical weapons had no special visible markings, and were often stored in the same area as conventional weapons.

Iraq has the technology to produce stable, highly lethal VX gas with long storage times. It may have developed improved binary and more stable weapons since the Gulf War.

Since 1992, Iraq attempted to covertly import precursors and production equipment for chemical weapons through Qatar, Saudi Arabia, and Jordan since the Gulf War.

A U.S. State Department spokesman reported on 16 November 1998 that Iraq has reported making 8,800 pounds (four tons) of VX nerve gas, 220,000 pounds (100 tons) to 330,000 pounds (150 tons) of nerve agents such as Sarin, and 1.1 million pounds (500 tons) to 1.32 million pounds (600 tons) of mustard gas. Data from UN weapons inspectors indicates that Iraq may have produced an additional 1.32 million pounds (600 tons) of these agents, divided evenly among the three. "In other words, these are the differences between what they say they have and what we have reason to believe they have."

Biological Weapons

Iraq had a highly compartmented "black" program with far tighter security regulations than its chemical program. Table 11 summarizes it's biological weapons program. Iraq had 18 major sites for some aspect of biological weapons effort before the Gulf War. Most were nondescript and had no guards or visible indications that they were military facilities.

Reports indicate that Iraq tested at least 7 principal biological agents for use against humans. Anthrax, botulinum, and aflatoxin are known to be weaponized. Iraq also looked at viruses, bacteria, and fungi and examined the possibility of weaponizing gas gangrene and mycotoxins. Some field trials were held of these agents.

Iraq examined foot and mouth disease, haemorrhagic conjunctivitis virus, rotavirus, and camel pox virus. It conducted research on a "wheat pathogen" and a mycotoxin similar to "yellow rain" defoliant. The "wheat smut" was first produced at Al Salman, and then put in major production during 1987–1988 at a plant near Mosul. Iraq claims the program was abandoned.

The August 1995 defection of Lieutenant General Husayn Kamel Majid, formerly in charge of Iraq's weapons of mass destruction, revealed the extent of their biological weapons program. Kamel's defection prompted Iraq to admit that it had:

- Imported 39 tons of growth media (31,000 kg or 68,200 lb.) for biological agents from three European firms. According to UNSCOM, 3,500 kg (or 7,700 lbs.) remains unaccounted for. Some estimates go as high as 17 tons. Each ton can be used to produce 10 tons of bacteriological weapons.
- Imported type cultures from the United States which can be modified to develop biological weapons.
- Had laboratory- and industrial-scale capability to manufacture various biological agents, including the bacteria which cause anthrax and botulism; aflatoxin, a naturally occurring carcinogen; clostridium perfringens, a gangrene-causing agent; the protein toxin Ricin; tricothecene mycotoxins, such as T-2 and DAS; and an anti-wheat fungus known as wheat cover smut. Iraq also conducted research into the rotavirus, the camel pox virus and the virus which causes haemorrhagic conjunctivitis.
- Created at least seven primary production facilities including the Sepp Institute at Muthanna, the Ghazi Research Institute at Amaria, the Daura Foot and Mouth Disease Institute, and facilities at Al-Hakim, Salman Pak Taji, and Fudaliyah. According to UNSCOM, weaponization occurred primarily at Muthanna through May 1987 (largely botulinum), and then moved to Al Salman (anthrax). In March 1988 a plant was open at Al Hakim, and in 1989 an aflatoxin plant was set up at Fudaliyah.
- Had a test site about 200 km west of Baghdad; used animals in cages and tested artillery and rocket rounds against live targets at ranges up to 16 km.
- Took fermenters and other equipment from Kuwait to improve effort during the Gulf War.

Iraq had least 79 civilian facilities capable of playing some role in biological weapons production still in existence in 1997.

Total Iraqi production of more orthodox biological weapons reached at least 19,000 liters of concentrated botulinum (10,000 liters filled into munitions); 8,500 liters of concentrated anthrax (6,500 liters filled into munitions); and 2,500 liters of concentrated aflatoxin (1,850 liters filled into munitions). It manufactured 6,000 liters of concentrated botulinum toxin and 8,425 liters of anthrax at Al-Hakim during 1990; 5400 liters of concentrated botulinum toxin at the Daura Foot and Mouth Disease Institute from November 1990 to 15 January 1991; 400

Table 11. *Current status of the Iraqi biological weapons program*

Agent	Declared concentrated amount		Declared total amount		Uncertainty	Comments
	liters	gallons	liters	gallons		
Anthrax	8,500	12,245		85,000	22,457	Could be 3-4 times declared amount
Botulinum toxin	19,400	NA		380,000	NA	Probably twice declared amount. Some extremely concentrated.
Gas gangrene Clostridium perfingens	340	90		3,400	900	Amounts could be higher
Aflatoxin	NA	NA		2,200	581	Major uncertainties
Ricin	NA	NA		10	2.7	Major uncertainties

Note: According to U.S. intelligence as of 19 February 1998.

liters of concentrated botulinum toxin at Taji; and 150 liters of concentrated anthrax at Salman Pak.

