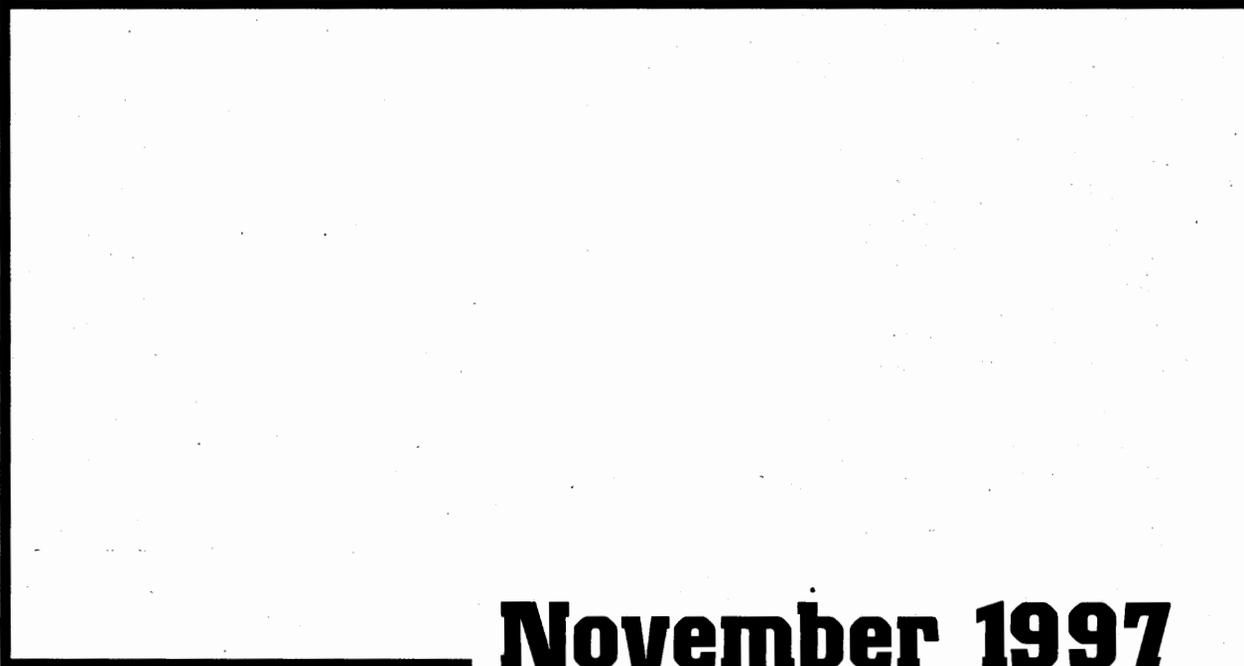


PROCEEDINGS

THREAT AND RESPONSE



November 1997

Office of the Secretary of Defense



904

**Proliferation:
Threat and Response**

November 1997

MESSAGE OF THE SECRETARY OF DEFENSE

In ancient times, Greek city-states assailed enemies with the noxious fumes of smoldering pitch and sulfur. Similarly, Chinese warriors wafted arsenic-laced smoke screens against their foes. In the Middle Ages, disease was used as a weapon of war against besieged cities. In World War I, American doughboys suffered the searing stench of mustard gas. In the last decade, Iraq used chemical weapons against Iran and its own people. With advanced technology and a smaller world of porous borders, the ability to unleash mass sickness, death, and destruction today has reached a far greater order of magnitude. A lone madman or nest of fanatics with a bottle of chemicals, a batch of plague-inducing bacteria, or a crude nuclear bomb can threaten or kill tens of thousands of people in a single act of malevolence.

These are not far-off or far-fetched scenarios. They are real—here and now. Weapons of mass destruction already have spread into new hands. As the new millennium approaches, the United States faces a heightened prospect that regional aggressors, third-rate armies, terrorist cells, and even religious cults will wield disproportionate power by using—or even threatening to use—nuclear, biological, or chemical weapons against our troops in the field and our people at home.

America's military superiority cannot shield us completely from this threat. Indeed, a paradox of the new strategic environment is that American military superiority actually *increases* the threat of nuclear, biological, and chemical attack against us by creating incentives for adversaries to challenge us asymmetrically. These weapons may be used as tools of terrorism against the American people. In warfare, these weapons may be used to attack U.S.

and coalition vulnerabilities, such as air bases and seaports. They may also be used in an attempt to counter U.S. dominance on the battlefield, neutralize vastly superior U.S. conventional forces and power projection capabilities, or deter U.S. involvement in a conflict.

These weapons pose a grave and urgent threat to international security. The May 1997 *Report of the Quadrennial Defense Review* concluded that U.S. defense planners must assume that use of chemical and biological weapons is a "likely condition of future warfare" and that these and nuclear weapons are likely to be used "early in the conflict to disrupt U.S. operations and logistics."

There is no single defense against this threat. Instead, it must be treated like a chronic disease. We constantly must be alert to the first signs and symptoms, and be ready and capable of employing a myriad of treatments.

Through the Department of Defense Counterproliferation Initiative, DoD contributes to government-wide efforts to prevent parties from obtaining, manufacturing, or retaining these weapons. The Initiative equips, trains, and prepares U.S. forces, in coalition with the forces of friends and allies, to prevail over an adversary who threatens or uses these weapons and their associated delivery systems.

This new edition of *Proliferation: Threat and Response* updates information about the nature of global proliferation and describes the policies and programs that DoD is carrying out to counter this growing threat to American citizens, armed forces, and allies.



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Section I

The Regional Proliferation Challenge

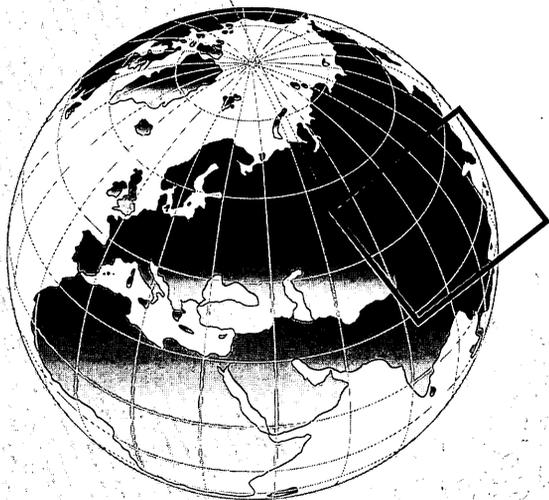


THE REGIONAL PROLIFERATION CHALLENGE

The May 1997 *Report of the Quadrennial Defense Review* (QDR) concluded that the threat or use of nuclear, biological, or chemical (NBC) weapons is a likely condition of future warfare and could occur in the early stages of war to disrupt U.S. operations and logistics. These weapons may be delivered by ballistic missiles, cruise missiles, aircraft, special operations forces, or other means. In many of the world's regions where the United States is likely to deploy forces— including Northeast Asia and the Middle East— potential adversaries have chemical and/or biological weapons and the missile systems

to deliver them, and actively seek nuclear weapons. Potential adversaries may seek to counter American conventional military superiority using less expensive and more attainable, asymmetrical means, including NBC weapons. To meet this challenge, as well as the possibility that NBC weapons might also be used in some smaller-scale contingencies, U.S. forces must be properly trained and equipped to operate effectively and decisively in the face of NBC attacks. The first section of this report details the proliferation of NBC weapons and the threat it poses to U.S. interests and forces.

