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# **SECURITY ASSISTANCE PERSPECTIVES**

## **World-Wide Conventional Arms Trade (1994-2000)**

### **A Forecast and Analysis**

[The following has been extracted from a report of a study (titled as above) conducted by the Office of the Under Secretary of Defense (Acquisition and Technology) pp. 15-44, dated December 1994. The study was designed to provide an analytical basis for conventional arms transfer decisions, and was directed by Dr. Kenneth Flamm, Principal Deputy Assistant Secretary of Defense for Dual Use Technology Policy and International Programs. Other U.S. government organizations, including the Department of Commerce and the Defense Security Assistance Agency, participated in the study. Chapter 3 of the report, which follows, provides a forecast of future defense trade and is the core of the report.]

#### **REQUIREMENTS DRIVEN COMMODITY FORECASTS**

*This chapter describes the development and results of forecasts of world-wide arms trade deliveries from 1994 through 2000 derived from requirements driven assessments. It is divided into five sections. Section 3.1 contains background information on the development of an arms trade database and on the forecast approach. Section 3.2 estimates the totality of arms trade world-wide by expanding the information in the database to account for both nations and categories of military items that have been excluded. Section 3.3 summarizes overall arms trade demand geographically for the Middle East, Asia, Europe, and the rest of the world. Section 3.4 provides a profile of the major arms suppliers in the world other than the U.S. Finally, Section 3.5 contains the buyer-seller-commodity specific forecasts. Forecasts were made in seven aggregate military item category groupings, roughly associated with industrial sectors—aircraft, helicopters, ships, vehicles, missiles, artillery, and C<sup>3</sup>I systems. New system procurements were forecasted separately from upgrades.*

#### **3.1 Forecast Approach**

DoD made requirements driven, commodity specific arms delivery forecasts, by country, for the period 1994 through 2000<sup>4</sup>. These forecasts were developed, automated, and entered into an Arms Trade Data Base (ATDB) created for this study. A four-step approach was used.

First, recognizing that only a small number of the more than 200 countries in the world make up the bulk of arms imports, a set of countries was selected for more detailed analysis. Selection criteria included economic strength, arms import history, and likelihood of purchasing from the

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<sup>4</sup>Appendix A. describes the development and results of an econometric forecast of the overall dollar value of arms trade deliveries from 1994 to 2000 to the principal purchasing geographical regions of the world. The forecast was developed to complement the requirements driven forecast documented in this chapter. Unfortunately, large differences between the upper and lower bounds of the econometric forecast limited the usefulness of the results in accomplishing the objectives of this study. The effects of the Cold War on the historical data greatly overshadowed the influences of other factors.

U.S. In total, 37 countries were chosen, as illustrated in Figure 3.1. For 1992 and 1993, these countries received 92 percent of total U.S. arms exports and 80 percent of the arms exports from the rest of the world—an overall average of 86 percent of global arms deliveries<sup>5</sup>.

**Figure 3.1 - Arms Trade Database Countries**

<p><b><u>Middle East</u></b></p> <ul style="list-style-type: none"> <li>• Egypt</li> <li>• Iran</li> <li>• Israel</li> <li>• Kuwait</li> <li>• Saudi Arabia</li> <li>• UAE</li> </ul>	<p><b><u>East Asia</u></b></p> <ul style="list-style-type: none"> <li>• Taiwan</li> <li>• Indonesia</li> <li>• Japan</li> <li>• South Korea</li> <li>• Malaysia</li> <li>• Singapore</li> <li>• Thailand</li> <li>• China</li> </ul> <p><b><u>South Asia</u></b></p> <ul style="list-style-type: none"> <li>• India</li> <li>• Pakistan</li> </ul>	<p><b><u>Europe</u></b></p> <ul style="list-style-type: none"> <li>• Austria</li> <li>• Finland</li> <li>• France</li> <li>• Germany</li> <li>• Greece</li> <li>• Italy</li> <li>• Norway</li> <li>• Portugal</li> <li>• Spain</li> <li>• Switzerland</li> <li>• Turkey</li> <li>• UK</li> </ul>	<p><b><u>Latin America</u></b></p> <ul style="list-style-type: none"> <li>• Argentina</li> <li>• Brazil</li> <li>• Chile</li> </ul> <p><b><u>Africa</u></b></p> <ul style="list-style-type: none"> <li>• Algeria</li> <li>• Morocco</li> <li>• South Africa</li> <li>• Tunisia</li> </ul> <p><b><u>Oceania</u></b></p> <ul style="list-style-type: none"> <li>• Australia</li> </ul>
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The second step of the approach was to project the weapon requirements for each of the selected countries. In some cases, the requirements were ascertained as a result of past discussions with the subject country. In other cases, the requirements were determined on the basis of an analysis of the overall military situation facing the country, the evolution of technology, and the need to respond to potential enemies' evolving capabilities.

Once the requirements were estimated, the third step was an assessment of how those requirements would be met—i.e., the acquisition strategy for these countries. Consideration was given to affordability, the country's technology base needs, the capability of the indigenous industrial base, the political situation within the country, and the threat perceptions. The output of this process was a set of commodity specific projections of arms imports throughout the decade. Figure 3.2 shows the individual military items included, and the way they were aggregated into seven category groupings for summarizing the forecasts. The military items being considered accounted for 90 percent of the dollar value of all arms deliveries to the ATDB countries on average in 1991 through 1993 when associated support costs were considered.

In the fourth and final step, assessments were made of the likelihood of an acquisition, the quantity that would be delivered within the study's time frame, the cost (defined to include both equipment and support), the potential sources, the determination of a systems upgrade versus new procurement, and the extent to which some coproduction arrangements would exist. Significant factors influencing these assessments include: prior buyer-seller relationships, the country's manufacturing capability, the types of equipment and support already in place, and the availability of financing. These assessments were then combined with deliveries already on contract to arrive at total projections for each country.

<sup>5</sup>1991 data were excluded since they were somewhat distorted by the fact that former Warsaw Pact exports were still sizable.

**Figure 3.2 - Arms Trade Database Categories**

<p><b><u>AIRCRAFT</u></b></p> <ul style="list-style-type: none"> <li>• Attack</li> <li>• Cargo</li> <li>• Fighter</li> <li>• Fighter/Attack</li> <li>• Surveillance</li> <li>• Tanker</li> <li>• Transport</li> <li>• Unmanned Aerial Vehicle</li> </ul>	<p><b><u>HELICOPTERS</u></b></p> <ul style="list-style-type: none"> <li>• Anti Submarine Warfare</li> <li>• Attack</li> <li>• Scout</li> <li>• Utility</li> </ul>	<p><b><u>SHIPS</u></b></p> <ul style="list-style-type: none"> <li>• Carrier</li> <li>• Destroyer</li> <li>• Frigate</li> <li>• Miscellaneous</li> <li>• Submarine</li> </ul>	<p><b><u>C<sup>3</sup>I SYSTEM</u></b></p> <ul style="list-style-type: none"> <li>• Communications</li> <li>• Electronics</li> <li>• Radar</li> </ul>
<p><b><u>VEHICLES</u></b></p> <ul style="list-style-type: none"> <li>• Armored Personnel Carrier</li> <li>• Infantry Fighting Vehicle</li> <li>• Miscellaneous</li> <li>• Tank</li> </ul>	<p><b><u>MISSILES</u></b></p> <ul style="list-style-type: none"> <li>• Air-to-Air</li> <li>• Anti-Tank</li> <li>• Ballistic</li> <li>• Cruise</li> <li>• Precision Guided</li> <li>• Surface-to-Air</li> <li>• Torpedo</li> </ul>	<p><b><u>ARTILLERY</u></b></p> <ul style="list-style-type: none"> <li>• Air Defense</li> <li>• Large Caliber</li> <li>• Multiple Rocket Launcher</li> </ul>	

Small arms were not included in the forecast because the focus of the study was on how U.S. arms trade policies might affect the U.S. share of global arms trade. U.S. small arms manufacturing is not a major component of U.S. international sales and small arms are not a large part of global arms trade. Many countries have their own indigenous small arms manufacturing capability, and therefore are not dependent on imports to acquire small arms. In addition, there is an inventory of literally millions of small arms available for sale in the marketplace.

There are three limitations to this forecast approach. First, because deliveries were used, the possible impacts of new sales agreements over this time period were not fully measured in the analysis, since deliveries on these contracts might not occur until well into the next century. Second, the "make" versus "buy" decision was forecast on a case-by-case basis in the database. Therefore, the extent to which policies might affect a domestic production decision was not considered. Finally, with the exception of the European Helicopter Consortium, sales by international consortia were considered to be domestic production within countries with participants in the consortia. However, very few such sales were projected in the forecast time frame. No forecast analogous to this exercise has ever been conducted, or published, in the past by DoD.

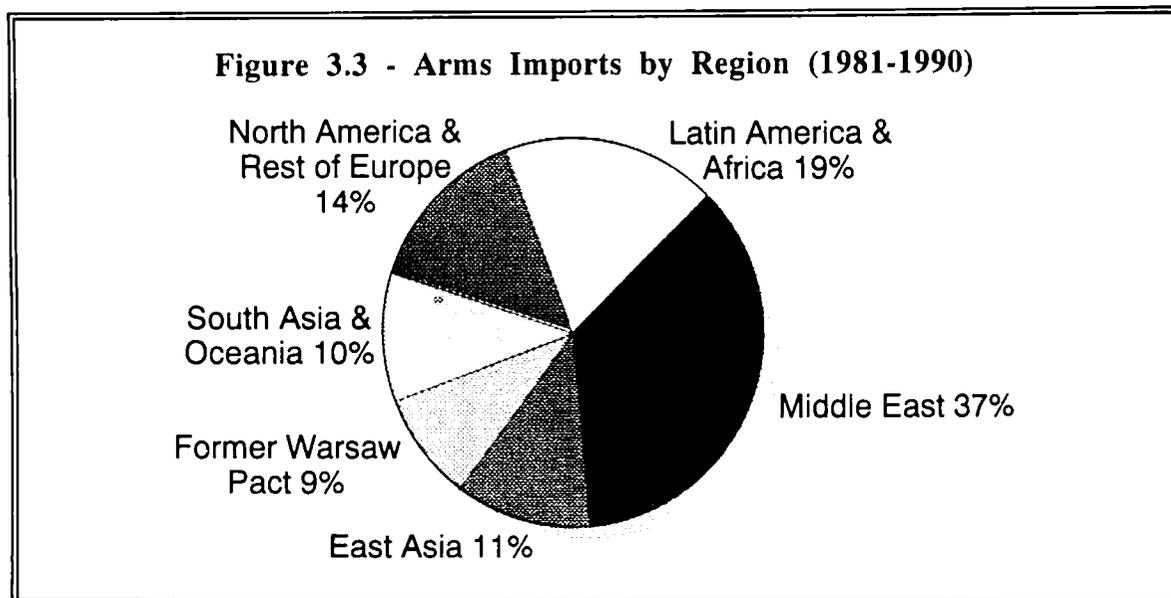
Despite these limitations, this study represents a major step forward in assembling a comprehensive future projection of exports by the U.S. defense industry.