Iraq is also known to have produced at least 1,850 liters of aflatoxin in solution at Fudaliyah; 340 liters of concentrated clostridium perfringens, a gangrene-causing biological agent, beginning in August 1990; and 10 liters of concentrated Ricin at Al Salam (Iraq claims it abandoned this work after tests failed).

Iraq weaponized at least three biological agents for use in the Gulf War. The weaponization consisted of at least 100 bombs and 16 missile warheads loaded with botulinum; 50 R-400 air-delivered bombs and 5 missile warheads loaded with anthrax; and 4 missile warheads and 7 R-400 bombs loaded with aflatoxin. The warheads were designed for operability with the Al Husayn Scud variant.

Iraq had other weaponization activities. It armed 155-mm artillery shells and 122-mm rockets with biological agents. It conducted field trials, weaponization tests, and live firings of 122-mm rockets armed with anthrax and botulinum toxin from March 1988 to May 1990. It tested Ricin for use in artillery shells.

Iraq produced at least 191 bombs and 25 missile warheads with biological agents. It developed and deployed 250-pound aluminum bombs covered in fiberglass. Bombs were designed so they could be mounted on both Soviet and French-made aircraft. They were rigged with parachutes for low-altitude drops to allow efficient slow delivery and aircraft to fly under radar coverage. Some debate over whether these bombs had cluster munitions or simply dispersed agent like LD-400 chemical bomb.

Iraq deployed at least 166 R-400 bombs with 85 liters of biological agents each during the Gulf War. it deployed them at two sites. One was near an abandoned runway where Iraq could fly in aircraft, arm them quickly, and disperse with no prior indication of activity and no reason for the UN to target the runway.

Iraq filled at least 25 Scud missile warheads and 157 bombs and aerial dispensers with biological agents during the Gulf War. It developed and stored drop tanks ready for use for three aircraft or RPVs with the capability of dispersing 2,000 liters of anthrax. Development took place in December 1990. It claimed later that tests showed the systems were ineffective. The UN found, however, that Iraq equipped crop-spraying helicopters for biological warfare and held exercises and tests simulating the spraying of anthrax spores.

Iraqi Mirages were given spray tanks to disperse biological agents, Iraq held trials as late as 13 January 1991. The Mirages were chosen because they have large 2,200-liter belly tanks and could be refueled by air, giving them a longer endurance and greater strike range. The tanks had electric valves to allow the agent to be released. The system was tested by releasing simulated agent into desert areas with scattered petri dishes to detect the biological agent. UNSCOM has video-tapes of the aircraft.

Project 144 at Taji produced at least 25 operational Al Husayn warheads. Ten of these were hidden deep in a railway tunnel, and 15 in holes dug in an unmanned hide site along the Tigris. Biological weapons were only distinguished from regular weapons by a black stripe.

The UN claims that Iraq has offered no evidence to corroborate its claims that it destroyed its stockpile of biological agents after the Gulf War. Further, Iraq retains the technology it acquired before the war, and evidence clearly indicates an ongoing research and development effort, in spite of the UN sanctions regime.

UNSCOM reported in October 1997 that Iraq has never provided a clear picture of the role of its military in its biological warfare program, and has claimed it only played a token role. It has never accounted for its disposal of growth media. The unaccounted-for media is sufficient, in quantity, for the production of over three times more of the biological agent—anthrax—Iraq claims to have been produced.

UNSCOM also reported that bulk warfare agent production appears to be vastly understated by Iraq. Expert calculations of possible agent production quantities, either by equipment capacity or growth media amounts, far exceed Iraq's stated results. Significant periods when Iraq claims its fermenters were not utilized are unexplained. Biological warfare field trials are underreported and inadequately described.

Additionally, claims regarding field trials of chemical and biological weapons using R400 bombs are contradictory and indicate that "more munitions were destroyed than were produced. The Commission is unable to verify that the unilateral destruction of the BW-filled Al Hussein warheads has taken place." There is no way to confirm whether Iraq destroyed 157 bombs of the R400 type, some of which were filled with botulin or anthrax spores.