Northeast Asia



NORTHEAST ASIA

GOALS AND INTERESTS

The strategic significance of Northeast Asia continues to grow. U.S. ties to Asian allies and friends span the range of security, economics, culture, and politics. The importance of long-standing U.S. alliances and security relationships in this region is further buttressed by the region's unprecedented economic growth over the past decade. Security and stability in this region are essential if economic relations are to continue to flourish.

Despite recent positive trends toward political liberalization and market-oriented economic reforms, legacies of the Cold War and numerous territorial disputes continue to burden the region, including the division of the Korean peninsula and the China-Taiwan dispute. Multiple national claims to territory in the South China Sea remain a potential source of conflict that could engage many of the region's nations. Additionally, leadership transitions facing many regimes in the region will have unknown consequences for regional stability.

The United States continues to seek a stable and economically prosperous region. Strong bilateral relations with friends and allies, particularly Japan and South Korea, are the foundation of U.S. efforts to encourage regional stability. Central to this goal are the approximately 100,000 soldiers, sailors, Marines, and airmen present in the region who reassure U.S. allies, deter aggression, and enhance stability. A long-term U.S. objective in the region remains the peaceful reunification of the Korean peninsula in accordance with the wishes of the Korean people. The United States, in close coordination with the Republic of Korea, will continue to maintain forces on the peninsula to safeguard mutual security interests into the foreseeable future.

Although the October 1994 Agreed Framework with North Korea over its nuclear facilities mitigated the immediate nuclear threat, Pyongyang still possesses an unreasonably large conventional force, as well as militarily significant chemical weapons and the means to deliver them. Proliferation, particularly the broad-based NBC weapons

and missile programs that North Korea has implemented, poses a significant challenge to U.S. security interests, as well as to those of U.S. allies and friends. The North Korean NBC weapons and missile programs have the potential to set off destabilizing arms races and heighten tensions throughout the region.

In the event of another war on the Korean peninsula, NBC weapons present a significant threat to U.S. forces and the security of U.S. allies. Should a conflict occur, North Korea would likely try to consolidate and control strategic areas of South Korea by striking quickly and attempting to destroy allied defenses before the United States can provide adequate reinforcements. Pyongyang would most likely attempt to accomplish this with its large conventional force and its chemical weapons and ballistic missiles.

It is critically important that the United States engage China so that it contributes to regional stability and acts as a responsible member of the international community. China, a nuclear weapons state since 1964, remains a source of concern because of the role Chinese companies continue to play in supplying a wide range of dual-use materials, equipment, and technologies that contribute to indigenous missile and chemical weapon programs in some countries of proliferation concern. China's influence is of critical importance in this region. The United States will continue to interact with China in order to promote adherence to international standards on human rights, nonproliferation, and international trade. The United States also seeks greater transparency in China's defense programs, including its planning and procurement processes, and will continue to engage China in a dialogue aimed at fostering cooperation and confidence-building. Beijing has signaled some willingness to adopt a more responsible supply policy by adhering to international nonproliferation norms like the Nuclear Non-Proliferation Treaty (NPT), by ratifying the Chemical Weapons Convention (CWC), and by reaffirming to the United States its pledge to abide by the basic terms of the Missile Technology Control Regime (MTCR) regarding

ballistic missile sales. However, the continued willingness of Chinese firms to engage in nuclear, chemical, and missile cooperation with countries of serious proliferation concern, such as Pakistan and Iran, presents security concerns in many regions where the United States has national interests at stake.

Counterproliferation will continue to be a strong component of the U.S. regional strategy in Northeast Asia as long as U.S. defense commitments and U.S. forces are threatened by the spread of NBC weapons and missiles. Should a proliferant go unchecked, calling U.S. capabilities and commitments into question, states may seek unilateral alternatives to ensure their security, thus stimulating proliferation.

CAPABILITIES, INTENTIONS, AND TRENDS

Introduction

In Northeast Asia, North Korea and China have substantial NBC weapons and missile capabilities. Should there be a conflict on the Korean peninsula, U.S. and allied forces must be prepared to defend against North Korean use of chemical weapons and ballistic missiles. The potential for China's use of ballistic missiles, should a regional conflict occur involving China, also is a particular concern.

North Korea supplies missiles and missile-related technology to countries in the Middle East, while China supplies various NBC- and missile-related equipment to countries in the Middle East and South Asia. Such sales serve both nations' economic and political interests and are especially critical as an income source for Pyongyang. Because of these supply policies, particularly missile exports, any improvements that China and North Korea make to their NBC weapon or missile capabilities in the coming years could have implications far beyond the region.

North Korea

OBJECTIVES, STRATEGIES, AND RESOURCES

Since the 1950s, Pyongyang's defense programs have been aimed at developing a strong military

force designed to preserve its regime, provide political leverage, and reunify the peninsula. The development of its NBC weapon and ballistic missile capabilities is viewed by Pyongyang as an important means of augmenting its large conventional land forces in the event of a conflict on the peninsula.

North Korea also uses sales of equipment and technologies to generate hard currency revenues for its depressed economy and as a means of supporting continued research and development for its NBC weapon and missile programs. Sales have consisted primarily of missiles and missile-related technology, mostly to countries in the Middle East. In the future, barring a diplomatic breakthrough, North Korea is likely to continue these sales and to market its equipment and technology, especially in the Middle East and South Asia.

Activity in North Korea's nuclear weapons material production program at Yongbyon was suspended in accordance with the October 1994 Agreed Framework. North Korea is abiding by its provisions of that agreement. Nevertheless, it retains key technology and expertise to restart its effort, should it decide to do so. The North also retains chemical warfare and ballistic missile capabilities, which it could employ against both military and civilian targets if war were to break out on the peninsula.

North Korea's economic situation has continued to decline, with an estimated drop of 5 percent in gross domestic product (GDP) annually for the last five years. This situation has severely limited Pyongyang's ability to support both the military and civilian sectors of the economy. Shortages, especially food, have been common in recent years. On several occasions, the North has requested and received emergency relief from the international community. Nevertheless, Pyongyang continues to invest scarce resources in developing and maintaining its military forces, including its chemical and biological warfare and missile programs.

