Chapter 37

# Proliferation of Advanced Weaponry: Threat to Stability

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Technological change is transforming the context of international security and commerce. The rapid expansion of cross-border trade and the free flow of intellectual as well as financial capital brought on by technological advances have made our national borders porous. Advanced weapons and technology enter global commerce more freely than at any time in living memory. The result: It is increasingly difficult for governments, including the United States, to exercise the kinds of foreign policy options and controls that they once did.

More and more states are capable of tapping into global markets, where technological advances by private corporations offer access to what often are not only solutions to urgent problems but also, in the wrong hands, lethal instruments of warfare. To take one prominent example, advances in biotechnology hold out the promise of eradicating disease and famine globally, even as their military potential could transform that promise into instruments of unprecedented savagery.

Increasing international flows of technology, investment, communications, trade, and labor will continue to exert dramatic and dynamic effects on almost every aspect of proliferation. And proliferation, broadly conceived, will increasingly present profound challenges and vulnerabilities to the U.S. military—including the Navy and the Marine Corps—their doctrine, tactics, warfighting strategies, and materiel.

The term *globalization* is inadequate and misleading as a stand-in for rapidly evolving international communications and economic interaction in the 21st century, especially if it is taken to mean that national borders are somehow unimportant or obsolete. In military terms, national borders are sacrosanct, and preventing hostile forces from compromising them is the first and most essential pillar of national security. Even in terms of alliance relations, nation-states are the political units whose militaries must enter into cooperative arrangements.

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If there is such a thing as globalization, it is surely a broad and ill defined process that proceeds at different rates in different places and has as its object the cross-border integration of many facets of economy, politics, techno-industrial collaboration, migration, finance, communications, and trade. The term is dispensable if the focus is on the proliferation of advanced weapons and military technology, and the kinds of multilateral instruments that may be useful in reducing the overall consequences and vulnerabilities that proliferation presents for the military and political leadership.

The fundamental rationale guiding defense strategy is that the Nation must stay militarily superior. For the most part, this has been interpreted to mean technological superiority. From the 1950s at least through the 1970s, the lead investor in communications, computers, and semiconductors in the United States was the Department of Defense. Pentagon research and development accounted for some of the most significant technical advances, such as supercomputers, geosynchronous satellites, and integrated circuitry. Strict government controls over research and development minimized unregulated technological diffusion and formed the basis for restrictive instruments such as export controls and supplier cartels.

Today, this situation is reversed. Commercial advances in the development and application of technologies, along with the rising pace and level of investment, mean that the arms business is rapidly becoming an adjunct of private enterprise. A recent study conducted by the Defense Science Board (DSB), an advisory committee of military contractors and private experts, announced the demise of the U.S. military industrial base. "It no longer exists in its Cold War form," the DSB study claims, pointing to the rapid commercialization and internationalization of military production that have occurred over the past decade. The U.S. arms industry, a corporate giant of the Cold War, is now "reconstituting itself into a global, more commercially oriented industry."[1]

While the DSB report tends to be overstated, there is more than a grain of truth in the proposition that the defense industrial base is increasingly multinational. In addition to rapid consolidation, this sector is integrating across national borders, using mergers, acquisitions, joint ventures, and other kinds of business partnerships and opportunities to increase efficiency. It is itself now a consumer of predominantly commercial products from many parts of the world. It depends, increasingly, on commercial business and arms exports for growth and profitability.

With few exceptions, the barriers between civilian and military technology have broken down. Among many examples, a commercial division of TRW that makes circuit boards for trucks has also manufactured them for F–22 fighter aircraft. Military industry and technology are spreading around the globe at an accelerating—and to some, an alarming—rate. By the 1980s, more than 180 major weapons systems were in international production at any given time, a dramatic increase from the 1960s, when weapons production was almost wholly national in origin. Today, this is an ordinary phenomenon, with literally thousands of associated international subcontracting arrangements. Codevelopment and licensed production of components and weapons systems among arms firms of different states are rising steadily.[2]

## Proliferation: No Parochial or Weapons-Specific Concern

Traditionally, work on proliferation has tended to concentrate on so-called weapons of mass destruction—nuclear, biological, and chemical weapons—and on missiles capable of delivering them at a range of 300 kilometers or more. The U.S. National Security Strategy explicitly states:

> Weapons of mass destruction pose the greatest potential threat to global stability and security. Proliferation of advanced weapons and technologies threatens to provide rogue states, terrorists and international crime organizations with the means to inflict terrible damage on the United States, our allies and U.S. citizens and troops abroad.[3]

Such language is typical of current thinking in that it focuses on weapons of mass destruction as the only weapons considered capable of inflicting catastrophic damage on the United States, its military, and its global interests.

But there is no compelling military or technological reason that four kinds of weapons (nuclear, biological, and chemical weapons and some missiles) are so often lumped together. In terms of the technical hurdles to production and deployment, delivery requirements, and lethality, nuclear, biological, and chemical weapons are highly dissimilar. There is no logical reason, moreover, to exclude nuclear-capable strike aircraft from the list.[4] Nor is there a compelling rationale for banning chemical weapons, biological ones, and intermediate-range nuclear forces while continuing to invest in and maintain very high, albeit somewhat reduced, levels of strategic nuclear weapons and related launchers (for example, strike aircraft, missiles).

That said, some progress in constructing a nonproliferation regime for so-called weapons of mass destruction has been achieved.[5] Efforts to control chemical and biological weapons—for example, the Chemical Weapons Convention and the Biological Weapons Convention—could become constituent elements of an evolving global security regime to regulate proliferation.[6] Dramatic political changes since 1991 and the negotiated reductions of former Soviet and U.S. strategic nuclear forces under the Strategic Arms Reduction Treaties I and II (the latter recently ratified by the Duma), have greatly decreased the perception of an imminent threat of cataclysmic nuclear war. Notwithstanding problematic developments in North Korea and Iran, nuclear weapons programs have been terminated in South Africa, Brazil, Argentina, and, for different reasons, in Iraq.

On the other side of the ledger, the emergence in 1999 of India and Pakistan as overt nuclear weapons states constitutes a major setback in efforts to retard the spread of nuclear weapons. Ironically, cooperative programs to dismantle or destroy elements of the former superpower arsenals have also substantially increased the available stockpile of weapons-grade plutonium and highly enriched uranium.[7] Excess Russian fissile material, in particular, is not subject to adequate safeguards or accounting standards, despite the Nunn-Lugar Cooperative Threat Reduction Program.[8] The possibility for excess fissile material to fall into the wrong hands will continue to present a major vulnerability for the foreseeable future.[9] Unemployed scientists and engineers who formerly worked on weapons programs pose a related security risk. Still, nuclear proliferation has proceeded on a horizontal path more slowly than many

had predicted, and vertical proliferation of nuclear weapons is substantially in remission, with the plausible exceptions of India, Pakistan, and Israel.

The same cannot be said of conventional weapons. Quite the reverse is true. The proliferation of powerful, advanced conventional arms and their means of production, targeting, and delivery is spinning out of control at a time when the weapons themselves are getting smarter, more precise, more lethal, and capable of deeper strikes with each iteration of information technology. Concern over the proliferation of these weapons is politically controversial in most industrialized and some industrializing countries. The predominant view among U.S. Government officials is, however, that proliferation of conventional weapons to most countries is relatively unimportant, especially compared with the proliferation of weapons of mass destruction.