### **3.2 Overall Arms Trade in the 1990s**

Figure 3.3 summarizes arms imports by geographical region in the 1980s. In total, arms imports from 1981 through 1990 were approximately \$625 billion in 1991 dollars. Leading arms importers were concentrated in the Middle East (\$230 billion, or approximately 37 percent of arms imports) and East Asia (11 percent of arms imports).

Figures for individual years were consistent with this overall pattern. For example, in 1991, Saudi Arabia, Iran, Syria, and Israel accounted for \$9.6 billion or about 38 percent of world arms imports. In East Asia, arms imports by Japan, South Korea, Thailand, Taiwan, and China

accounted for \$2.4 billion or almost 10 percent of 1991 world arms imports. Thus, a relatively few countries in the Middle East and East Asia accounted for almost half of 1991 world arms imports. The remaining half of 1991 arms imports was highly dispersed among 129 other countries.



The combination of Latin America and Africa imported nearly \$120 billion in arms in the 1980s. This sum equaled about 19 percent of total imports during that period. The former Warsaw Pact countries represented approximately nine percent of the 1980s total with more than \$50 billion in purchases. North America and the rest of Europe bought more than \$90 billion in defense equipment—approximately 14 percent of the world total. South Asia and Oceania together accounted for about 10 percent.

Data in the ATDB indicate that arms trade deliveries of major equipment items to the ATDB countries from 1994 through 2000 will range between \$172.6 billion and \$202.5 billion in 1991 constant dollars. The upper bound was calculated on the basis of the higher cost estimate for every potential sale in the ATDB. The lower bound figure is based on the smaller cost estimate for only those potential sales with a medium to high likelihood of occurrence<sup>6</sup>.

To calculate projected total arms trade deliveries to all countries, three adjustments were made:

- (1) The ATDB 1994-2000 estimates of aggregate expenditures were increased to account for the fact that major commodities represent approximately 90 percent of all defense equipment deliveries to the ATDB countries in 1991-1993.<sup>7</sup>
- (2) Estimated 1994-2000 ATDB aggregate expenditures were further increased to account for the fact that deliveries to the ATDB countries comprised about 86 percent of global arms trade in 1992-1993.
- (3) The \$68.3 billion of actual world-wide arms trade (all countries, all items) in 1991 through 1993 was also included.

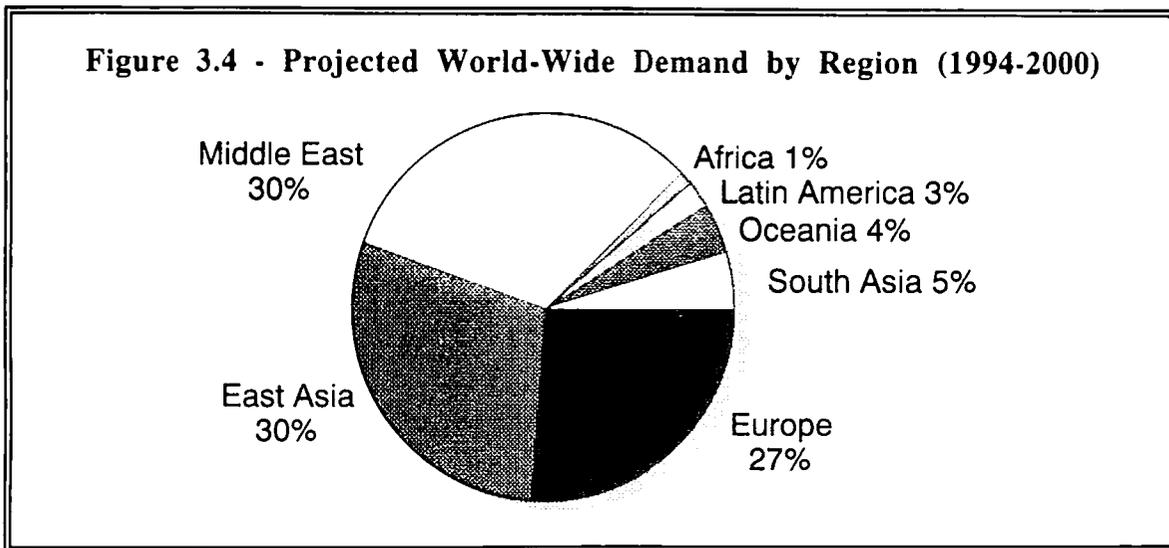
<sup>6</sup>This methodology for determining upper and lower bounds is used consistently throughout the report.

<sup>7</sup>91 percent for the U.S., 89 percent for the rest of the world.

Based on these adjustments, global defense trade from 1991 through 2000 is projected to range between \$291.3 billion and \$329.9 billion in 1991 constant dollars. This represents a 47 to 53 percent reduction from the \$625.3 billion of total arms exports over the 1981-1990 time period. Given current arms trade experience, actual values will probably be much closer to the lower bound.

### 3.3 Aggregate Demand by Region

This section pictures total demand by region on the basis of the information in the ATDB. Therefore, the percentage breakdowns in Figure 3.4 represent only major military items and are based on the \$202.5 billion in deliveries by the 37 ATDB countries aggregated geographically.<sup>8</sup> The following four subsections discuss the regions in more detail.



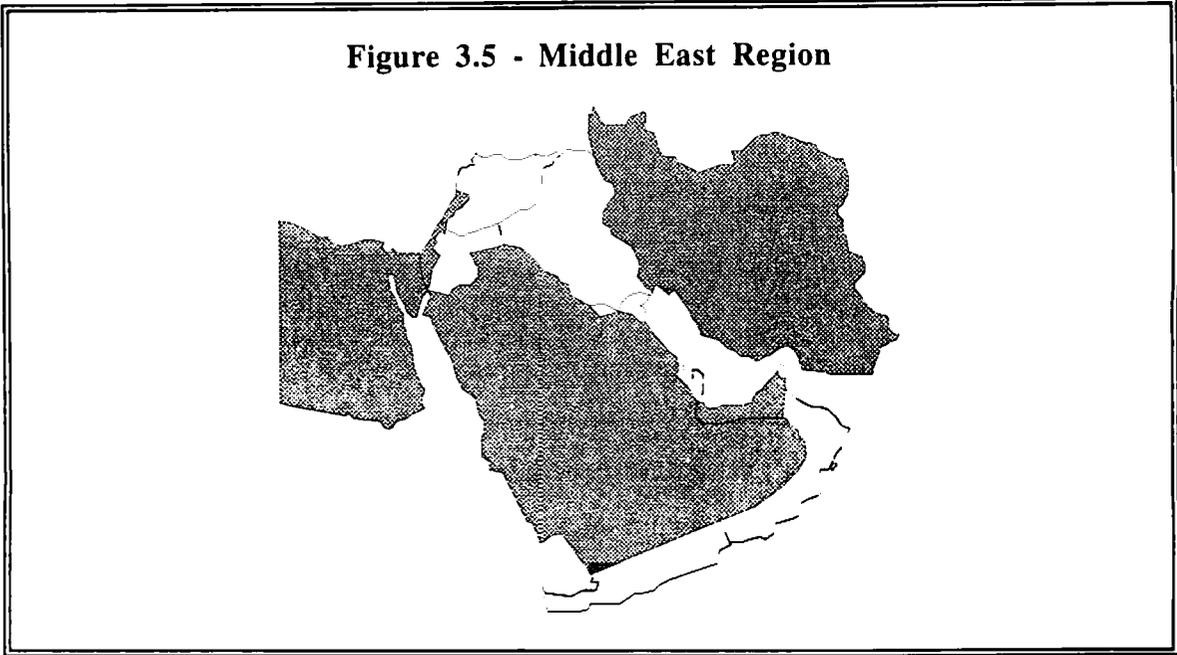
#### 3.3.1 Middle East Demand

The Middle East region, with ATDB countries highlighted, is pictured in Figure 3.5. In 1991 constant dollars, projections of arms imports range between \$54.2 billion and \$63.6 billion for the ATDB Middle East countries for the remainder of the decade -- 1994 through 2000. These figures include only those major military items identified in the ATDB. The breakdown of these potential imports, by nation, is portrayed in Figure 3.6.

The Middle East region is expected to continue to be the world's largest market for arms through the rest of the decade, accounting for approximately 30 percent of all deliveries. East Asia will be a very close second.

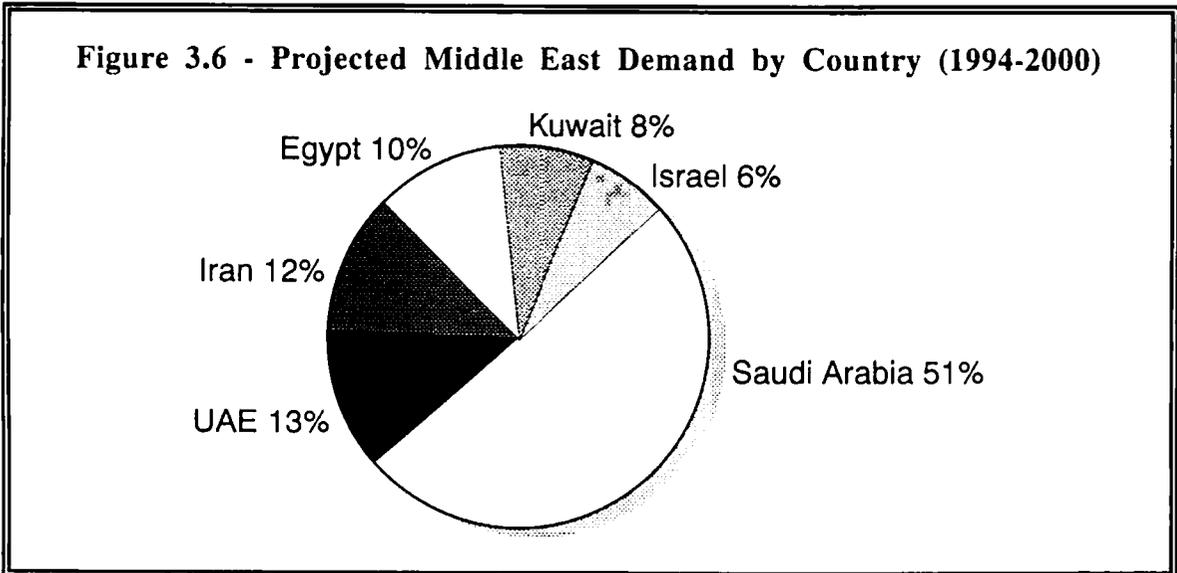
<sup>8</sup>The percentages are based on the upper bound defense trade delivery projections. Similar procedures were used to calculate the percentages for the remainder of the report, unless explicitly indicated otherwise.

**Figure 3.5 - Middle East Region**



Saudi Arabia will remain the world's largest arms importer and is expected to acquire an estimated \$32.4 billion in military equipment during the remainder of the decade. By itself, Saudi Arabia accounts for more than half of the total Middle East demand. Procurements will include advanced fighter aircraft, major ground arms, and support equipment and systems. The Saudi government has already contracted for a range of equipment and support that includes the U.S. M1A2 tank, the F-15, the Bradley infantry fighting vehicle, and the British Tornado fighter. Major procurements for helicopters and electronic warfare equipment are also anticipated. Currently, the relatively low world market price levels for petroleum continue to hamper the potential procurement of frigates, tanker aircraft, and airborne warning and control systems. Depending on procurement needs and military concerns, transactions could be funded through loans, off-budget financing, or a stretch out of payments. Oil barter may be one of the more attractive Saudi payment options if oil prices remain at reduced levels. Not only would a market outlet be assured, but the visibility of any contractual discounts or commissions would be reduced or eliminated.