NUCLEAR PROGRAM

As a result of the 1994 Agreed Framework, key facilities at North Korea's Yongbyon nuclear complex either were shut down or construction was halted. Although it is believed that the North

previously produced enough plutonium for at least one weapon, under the terms of the Agreed Framework, Pyongyang agreed to freeze its plutonium production capability at Yongbyon. Currently, it has halted operations of the 5-megawatt (electric) plutonium production reactor, where U.S. personnel are helping to prepare spent fuel for eventual shipment out of North Korea. Also, North Korea has ceased construction on two large reactors that could have produced large quantities of plutonium, suspended operations at the reprocessing plant, and agreed to dismantle nuclear facilities covered by the Agreed Framework, eventually, in exchange for two light-water reactors, which are less easily exploited for weapons production. However, the North does retain key nuclear technology and

expertise and is not obligated to dismantle facilities acknowledged in the Agreed Framework for several more years.

So far, North Korea has adhered to provisions of the Agreed Framework. However, in some areas progress has been slow. In 1996, for example, work on fuel storage (canning) at the 5-megawatt (electric) reactor was halted temporarily, as were discussions on the light-water reactor program. Fuel canning under the auspices of the International Atomic Energy Agency (IAEA) has resumed and is progressing slowly; it is expected to be complete by the end of 1997. Also, preliminary activity related to the construction of the light-water reactor began in August 1997.

NORTH KOREA: NBC WEAPONS AND MISSILE PROGRAMS	
Nuclear	<p>Signed the 1994 Agreed Framework, freezing nuclear weapons material production at Yongbyon complex.</p> <p>Produced enough plutonium prior to 1994 agreement for at least one nuclear weapon.</p> <p>Ratified the Nuclear Non-Proliferation Treaty; later declared it has a special status. This status is not recognized by the United States or the United Nations. Has not signed the Comprehensive Test Ban Treaty.</p>
Chemical	<p>Produces and is capable of using wide variety of agents and delivery means, which could be employed against U.S. and allied forces.</p> <p>Has not signed the Chemical Weapons Convention.</p>
Biological	<p>Pursued biological warfare research and development for many years.</p> <p>Possesses biotechnical infrastructure capable of supporting limited biological warfare effort.</p> <p>Ratified the Biological and Toxin Weapons Convention.</p>
Ballistic Missiles	<p>Produces and is capable of using SCUD B and SCUD C missiles.</p> <p>Developed the No Dong Missile (approximately 1,000 kilometers).</p> <p>Developing longer range missiles: Taepo Dong 1 (more than 1,500 kilometers) and Taepo Dong 2 (4,000-6,000 kilometers).</p> <p>Not a member of the Missile Technology Control Regime.</p>
Other Means of Delivery Available	<p>Land- and sea-launched anti-ship cruise missiles; none have NBC warheads.</p> <p>Aircraft (fighters, bombers, helicopters).</p> <p>Ground systems (artillery, rocket launchers, mortars, sprayers).</p>

KEY PROVISIONS OF THE 1994 AGREED FRAMEWORK	
North Korea	<p>Freeze graphite-moderated nuclear reactors and other related facilities at Yongbyon.</p> <p>Dismantle above facilities after significant portions of the first light-water reactor are constructed.</p> <p>Allow safe disposal of spent fuel from 5-megawatt (electric) reactor.</p>
United States	<p>Set up international organization (Korean Peninsula Energy Development Organization).</p> <p>Provide Department of Energy personnel to safely can and dispose of spent fuel from the 5-megawatt (electric) reactor.</p>
Korean Peninsula Energy Development Organization (KEDO)	<p>International Consortium including the Republic of Korea, Japan, and the United States.</p> <p>Arrange for delivery of heavy fuel oil to offset North's energy loss.</p> <p>Finance and construct two light water reactors by 2003.</p>

CHEMICAL PROGRAM

By the late 1980s, Pyongyang was able to produce large quantities of chemical agents and munitions independently. Its chemical warfare effort was intensified and expanded further between 1990 and 1995. Today North Korea is believed to have a sizable stockpile of chemical weapons. In keeping with Pyongyang's self-reliant philosophy, it has achieved the capability to manufacture large quantities of nerve, blister, choking, and blood agents. As a result of this effort, chemical weapons may have become an integral part of North Korea's war-fighting strategy.

In any attack on the South, North Korea could use its arsenal of chemical weapons to attack U.S. or allied forces deployed along the demilitarized zone (DMZ), as well as to try to isolate the peninsula from strategic reinforcements by attacking ports and airfields deeper inside South Korea. The North could use a variety of means to deliver chemical agents, including domestically produced artillery, multiple rocket launchers, mortars, aerial bombs, and ballistic missiles.

Pyongyang's huge military, as well as its civilian population, is prepared for operations in a contaminated environment. Many troops are equipped with chemical protective gear, including masks, suits,

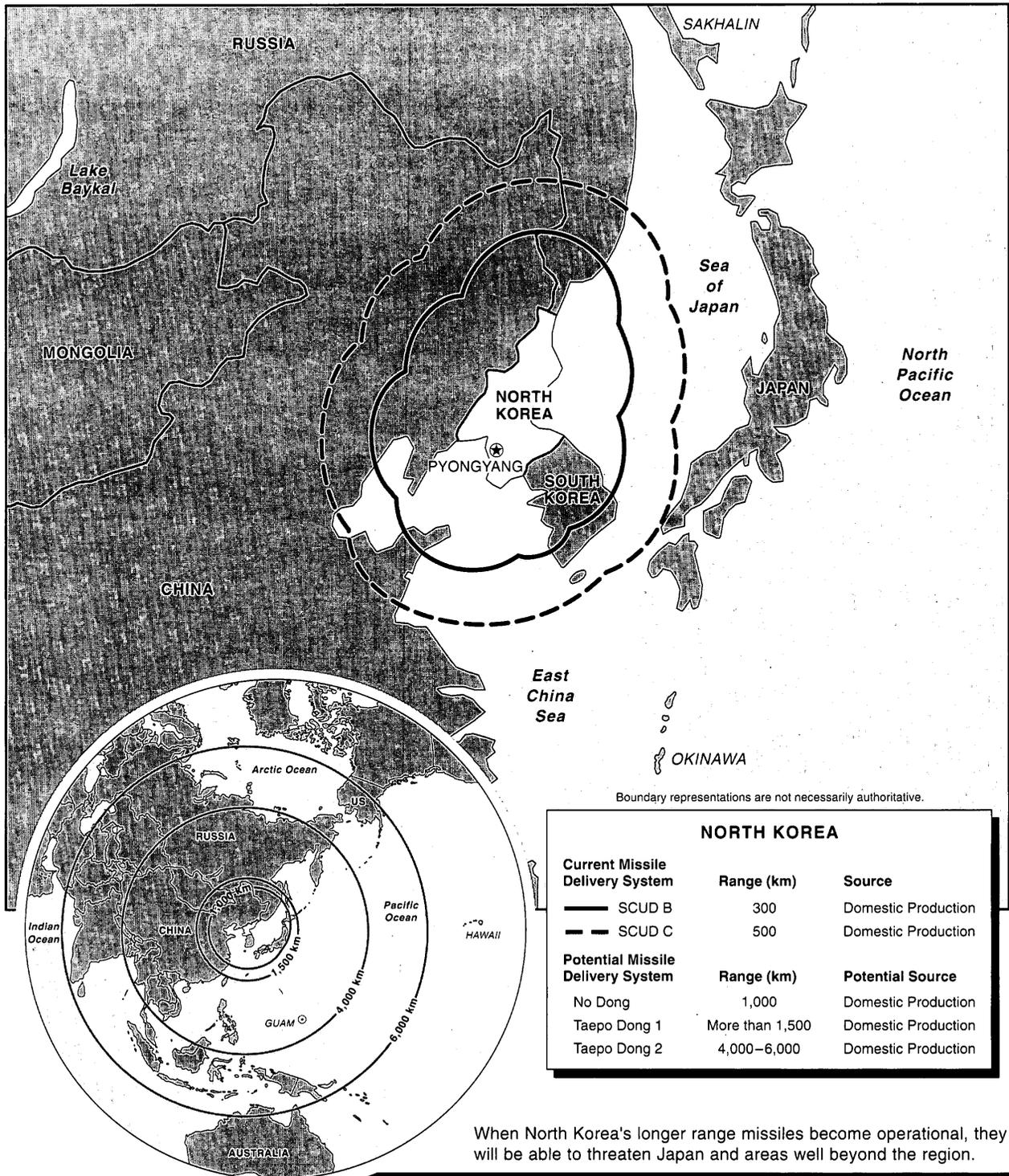
detectors, and decontamination systems. North Korean forces regularly train for operations in chemically contaminated environments. Additionally, North Korean civilians conduct regular chemical warfare drills; the civilian population is required to store and maintain chemical warfare protective equipment at home. While North Korean propaganda emphasizes the threat of U.S. and South Korean use of chemical agents, these preparations for chemical use could also support offensive use of chemical weapons.