But inside the armed services one sometimes finds a different perspective, typically because it is the men and women in uniform who might use and face such weapons in warfare. The Navy has long taken a proactive view on this subject. In 1984 a former Chief of Naval Operations wrote in *The Maritime Strategy*:

> The international setting is complicated by the proliferation of modern, high-technology weaponry . . . impressive conventional arsenals possessed by Third World nations pose an immediate concern. While these weapons do not fundamentally change the causes of instability, they do change the nature of conflict and the threats we face. Naval forces must be prepared to encounter high-technology, combined-arms threats in virtually every ocean of the world.[10]

Conventional weapons have in fact taken their toll on international security. Over the past 50 years, there have been more that 160 wars with an estimated loss of 24.5 million lives, all of them to conventional weapons.[11] Few casualties can be attributed to intentional use of weapons of mass destruction over the same period, with the exception of victims of chemical weapons widely reported to have been used in the Iran-Iraq war in the 1980s.[12] It makes sense, accordingly, to pay attention to the nature of conventional proliferation, to understand its root causes and processes, and to find ways to mitigate its effects.

As the nature of conventional warfare changes—due at least in part to technological advances, new doctrines, and force structures in the U.S. military—it is likely that potential rival militaries will seek means to counter what they perceive as an overwhelming U.S. military superiority.[13] Similarly, at a regional level, weaker countries may build crude chemical, biological, or even nuclear weapons to counter the "conventional" superiority of potential or proven hostile neighbors, who might then feel compelled to respond in kind. For these reasons, inattention to conventional proliferation might damage the fabric of existing and emerging nonproliferation regimes. It might lead numerous states to invest in the kinds of asymmetrical capabilities that would threaten not only their immediate neighbors but also U.S. forces and interests in many parts of the world.

Nevertheless, some analysts see the major threat of trade in conventional weapons as residing predominantly in irresponsible arms transfers by Russia, France, or China, for example, to a handful of so-called rogue states—typically, Iran, Iraq, Libya, North Korea, and Syria. The Clinton administration took this approach, and

some in Congress have urged sanctions in response to particularly egregious cases. There is some basis for this concern. In particular, reported Chinese missile sales to Iran and North Korea, as well as Russian sales of Kilo-class diesel submarines to Iran, have caused considerable consternation in Western military and diplomatic circles.[14] The ability to dissuade this commerce, however, has been overshadowed by the predominance of the United States in the arms market. The Chinese are unimpressed with U.S. concerns over missile sales when the United States averaged more than $2 billion in sales of advanced fighter aircraft between 1993 and 1997.

The problem with the overall approach is, of course, that no one can predict which states will be considered rogues in the future. The French, who made extensive arms sales to Iraq in the 1980s, did not foresee the invasion of Kuwait in 1990. The Germans, who provided technicians and parts to Iraqi missile laboratories, did not anticipate that Iraq would launch missile attacks against Saudi Arabia and Israel during the Persian Gulf War. And the U.S. Government did not predict the Islamic revolution in Iran, even though it trained 11,000 Iranian officers and sold $11 billion in advanced weapons to that country.[15] In line with this view, it should be noted that the State Department has recently dropped the characterization "rogue" from its official pronouncements.

With reference to the Persian Gulf, it is well to consider the fragility of some of the monarchies and other governments in that region of the world. Selling massive amounts of advanced armaments to the Persian Gulf States on the theory that Iraq or Iran will remain the bad guys and the recipients the good guys is surely an overly simplistic policy, given the complex military imbalance in the Greater Middle East and the history of warfare in that region. In some cases, providing a particular weapons system or capability to one state also sets in train a diplomatic logic that leads to counterpart sales, for example, to Israel and Egypt, thus ratcheting up, once again, the level of armaments in a hostile and militarily unstable neighborhood.

The argument is sometimes made that many of the states to which advanced weapons are sold will simply be unable to use the equipment in a militarily effective manner. The purpose of that argument is often to downplay the significance of a particular sale, often of strike aircraft. If the country cannot really use the weapons, so the argument goes, or if the seller can control their use by denial of service or spare parts, then the sale is likely to have fewer military consequences. But beyond being thoroughly cynical, this logic has additional implications.

It may be that the countries in question have gained only a false sense of security when they buy high-end weaponry. After all, the weapons acquired by Kuwait prior to the Iraqi invasion were unable even to blunt the attack, and some fell into enemy hands. But it may also turn out, as in the case of Saudi Arabia, that the country also bought an implicit security guarantor, in this case the United States, which provided most of the troops and material for coalition forces during the Persian Gulf War. In many of the countries in question, the vast sums dedicated to weapons procurement could also have been used to ameliorate social conditions or invested in developing indigenous technology or even rudimentary civil infrastructure.[16]

In addition to the military-diplomatic perspective, trends in commercial technology markets also presage declining control by governments over the disposition

of dual-use innovations. Critical technologies vital to defense, from supercomputers to biotechnologies to fiber optics, are increasingly commercial in origin. As developing countries establish their own arms industries, they, too, become more capable of tapping into new sources of commercially and militarily useful goods without reference to constraints imposed by larger powers. In the future, an ever-shrinking percentage of technology will be subject to direct government controls, testing the viability of supplier cartels or trade restrictions for all but a select number of the most advanced technologies.

Of key concern are technologies with potentially significant military applications, along with a smaller set of military-only items such as fuse, warhead, and signature reduction technologies. This broad category of items, taking the form of hardware in some cases, but intellectual property in others, may move through international trade in what appear to be nonmilitary and therefore unproblematic ways. For instance, the same equipment used legitimately by hospitals and pharmaceutical companies to develop vaccines may also be used for the large-scale production of biological weapons by desperate governments or even terrorist organizations. Given today's weapons systems engineering and the growing roles of sensing, data-processing, and communication technologies in the effectiveness of advanced weapons and military operations, the increasing diffusion of such items will likely compound some of the security pathologies that are emerging in the global economy.

## Forms of Conventional Proliferation

Conventional proliferation is, of course, a complex phenomenon, and it takes several distinct forms. Considered in the following are five different categories of proliferation, starting with the arms trade.

### *The Arms Trade (Proliferation 1)*

Whether conducted as foreign military sales, direct commercial sales, or transfer of excess defense articles, the export of weapons by the United States, places increasingly advanced military assets and capabilities in the hands of militaries abroad. Most are friends and allies. And most weapons are controlled most of the time, although there are exceptions, such as the weapons and training provided to Iran prior to that nation's Islamic revolution. Even so, the empirical record of weapons sold or transferred to allies provides a reasonable assurance that they will not be used against U.S. forces in the foreseeable future.

But the same degree of control does not adhere to the exports of our allies and friends. The French and Germans helped to arm Iraq in the 1980s, for example, and it was, of course, a French-made Exocet missile that struck the USS *Stark* with such devastating effect in 1987. Most of the major arms-exporting nations depend on foreign sales to maintain national industries—to achieve economies of scale, to reduce unit costs, and to fund future research and development. Increasingly, even the United States with its vastly superior military industrial capabilities is caught in this conundrum. Rampant overcapacity and reduced demand for

arms over the past decade have led to intense industrial consolidation, and to economic and political competition for export sales. Since the late 1980s, and increasingly so, almost any state with sufficient financial resources has been able to obtain a full range of rather advanced conventional weapons.