**Figure 3.6 - Projected Middle East Demand by Country (1994-2000)**



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An additional \$13 billion in arms are expected to be delivered to Kuwait and the United Arab Emirates (UAE)—other members of the Gulf Cooperation Council<sup>9</sup>. Sales will include advanced conventional weapons such U.S. Patriot missiles, AH-64 Apache attack helicopters, and French LeClerc tanks. Kuwait accounts for eight percent of Middle East deliveries while the UAE is about 13 percent of the market.

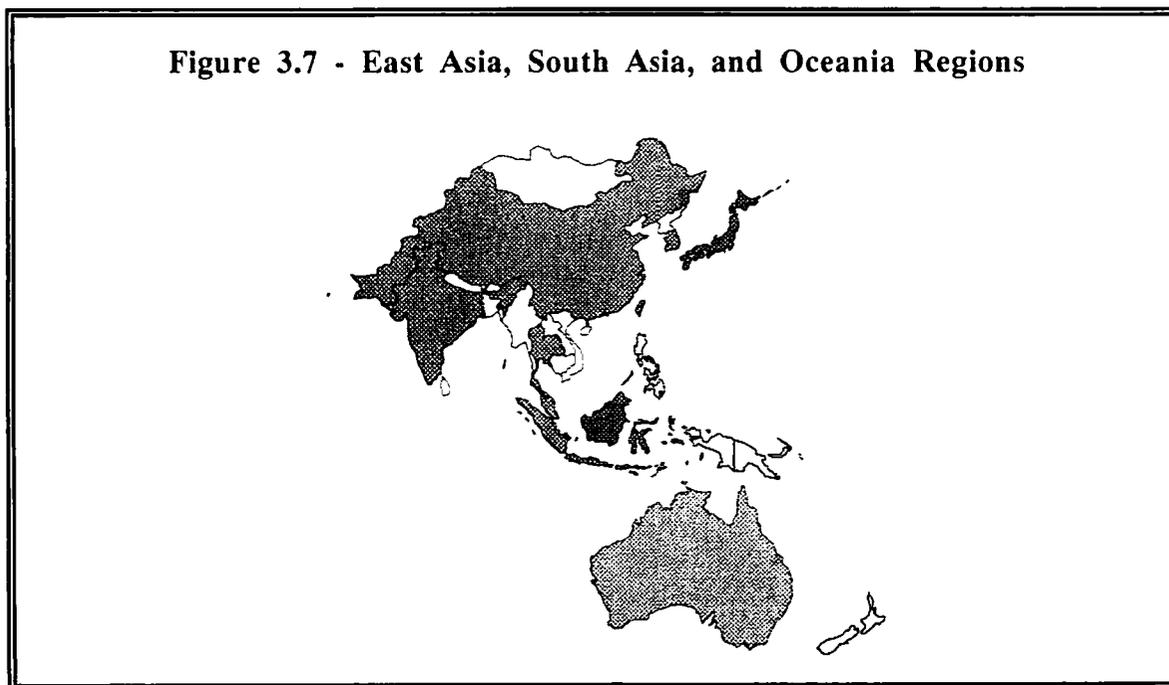
Iran may spend as much as \$7.7 billion by the year 2000 for fighter aircraft, Scud missiles, attack boats, submarines, surface-to-air missiles, ship-to-ship missiles, tanks and armored personnel carriers. Russia, China, and North Korea will be Iran's main suppliers. Iran's arms imports represent 12 percent of all Middle East deliveries.

Egypt plans to buy tanks, other armored vehicles, anti-submarine warfare helicopters, and air defense missiles during the rest of the decade. In total, Egypt is projected to spend as much as \$6.7 billion for arms—about ten percent of the Middle East market.

In addition to taking delivery on F-15 aircraft already purchased from the U.S., Israel plans to spend more than \$1.1 billion for a multiple rocket launching system and an air defense system. Israel accounts for approximately six percent of the Middle East demand.

### 3.3.2 East Asia, South Asia, and Oceania Demand

Figure 3.7 highlights the ATDB countries in East Asia, South Asia, and Oceania. For the commodities included in the ATDB, these countries represent between \$68.6 billion and \$77.6 billion, in 1991 constant dollars, in projected arms trade deliveries from 1994 through 2000. Figure 3.8 shows how these imports are estimated to be split among the countries involved. These large sales are driven by economic growth and historic rivalries.

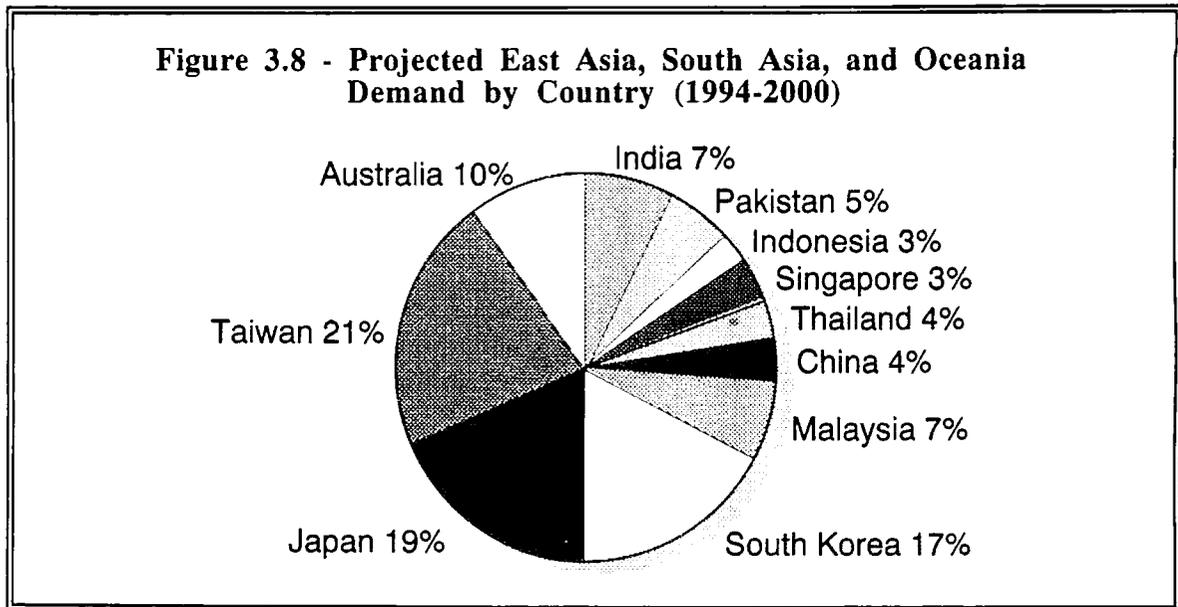


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<sup>9</sup>The Gulf Cooperation Council includes Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates.

East Asia arms import projections through the end of the decade are almost as large as those for the Middle East. Estimates range from \$53.7 billion to \$60.4 billion. Like the Middle East, East Asia is expected to account for 30 percent of world-wide arms trade through the year 2000. Taiwan, Japan, and South Korea are the three largest arms buying countries in the region and rank third through fifth world-wide, behind Saudi Arabia and Turkey, respectively.

Taiwan is expected to take delivery of \$16.5 billion of defense equipment through the end of the decade. Imports include French Lafayette class frigates, Mirage 2000-5 and U.S. F-16 fighters. Additionally, U.S. firms are supplying technical and material assistance to Taiwan's multibillion dollar Indigenous Defense Fighter program. Taiwan is negotiating with the Netherlands and Germany for submarines and is shopping for U.S. and other Western supplied missiles, naval guns, radar and sonar to equip its frigates. Taipei may encounter difficulties in obtaining some arms, due to Chinese efforts to preclude certain arms transactions with Taiwan.



Japan will be East Asia's second biggest arms importer, procuring between \$13.9 billion and \$14.3 billion of arms imports. Japan will continue its planned acquisitions of U.S. supplied equipment including AWACS aircraft, the Aegis missile defense system, the Multiple Launch Rocket System, and equipment for the FSX indigenous fighter codevelopment program. A reduction in the former Soviet threat to Japan resulted in cutbacks in Japan's Type-90 tank and F-15 interceptor acquisition programs.

South Korea plans to address the North Korean military's numerical advantages through acquisition of technologically advanced weapon systems. Projected deliveries in the remainder of the decade total between \$11.3 billion and \$13.5 billion. South Korea has entered a coproduction arrangement to build U.S. F-16 fighter aircraft and has purchased U.S. P-3C maritime patrol aircraft. South Korea's long term naval development plans call for establishing a blue water fleet including domestically produced KDX destroyers equipped with Western combat systems and German Type-209 submarines. South Korea intends to bolster its ground forces by license producing its K-1 main battle tank and purchasing surface-to-air missiles, self propelled artillery, and attack and utility helicopters.

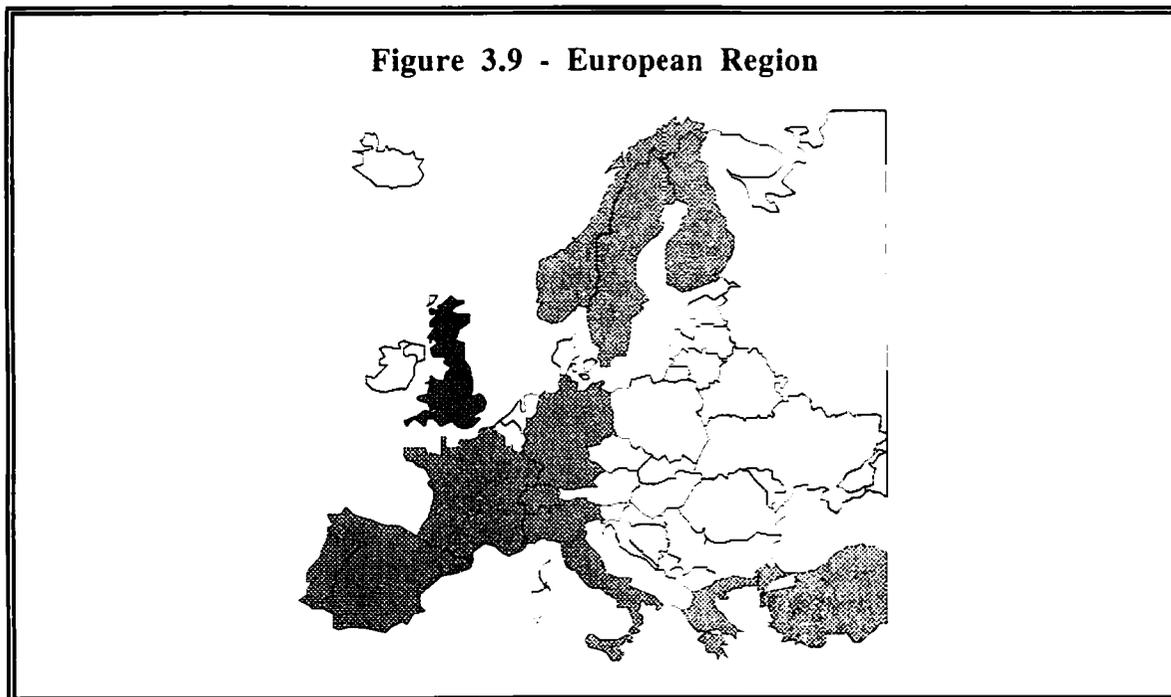
South Asia arms acquisitions from 1994 to 2000 are estimated to range from \$7.4 billion to \$9.5 billion, accounting for five percent of the world-wide market. Both India and Pakistan are planning purchases of tanks, artillery, helicopters, fighter aircraft, and air defense systems.