North Korea has not signed the Chemical Weapons Convention and is not likely to do so in the near-term because of the required intrusive inspections and verification provisions.

BIOLOGICAL PROGRAM

North Korea has pursued research and development related to biological warfare capabilities for the past 30 years. North Korean resources, including a biotechnical infrastructure, are sufficient to support production of limited quantities of infectious biological warfare agents, toxins, and possibly crude biological weapons. North Korea has a wide variety of means available for military delivery of biological warfare agents. North Korea has ratified the Biological and Toxin Weapons Convention (BWC).

Estimated Ranges of Current and Potential North Korean Ballistic Missiles



BALLISTIC MISSILES

Despite economic and political problems, Pyongyang continues to attach a high priority to the development and sale of ballistic missiles, equipment, and related technology. Since the early 1980s, North Korea has pursued an aggressive program which has steadily progressed from producing and exporting SCUD short range ballistic missiles (SRBMs) to work on development of medium- and long range missiles.

North Korea produces two variants of the former Soviet Union's SCUD SRBM, the SCUD B and SCUD C. It has a production capacity of four to eight SCUDs monthly, both for export and for its own armed forces. Pyongyang has hundreds of SCUDs in its inventory and available for use by its missile forces. It also has developed the No Dong medium range ballistic missile (MRBM), based on SCUD technology, likely for its own use as well as for export.

North Korea has two additional ballistic missile systems in the early stages of development, the Taepo Dong 1 and Taepo Dong 2. Both missiles are two-stage systems and likely would employ separating warheads. Both systems appear to represent a logical evolution of the experience gained through work on the SCUD and No Dong systems.

Taepo Dong 1 flight testing could begin at any time. However, both Taepo Dong missiles represent a significant technological departure from the proven SCUD designs. North Korea has little experience flight testing its missiles and has no experience testing multistage ballistic missiles or other related technologies. This lack of test experience could complicate North Korea's ability to evaluate, improve, or repair flaws in its missile designs.

CRUISE MISSILES AND OTHER MEANS OF DELIVERY

North Korea has several types of short range land- and sea-launched anti-ship cruise missiles. In the past, North Korea has produced two versions of cruise missiles based on Soviet and Chinese designs; these have ranges of about 100 kilometers.

North Korea also has a variety of fighters, bombers, helicopters, artillery, rockets, mortars, and sprayers available as potential means of delivery for NBC weapons.

ROLE AS SUPPLIER

North Korea operates a complex, integrated network of trading companies, brokers, shippers, and banks that facilitate NBC weapon and ballistic missile-related trade. This trade involves complete systems, components, manufacturing and test equipment, and technology. Since the late 1980s, North Korea has used its networks to locate and acquire technologies as well as to pursue a sales program, selling missiles to countries such as Iran and Syria. North Korea provided material and know-how for domestic missile production programs in both Iran and Syria. Should these or other states acquire longer range North Korean missiles currently being developed, these states could pose a threat far beyond their neighbors. North Korea is not a member of the MTCR and is not expected to join, at least for the immediate future, but is engaged in missile talks with the United States.

China

OBJECTIVES, STRATEGIES, AND RESOURCES

China's national objectives include comprehensive modernization of the country. This modernization encompasses major improvements to China's technological base, economy, and military establishment, as well as rapid economic growth, domestic stability, eventual recovery of claimed territories, and most important, preservation of the current communist political system.

China's strategy consists of developing sufficient modern military forces to exert influence within the region, deter enemies, preserve independence of action in foreign affairs, protect its economic resources and maritime areas, and defend the sovereignty of its territory. As a means to attain this strategy, China has nuclear and chemical weapons capabilities with the ability to deliver them, including a wide variety of ballistic missiles. It will continue to modernize these forces in the coming years.

CHINA: NBC WEAPONS AND MISSILE PROGRAMS	
Nuclear	<p>Completed series of tests in 1996.</p> <p>Deployed over 100 warheads on ballistic missiles.</p> <p>Maintains stockpile of fissile material.</p> <p>Ratified the Nuclear Non-Proliferation Treaty and signed the Comprehensive Test Ban Treaty.</p>
Chemical	<p>Produces and is capable of using wide variety of agents and delivery means.</p> <p>Ratified the Chemical Weapons Convention.</p>
Biological	<p>Possesses infrastructure necessary for biological warfare program.</p> <p>Likely has maintained an offensive biological warfare program since acceding to the Biological and Toxin Weapons Convention in 1984.</p>
Ballistic Missiles	<p>Produces and is capable of using wide variety of land- and sea-based ballistic missiles.</p> <p>Fired missiles near Taiwan (1995 and 1996).</p> <p>Embarked on modernization program.</p> <p>Pledged to adhere to the Missile Technology Control Regime.</p>
Other Means of Delivery Available	<p>Land-, sea-, and air-launched cruise missiles, mostly anti-ship.</p> <p>Aircraft (fighters, bombers, helicopters).</p> <p>Ground systems (artillery, rocket launchers, mortars).</p>

China's resource allocation for overall defense and modernization for nuclear, chemical, and missile forces is not expected to increase significantly. Current defense expenditures total approximately 5 percent of China's total GDP. It is estimated that actual military spending will increase at a rate similar to China's economic growth. Projecting a realistic modest growth pattern, including expected economic fluctuations, total military funding levels are expected to average over \$40 billion (in constant 1994 dollars) annually between 1997 and 2006.