It has long been the policy of the United States and its major allies, with the single exception of Japan, to export advanced weapons to a wide variety of states. The United States, for example, has security assistance relationships with 183 nations. In the absence of superpower confrontation, however, the motivations behind arms sales have become largely economic.[17] This situation has reduced, but not eliminated, the influence of foreign policy considerations on the transfer of advanced military technology and potent weapons. Three cases of recent and pending arms sales may be instructive:

*Case 1. M1 Tanks to Turkey.* At this writing, the United States is competing to make a sale of 1,000 M1-series main battle tanks to Turkey. This is not an inconsiderable number. The Army, for example, plans to acquire 83 M1-series tanks through the year 2013 from General Dynamics, the single U.S. tank manufacturer. But Turkey, a North Atlantic Treaty Organization (NATO) member, intends to buy 1,000 main battle tanks at a cost exceeding $8 billion. If Turkey buys M1 tanks, production at General Dynamics will keep humming; if not, the lines will be idle.

This is the old argument about keeping the military industrial base "warm." But in terms of foreign policy and international security, selling tanks to Turkey is at best a dicey proposition. Turkey has legitimate security needs. Yet its most likely adversary is Greece, another NATO member. As a flag-rank security assistance officer recently stated, neither Turkey nor Greece needs new tanks. But he was quick to add the standard bromide that if the United States refused to sell M1 tanks to Turkey, another supplier most certainly would be found. The Turks, he argued, are determined to get new tanks, the contest being between the M1 and the German Leopard 2.[18] This is a case, if consummated, in which economic considerations may have clouded the judgment of our leaders, trammeled our foreign policy, and increased the likelihood of tension within the NATO Alliance.

*Case 2. No Aegis for Taiwan.* In April 2000, Washington agreed to sell Pave Paws long-range radar and air-launched missiles to Taipei, prompting a "principled" diplomatic protest from Beijing. At the same time, however, the United States declined to sell Aegis-equipped destroyers and submarines, pending study of Taiwan's needs.[19]

Observers might judge that this decision was prompted by a concern that the presence of submarines and Aegis destroyers would increase tensions with China. And there may also have been concern that releasing Aegis technology to Taiwan, if it could not be controlled, might compromise the security of future Navy operations. This is a clear case in which security and foreign policy considerations have partially overcome the economic considerations that typically drive the arms trade.

*Case 3. F–16s for the United Arab Emirates.* In March 2000, the United Arab Emirates (UAE) contracted with Lockheed Martin to buy 80 F–16 fighter aircraft for $6.4 billion.[20] The UAE is, of course, one of several small Arab sheikhdoms

that are both friendly to the United States and militarily vulnerable to larger, more powerful states in the region, such as Iran and Iraq. From the U.S. point of view, the threat from Iran and Iraq is more from unconventional weapons. So it is difficult to see how these states would be deterred by the presence of new F–16s in the UAE. It is, accordingly, doubtful that these weapons will improve security or stability in the region, although they may presage another U.S. foreign entanglement if the UAE is attacked by one of its neighbors, as Kuwait was in 1991. The sale is, however, an economic bonanza for Lockheed because the American taxpayer long ago paid for the development of the fighter and its domestic production facilities.

In 1995, the Clinton administration explicitly recognized the economic health of the U.S. arms industries as a criterion to be considered in evaluating arms sales.[21] Proposed sales are worked out in detail between the buyer and U.S. security assistance personnel or representatives of American companies. If the administration tenders a letter of offer and acceptance, the sale is made. And even though most arms sales come under the jurisdiction of the Arms Export Control Act, the presumption favors sale. Congress has not taken a floor vote on an arms sale since 1986, and no sale has been disapproved by Congress.[22] When a proposed sale is not consummated, it is usually, although not always, because the buyer cannot pay the bill or has turned to another supplier.[23] The UAE F–16 buy is a case in which economic considerations lead us to dupe friends in the Persian Gulf into believing that their security will somehow be enhanced by gold-plated armaments. As discussed earlier, their only real security is a foreign guarantor.

The United States is, of course, not the only major arms exporter, although in recent years it has broken away from the pack. As shown in table 1, of the top 15 suppliers of major conventional weapons, the U.S. share of arms exports was 50 percent from 1994 through 1998, the most recent year for which data are available. The number two supplier, Russia, took about 11.5 percent of the market, followed by France, the United Kingdom, and Germany with 9.9, 8.3, and 6.7 percent, respectively. China occupies a distant sixth place with only 2.6 percent of this export market.

As table 2 indicates, when the full range of military transfers and services is included, the numbers increase substantially; in fact, when the U.S. data from tables 1 and 2 are compared, the total for the years 1994–1998 increases from $53.9 billion to $78.1 billion, or an increase of about 45 percent. Unfortunately, comparable figures are not as readily available for the other countries listed in table 1. But if they were, it is likely that large increases would be observed, as in the case of France (see note to table 1), which shows an increase similar to that observed in the U.S. figures. The arms trade is much larger than is generally imagined.

**Table 1. Leading Suppliers of Major Conventional Weapons, 1994–1998 (U.S. $ billions at constant 1990 prices)**

| *Rank* | *Supplier* | **1994** | **1995** | **1996** | **1997** | **1998** | *Total* |
|---|---|---|---|---|---|---|---|
| 1 | USA | 9.8 | 9.6 | 9.7 | 12.4 | 12.3 | 53.9 |
| 2 | Russia | 1.2 | 3.3 | 3.6 | 3.0 | 1.3 | 12.3 |
| 3 | France* | 0.8 | 0.8 | 1.9 | 3.3 | 3.8 | 10.6 |
| 4 | U.K. | 1.5 | 1.7 | 1.8 | 3.2 | 0.7 | 8.9 |
| 5 | Germany | 2.6 | 1.4 | 1.4 | 0.7 | 1.1 | 7.2 |
| 6 | China | 0.7 | 0.8 | 0.8 | 0.3 | 0.2 | 2.8 |
| 7 | Netherlands | 0.5 | 0.4 | 0.4 | 0.6 | 0.5 | 2.3 |
| 8 | Italy | 0.3 | 0.3 | 0.4 | 0.4 | 0.3 | 1.8 |
| 9 | Ukraine | 0.2 | 0.2 | 0.2 | 0.5 | 0.4 | 1.5 |
| 10 | Canada | 0.4 | 0.4 | 0.2 | 0.1 | 0.2 | 1.4 |
| 11 | Spain | 0.3 | 0.1 | 0.1 | 0.6 | 0.2 | 1.3 |
| 12 | Israel | 0.1 | 0.2 | 0.3 | 0.3 | 0.1 | 1.0 |
| 13 | Czech Rep | 0.4 | 0.2 | 0.1 | 0 | 0 | 0.7 |
| 14 | Belarus | 0 | 0 | 0.1 | 0.5 | 0 | 0.7 |
| 15 | Belgium | 0 | 0.3 | 0.1 | 0.1 | 0.1 | 0.6 |
| **Total** | | **18.8** | **18.8** | **21.2** | **26.1** | **21.2** | **107.1** |

*According to a March 2000 *Report to Parliament on France's Armament Exports,* France exported $6.3 billion in "materiel and associated services" in 1998, nearly double the amount represented in the table (source: *Defense News*, May 8, 2000, p. 3).
**Source:** Stockholm International Peace Research Institute, *The Leading 31 Suppliers of Major Conventional Weapons, 1994–98,* Arms Transfer Project, Stockholm, June 18, 1999.