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Oceania arms imports are expected to reach \$7.6 billion in the rest of the 1990's—four percent of arms trade deliveries world-wide. Australia will account for the bulk of these deliveries, as an ambitious air and surface modernization program, tailored to support Australia's two ocean doctrine, dominates this region's arms imports. Deliveries over the period include those associated with Australia's major planned purchases of maritime patrol aircraft, frigates and submarines.

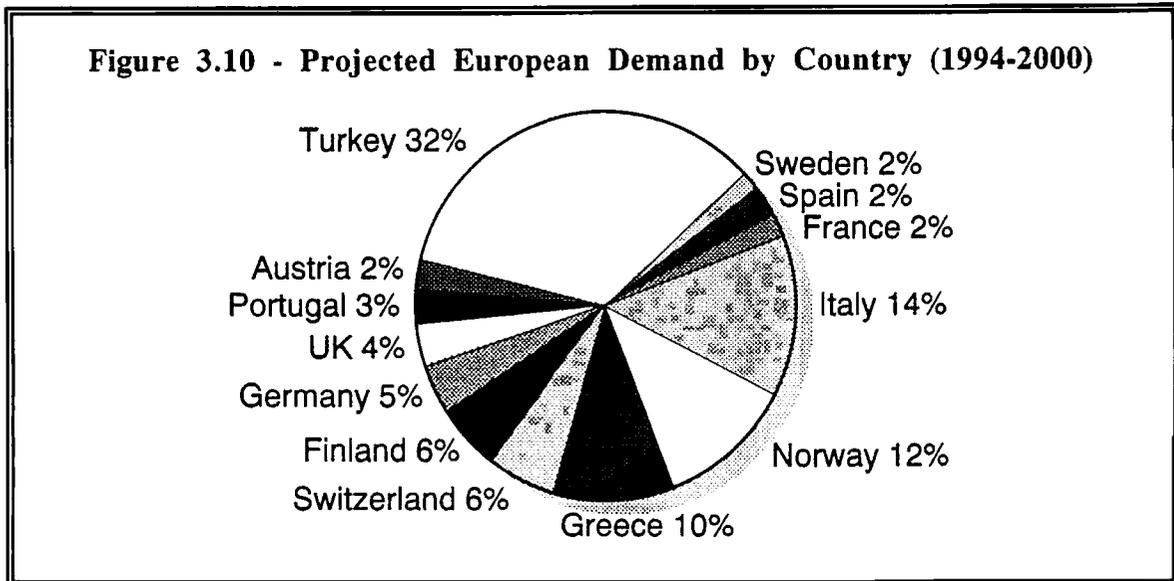
### 3.3.3 European Demand

The European region is defined in Figure 3.9—the ATDB countries are highlighted. In the 1994 to 2000 time period, deliveries of major military items to the ATDB European countries will range between \$46.2 billion and \$53.9 billion in 1991 dollars, accounting for 27 percent of world-wide arms acquisitions. Figure 3.10 shows the percentage of regional imports by country.



About 75 percent of the deliveries to European countries through-the end of the decade are already under contract. Two conflicting pressures characterize European arms imports. First, there is a strong tendency for European countries to purchase weapon systems and related defense items from other European countries whenever possible. On the other hand, the downsizing in defense budgets is leading to a reevaluation of costly indigenous or codevelopment programs. Market shifts may favor the purchase or coproduction of U.S. or French fighters if Britain, Germany, Italy, and Spain decide to abandon their Eurofighter 2000 project.

**Figure 3.10 - Projected European Demand by Country (1994-2000)**



Southern European countries account for a majority of the purchases yet to be made that will result in deliveries over the forecast period. Turkey is estimated to be the second largest arms importer in the world, with estimated delivery values from \$16.4 billion to \$17.9 billion. Potential arms purchases include tanks, multiple rocket launchers, cargo aircraft, airborne surveillance systems, refueling aircraft, Patriot and Stinger air defense missiles, anti-submarine warfare helicopters, and minehunter hulls. Potential Greek deliveries range between \$4.1 billion and \$5.5 billion, and include multiple rocket launchers, training aircraft, reconnaissance aircraft, attack helicopters, Patriot batteries, anti-radiation missiles, and air-to-air missiles.

Norway and Switzerland also plan for some sizable purchases not already under contract. Combined arms imports may be as high as \$9.4 billion. Norway may buy air-to-air missiles, multiple rocket launching systems, sea mines, and anti-submarine warfare torpedoes. Switzerland has expressed interest in multiple rocket launching systems, airborne surveillance systems, surface-to-air missiles, and anti-tank missiles.

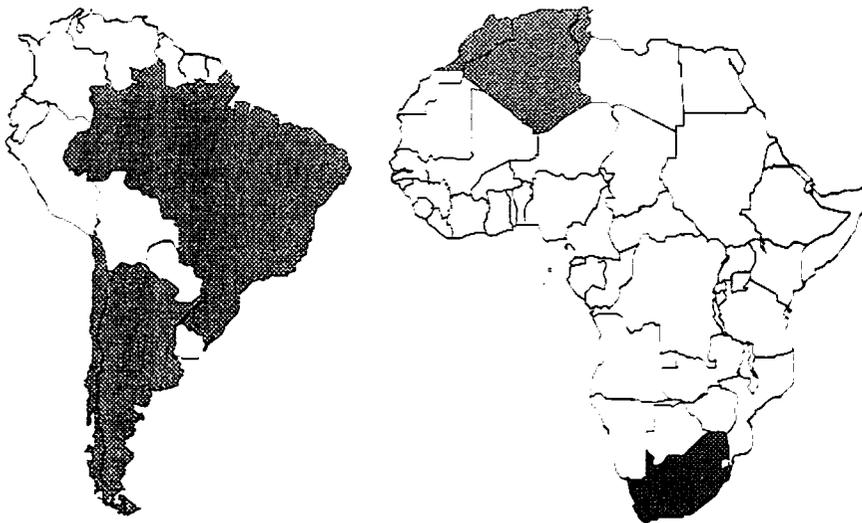
Although not in the ATDB, former Warsaw Pact countries are expected to slash their imports by more than 50 percent from their aggregate \$55 billion level in the 1980s. They will mostly be characterized by Russian supplied arms provided in exchange for debt forgiveness. The end of arms imports from the former East Germany (which were one-fifth of the Pact's total), significant economic difficulties, and large military force reductions in these countries will contribute to the decline.

### **3.3.4 Africa and Latin America Demand**

Countries in the ATDB in Africa and Latin America are highlighted in Figure 3.11. Figure 3.12 shows the breakdown of projected ATDB major defense item sales among the countries involved.<sup>10</sup> While these areas in the world represent places of potentially high regional instability, the total dollar value of potential arms sales is relatively small. For the remainder of the decade, imports of major defense items for these countries are expected to range between \$3.6 billion and \$7.3 billion in 1991 constant dollars.

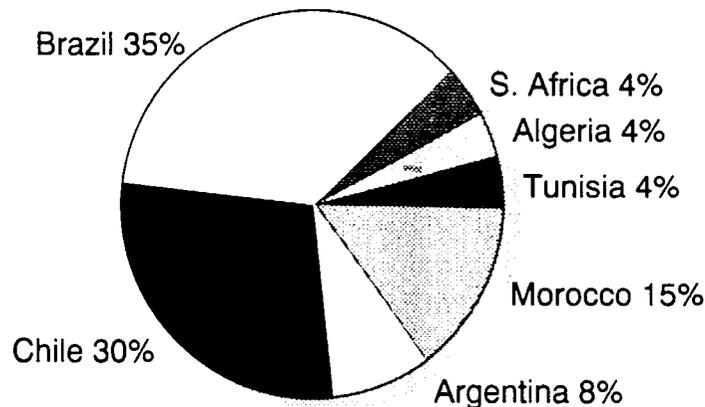
<sup>10</sup>Egypt is included in the Middle East region.

**Figure 3.11 - Africa and Latin America Regions**



Africa represents only about one percent of world-wide arms sales, with projected expenditures as high as \$2.0 billion. The key projected acquisitions by African countries include both new and used fighters and other aircraft, as well as surplus armor and ships. Algeria is expected to rely on Russian equipment. Morocco has expressed interest in the purchase of F-16s or Mirage 2000s, as well as training aircraft and UK Lynx helicopters. Tunisia plans to purchase U.S. C-130 aircraft; additional purchases of F-5 or A-7 combat aircraft are possible.

**Figure 3.12 - Projected Africa and Latin America Demand by Country (1994-2000)**



Latin American arms procurement may range between \$3.6 billion and \$5.2 billion—about three percent of the market. Funding constraints are expected to continue to limit the purchases of even the highest priority arms imports by Latin American governments. Emphasis will continue to be placed on procurements in response to regional rivalry as well as for internal security requirements to combat insurgencies or drug traffickers. Equipment upgrades will become a priority as these nations attempt to maintain their conventional forces with limited funds.

Financing of major imports will remain questionable. Brazil has expressed interest in buying fighter aircraft and surveillance aircraft. Approximately 50 percent of Argentina's arms imports are already under contract. Chile may seek to acquire fighter aircraft, cruise missiles, and torpedoes.

### 3.4 Supplier Profiles

Table 3.1 shows the top six arms supplier countries based on 1992 and 1993 deliveries. These countries accounted for more than 90 percent of the world-wide totals. Although the rankings varied in each year, the same countries comprised the top six suppliers for both years. Exporters of advanced equipment and firms specializing in certain niche markets are expected to be the most successful military suppliers for the remainder of the decade. France, Germany and the UK are projected to be the largest arms exporters behind the United States. Export of Soviet-style arms are not expected to increase significantly from their current reduced levels for the remainder of the 1990s.

**Table 3.1 - Top Six Arms Supplier Countries (1992-93)**  
(billion constant 1991 dollars)

<u>Country</u>	<u>1992 Sales</u>		<u>1993 Sales</u>	
	<u>Dollars</u>	<u>Percent</u>	<u>Dollars</u>	<u>Percent</u>
U.S.	10.3	46	10.8	53
UK	4.3	19	4.1	20
Russia	2.3	10	2.5	12
Germany	1.1	5	1.1	5
China	0.8	4	0.9	4
France	1.4	6	0.6	3

Note: U.S. figures are based on estimates made in July 1994 to be consistent with the rest of this report. Figures for other nations are current as of December 1994. Percentages derived on the basis of totals are estimated in July 1994.