China is pursuing a strategy of close political and economic relations with a variety of nations. In support of this strategy, China continues its role as a supplier of military and technical assistance. Such sales are a major additional source of revenue for the defense budget. The profits from these sales are used to finance military equipment modernization and to defray military operating costs. Additionally, Chinese entities have provided ballistic missiles and related technology, as well as nuclear and chemical technology, to Middle Eastern and South Asian countries.

China's NBC and missile programs also receive the benefit of an infusion of foreign know-how. Many Chinese scientists and engineers have received or are receiving their educations and technical experience in the West. China and Russia have renewed and expanded their military cooperation, which has the potential to assist China's military modernization effort. China is seeking to exploit the poor economic conditions in former Soviet states by encouraging collaboration with former Soviet scientists and technicians. Beijing also is trying to acquire a variety of Western technologies that it can adapt for its own military industry.

NUCLEAR PROGRAM

China considers nuclear weapons primarily within the larger context of maintaining deterrence vis-a-vis the United States and Russia and as enhancing its status as an international power. China first tested a nuclear weapon in 1964. It completed a series of nuclear weapons tests in 1996, probably to finalize weapon designs. Since July 30, 1996, China has been under a self-imposed moratorium

on nuclear testing and has signed the Comprehensive Test Ban Treaty (CTBT). China joined the IAEA in 1983 and acceded to the NPT in 1992. In 1997, China issued detailed nuclear export control regulations and became a member of the Zangger NPT Exporters' Committee. China frequently has stated that it will never be the first to use nuclear weapons against another nuclear power and that it never will use them against a nonnuclear power.

China has over 100 nuclear warheads deployed operationally on ballistic missiles. Additional warheads are in storage. China is not currently believed to be producing fissile material for nuclear weapons, but it has a stockpile of fissile material sufficient to increase or improve its weapon inventory. Such warhead improvements could complement China's missile modernization effort.

CHEMICAL PROGRAM

The Chinese have an advanced chemical warfare program, including research and development, production, and weaponization capabilities. Chinese military forces have a good understanding of chemical warfare doctrine, having studied the tactics and doctrine of the former Soviet Union. Chinese military forces conduct defensive chemical warfare training and are prepared to operate in contaminated environments. In the near future, China is likely to achieve the necessary expertise and delivery capability to integrate chemical weapons successfully into overall military operations.

China's current inventory of chemical agents includes the full range of traditional agents, and China is conducting research into more advanced agents. It has a wide variety of delivery systems for chemical agents, including tube artillery, rockets, mortars, landmines, aerial bombs, sprayers, and SRBMs. China signed the Chemical Weapons Convention in January 1993, and ratified it shortly after the U.S. ratification in April 1997.

BIOLOGICAL PROGRAM

China acceded to the Biological and Toxin Weapons Convention in 1984, though its declarations under the BWC confidence-building measures are

believed to have been inaccurate and incomplete. China has consistently claimed that it has never researched, manufactured, produced, or possessed biological weapons and that it would never do so. However, China possesses an advanced biotechnology infrastructure and the biocontainment facilities necessary to perform research and development on lethal pathogens. Moreover, China likely has maintained the offensive biological warfare program it is believed to have had before acceding to the BWC.

BALLISTIC MISSILES

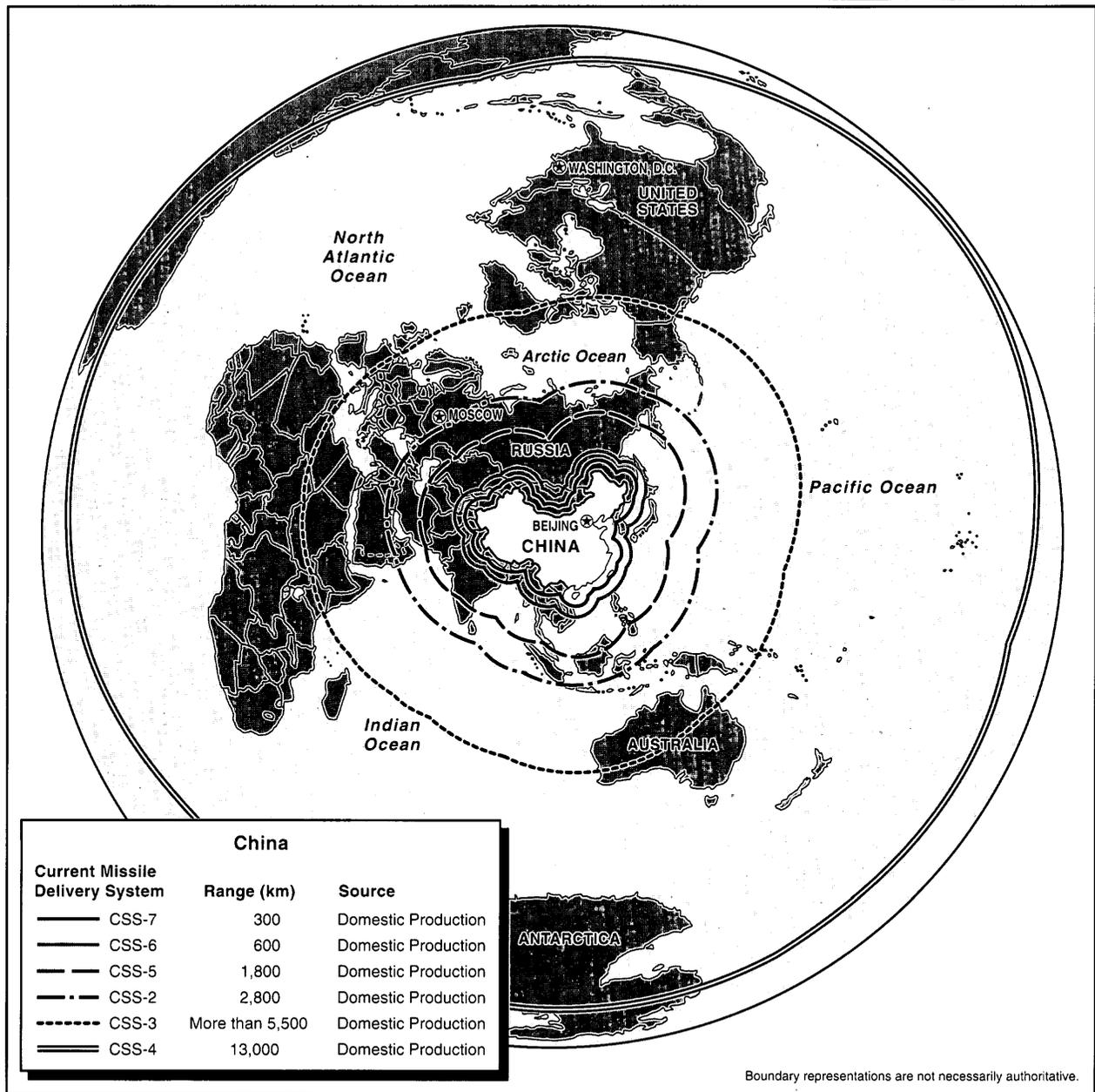
China has an extensive and well-established ballistic missile industrial infrastructure and has developed and produced a variety of land- and sea-based ballistic missiles. Only the former Soviet Union and the United States have more extensive production capabilities for ballistic missiles. China's missile force is designed to serve as a strategic deterrent against Russia and the United States. China is the only country other than Russia whose land-based strategic missiles can strike the United States. China increasingly sees ballistic missiles as important weapons for a regional conflict or use as psychological weapons. For example, China fired a number of CSS-6 SRBMs into waters near Taiwan in 1995 and 1996 to deter what Beijing saw as moves by Taiwan toward independence.