UNSCOM concluded that "The September 1997 FFCD fails to give a remotely credible account of Iraq's biological program. This opinion has been endorsed by an international panel of experts."

UNSCOM cannot confirm the unilateral destruction of 25 warheads. It can confirm the destruction of 23 of at least 157 bombs.

Iraq may have more aerosol tanks. It retains laboratory capability to manufacture various biological agents, including the bacteria which cause anthrax, botulism, tularemia and typhoid. Many additional civilian facilities are capable of playing some role in biological weapons production.

A State Department spokesman reported on 16 November 1998 that there is a large discrepancy between the amount of biological growth media procured and the amount of agents that were or could have been produced. Baghdad has not adequately explained where some 8,000 pounds (3,500 kg) went out of some 68,000 pounds (31,000 kg) of biological growth media it imported. Iraq's accounting of the amount of the agent it produced and the number of failed batches is seriously flawed and cannot be reconciled on the basis of the disclosure Iraq has made.

Nuclear Weapons

Inspections by UN teams have found evidence of two successful weapons designs, a neutron initiator, explosives and triggering technology needed for production of bombs, plutonium processing technology, centrifuge technology, Calutron enrichment technology, and experiments with chemical separation technology. Iraq had some expert technical support, including at least one German scientist who provided the technical plans for the URENCO TC-11 centrifuge.

Iraq's main nuclear weapons–related facilities were:

- Al Atheer—center of nuclear weapons program. Uranium metallurgy; production of shaped charges for bombs, remote controlled facilities for high explosives manufacture
- Al Tuwaitha—triggering systems, neutron initiators, uranium metallurgy, and hot cells for plutonium separation. Laboratory production of UO_2, UCL_4, UF_6, and fuel fabrication facility Prototype-scale gas centrifuge, prototype EMIS facility, and

testing of laser isotope separation technology

- Al Qa Qa—high explosives storage, testing of detonators for high explosive component of implosion nuclear weapons
- Al Musaiyib/Al Hatteen—high explosive testing, hydrodynamic studies of bombs
- Al Hadre—firing range for high explosive devices, including FAE
- Ash Sharq—designed for mass production of weapons grade material using EMIS
- Al Furat—designed for mass production of weapons grade material using centrifuge method
- Al Jesira (Mosul)—mass production of UCL_4
- Al Qaim—phosphate plant for production of U308
- Akashat—uranium mine

Iraq had three reactor programs:

- Osiraq/Tammuz I—40-megawatt light-water reactor destroyed by Israeli air attack in 1981
- Isis/Tammuz—II 800-kilowatt light water reactor destroyed by Coalition air attack in 1991
- IRT-5000—5-megawatt light water reactor damaged by Coalition air attack in 1991

Iraq used Calutron (EMIS), centrifuges, plutonium processing, chemical defusion, and foreign purchases to create new production capability after Israel destroyed most of Osiraq.

Iraq established a centrifuge enrichment system in Rashidya and conducted research into the nuclear fuel cycle to facilitate development of a nuclear device.

After invading Kuwait, Iraq attempted to accelerate its program to develop a nuclear weapon by using radioactive fuel from French and Russian-built reactors. It made a crash effort in September 1990 to recover enriched fuel from its supposedly safe-guarded French and Russian reactors, with the goal of producing a nuclear weapon by April 1991. The program was only halted after Coalition air raids destroyed key facilities on 17 January 1991.

Iraq conducted research into the production of a radiological weapon, which disperses lethal radioactive material without initiating a nuclear explosion. Orders were given in 1987 to explore the use of radiological weapons for area denial in the Iran-Iraq War. Three prototype bombs were detonated at test sites—one as a ground level static test and two others dropped from aircraft. Iraq claims the results were disappointing and that the project was shelved but it has no records or evidence to prove this.

UN teams have found and destroyed or secured new stockpiles of illegal enriched material, major production and R&D facilities, and equipment including Calutron enriching equipment.

UNSCOM believes that Iraq's nuclear program has been largely disabled and remains incapacitated, but warns that Iraq retains substantial technology and established a clandestine purchasing system in 1990 that it has used to import forbidden components since the Gulf War.

Iraq still retains the technology developed before the Gulf War and US experts believe an ongoing research and development effort continues, in spite of the UN sanctions regime. The major remaining uncertainties are:

- Did Iraq conceal an effective high-speed centrifuge program?
- Are there elements for radiological weapons?
- Is Iraq actively seeking to clandestinely buy components for nuclear weapons and examining the purchase of fissile material from outside?
- Is Iraq continuing with the development of a missile warhead suited to the use of a nuclear device?