**Table 2. United States Exports of Conventional Weapons, 1990–1998 (U.S. $ billions)**

| *Fiscal Year* | *Foreign Military Sales* | *Direct Commercial Sales* | *Total* |
|---|---|---|---|
| 1990 | 7.7 | 6.2 | 14.0 |
| 1991 | 8.8 | 5.2 | 14.0 |
| 1992 | 10.1 | 2.7 | 12.7 |
| 1993 | 11.3 | 3.8 | 15.1 |
| 1994 | 9.5 | 3.3 | 12.8 |
| 1995 | 11.9 | 3.2 | 15.1 |
| 1996 | 11.6 | 1.6 | 13.1 |
| 1997 | 19.2 | 1.8 | 21.1 |
| 1998 | 13.5 | 2.0 | 15.6 |
| **Total** | **103.6** | **29.8** | **133.4** |

*Numbers are not adjusted for inflation and may not add due to rounding.
**Source:** Defense Security Cooperation Agency, *Foreign Military Sales, Foreign Military Construction Sales, and Military Assistance Facts,* Facts Book, figure 2, "Foreign Military Sales Deliveries (Defense Articles and Services and Construction)," September 30, 1998.

### *Licensed Production (Proliferation 2)*

The international transfer of military technology and the licensed production of military systems constitute a second major element of conventional proliferation. Beginning in the late 1960s under the Nixon Doctrine, transfer of military technology to U.S. allies was seen as a way of enhancing alliance relations, building NATO military capability and interoperability,[24] and, in the developing world, reducing the dependence of Asian allies on U.S. forces by building indigenous arms industries. Throughout the 1980s, the number of major weapon systems being produced under international licensing agreements steadily increased. With its superior technology, the United States led the pack, transferring production of about as many major weapons to other nations as the Europeans and the Soviets combined.[25]

While modest at first, after 1980, about half of all licensed production took place in developing countries. In 1988, for example, India, Egypt, Indonesia, South Korea, Taiwan, and Brazil were producing 43 different major weapons under international licensing agreements. Major systems transferred have included the U.S. M1 Abrams tank (Egypt), the U.S. F–16 fighter and Multiple Launch Rocket System (Turkey), the German Type 209 submarine (Brazil and South Korea), the French Alpha Jet (Egypt), the Soviet MiG–27 fighter (India), the British Jaguar fighter (India), the French Super Puma helicopter (Indonesia), the French MILAN Anti-Tank Missile (India), and the German BK 117 helicopter (Indonesia).[26] These and hundreds of other transfers directly proliferated military technology and production know-how to a wide array of nations.

The measure of major weapons systems used in table 1 does not say much about the industrial infrastructure at the level of parts and components. When production of a large-scale major weapons system is transferred from one country to another, such as the M1 or the F–15, literally hundreds of companies can be involved in each country in the transfer and manufacture of parts and components. These companies may be primarily doing business in the arms sector, or just as likely, they will have operations in the nonmilitary, commercial economy as well. This category overlaps with *Proliferation 1* and *Proliferation 4* because the transfer of production technology is often part of a major arms sale, and the companies involved at the subcontract level can be loosely but accurately classified as civil-military enterprises.

### *Military Multinationals (Proliferation 3)*

Cross-border integration of the military industrial base at the prime contractor level is a third major driver in the proliferation of conventional weapons. The companies in question are mainly in the business of manufacturing weapons systems and providing associated maintenance and construction services. In recent years, they have consolidated on both sides of the Atlantic. They may also be the military division or arms subsidiary of a multinational corporation that is sourcing, manufacturing, subcontracting, conducting intrafirm trade, and selling in several sectors of the economy in many parts of the world. In the United States, these typically include

such corporations as Boeing, Lockheed Martin, Raytheon, and United Technologies. Their counterparts in Europe include such companies as Thompson (France), DASA (Germany), and British Aerospace.

Among such companies, there is a long history of transatlantic and inter-European collaboration in military technology and industry, although it has not always been successful. This has taken the form of teaming arrangements, joint ventures, mergers and acquisitions, foreign direct investment, and strategic alliances. Fundamental to these arrangements is the growing perception that the military sector is very much like other high-technology sectors of the global economy, notwithstanding that it is more strictly regulated for reasons of national and international security.

At the core of this development is the emergence of multinational corporations or their divisions that conduct business primarily in the arms sector under contract to various governments. To the extent that arms corporations act as free agents in the international economy, their relationship to the country of origin and its military security becomes attenuated. Given enough latitude, they can and do change the balance of power among nations, merely by making advanced military technology and weapons available to a range of buyers according to free market principles. The impact of this development on the Navy and Marine Corps may not be immediate or direct. But if established trends continue, it might be prudent to revisit and update Admiral Watkins' admonition for the 21st century as follows:

> The international setting is complicated by the proliferation of modern, high-technology weaponry. . . . Naval forces will have to be prepared to encounter reconnaissance strike capabilities, smart weapons emanating from dispersed platforms, and increased lethality threats in virtually every littoral region of the world.

### *Civil-Military Integration (Proliferation 4)*

A fourth major element in the proliferation of conventional weapons is the increased use of parts, tools, components, and software in military systems that were initially designed and produced for commercial markets. Typically referred to as "civil-military integration" at the subtiers of the military industrial base, this increasingly involves commercial off-the-shelf purchases and the incorporation of information technology products into weapon systems.

The companies that supply such parts and services may be multinational or foreign-based, and military sales often account for only a small fraction of their overall business. The semiconductor industry is a primary example. Increasingly, so the argument goes, the industrial base that supports Department of Defense procurement is multinational, both in its business practices and its ownership and location.

The economic efficiencies achieved, however, obviously have to be weighed against the price in terms of national and international security. Even if most industries can make powerful arguments in favor of free and open commerce, these arguments cannot credibly be extended to exports of advanced weapons. Citizens believe that arms industries exist because states need to ensure national security and have developed industrial policies to that end. Corporations today seem to have forgotten

their origins and are growing and adapting to meet the demands of the global marketplace—as if they were producing cars or compact disk players.

Greater commercial procurement has been promoted for many years as a way to increase efficiency and drive down costs within the Department of Defense. While some analysts have been concerned about vulnerabilities such as interruption of supply or dependence on foreign producers for critical components, almost no consideration has been given to the consequences that increased civil-military integration has for the global diffusion of militarily useful technologies.