China has embarked on a ballistic missile modernization program. While adding more missiles and launchers to its inventory, China also is concentrating on replacing liquid-propellant missiles with mobile solid-propellant missiles, reflecting concerns for survivability, maintenance, and reliability.

CRUISE MISSILES AND OTHER MEANS OF DELIVERY

China has produced several types of land-, sea-, and air-launched cruise missiles. Most are short range and are deployed for anti-ship operations. China has exported several versions of these missiles to countries in the Middle East and South Asia. China also has a variety of fighters, bombers, helicopters, artillery, rockets, mortars, and sprayers available as potential means of delivery for NBC weapons.

Estimated Ranges of Current Chinese Ballistic Missiles



ROLE AS SUPPLIER

In recent years, China has increasingly participated in arms control and nonproliferation regimes and has accepted Western initiatives on such issues as extension of the NPT, the ratification of the CWC, and signing the CTBT. China attended the May 1997 meeting of the Zangger NPT Exporters’

Committee as an observer and joined the Committee in October 1997. The Zangger Committee is a group of states parties to the NPT, that has developed a safeguard trigger list of items that member states will export to facilities in non-nuclear weapons states only if these facilities are under IAEA safeguards.

Also, China has a bilateral agreement with the United States under which it has agreed to ban all exports of MTCR-class ground-to-ground missiles and to abide by the original 1987 MTCR guidelines and parameters. Nonetheless, the United States remains concerned about continuing Chinese assistance to missile programs in some countries of proliferation concern. In most cases, Beijing agrees publicly on the danger and inadvisability of NBC weapons and missile proliferation. On the other hand, China's continuing and long-standing economic and security relationships provide incentives for activities that are inconsistent with some nonproliferation norms. These interests are likely to continue to drive Chinese supply activities for the next few years. Because of Chinese supply activities, particularly missile-related exports, improvements to China's military production capabilities can have major implications for the proliferation of NBC weapons and missile technologies, especially in the Middle East and South Asia.

In South Asia, Chinese policy is driven in part by its long-standing rivalry with India. China views Pakistan's nuclear and missile programs as an important balance to India's more powerful conventional military forces and its nuclear weapons and missile programs. Before its 1992 NPT accession, China provided assistance to Pakistan's nuclear weapons program. Concerns about possible continued assistance persisted even after accession.

In May 1996, China further clarified its nuclear nonproliferation policy by announcing that it would not provide assistance to unsafeguarded nuclear facilities. Since that time, the United States has raised with Beijing concerns about certain activities with Pakistan, but there is no basis to conclude that China is not honoring its pledge. Chinese firms continue to assist Pakistan's indigenous missile development effort.

China probably perceives its support to Iran as enhancing its presence in the Gulf and helping to ensure access to a key source of oil—essential to China's expanding economy. The United States has sought to persuade China that support to Iran contributes to instability in the Gulf region and thereby jeopardizes its access to oil. Beijing has provided technical assistance and equipment to Iran's nuclear program under IAEA safeguards. China has also

provided assurances that it will not engage in additional nuclear cooperation with Iran. China also is an important supplier of equipment, materials, and technology for Iran's chemical warfare and ballistic missile programs. China is not a member of the Australia Group and refuses to restrict sales of any chemicals not listed in the CWC. While China has not sold Iran any MTCR-proscribed ballistic missiles, Chinese firms have assisted Iran's missile industry.