A substantial number of declared nuclear weapons components and research equipment has never been recovered. There is no reason to assume that Iraqi declarations were comprehensive.

The Sudan

Delivery Systems

There is no evidence of a program. The Sudan does have F-5, MiG-21, and MiG-23 attack fighters.

Chemical Weapons

Khartoum served as the site of a VX nerve gas production facility at the Shifa Pharmaceutical Plant, which was linked to the terrorist Osama

Bin Laden. It was destroyed by U.S. cruise missiles on 20 August 1998.

Biological Weapons

There may be some early research activity related to terrorist groups, but there is no evidence of production capability.

Nuclear Weapons

There is no evidence of any program.

Iraqi Covert Break-Out Capabilities

UNSCOM and the IAEA's success have created new priorities for Iraqi proliferation. The UN's success in destroying the large facilities Iraq needs to produce fissile materials may well have led Iraq to focus on covert cell-like activities to manufacture highly lethal biological weapons as a substitute for nuclear weapons.

All of the biological agents Iraq had at the time of the Gulf War seem to have been "wet" agents with limited storage life and limited operational lethality. Iraq may have clandestinely carried out all of the research necessarily to develop a production capability for dry, storage micro-power weapons, which would be far easier to stockpile, and have much more operational lethality.

Iraq did not have advanced binary chemical weapons, and most of its chemical weapons used unstable ingredients. Iraq has illegally imported specialized glassware since the Gulf War, and may well have developed advanced binary weapons and tested them in small numbers. It may be able to use a wider range of precursors and have developed plans to produce precursors in Iraq. It may have improved its technology for the production of VX gas.

Iraq is likely to covertly exploit Western analyses and critiques of its pre-war proliferation efforts to correct many of the problems in the organization of its proliferation efforts, its weapons design, and its organization for their use.

Iraqi bombs and warheads were relatively crude designs which did not store chemical and biological agents well and which did a poor job of dispersing them. Fusing and detonation systems did a poor job of ensuring detonation at the right height, and Iraq made little use of remote sensors and weather models for long-range targeting and strike planning. Iraq could clandestinely design and test greatly improved shells, bombs, and warheads. The key tests could be conducted using towers, simulated agents, and even indoor facilities. Improved targeting, weather sensors, and other aids to strike planning are dual-use or civil technologies that are not controlled by UNSCOM. The net impact would weapons that could be 5–10 times more effective than the relatively crude designs Iraq had rushed into service under the pressure of the Iran-Iraq War.

UNSCOM and the IAEA's successes give Iraq an equally high priority to explore ways of obtaining fissile material from the FSU or other potential supplier countries and prepare for a major purchase effort the moment sanctions and inspections are lifted. Iraq has the hard currency to buy its way into the nuclear club. It could probably clandestinely assemble all of the components of a large nuclear device except the fissile material, in hopes of finding some illegal source of such material.

The components for cruise missiles are becoming steadily more available on the commercial market, and Iraq has every incentive to create a covert program to examine the possibility of manufacturing or assembling cruise missiles in Iraq.

UN inspections and sanctions may also drive Iraq to adopt new delivery methods ranging from clandestine delivery and the use of proxies to sheltered launch-on-warning capabilities designed to counter the U.S. airpower advantage.

Iraq can legally maintain and test missiles with ranges up to 150 km. This allows for exoatmospheric reentry testing and some testing of improved guidance systems. Computer simulation, wind tunnel models, and production engineering tests can all be carried out clandestinely under the present inspection regime. It is possible that Iraq could develop dummy or operational high-explosive warheads with shapes and weight distribution of a kind that would allow it to test concepts for improving its warheads for weapons of mass destruction. The testing of improved bombs using simulated agents would be almost impossible to detect, as would the testing of improved spray systems for biological warfare.

Iraq has had half a decade in which to improve its decoys, dispersal concepts, dedicated command and control links, targeting methods, and strike plans. This kind of passive warfare planning is impossible to forbid and monitor, but ultimately is as important and lethal as any improvement in hardware.

There is no evidence that Iraq made an effort to develop specialized chemical and biological devices for covert operations, proxy warfare, or terrorist use. It would be simple to do so clandestinely and such devices would be simple to manufacture.

Counter-Proliferation

No one area of focus can possibly be effective. There is no present prospect that any combination of arms control and active/passive counter-proliferation can fully secure the region, any state in the region, or Western power projection forces.

However, a synergistic effort blending arms control, containment, preemptive options, deterrence, retaliation, and civil defense should offer significant stability. There is no present prospect that such stability can be offered without at least tacit U.S. threats to retaliate with nuclear weapons.