### *Reconnaissance Strike Capabilities (Proliferation 5)*

Finally, there is increasing discussion that the United States may be developing a qualitatively new revolution in military affairs. At the heart of this new force structure is large-scale use of commercial information technologies and components enabling warfare based on command, control, communications, and computers, intelligence, surveillance, and reconnaissance ($C^4ISR$) assets. This is a fifth major element of the proliferation of conventional weapons technologies, which many believe must be pursued and extended to NATO and perhaps other allies.[27]

Some items, such as precision-guided munitions, 1-meter resolution commercial satellites, and smart weapons are already deployed, while others are 10 to 20 years away from completion. By 2010, precursor elements of the revolution are expected to "provide an order of magnitude improvement in lethality."[28] To some, these technological innovations will lead over time to an as yet notional integrated network of military systems, capable of destroying targets at great distances with pinpoint accuracy, using standoff weapons fired from geographically dispersed platforms.[29]

If successful, these military technological developments could stimulate a qualitatively new form of conventional warfare capability, which might be perceived by many countries as an unacceptable advantage for the United States. Developing countries, who may construe U.S. military peacekeeping activities, for example, as a global police function, may buy commercially available computers, satellites, and imagery sensors in order to assemble elements of their own reconnaissance strike capability. They might concentrate limited resources in areas where the Navy is most vulnerable. Others countries might resort to developing crude versions of nuclear, biological, or chemical weapons as a way to thwart U.S. military superiority. Such low-technology deterrence weapons might be capable of inflicting unacceptable damage on the American homeland or our troops and interests abroad.[30]

## Challenge to the Inevitability of Global Proliferation

These five aspects of proliferation obviously overlap and are cumulative. They add up to largely uncontrolled international diffusion of military technical capability over which there is little or no effective oversight. It is a process that has been gaining momentum for several decades. During the Cold War, political authorities and most security analysts largely ignored the problem of the spread of military technology because of the seemingly unassailable assumption that the United States would

always stay ahead. They envisaged a permanent technical hierarchy in the international system, which the United States would dominate and which would translate into political leadership as well as military superiority on the battlefield.

As one means of preserving U.S. military technical superiority over the Soviet Union, an elaborate system of supply-side export controls was constructed through the Export Administration Act, the Arms Export Control Act, the Coordinating Committee on Multilateral Export Controls (COCOM), and a variety of other measures administered by the Departments of Defense, State, and Commerce. During the l990s, however, the Cold War system of controls was largely dismantled or substantially liberalized. Tectonic political changes of the past decade, however, have lessened concern over the diffusion of advanced technology, and the desire of American companies to sell into international markets has slowly but irresistibly taken precedence. Moreover, as the distinction between civil and military technology diminishes, as a practical matter, it is increasingly difficult to know which items and technologies to control.

Indeed, the arguments against exporting militarily useful items and technologies have now come full circle. Senior government officials and their counterparts in the private sector argue that the United States must draw on and contribute to a transnational military industrial base, not only to reduce procurement costs but also, more importantly, to gain access to the best technology in order to hold the technological edge. To these ends, they have embraced a number of assumptions and acquisition polices that—if accepted and implemented—would accelerate widespread proliferation of cutting-edge conventional military capabilities.

In support of such policies, some analysts contend that rapidly evolving international communications and economic interaction are producing global access to the essential technologies that will support and equip militaries in the 21st century. Some also argue that the trade in high-technology items and international exchange of scientists and engineers is creating global technological parity as well. These are questionable propositions at best. No one seriously thinks that all states—for example, Mozambique, Cuba, or North Korea—will enter the future military technical competition with anything resembling a modern military. For even potentially more threatening states (for example, China or India), a substantial technological gap exists and will remain for the foreseeable future.

The technologies that underpin the modern military are extremely expensive and difficult to acquire. The United States, which has achieved military technical supremacy and is far ahead of its closest competitor, has done so as a matter of public policy dating back to the 1950s. This has been possible because of the strength of the American economy, as well as an enduring political consensus to commit public funds to ensure dominance throughout the post-World War II period. Few, if any, developing states could achieve access to even a majority of advanced military technical capabilities without explicit assistance from the United States or one of its advanced industrial European or Asian allies.[31] This is particularly true at the systems integration level.

There is even considerable concern, although we do not share it, that a growing gap in U.S. and European military technical capabilities might undermine NATO

cohesion, thereby limiting the ability of the United States to enter into coalition warfare. Overall, a technological leveling is certainly in progress, but it is hardly global in scope, and it can be largely attributed to consolidation and competition in the commercial, nonmilitary sectors of the international economy. The application of high-end commercial technologies to military purposes is a difficult, long-term, and very expensive project. Few states can be expected to achieve it. This fortunate circumstance provides time to build multilateral institutions to address proliferation.

The technologies that sustain modern militaries are constantly changing and must constantly be upgraded, again at great cost. If the United States is poised at the brink of another revolution in military affairs, it is also riding the crest of the longest economic expansion in modern times. If economic growth should falter, or worse, if a recession should develop, the tax revenues necessary to modernize military forces might not be so readily available. In the absence of a clear and present military threat, the needs of a capabilities-based military might receive less priority. National resources might be turned to other perceived pressing needs, for example, a bailout of Social Security, provision of health benefits for an aging population, or civil infrastructure construction projects.

The argument is frequently advanced that international military industrial integration—for example, increased licensed production, the creation of military multinational corporations—will help reduce costs by improving U.S. access to foreign technology and capital. It is also argued that a transatlantic military industrial base would strengthen NATO, in part by reducing the technological gap between the U.S. and European military establishments. The question arises: If the Europeans, with whom we have had so much military technical cooperation, cannot keep up, how will anyone else manage it?

The answer, of course, is that the United States would have to take great pains to foster technological parity in the military field. For this reason, the United States can influence the pace and direction of conventional proliferation more than any other country. It is, of course, theoretically possible that many nations will eventually gain access to world-class militarily relevant technology, but there is nothing inevitable in such an outcome. There is a debate that needs to take place concerning the consequences of pursuing foreign and military industrial policies that broadly and purposefully proliferate military and dual-use technologies. Fortunately, access to technology does not mean that it will be acquired. And acquisition of a technology is no guarantee that it can be successfully integrated into a weapons system, or into an overarching system of systems, such as that envisaged by the would-be architects of the 21st century revolution in military affairs.

Clearly, militarily useful technology is neither a static nor a measurable thing. It is constantly evolving, subject to unanticipated scientific and technical progress, unexpected countermeasures, and myriad other variables and uncertainties. This is no great insight, but rather merely a reiteration of common knowledge. Over the past two decades, the United States has made massive investments and now possesses a substantial lead in power projection using reconnaissance and long-range, accurate weapons. We are still in the initial stages of developing an "advanced reconnaissance strike capability," which no other nation is likely to achieve for many years to come.

This does not mean, however, that we can rest on our laurels, or cease to be vigilant in our intelligence gathering and analysis of foreign military capabilities. As three noted military analysts have argued:

> Because it requires the integration of many functions and technical components, the development of an advanced reconnaissance strike capability cannot emerge as quickly as the underlying revolution in information handling that enables it. No other military organization is within a decade of matching the United States in this respect, and the United States is more than a decade away from complete realization of the development it has pioneered. The problem of regulating reconnaissance strike capability has nonetheless been inexorably posed. A security nightmare looms and its prevention creates a powerful incentive for cooperative arrangements.[32]

International arms production cannot, accordingly, be seen as an unalloyed public good—even if there are potential economic benefits. If progressive consolidation relieves the surplus capacity plaguing the arms sectors in all the industrial economies, it might also reduce national defense burdens and remove one critical impetus for indiscriminate arms exports. In any case, procurement from nonmilitary commercial enterprises can help reduce the costs of national defense investment, updating the military capabilities of the United States and other countries with the most advanced computing, sensing, and communications systems. And to the extent that commercial competition discourages usual and customary practices, the burden of producing redundant and overdesigned weapons systems with huge cost overruns may no longer be imposed on taxpayers.