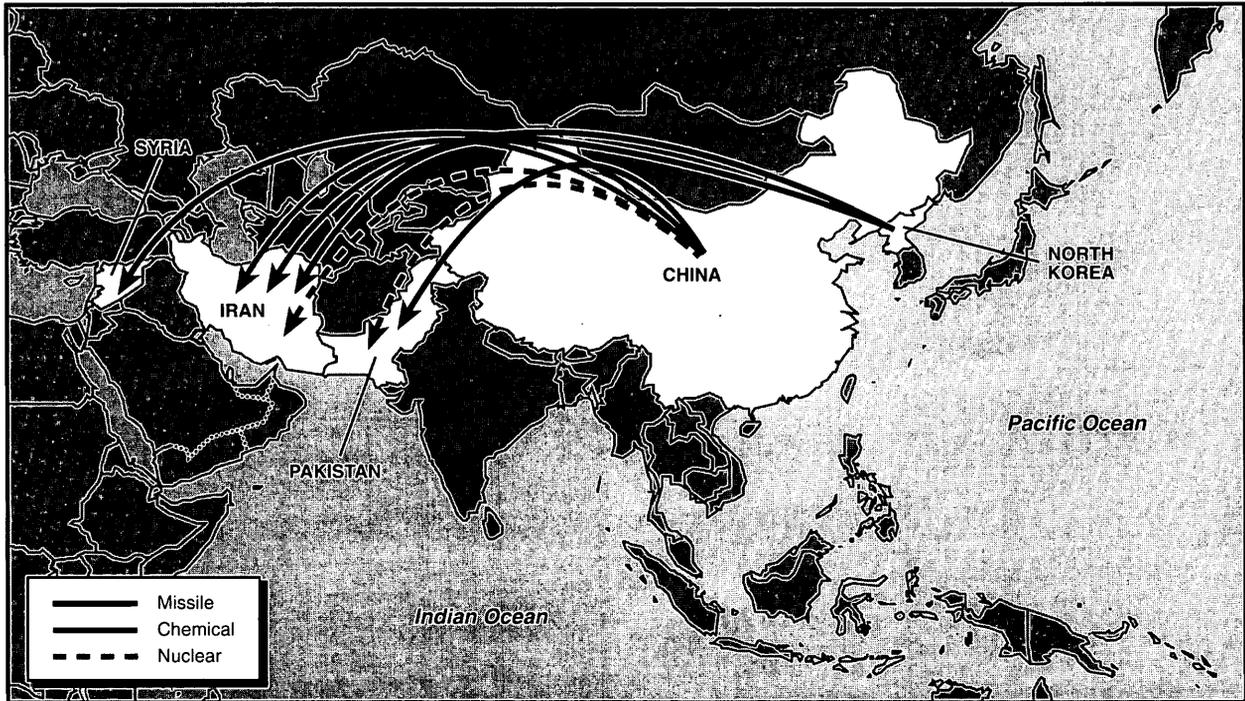
CONCLUSION

North Korea maintains a large army, threatening South Korea and U.S. military forces positioned there. The basic goal of North Korea's offensive strategy is to consolidate and quickly control strategic areas of the South and destroy the allied defense before the United States can provide significant military reinforcement. North Korea could use chemical weapons and ballistic missiles, and possibly biological weapons, to support this strategy. North Korea's NBC weapons and missiles also threaten Japan, and Pyongyang has declared publicly its intentions to target U.S. facilities in Japan to disrupt the resupply of South Korea. Pyongyang's policy of supplying rogue states with ballistic missiles and related technology remains a factor in the advancement of several Middle Eastern missile production programs. As the North develops even longer range missiles and improves its chemical warfare capabilities, the potential exists for additional North Korea exports.

China will continue to take actions that will advance its status as an international power. China's current actions indicate that it will gradually improve its NBC weapon and missile capabilities. While it will support nonproliferation regimes publicly, China is most likely to take concrete steps in support of arms control regimes only when such steps serve its overall larger interests.

China may choose not to sell certain technologies to some unstable areas, but other sales will continue to occur, driven by China's perception of its own self-interest. Finally, although relations with India have improved, the Chinese-Indian rivalry persists; as a balance, China likely will maintain a special relationship with Pakistan.

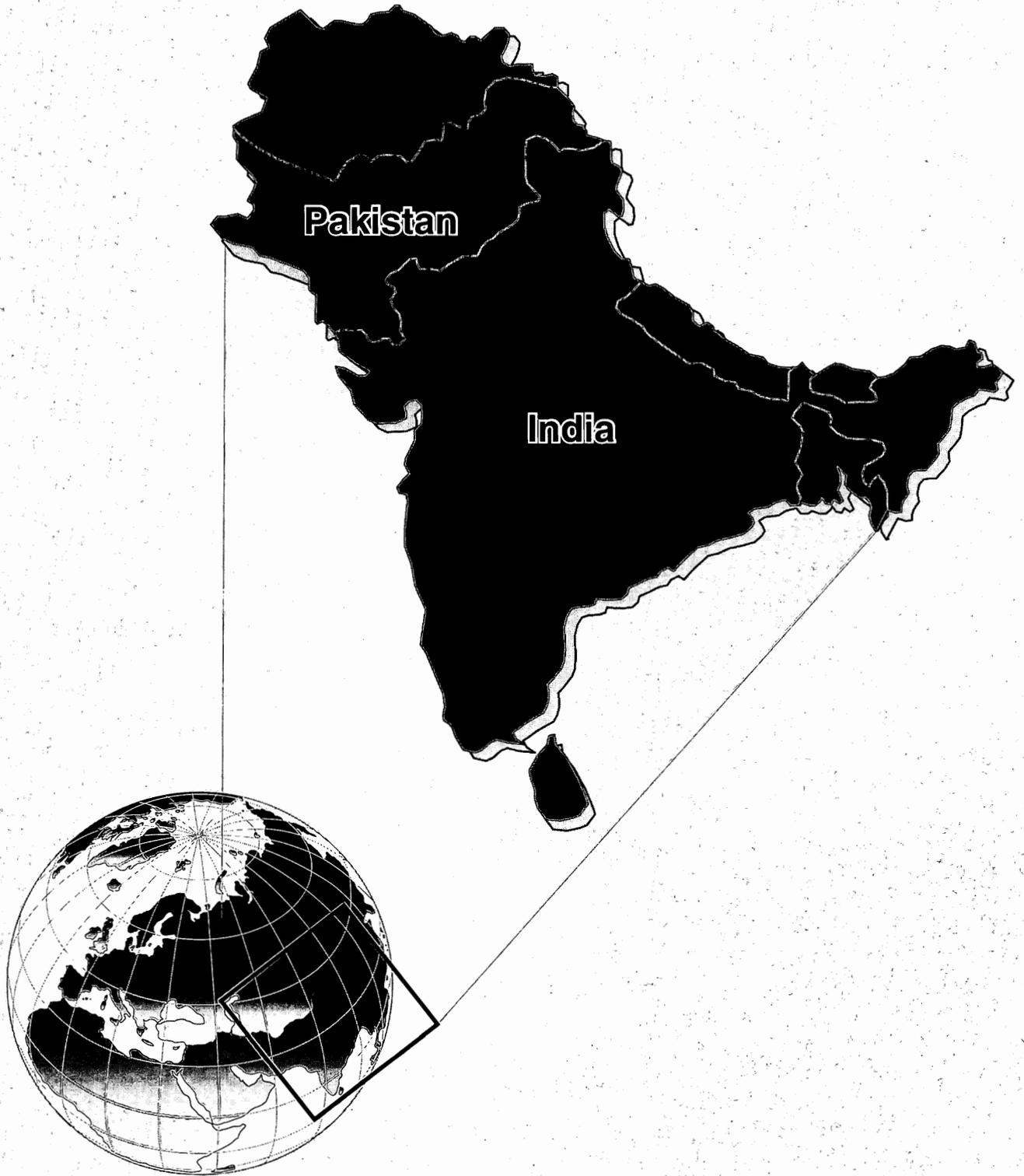
***China and North Korea: Suppliers of NBC- and
Missile-Related Technologies***



The NBC weapon and missile programs in North Korea and China will remain serious concerns for the region and for the United States. The programs pose threats in terms of potential use in a conflict in

Northeast Asia and because of the potential proliferation of these weapons and supporting technologies to other regions where the United States also has critical interests.

South Asia



SOUTH ASIA

GOALS AND INTERESTS

The United States has important security interests in South Asia, including preventing another Indo-Pakistani war, enhancing regional stability, and stemming the proliferation of weapons of mass destruction. The United States seeks to persuade India and Pakistan to exercise restraint in their nuclear and missile programs and to bring their programs into conformity with international standards. The consequences of a nuclear war between India and Pakistan would be catastrophic, both in terms of the loss of life and in lowering the threshold for nuclear use in other parts of the world, particularly the adjacent Middle East/North Africa region. Deployment of ballistic missiles would pose especially troubling security risks, given the relatively short distances between major population centers in South Asia and the brief time required for missiles to travel such distances. This factor will compress decisionmaking cycles for national leaders and battlefield commanders, reducing stability during times of crisis.

In addition to the immediate risks to regional security, the development of NBC weapons in South Asia has the potential to undercut broader U.S. and international nonproliferation objectives. Both India and Pakistan, for different reasons, have refused to sign the NPT. Their nuclear programs, outside of this widely accepted international norm, serve as dangerous examples for nations in other regions.