### Major Foreign Exporting Countries

Reduced global demand for major arms in this decade will result in a dramatic decline in France's arms exports from the \$50 billion level sold during the 1980s. However, France is still expected to be the world's second largest arms exporter over the remainder of this decade. French arms exports cover almost the entire spectrum of conventional arms. Competition from the French arms industry will continue to be effective in several important markets such as those for tactical missiles, military electronics, and advanced naval equipment. Aerospatiale's new MM40 Block 2 Exocet anti-ship missile will be a rival to the U.S. Harpoon because of its flexible targeting capabilities and a somewhat stealthier flight profile. Several countries in Europe, East Asia, and the Persian Gulf are potential candidates to equip their naval combatants with French anti-ship cruise missiles. Aerospatiale is also targeting existing U.S. export customers for its improved AS-30L missile, modified for operation with the F-16. French firms are projected to capture a larger share of the precision guided munitions market in the mid-1990s with the planned introduction of the Apache modular, autonomous standoff munition. Additionally, the MICA air-to-air missile will compete with the U.S. AMRAAM for air-to-air missile sales to a wide range of customers during the decade.

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The UK will remain a viable competitor in the international arms market and should be able to sustain its past export levels, which totaled more than \$35 billion during the 1980s. Naval systems being marketed by the UK include surface ships, diesel submarines, antisubmarine warfare and utility helicopters, and fixed wing maritime patrol aircraft. Malaysia, Oman, Qatar, Saudi Arabia, and Spain are buying various types of coastal combatant ships, and Australia is interested in British minehunter vessels. In the aircraft markets, the Hawk attack/trainer aircraft continues to be competitive because of its cost, simplicity, and flexibility. Smiths Industries and the General Electric Company of the UK are strong competitors in the fighter upgrade market with their systems integration efforts and equipment for weapon delivery and cockpit displays. Army and naval versions of the Westland Lynx helicopter have been and are projected to continue to be very competitive systems in the global helicopter market.

Germany is projected to become one of the leading arms exporters in the 1990s. German weapon system exports will be concentrated primarily in the aircraft and ship markets. The Alpha jet trainer is projected to be competitive in the large global trainer aircraft market because of its favorable cost and performance characteristics. German naval exports are projected to dominate the global submarine market and to be very competitive for sales of frigates, smaller vessels, and torpedoes to a variety of prospective buyers. In addition, Germany recently signed a major contract with Sweden to sell Leopard II tanks. As a consequence of the downsizing of the German armed forces, a significant portion of German arms exports will also include used equipment that is no longer needed by the German military. Transfers of M113 armored personnel carriers to Portugal, as well as RF-4 reconnaissance aircraft to both Greece and Turkey are anticipated during this decade.

### **Minor Exporting Countries**

Minor exporting countries can generally be categorized into two groups: suppliers marketing sophisticated, modern systems and suppliers marketing older, less sophisticated weapon systems, generally to buyers from developing nations. All of the minor exporters will face increased competition for fewer sales in the current decade, analogous to the situation facing the larger exporters. However, due to their smaller arms industries and limited resources, many minor exporters will target niche markets. The sales prospects for the more sophisticated minor exporters are more stable than those for less sophisticated suppliers like China, North Korea, and the East European countries. Without a conflict such as the Iran-Iraq war, there is declining demand for most of the outdated arms offered by the latter group.

Italy, Spain, and Sweden are nations with well developed defense industries, a history of arms exports, and significant prospects for continued arms exports throughout the decade to a variety of buyers. Italy's arms exports will focus on transport aircraft and smaller naval vessels and combat systems, targeting customers such as Argentina, Australia, Japan, Malaysia and Pakistan. Italy is a member of the European Helicopter consortium, along with France, Germany, and the Netherlands, which is currently developing the NH-90 transport helicopter for the European market. Spain is a strong competitor in the transport aircraft market with prospects for sales to a number of nations including Australia, Chile, Indonesia, Malaysia, Morocco, South Korea, Tunisia, and Turkey. Spain is also a player in the minor combatant vessel export market, targeting Egypt, Morocco and Thailand. While Sweden's Gripen aircraft is not expected to be a major competitor in the global multi-role fighter aircraft market, Swedish submarines and naval combat systems are strong competitors in the global naval market with potential sales to Australia, Norway, Pakistan, and South Korea. Sweden also produces infantry fighting vehicles for export, with prospects for sales to Norway and Saudi Arabia.

Israel is becoming more active in the international arms export market, building on its experience in providing advanced military equipment and technology to a variety of customers. Israel has developed into a world class supplier of electronics and tactical missiles, and will remain

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a strong competitor in the global aircraft and armor upgrade markets during this decade. Israeli firms obtained good market visibility when they won the contract to upgrade Mig-21s for Romania, and are competing for more contracts to upgrade aircraft for a number of nations including Australia, Bulgaria, Chile, India, and Spain. In addition, Israel is actively promoting naval electronic warfare equipment and missile sales. Israel is also recognized as one of the world's leading UAV producers, a market segment with substantial growth potential in the future.

Brazil's arms exports are trainer aircraft and multiple rocket launch systems. The AMX fighter is coproduced with Italy and has no significant prospects for export in the near future. The Tucano trainer represents the nation's most promising aircraft export potential with strong prospects for sales throughout the decade. Brazil's multiple rocket launch system is in competition for sale to the United Arab Emirates among others.

Although the Soviet Union was the largest arms exporter during the Cold War, Russia has not been able to maintain anywhere near the previous level of arms exports since the end of the Cold War. Russian military systems available for export cover the whole market spectrum; however, prospects for sales during the 1990s are limited. Russia is marketing a variety of aircraft (including its most advanced fighters), armored vehicles, naval systems, and missiles throughout the world, but with limited success. Overall, export sales projections for Russian arms, in dollar terms, remain low.

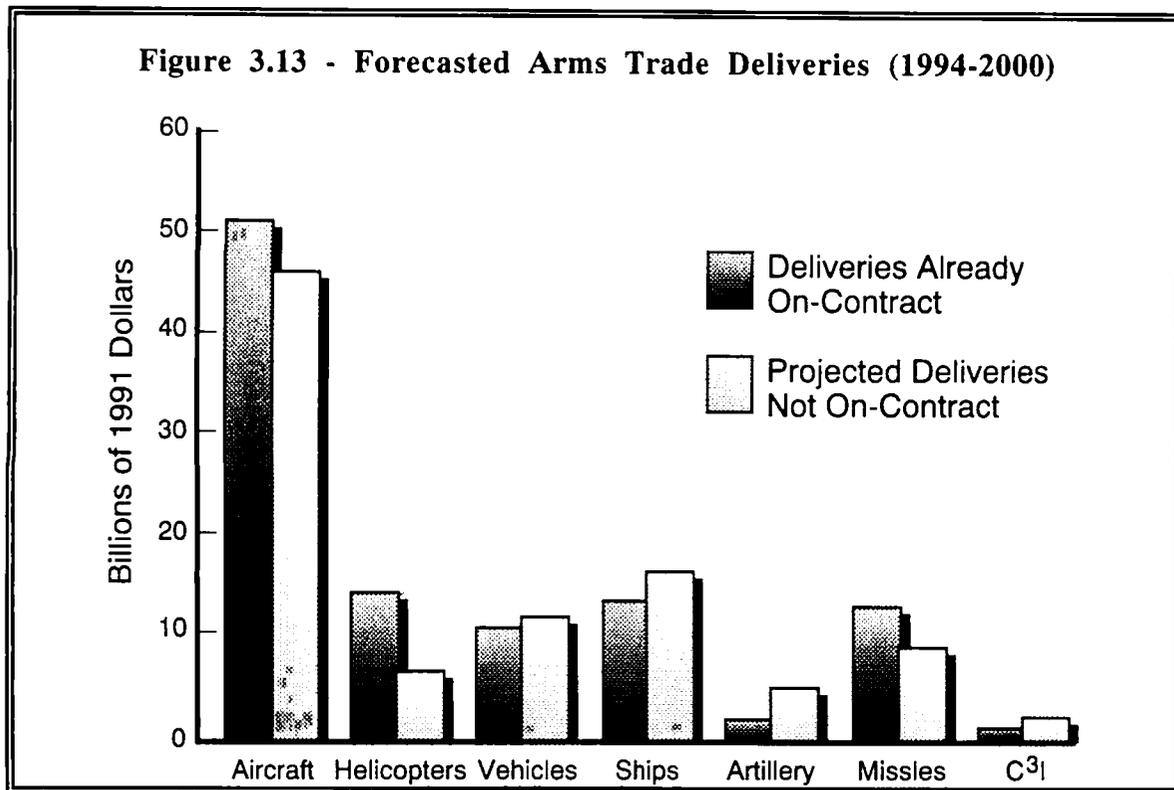
China's success as an arms exporter in the 1980s was directly attributable to the Iran-Iraq war. However, it faces more limited market prospects for this decade without an ability to provide clients with advanced weapons. Chinese exports have held at \$1 billion or less over the past three years. China will continue to rely on the sale of cheaper major systems such as the F-7 fighter to countries such as Iran, Pakistan, and Burma that lack access to or cannot afford more advanced systems. However, China is already facing increased competition for some of these customers, as France and Britain are promoting exports to Pakistan. China is currently attempting to improve its international sales, in part by obtaining technological assistance from Russia. Moscow has been willing to assist with a number of Chinese programs, including the new Super-7 fighter plane. Even with Russia's help, this aircraft is not scheduled for delivery until the latter part of the decade.

At the low end of the market, former Soviet countries can offer equipment that is cheaper than Western arms and usually superior to Chinese products. As early as 1990, Russia replaced China as Iran's biggest arms supplier. Even Poland and Bulgaria have successfully competed against the Chinese for Iranian ground and missile systems projects.

Eastern European countries might be able to hold their own in the sale of their basic ground armaments and certain specialized items, such as jet trainers and electronic equipment, for the remainder of the decade. Overall export sales will decline, however, for the next few years.

### **3.5 Commodity Forecast Results**

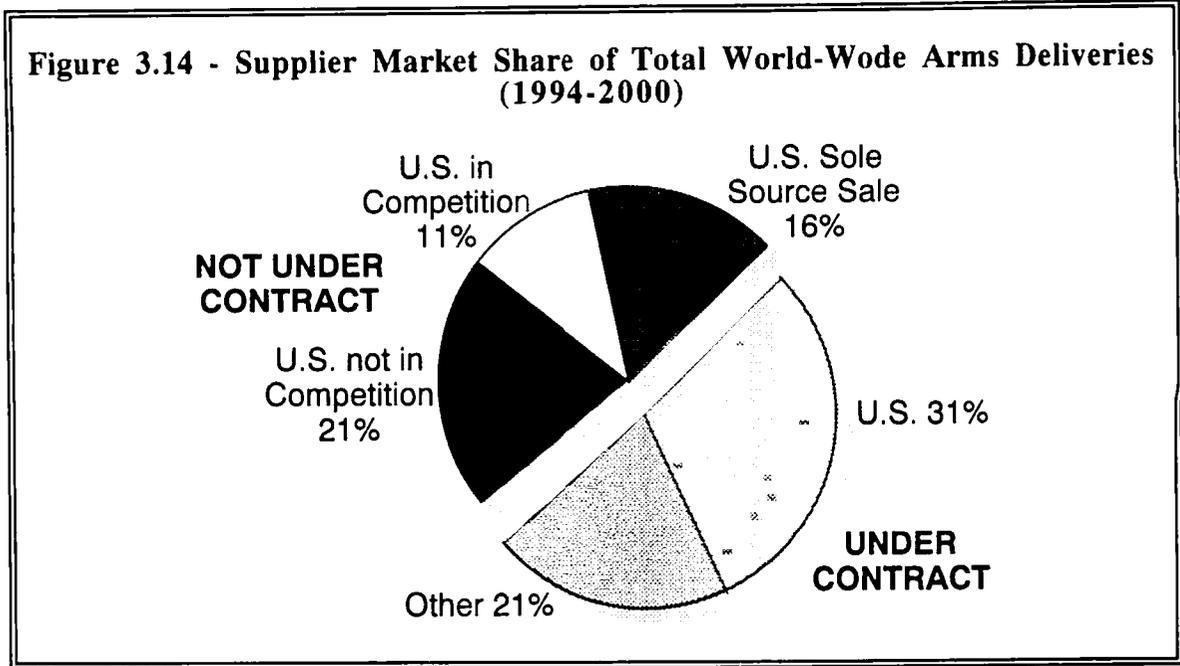
Figure 3.13 shows the breakdown by major defense item category of the \$202.5 billion upper bound of ATDB deliveries, in 1991 constant dollars. Figure 3.13 also indicates whether the delivery is already under contract or is the result of a projected future sale.