It is possible, although by no means certain, that new acquisition strategies and industrial policies taking advantage of commercial opportunities make sense in terms of acquiring the most capable weapons at an affordable price. But it is one thing to recognize structural changes in the international economy that lead to the rapid development and diffusion of military technology. It is, however, quite another to implement industrial policies that would accelerate the emergence of foreign military organizations with advanced reconnaissance strike capabilities, now referred to variously as a revolution in military affairs or as $C^4$ISR assets. Responsible officials have paid insufficient attention to the implications of an accelerated proliferation of militarily relevant technologies for international security.

## A Multilateral Approach

The failure to develop policies to manage the global spread of arms and militarily useful technology and to write international codes of conduct that could help curtail unwise arms exports is symptomatic. It suggests a larger problem: an inability to define a concept of security that can elevate international interests above parochial political and economic concerns. It also reflects a deep institutional inertia. Even as the effectiveness of export controls wanes, treated largely as a nuisance that neither controls technologies nor advances business interests, officials of the Departments of State, Defense, and Commerce who pass judgment on export license applications have resisted proposals for needed reform.

The end of the Cold War and the emergence of a global information economy have radically changed the way that business is conducted. The challenge is to create new policy instruments that are effective in retarding proliferation, while letting the market determine the outcome for legitimate trade. This is especially crucial in technology markets, where there are many channels of supply, and where many innovations with wholly legitimate or nonmilitary applications also contribute to weapons development. In such commercial markets, economic imperatives make a competitive trading system inevitable.[33]

Proliferation has been elevated to the center of U.S. military planning but, as suggested earlier, it is almost exclusively focused on so-called weapons of mass destruction and some missiles. There are also less well-known efforts to control "weapons of ill repute," such as antipersonnel mines, blinding lasers, and a variety of fragmentation and incendiary devices. At the same time, in a gaping logical disjunction, shorter range missiles, combat aircraft, surface ships, and submarines—all of which can deliver nuclear, biological, and chemical ordnance—continue to be traded widely.

The term *weapons of mass destruction* is based more on historical usage than on analysis of the characteristics of various weapons. But the false dichotomy between weapons of mass destruction and conventional ones has helped legitimize largely unrestricted trade in the latter. Consequently, there are few effective controls over the sale of conventional weapons or the transfer of associated underlying production technologies. As innovations produced by the information technology industries are incorporated into weapons, a sound multilateral policy on arms exports and transfers of military technology becomes increasingly important.

Realism about the increasing futility of sovereignty-based controls in the face of global technology markets, however, should not be a pretext for fatalism. A new system of trade regulation should move away from increasingly ineffectual efforts to choke off the supply of technology and toward greater transparency in contracting and assurances as to the ultimate purpose to which sensitive technologies are put. This would shift the responsibility for misuse squarely to those to whom it belongs: the recipients and the supplier companies involved. A system of this kind need not impede the global operations of legitimate businesses in the high-technology commercial sectors. Policymakers and business leaders have made these kinds of discriminations in other areas—for example, with copyrights, trademarks, and other forms of intellectual property rights protection, as well as efforts to prevent legitimate products like pharmaceuticals from being diverted to proscribed ends.

As matters now stand, however, there is no functional worldwide arrangement to manage competing state interests or to cope with international pathologies, such as industrial mercenaries, terrorists, and narco-traffickers. There is not even a functional equivalent for the regime of the Coordinating Committee on Multilateral Export Controls (COCOM) that restricted sales of military technology and equipment to the Soviet bloc during the Cold War. The Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies was signed by 33 nations in July 1996,[34] and the initial terms and conditions of the new international organization were adopted and published.[35] But to date, the arrangement has received scant

attention from the policy community and only ridicule from the arms lobby. It is currently languishing with little high-level involvement. Wassenaar does not have the teeth to control arms exports; it serves, at the moment, only as a forum for exchanging information about weapons sales.

The consequences of rapid global economic integration—a process that has been advancing steadily throughout the post-World War II period—have quite suddenly attracted popular attention. For example, many critics treat the World Trade Organization and the North American Free Trade Agreement as entities that appeared magically on the political scene in the 1990s, suddenly threatening the foundations of our domestic regulatory and social policy. Viewed from this perspective, multinational corporations and their allies in government appear to be bent on creating a world in which they can dictate to every country its social, environmental, and labor law. And competition among jurisdictions for business and competition among workers for jobs are forcing the United States into a race to the bottom, in which the weakest regulatory regimes and the lowest wages set the standard that everyone in the world must meet.

Applied to arms production and militarily useful technology, global economic integration threatens a new round of weapons proliferation that will circumvent the emerging framework of agreements on weapons of mass destruction. Unregulated commercial exchange directly impedes the achievement of peace and international security. Clearly, the world needs a new concept of proliferation that can override parochial economic interests and the fanciful notion that conventional arms are commodities that should be traded freely.

It is paradoxical, and troubling, that popular opinion has turned so hostile to multilateral economic and regulatory institutions at a time when international cooperation is so essential. The threat that destructive technology will be spread through commercial competition, the threat that giant firms will trigger a regulatory price war among governments, the threat that no country will bear the costs of reducing carbon dioxide emissions or military exports because no other country is seriously doing so—all can be overcome only through cooperative international agreements. Recent protests in Seattle and Washington notwithstanding, developing international instruments that retard proliferation will benefit everyone, even if sometimes individual and national sovereignty is attenuated.

In addition to a renewed commitment to multilateralism, governments must look for new modalities in regulation. As firms consolidate into ever-larger corporate entities, it may well become necessary to draw them into the regulatory process. Big firms use their power to influence regulations, but they are also vulnerable when the public judges their conduct to be immoral or irresponsible. Just as American firms helped to formulate the code of conduct under which they operated in South Africa in the past or to control the trade in chemical weapons, the multinational information technology industry, for example, together with nongovernmental organizations (NGOs), might play an active role in the formulation of standards of corporate conduct to regulate proliferation of dangerous technologies and goods.

Cooperation among governments, industry, and civil society in formulating and enforcing regulations is urgent when cutting-edge technology and trade in knowledge

is concerned, notably when military applications pose a threat. The public sector needs the expertise that business and NGOs can contribute. They should explore how best to employ existing institutions and new multilateral initiatives to meet the challenges of the global spread of militarily useful technology. If the Wassenaar Arrangement is to have any effect, it must, at a minimum, identify a set of specific technologies and particular weapons that should be subject to restrictions or prohibitions. Such a list has eluded consensus among members to date. In lieu of making an immediate and sustained commitment to a Wassenaar process of this kind, there are a few practical steps that should be considered for policy innovations.

### *Global Monitoring*

Analysis is needed on how the United States could take the lead in getting other countries to recognize that managing technology trade—from biotechnologies to space systems—increasingly will have to shift away from an exclusive focus on supply controls and toward monitoring the application of technologies. Although current agreements include end-use assurances as part of contracts, they have not been reliably enforced. Recognition of this fact will not alone meet the challenge, but it does provide a principle.

Countries choosing not to join a managed trade regime could be denied access to its benefits or given access on significantly more restrictive terms, at costs that become more directly calculable by governments and individuals. By seeking to advance the principle of free trade for all compliant states and by providing a clear incentive to suppliers and recipients to abide by monitoring arrangements in return for greater market access, the regime could remove many of the political impediments currently hampering control initiatives, including the perception of discriminatory application among potential recipients.