Such policies cannot work by enforcing restraint on friends, not enemies. There is no near to mid-term prospect that Israel can give up nuclear weapons.

Creeping proliferation will follow the line of least resistance. There is no present prospect that any combination of measures can defend against biological warfare, and many proposed forms of counter-proliferation act as incentives to develop biological weapons and use unconventional means of delivery.

Theater missile defense will be meaningless without radical improvements in defense against air attacks, cruise missiles, and unconventional means of delivery.

Possible Counter-Proliferation Policies

Possible counter-proliferation policies include:

- *Dissuasion,* to convince non-weapons of mass destruction states that their security interests are best served through not acquiring weapons of mass destruction
- *Denial,* to curtail access to technology and materials for weapons of mass destruction through export controls and other tools
- *Arms control efforts*, to reinforce the Nuclear Non-Proliferation Treaty, Biological and Chemical Weapons Conventions, nuclear free zones, conventional arms treaties that stabilize arms races, confidence and security building measures, and Anti-Ballistic Missile Treaty clarification efforts allowing U.S. deployment of advanced theater ballistic missile defenses.
- *Region-wide arms control agreements* backed by intelligence sharing and ruthless, intrusive challenge inspection without regard for the niceties of sovereignty.
- *International pressure*, to punish violators with trade sanctions, to publicize and expose companies and countries that assist proliferators, and to share intelligence to heighten awareness of the proliferation problem.
- *Defusion of potentially dangerous situations* by undertaking actions to reduce the threat from weapons of mass destruction already in the hands of selected countries—such as agreements to destroy, inspect, convert, monitor, or even reverse their capabilities.
- *Military capabilities* prepared to seize, disable, or destroy weapons of mass destruction in time of conflict.
- *Improved tracking and detection* of sales, technology transfer, research efforts, extremist groups.
- *Defensive capabilities,* both active (theater missile defenses) and passive (protective gear and vaccines), mitigating or neutralizing the effects of weapons of mass destruction and enabling U.S. forces to fight effectively even on a contaminated battlefield.
- *Declared and convincing counterstrike options* ranging from conventional strikes devastating a user nation's economy, political structure, and military forces to the use of nuclear weapons against the population centers of user nations and groups.

Key Force Improvements Affecting Counter-Proliferation Policy

The following force improvements will significantly affect counter-proliferation policy in the coming years.

1. Detection and characterization of biological and chemical agents. This initiative is intended to accelerate the fielding of stand-off and point detection and characterization systems by up to six years. It also addresses the integration of sensors into existing and planned carrier platforms, emphasizing man-portability and compatibility with UAVs.

2. Detection, characterization, and defeat of hard, underground targets. The United States is seeking new sensors, enhanced lethality, and penetrating weapons to increase the probability of defeating the target while minimizing the risk of collateral damage.

3. Detection, localization and neutralization of weapons of mass destruction inside and outside the United StateS. The United States is seeking to identify and evaluate systems, force structures, and operational plans to protect key military facilities and logistic nodes, and conduct joint exercises to improve the capability to respond to potential biological and chemical threats.

4. Development and deployment of additional passive defense capabilities for U.S. forces, including development and production of biological agent vaccines. This program will develop and field improved protective suits, shelters, filter systems, and equipment two to five years faster than previously planned. It also restores funding to the development of improved decontamination methods.

5. Support for weapons of mass destruction related arms control measure,s including strengthening the NNPT, CTBT, and BWC. This includes establishing a COCOM successor regime and improving controls on exports and technology by strengthening the MTCR, Nuclear Suppliers Group and Australia Group.

6. Missile defense capabilities, with primary emphasis on theater ballistic missile defenses. This activity involves improvements in active and passive defenses, attack operations, and improvements in BM/C^{4}I, as well as the deployment of theater missile defenses. The primary focus, however, is on anti-ballistic missile defenses, and in the near term, this involves the development of the Patriot Advanced Capability Level-3 (PAC-3/ERINT), Navy area theater missile defense (Aegis), and theater high altitude area defense (THAAD).

7. Publicized counterstrike options. Options range from a convincing declared capability to conduct precision mass air and missile strikes with conventional weapons that can devastate user states to use of nuclear weapons escalating to the destruction of population centers.

8. A new force tailored to dealing with terrorist and unconventional threats. This involves new intelligence and tracking systems dedicated to the prevention of mass terrorism, and special forces tailored to detect and attack terrorist groups and deal with unconventional uses of weapons of mass destruction.