In total, \$106.5 billion of the forecasted arms trade deliveries are already under contract, and future contracts are expected to generate an additional \$96.0 billion in deliveries. Aircraft deliveries represent the bulk of the market, with deliveries from future contracts expected to be about ten percent lower than deliveries from existing contracts. The corresponding decline for helicopters is estimated to be 50 percent, meaning two thirds of forecasted helicopter deliveries are already under contract. Also, deliveries from future missile contracts are expected to be approximately 30 percent lower than already contracted deliveries.

For the remaining ATDB categories, the deliveries from future contracts are higher than deliveries currently under contract. The projected increases are ten percent for vehicles and 20 percent for ships. C<sup>3</sup>I, an anticipated growth area, shows a projected increase of more than 100 percent. While future contracts for artillery systems show an even higher growth rate, this projection is indicative of uncertainty in the market. If Figure 3.13 were constructed for the lower bound sales scenario, the artillery increase would be almost nil, while the C<sup>3</sup>I increase would remain above 100 percent.

Figure 3.14 shows that, in total, existing contracts account for between \$102.9 billion and \$106.5 billion, about 52 percent of the ATDB data. The U.S. share is about 63 percent. The ATDB forecasts between \$69.5 billion and \$96.0 billion of deliveries for future contracts. Based on the ratio to the larger of the two numbers, more than one third of these deliveries will be from competing contracts expected to be sole source to the U.S. The U.S. will be in competition for an additional 25 percent of the contracts. The U.S. will not compete for the remaining portion (42 percent) of these sales.



The following seven subsections discuss each of these categories individually. Included in each of these subsections is a pie chart profiling supplier country market share of world-wide deliveries. These pie charts are similar in format to Figure 3.14 which shows data for all commodities combined.

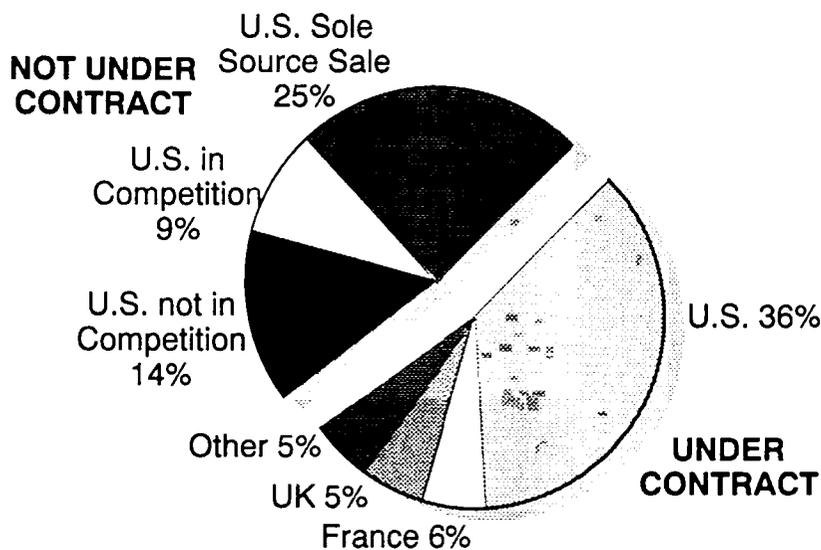
Figure 3.14 and the subsequent commodity pie charts are divided into two sections—"under contract" and "not under contract". The "not under contract" section is further divided into sales projections where (1) the U.S. is believed to be the sole source, for reasons such as interoperability with existing equipment, buyer stated intentions, and unique capabilities not offered by competing producers; (2) the U.S. is in competition with other countries for the sale; and (3) the U.S. is not competitive for the sale, based on such factors as who the buyer is and the buyer's stated (or assumed) intentions.

### 3.5.1 Aircraft Forecast

Figure 3.15 depicts global aircraft market deliveries projected in the ATDB for the remainder of the decade. In total, this market may range from \$85.6 billion to \$96.7 billion in constant 1991 dollars—about 51 percent of the revenue in the ATDB. Attack, cargo, fighter, fighter/attack, surveillance, tanker, and trainer aircraft are all included.

Existing contracts account for 52 percent of the total deliveries and are valued between \$49.4 billion and \$50.9 billion. The U.S. 36 percent share of the global market represents between \$35.0 billion and \$35.5 billion—nearly 3,000 new aircraft and almost 400 aircraft upgrades. France is projected to be the second leading aircraft supplier with six percent of the market under contract, consisting solely of Mirage 2000-5 fighters. The UK contracts for deliveries of approximately 35 billion constitutes about five percent of the total market. Other suppliers with contracts include Brazil (\$1.4 billion), Spain (\$1.0 billion), Germany (\$0.8 billion), Russia (\$0.8 billion), Czech Republic and Slovakia (\$0.4 billion), Israel (\$0.5 billion), Belgium (\$0.1 billion), China (\$0.1 billion), and Netherlands (\$0.1 billion).

**Figure 3.15 - Supplier Market Share of World-Wide Aircraft Deliveries (1994-2000)**



Aircraft upgrades under contract to the U.S. consist of work on U.S. aircraft as well as one transaction involving Tornados for Italy. France is also modifying Tornado aircraft. Israel's upgrade sales include improvements to an assortment of old and new French and U.S. aircraft.

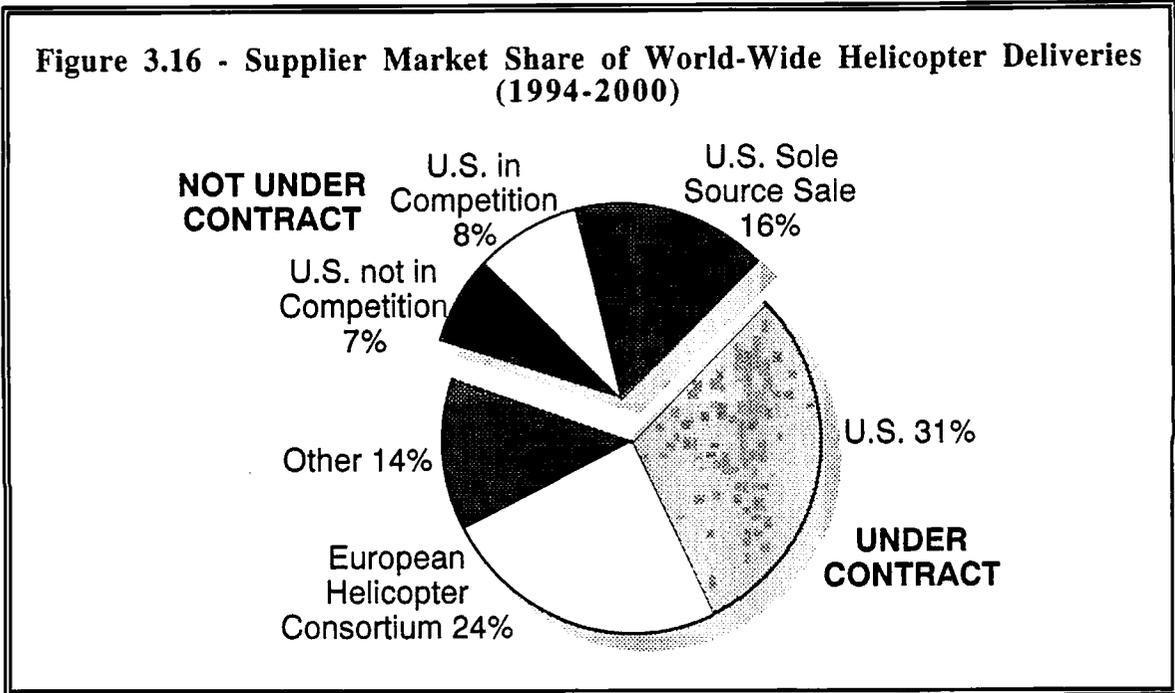
Approximately 1,500 new aircraft sales and nearly 400 aircraft upgrades are not yet under contract, but are projected for delivery by the year 2000. The U.S. is estimated to be the sole source for 25 percent (\$20.1 billion to \$23.9 billion) and in competition for another nine percent (\$6.3 billion to \$8.4 billion) of these deliveries on future sales. The U.S. is not competing for another 14 percent of the market, valued between \$9.5 billion and \$15.5 billion, where the buyer either is unwilling to purchase from the U.S. or the U.S. would not sell to the buyer country.

For sales not under contract, principal U.S. competitors for attack and fighter aircraft are France and Russia; surveillance aircraft competitors include France, the Netherlands, and the UK. The U.S. is competing against France and Switzerland for a sale of fighter/attack aircraft to Austria. The U.S. has good potential in the lucrative fighter and surveillance aircraft categories. The U.S. is expected to face competition from Spain for a sale of 40 Harrier attack aircraft to Thailand. The trainer aircraft category has no U.S. presence. For upgrades not under contract, principal U.S. competitors are France and Israel.

In summary, the U.S. accounts for 70 percent of the deliveries already under contract and between 52 and 71 percent of deliveries not under contract. The U.S. share of total aircraft deliveries ranges between 61 and 70 percent of the market. These percentages are roughly insensitive to the use of the upper or lower bound of the aircraft delivery estimates.

### 3.5.2 Helicopter Forecast

Figure 3.16 contains the percentages of world-wide anti-submarine warfare, attack, scout, and utility helicopter and helicopter upgrade deliveries from 1994 to 2000, based on information in the ATDB. The size of this market, which is approximately ten percent of total arms deliveries, is estimated to vary between \$19.1 billion and \$20.2 billion in 1991 dollars.



The U.S. 31 percent share of all deliveries under existing contracts includes more than 750 new helicopter sales, valued at \$6.2 billion. The deliveries are composed primarily of Apache attack and Blackhawk utility helicopters. A European helicopter consortium closely follows the U.S. with 24 percent of deliveries already under contract—consisting entirely of NH-90 utility helicopters. The remaining suppliers of helicopters already under contract include France (\$0.2 billion), the UK (\$0.9 billion), and Italy (\$1.6 billion).