### *Transparency*

Are there ways in which the United States could engage its industrial partners, both governments and private firms, in designing and instituting a system of safeguards for certain sensitive technologies that are being sold to countries whose stability is not assured? Such end-use arrangements would require heightened levels of transparency in international trade and effective enforcement mechanisms.

### *Multilateral Aid*

It is clear that trade in proscribed technologies has been much exacerbated by the economic stresses and discontinuities brought on by the fall of the Soviet Union and the communist governments in East European states. The United States needs to know a great deal more about policies for resolving Russia's dilemmas in order to counter these trends. The possibility of aid to countries to establish technology control programs needs further examination. There is precedent: With the assistance of Western specialists, the Russian government began in the mid-1990s to set up a special body, composed of senior officials from departments in the foreign policy, indus-

try, economics, finance, and security ministries, with responsibility for exercising political control over arms imports and exports. Similar efforts are occurring in China and in the former Soviet republics.

### *Supply-Side Controls*

It should be acknowledged that some supplier restrictions still play a critical role in identifying and targeting technologies that are almost exclusively pertinent to proscribed weapons development. Many vital ingredients for missile development, such as advanced guidance needed for accuracy, remain in the hands of just a few suppliers, and such commerce must be isolated from routine trade. As with domestic policy, the challenge is identifying the appropriate balance between promoting free enterprise and retarding the proliferation of dangerous military technologies that creates vulnerabilities, especially for the United States.

### *Global Coordination*

The central question is on how to build sustainable multilateral regimes. A multinational secretariat with the mandate to monitor sensitive technology transfers in an integrated manner could reduce problems posed by the fragmentation of existing national arrangements and bolster their effectiveness. Such an organ would seek to formalize and streamline control guidelines, establish procedures for routine consultations among participants, anticipate new technological breakthroughs, and install a global code of conduct for the arms trade.

### *Government-Industry Partnerships*

To make such a regime work, cooperation with industry is essential. The U.S. Government often imposes trade restrictions after only limited consultation with industry. The result has been industry antagonism and efforts to undercut unpopular policies through Congress or the media. There is growing recognition, however, in both government and industry, that multinational corporations have both an obligation and a vital role to play in the matter of addressing problems of public policy. As the main source of expertise on technology, and as the parties most often involved in daily transactions, companies may be the best means by which governments can track compliance with restrictions on exported products. Industry can help identify relevant building blocks and "fingerprints" for particular proscribed technologies, and devise safeguards and other end-use restrictions to prevent the diversion of civilian or dual-use equipment to military application.[36]

Industry today and in the future will be affected increasingly by the proliferation of weapons worldwide and the escalating violence associated with it. The case of Iraq in the early 1990s is a good illustration of the hazards of unregulated commerce in components and material. That commerce aided in the development of Iraq's biological, chemical, and missile capabilities. As business is disrupted by military conflict or regional instability, legitimate industries will doubtless be encouraged to seek new ways to aid in the regulation of sensitive technologies.

### *The Role of Multilateral Financial Institutions*

International lending institutions such as the International Bank for Reconstruction and Development and the International Monetary Fund could play a role in linking international financial assistance to various norms of military behavior. Recent interest in influencing the size of national defense expenditures could be extended to concerns about diversion of technologies. These institutions have begun to attenuate their decades-long support for the formal fiction that a country's defense sector should not be included in evaluations of its economic performance, political stability, or other variables that factor into decisions about credit or aid eligibility. Direct financial inducements are being used increasingly to constrain former Soviet weapons designers and engineers from lending their expertise to defense industries in developing nations.

### *Reform of Institutions*

Domestic agencies with jurisdiction for technology exports, from the Departments of Commerce to State to Defense, obviously have different and often conflicting missions. In the current state of play, confusion over mandates and objectives means that too much time is spent in settling disputes and not enough in making export control systems effective and efficient. Senior policymakers often lack a balanced view of important policy issues; regulations are redundant and may conflict; enforcement jurisdictions compete for the same ground; and information flow within and among agencies is inadequate, inefficient, or both.

Thinking through organizational innovations will necessarily involve an examination of whether consolidation of some or all elements of the arms and dual-use technology export application, review, and approval procedures in a single organization would improve policy effectiveness. To the extent that multiple offices, staffs, registration and analysis procedures, forms, data systems, and review processes could be combined and simplified, there would be significant efficiency gains. American business has a legitimate concern that its international competitors could gain an advantage from the inconsistent and slow-moving U.S. regulation of technology exports.

## Conclusion

The displacement of the unambiguous Soviet threat has elevated proliferation as the rubric under which to address a multitude of national security objectives—designing intervention forces to counter Third World arsenals, developing and deploying national defenses against missile attacks by regional powers, crafting preparedness schemes or specific countermeasures for terrorism at home and abroad, and reaffirming the importance of nuclear deterrence to dissuade states from pursuing their own weapons of mass destruction programs. Organizational and financial resources have risen accordingly, accompanied by a vast and rapid increase in antiproliferation and response agencies, bureaus, and special task forces, each with its own stake in the broader debate over weapons and technology proliferation. Formerly the preoccupation of diplomats and arms control advocates, proliferation is today a national *cause célèbre*.

But the overwhelming preoccupation of the United States with preventing states from acquiring weapons of mass destruction—predominantly nuclear weapons—has overshadowed any serious effort to regulate the instruments that account for almost all of the millions of casualties inflicted in the wars of the last 50 years. In this New World Order, complex multilateral cooperation between governments, industry, NGOs, and global financial institutions is necessary to stem the illicit trade in advanced technologies. Thus far, however, there has been a failure to manage the global spread of militarily useful conventional technologies. This is due in large measure to the reluctance of existing institutions to consider significant reforms in procedures or criteria. Like so many other post-Cold War issues, the proliferation of advanced technologies points to the need for new institutions that can help articulate international codes of conduct and design broader incentives to encourage collaboration between business and government and more emphasis on transparency in trade as part of a global national security strategy.

## Notes

[1] Office of the Secretary of Defense, report of the Defense Science Board Task Force on Globalization and Security (Washington, DC: Government Printing Office, December, 1999).

[2] William W. Keller, *Arm in Arm: The Political Economy of the Global Arms Trade* (New York: Basic Books, 1995), 97–145.

[3] The White House, Office of the Press Secretary, *A National Security Strategy for a New Century* (Washington, DC: Government Printing Office, January 5, 2000), 6.

[4] John Harvey, *Assessing Ballistic Missile Proliferation and Its Control: CISAC Report* (Stanford, CA: Stanford University Press, November 1991).

[5] The Chemical Weapons Convention and Biological Weapons Convention are multilateral regimes that ban development, use, and even possession of these weapons. In 1987, the Intermediate Nuclear Forces Treaty banned a whole class of U.S. and Soviet weapons on a bilateral basis. The START agreements involve reductions in strategic nuclear weapons only. The Missile Technology Control Regime, which is not a treaty, seeks to stem the proliferation of missiles with a range of 300 or more kilometers by coordinating policies of member states.