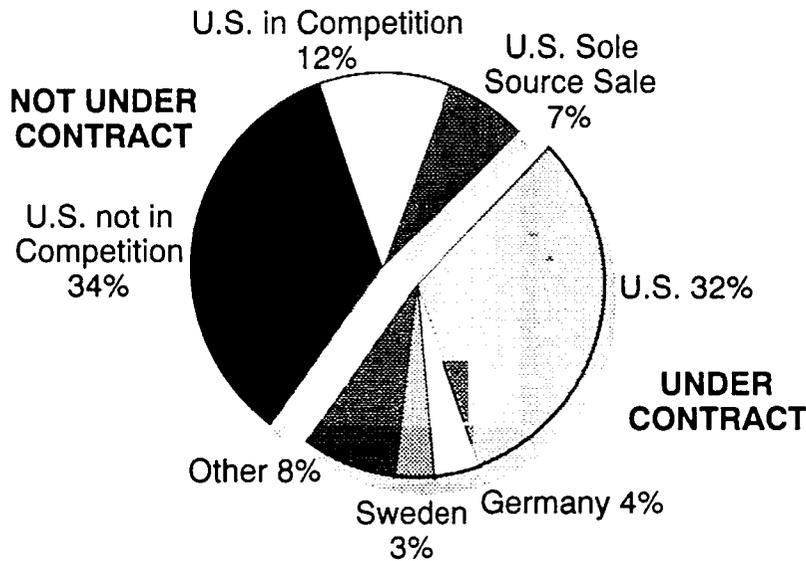
Future sales are projected to account for nearly 500 additional helicopters. The U.S. is projected to be the sole source for between 76 and 79 percent, valued between \$2.5 billion and \$3.3 billion, of deliveries from future sales. The U.S. is in competition with products from France, Germany, the UK, and Russia for an additional \$1.5 to \$1.7 billion in deliveries from utility helicopter sales. The U.S. will not compete for the remaining \$1.2 billion to \$1.3 billion in deliveries not under contract.

In summary, the U.S. contracts for helicopter deliveries equate to 45 percent of all currently contracted helicopter deliveries. The U.S. potential share of deliveries from future contracts ranges between 52 and 79 percent of the market. In total, the U.S. market share is projected to vary between 47 and 56 percent of the global helicopter market. These findings apply to both upper and lower bound helicopter delivery estimates.

### 3.5.3 Vehicle Forecast

Global vehicle deliveries are portrayed in Figure 3.17. Total dollar values of these deliveries may range, in 1991 constant dollars, from \$18.3 billion to \$22.7 billion, according to the ATDB. This market includes new sales and upgrades of armored personnel carriers, infantry fighting vehicles, miscellaneous vehicles, and tanks. Vehicle deliveries account for about 11 percent of all arms trade through the year 2000.

**Figure 3.17 - Supplier Market Share of World-Wide Vehicle Deliveries (1994-2000)**



The portion of Figure 3.17 depicting existing contracts is between \$10.6 billion and \$10.8 billion. With percentages expressed for the total market, the U.S. 32 percent share for new vehicle deliveries from existing contracts is valued at \$7.3 billion, consisting primarily of sales of M1 tanks and infantry fighting vehicles. The U.S. has no contracted vehicle upgrade deliveries. Germany is second to the U.S. with only four percent of the market—\$0.9 billion of deliveries under contract consisting of armored personnel carriers and tanks. Sweden will deliver about \$0.8 billion in vehicles (three percent of the market) from existing contracts, primarily armored personnel carriers to Norway and Saudi Arabia. Some other suppliers with existing contracts include Canada (\$0.6 billion), Russia (\$0.4 billion), the UK (\$0.3 billion), China (\$0.1 billion), and South Korea (\$0.1 billion).

Vehicle exports not yet under contract are estimated to total between \$7.7 billion and \$11.9 billion. The U.S. is expected to be the sole source supplier for \$0.9 billion to \$1.5 billion representing seven percent of the global market. The U.S. is in competition for deliveries of another 12 percent (\$2.6 billion). These deliveries would be for infantry fighting vehicles to Switzerland, in competition against products from Germany; armored personnel carriers to Kuwait and Egypt, in competition with Canada and the Netherlands, respectively; and a tank sale to Saudi Arabia, in competition against the UK. The U.S. is not expected to compete against a potential Russian tank sale to India and a Swiss/Canadian armored personnel carrier sale to Saudi Arabia. Vehicle upgrades not yet under contract are dominated by expected large tank upgrades in India and South Korea.

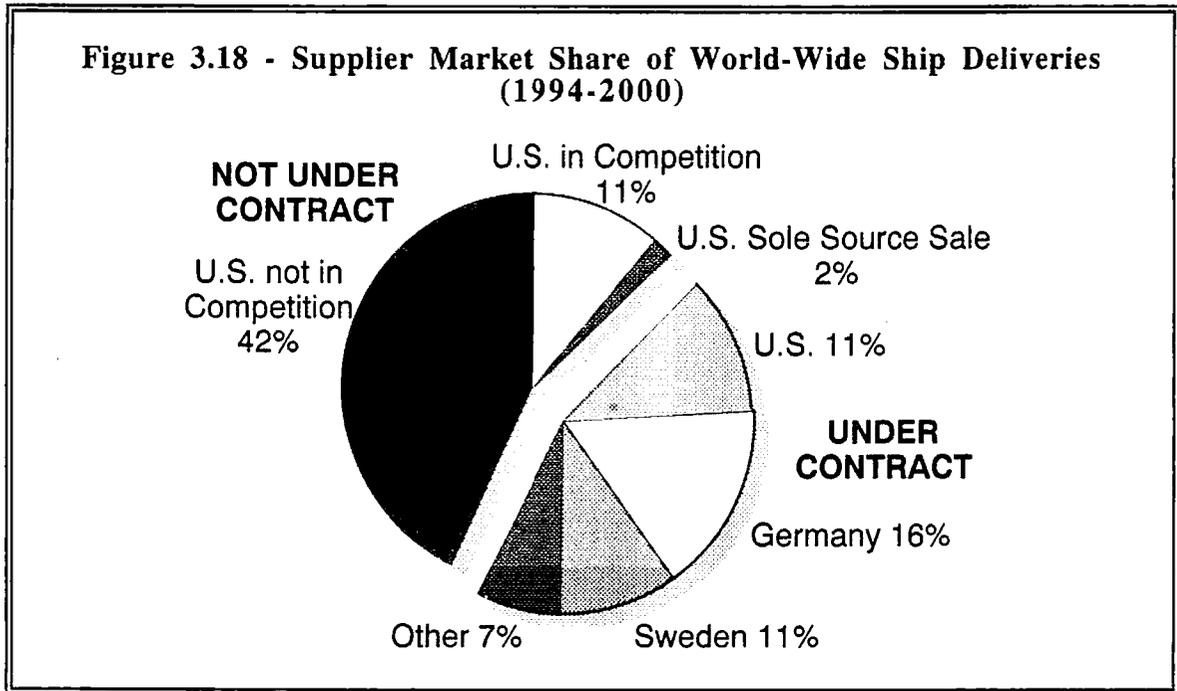
In summary, U.S. vehicle deliveries already under contract represent nearly 70 percent of the total under contract. This is the only category where U.S. export expectations from sales not yet made are substantially lower, on a percentage basis, than from existing sales. The U.S. estimated market share of deliveries not under contract ranges from 13 to 35 percent of that market segment. When contracted and not contracted sales are combined, the U.S. share is projected to vary between 39 and 50 percent of the global market. Similar conclusions are drawn from both upper and lower delivery estimates.

### 3.5.4 Ship Forecast

Acquisitions of ships and ship upgrades for the rest of the decade are shown in Figure 3.18 on a percentage basis. The ship category includes carriers, destroyers, frigates, miscellaneous ships, and submarines. Total deliveries were valued between \$24.5 billion and \$29.7 billion in constant 1991 dollars—about 15 percent of total ATDB revenue.

Ships are the only major arms export category not dominated by the U.S. Only 11 percent of the market is U.S. deliveries from existing contracts—approximately 30 frigates and miscellaneous craft to a variety of customers, and some Egyptian submarine upgrades at a combined value of \$3.2 billion. These deliveries place the U.S. as the third largest exporter based on existing contracts. Germany leads all suppliers with 16 percent, or \$4.6 billion, of deliveries under contract (a mixture of frigates and submarines). Sweden is second with \$3.3 billion of deliveries under existing contracts. Other suppliers with delivery contracts include the UK (\$0.9 billion), Russia (\$0.4 billion), Spain (\$0.3 billion), and China, Italy, and the Netherlands (\$0.2 billion each).

The potential for additional U.S. exports in the portion of the ship market not yet on order is similar to contracted deliveries. The world market for military ships is relatively small but competitive. The U.S. is not a major ship exporter and will most likely retain only a limited share of this market. Although the U.S. has not been producing non-nuclear submarines for many years, on April 7, 1994, the State Department granted an export license to Ingalls Shipbuilding to allow the shipyard to continue its efforts to market and build diesel-powered submarines in the U.S. for possible export.

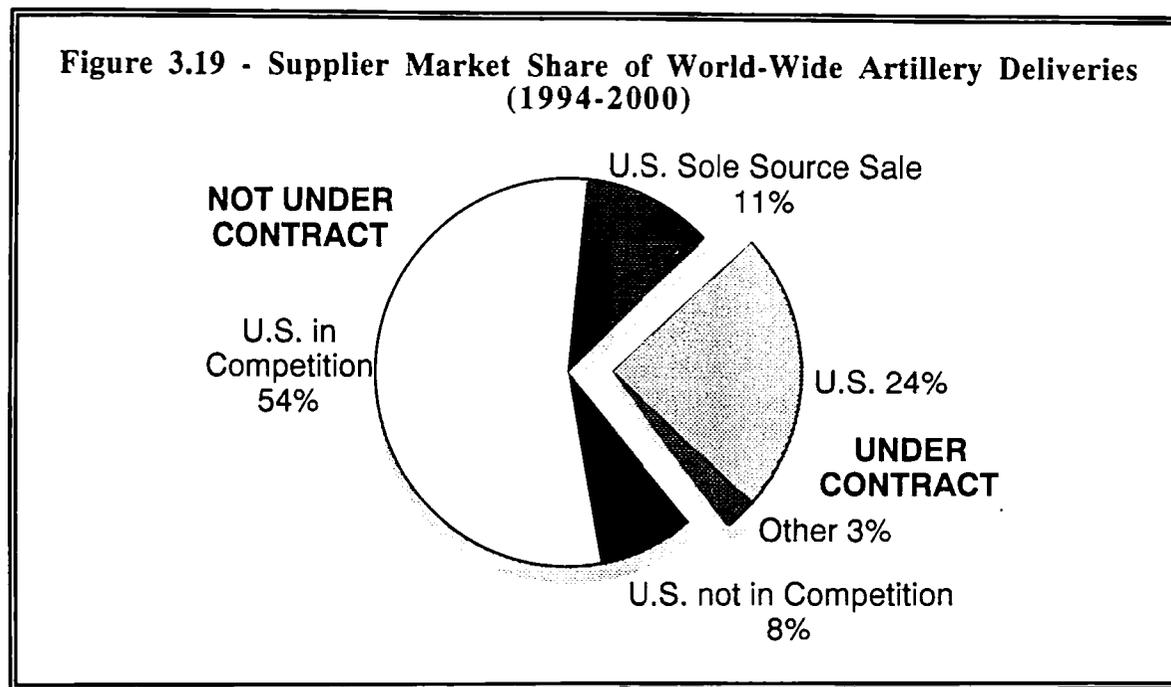


With percentages based on the total market, the U.S. is considered to be the sole source for future contracts for only two percent of the global deliveries. The U.S. is in competition for approximately 11 percent of the market, valued between \$2.5 billion and \$3.2 billion, principally for the sale of missile patrol boats to Saudi Arabia and frigates to the UAE. The U.S. is not a competitor for between \$3.5 billion and \$12.8 of deliveries from future sales agreements.