[6] Leonard S. Spector and Jonathan Dean, "Cooperative Security: Assessing the Tools of the Trade," in *Global Engagement: Cooperation and Security in the 21st Century*, ed. Janne E. Nolan (Washington, DC: The Brookings Institution, 1994), 147–161.

[7] At the end of 1994, for example, there was an estimated 1,514 tons of U.S. and Russian excess weapon-grade plutonium and highly enriched uranium. David Albright and Kevin O'Neill, eds., *The Challenges of Fissile Material Control* (Washington, DC: Institute for Science and International Security, 1999), 31. See also David Albright et al., *Plutonium and Highly Enriched Uranium 1996: World Inventories, Capabilities, and Policies* (New York: Oxford University Press and Stockholm International Peace Research Institute, 1997), 441–443.

[8] Jessica Eve Stern, "Cooperative Activities to Improve Fissile Material Protection, Control, and Accounting," in *Dismantling the Cold War: U.S. and NIS Perspectives on the Nunn-Lugar Cooperative Threat Reduction Program*, eds. John M. Shields and William C. Potter (Cambridge, MA: The MIT Press, 1997), 342–343.

[9] Graham T. Allison et al., *Avoiding Nuclear Anarchy* (Cambridge, MA: MIT Press, 1996), 7–8.

[10] James D. Watkins, *The Maritime Strategy* (Annapolis, MD: Naval Institute Press, January 1986), 6.

[11] Ruth Leger Sivard, *World Military and Social Expenditures 1996* (Washington, DC: World Priorities, Inc., 1996), 18–19.

[12] It is likely that there were several hundred deaths and several thousand casualties attributable to Iraqi use of mustard gas and tabun nerve gas in the Iran-Iraq war. See, for example, Julian Perry Robinson and Jozef Goldblat, *Chemical Warfare in the Iraq-Iran War*, Fact Sheet; Stockholm International Peace Research Institute, May 1984.

[13] Richard L. Kugler, "Conventional Operations and Warfare: A New Era Ahead?" in *Strategic Assessment 1999: Priorities for a Turbulent World*, ed. Hans Binnendijk (Washington, DC: National Defense University Press, 1999), 270–271.

[14] "China has also supplied CSS–2 intermediate range ballistic missiles to Saudi Arabia, Silkworm anti-ship missiles to Iran and Iraq, and ballistic missile technology to Pakistan and perhaps Iran, North Korea and others. China developed the mobile, solid-fuel M–9 and M–11 short range ballistic missiles reportedly with Pakistan, Syria, and Iran as interested buyers," Robert Shuey and Shirley A. Kan, *Chinese Missile and Nuclear Proliferation: Issues for Congress*, CRS Issue Brief (Washington, DC: Government Printing Office, November 16, 1995) and Kenneth Katzman, *Iran: Current Developments and U.S. Policy*, CRS Issue Brief 93033 (Washington, DC: Government Printing Office, January 2, 1997).

[15] U.S. Department of Defense, Defense Security Assistance Agency, *Foreign Military Sales, Foreign Military Construction Sales and Military Assistance Facts* (Washington, DC: Government Printing Office, September 30, 1989), 3; U.S. Department of Defense, Defense Security Assistance Agency, *Fiscal Year Series* (Washington, DC: Government Printing Office, September 30, 1989), 101.

[16] Yahya M. Sadowski, *Scuds or Butter: The Political Economy of Arms Control in the Middle East* (Washington, DC: The Brookings Institution, 1993).

[17] For a discussion of post-Cold War arms export policy, see William W. Keller and Janne E. Nolan, "The Arms Trade: Business As Usual?" *Foreign Policy* 109 (Winter 1997/98), 113–125.

[18] Ironically, both the Abrams M–1 and the Leopard 2 grew out of a failed attempt by the United States and West Germany to collaborate on a common main battle tank in the 1970s. Marsh Gelbart, *Tanks: Main Battle Tanks and Light Tanks* (London: Brassey's UK, Ltd., 1996), 33.

[19] Ted Plafker, "Chinese Protest U.S. Sale of Weapons, Radar to Taiwan," *The Washington Post*, April 19, 2000, A28.

[20] Christopher Parkes, "UAE Signs $6.4bn Deal to Buy Lockheed Fighter Jets," *The Financial Times*, March 6, 2000, 1.

[21] Office of the Press Secretary, The White House, "Criteria for Decisionmaking on U.S. Arms Exports," Fact Sheet (February 17, 1995), 1.

[22] Cynthia McKinney (D–GA), *Congressional Record* (May 24, 1995), H5502.

[23] In fairness, it must be acknowledged that the services, the State Department, and The White House staff do occasionally prohibit arms sales for foreign policy reasons or because of a concern that a sale might potentially create a military vulnerability. These would, however, be the exceptions that prove the rule.

[24] Building rationalization, standardization, and interoperability (RSI) has long been an elusive goal within the NATO alliance.

[25] U.S. Congress, Office of Technology Assessment, *Global Arms Trade: Commerce in Advanced Military Technology and Weapons*, OTA–ISC–460 (Washington, DC: Government Printing Office, June 1991), 7.

[26] U.S. Congress, Office of Technology Assessment, *Global Arms Trade*, 8.

[27] David C. Gompert, Richard L. Kugler, and Martin C. Libicki, *Mind the Gap: Promoting a Transatlantic Revolution in Military Affairs* (Washington, DC: National Defense University Press, 1999).

[28] U.S. Joint Chiefs of Staff, *Joint Vision 2010* (Washington, DC: Department of Defense, 1998), 13.

[29] For a discussion of this concept, see Paul K. Davis et al., *Strategic Issues and Options for the Quadrennial Defense Review* (Santa Monica, CA: RAND, 1997), ix, 32–40.

[30] For a discussion of such "recomplicating issues," see Charles J. Dunlap, Jr., *Technology and the 21st Century Battlefield: Recomplicating Moral Life for the Statesman and the Soldier* (Carlisle, PA: Army War College, Strategic Studies Institute, January 15, 1999).

[31] India's Light Combat Aircraft (LCA) program is now 7 years behind schedule, with further delays anticipated. This has occurred even though the United States has provided significant technical help, including provision of a fly-by-wire system made by Lockheed Martin and customized by India's Bharat Electronics, Ltd, a state-owned enterprise. *Defense News*, May 8, 2000, 10.

[32] Ashton B. Carter, William J. Perry, and John D. Steinbruner, *A New Concept of Cooperative Security*, Brookings Occasional Papers (Washington, DC: The Brookings Institution, 1992), 50.

[33] Paradoxically, the economic benefits of the weapons trade are fairly modest: the average annual value of purely military exports represents only 0.7 percent of global trade.

[34] In December 1995, after almost 2 years of extremely sensitive and difficult negotiations, 28 countries established the Wassenaar Arrangement. The original signatories were Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Poland, Portugal, the Russian Federation, the Slovak Republic, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States; with Argentina, Bulgaria, the Republic of Korea, Romania, and Ukraine joining in July 1996. Andrew J. Pierre, ed., *Cascade of Arms: Controlling Conventional Weapons Proliferation in the 1990s* (Washington, DC: The Brookings Institution, 1997), preface.

[35] "The Wassenaar Arrangement, Initial Elements, as adopted by the Plenary of July 11–12, 1996."

[36] An important precedent for this kind of collaboration is the vital role played by the Chemical Manufacturers Association in devising and promoting controls for the Chemical Weapons Treaty.