In summary, the U.S. accounts for 24 percent of ship deliveries already under contract. The U.S. share of deliveries from future contracts may range from 3 to 22 percent. In combination, the U.S. share of global ship deliveries is projected to vary between 12 and 23 percent. Similar results may be derived from the lower bound delivery scenario.

### 3.5.5 Artillery Forecast

Global artillery systems deliveries from 1994 through 2000 are depicted in Figure 3.19 which provides a percentage breakdown of the contracted and non-contracted portions of the market. Air defense artillery, multiple rocket launch systems, and large caliber artillery systems have all been included. The size of this market, in 1991 dollars, is estimated to be between \$3.9 billion and \$7.2 billion according to the information in the ATDB. This represents about four percent of total arms trade.



The U.S. dominates this market, with \$1.7 billion in revenue from deliveries for existing contracts, representing 24 percent of the total market. In total, deliveries from existing contracts are valued at \$1.9 billion. The U.S. sells 155mm and 8-inch self-propelled howitzers and its Multiple Launch Rocket System (MLRS)—approximately 900 systems in total. The U.S. is also supporting an Israeli upgrade of U.S. manufactured 155mm howitzers. Other suppliers with contracts include a European 155mm howitzer consortium (\$0.1 billion) and South Africa (\$0.1 billion).

The artillery deliveries projected from future contracts are estimated to be between \$2.0 billion and \$5.3 billion. The U.S. is considered to be the sole source supplier for 15 percent of the deliveries from future contracts, valued at \$0.2 billion. The U.S. is also in competition for an additional \$0.7 billion to \$4.0 billion in artillery exports in the future. This competition includes the sale of howitzers to Kuwait and India, and MLRS to Saudi Arabia and the UAE. The U.S. is not in competition for future deliveries representing about eight percent (\$0.6 billion) of the total market. Russia and Israel have the edge in this market segment.

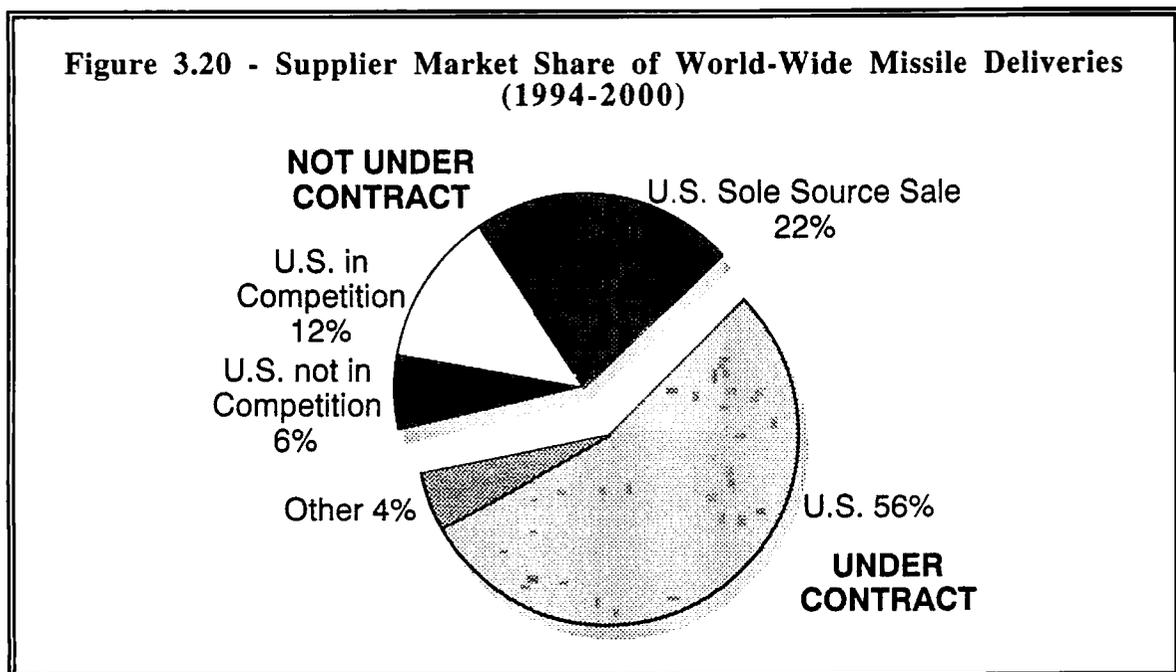
In summary, the U.S. will deliver 90 percent of all artillery systems already under contract. For deliveries not under contract, the U.S. share may range between 14 and 89 percent. When all deliveries are combined, the U.S. market share is projected to vary between 34 and 89 percent when the upper bound market projection is used. For the lower bound sales estimate, results are somewhat different. The total U.S. share is estimated to lie between 63 and 89 percent of the market, implying that the greatest uncertainty for the U.S. market share is generated by the low likelihood of sales by other nations.

### 3.5.6 Missile Forecast

Figure 3.20 shows the percentage share of missile deliveries through the year 2000. The global missile market was subdivided into seven categories: air-to-air missiles, anti-tank guided missiles, ballistic missiles, cruise missiles, precision guided missiles, surface-to-air missiles, and torpedoes. The ATDB values these deliveries, totaling more than 15,000 individual missiles, between \$17.7 billion and \$22.1 billion, in 1991 constant dollars, accounting for approximately 11 percent of total arms exports. Most of this market consists of new sales, with a limited number of Hawk surface-to-air-missile and torpedo upgrades.

The U.S. dominates in this market. Of the \$12.9 billion to \$13.1 billion already under contract, the U.S. portion ranges between \$11.9 billion and \$12.2 billion. Other suppliers with existing contracts include North Korea (\$0.4 billion), France (\$0.3 billion), and Israel (\$0.3 billion).

The almost 9,000 potential missile deliveries not yet under contract have an estimated value between \$4.8 billion and \$9.0 billion. Twenty-two percent of deliveries from future contracts, between \$1.1 billion and \$4.8 billion, are expected to be from U.S. sole source sales. The U.S. is in competition, principally with France, Germany, and Russia, for additional contracts of between \$2.6 billion and \$2.7 billion—12 percent of the total missile market. The U.S. is not expected to compete for \$1.0 to \$1.4 billion in deliveries.

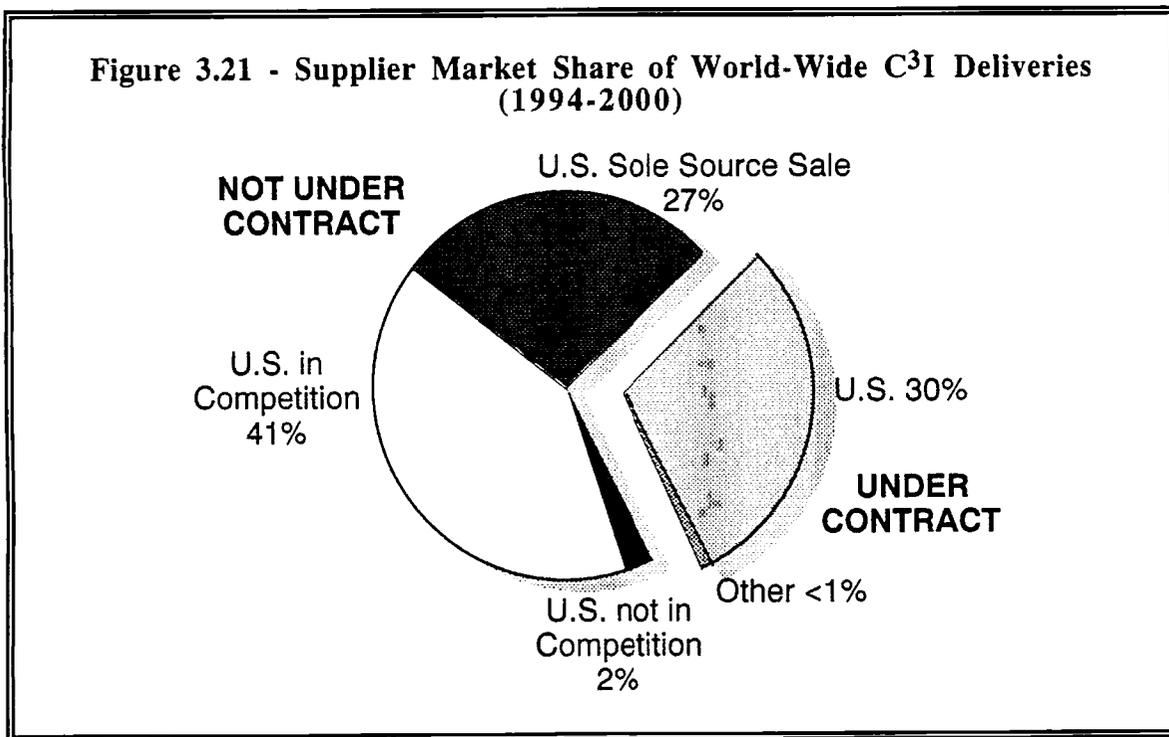


In summary, the U.S. will deliver approximately 93 percent of the dollar value of missiles already under contract. The expected U.S. share of deliveries from future contracts may range between 54 and 84 percent of the high market estimate and between 24 and 75 percent of the low market estimate. This implies that the U.S. is the sole source competitor for some of the more tenuous sales. The U.S. total market share is projected to be in the 74 to 89 percent range in either case.

### 3.5.7 C<sup>3</sup>I Forecast

Figure 3.21 shows the percentages of the C<sup>3</sup>I market as provided by the ATDB. The C<sup>3</sup>I market export deliveries are valued between \$3.6 billion and \$3.8 billion in 1991 dollars, through the end of the decade. While this represents only two percent of world-wide arms trade, C<sup>3</sup>I sales are an expected growth area. C<sup>3</sup>I systems or subsystems include radar, communication, and targeting Systems.

Nearly all deliveries from the \$1.1 billion in existing contracts, are of U.S. origin. The value of deliveries from future contracts may range between \$2.5 billion and \$2.6 billion. The U.S. is estimated to be the sole source for \$1.0 billion of the future deliveries, or about 27 percent of the global market. The U.S. is primarily in competition with France for about 41 percent of the global market valued at \$1.3 billion to \$1.5 billion.



In summary, the U.S. has nearly 100 percent of the deliveries from existing contracts. For both high and low market estimates, the U.S. share of deliveries under future contracts is projected to be between 40 and 96 percent of the market. The U.S. share of all deliveries will be between 61 and 98 percent of the C<sup>3</sup>I market.