The NBC weapons and missile infrastructures in South Asia also pose potential proliferation threats as possible sources of supply. India and Pakistan's slowness to adopt export controls consistent with established international control regimes is reason for concern. Although neither country has transferred its NBC and ballistic missile technology or expertise to states outside the region to date, such transfers remain a dangerous possibility.

CAPABILITIES, INTENTIONS, AND TRENDS

India and Pakistan

The long-standing Indo-Pakistani rivalry continues to drive the pursuit of NBC weapons and especially ballistic missiles on the Asian subcontinent. After 50 years of independence and three wars, territorial disputes and deep-seated mistrust continue to divide the two countries. Each maintains substantial forces along their common border. These forces frequently exchange small arms and artillery fire along the Line of Control in disputed Kashmir. Although China soundly defeated the Indian Army in a 1962 border war, New Delhi's relations with Beijing have improved in recent years. Indian strategists cite Chinese nuclear and conventional capabilities when justifying Indian defense programs.

New Delhi and Islamabad continue to maintain an ambiguous posture on nuclear weapons. While denying nuclear weapons possession, both governments feel it is important to pursue nuclear weapons programs. Both Indian and Pakistani officials occasionally acknowledge that nuclear weapons could quickly be constructed if required. Strategists in both countries—particularly in Pakistan, with its smaller conventional forces—see their nuclear capabilities as an important deterrent to conflict.

India and Pakistan are developing ballistic missiles. As with other weapons programs, Pakistani and Indian pursuit of ballistic missiles is largely driven by the perception that these missiles are necessary to counter their rival's capabilities. India's development of MRBMs also is motivated by its desire to be recognized as a great power and strategic competitor with China.

Meanwhile, both countries, especially India, remain suspicious of—and opposed to—most nonproliferation regimes, which they perceive as attempts by countries possessing such capabilities to discriminate against those that do not. India and Pakistan have ratified the CWC. Neither has signed, nor is expected to sign, the NPT or adhere to, or become a member of, the MTCR.

Also, neither country signed the CTBT during the 1996 negotiations. In fact, India attempted to block the draft treaty in the Conference on Disarmament and again in the UN General Assembly, citing its

desire for a firm commitment from nuclear powers to a date for total disarmament and a provision that the treaty will not enter into force without Indian participation. Pakistan did not attempt to block the CTBT but refused to sign unless India signed the treaty.

NUCLEAR PROGRAMS

Initiation of India's nuclear weapons effort, including its 1974 test, was a direct response to China's pursuit of nuclear weapons and its test in 1964. India remains motivated to keep and improve its nuclear capabilities to counter nuclear forces in China and in Pakistan. New Delhi also views nuclear weapons as a symbol of international power and prestige.

India's nuclear energy development program remains active and has allowed it to obtain the essential materials and facilities needed to produce nuclear weapons. This infrastructure includes seven operating nuclear power plants, two research reactors at the Bhabha Atomic Research Center near Bombay, where India produced its stock of weapons-grade plutonium, and resources for producing and reprocessing plutonium and enriching uranium. As additional indigenously built nuclear power reactors become operational, India's capability to produce weapons-grade plutonium will increase. Although India is a member of the International Atomic Energy Agency, only some Indian nuclear reactors are subject to IAEA safeguards.

INDIA AND PAKISTAN: NBC WEAPONS AND MISSILE PROGRAMS	
Nuclear	<p>Both possess adequate fissile material and components to assemble a limited number of nuclear weapons.</p> <p>Both have substantial nuclear infrastructures.</p> <p>Neither has signed the Nuclear Non-Proliferation Treaty nor the Comprehensive Test Ban Treaty.</p>
Chemical	<p>India has a sizable chemical industry and recently declared its chemical warfare program, as called for under the CWC.</p> <p>Pakistan has the ability to transition from research and development to chemical agent production.</p> <p>India and Pakistan have ratified the Chemical Weapons Convention.</p>
Biological	<p>India has research and development facilities geared toward biological warfare defense.</p> <p>Pakistan may have the capability to support a limited biological warfare program.</p> <p>Both have ratified the Biological and Toxin Weapons Convention.</p>
Ballistic Missiles	<p>- India: Prithvi - two versions - 150-kilometer range; 250-kilometer range. Agni - testing stage; intended range: 2,000-kilometers.</p> <p>- Pakistan: Hatf I - 80-kilometer range. Mobile SRBM - 300-kilometer range.</p> <p>Neither is a member of the Missile Technology Control Regime.</p>
Other Means of Delivery Available	<p>India has shipborne and airborne anti-ship cruise missiles; Pakistan has shipborne, submarine-launched, and airborne anti-ship cruise missiles; none have NBC warheads.</p> <p>Aircraft: both have fighter bombers.</p> <p>Ground systems: both have artillery and rockets.</p>

India's nuclear infrastructure has allowed it to produce enough fissile material and components for several nuclear weapons, which could probably be assembled fairly quickly. India presently has fighter aircraft capable of delivering a nuclear payload. It also has ballistic missiles that may be capable of delivering a nuclear payload in the future.

Despite the intense public debate over the CTBT in 1995 and 1996, New Delhi continues to maintain its policy of nuclear ambiguity. India has not conducted any nuclear tests since its one test in 1974; however, internal political pressures to conduct further tests are likely to continue.

Pakistan's nuclear weapons program is driven by its need to counter India's superiority in conventional forces. It has a well-developed program, including the facilities for uranium conversion and enrichment and the infrastructure to produce nuclear weapons. In March 1996, Pakistan commissioned an unsafeguarded nuclear reactor, expected to become fully operational in the late 1990s, that will provide it with a capability to produce weapons-grade plutonium.

Pakistan probably has enough fissile material and components for a few nuclear weapons. Like India, Pakistan probably could assemble the weapons fairly quickly and it has aircraft and possibly ballistic missiles that are believed capable of delivery.

Unlike India, Pakistan has never tested a nuclear device, although after the 1996 press reports of Indian test preparations, Pakistani government officials insinuated that Pakistan had the capability to conduct a nuclear test and would do so if India did. Pakistan has taken the public position that if India would sign the NPT, it would also. Like India, not all of Pakistan's nuclear facilities are under IAEA safeguards.

CHEMICAL AND BIOLOGICAL PROGRAMS

India has an extensive commercial chemical industry and it produces a vast number of chemicals for domestic consumption. India has also exported a wide array of chemical products, including Australia Group-controlled items, to several countries of proliferation concern in the Middle East.

Australia Group-controlled items include specific chemical agent precursors, microorganisms with biological warfare applications, and dual-use equipment that can be used in chemical or biological warfare programs. India ratified the CWC in September 1996. In June 1997, it submitted chemical weapons declarations to the governing body of the CWC in The Hague. This is the first time the Indians have publicly acknowledged a chemical warfare program. The Indian Defense Ministry declared that all related facilities will be open for inspection.

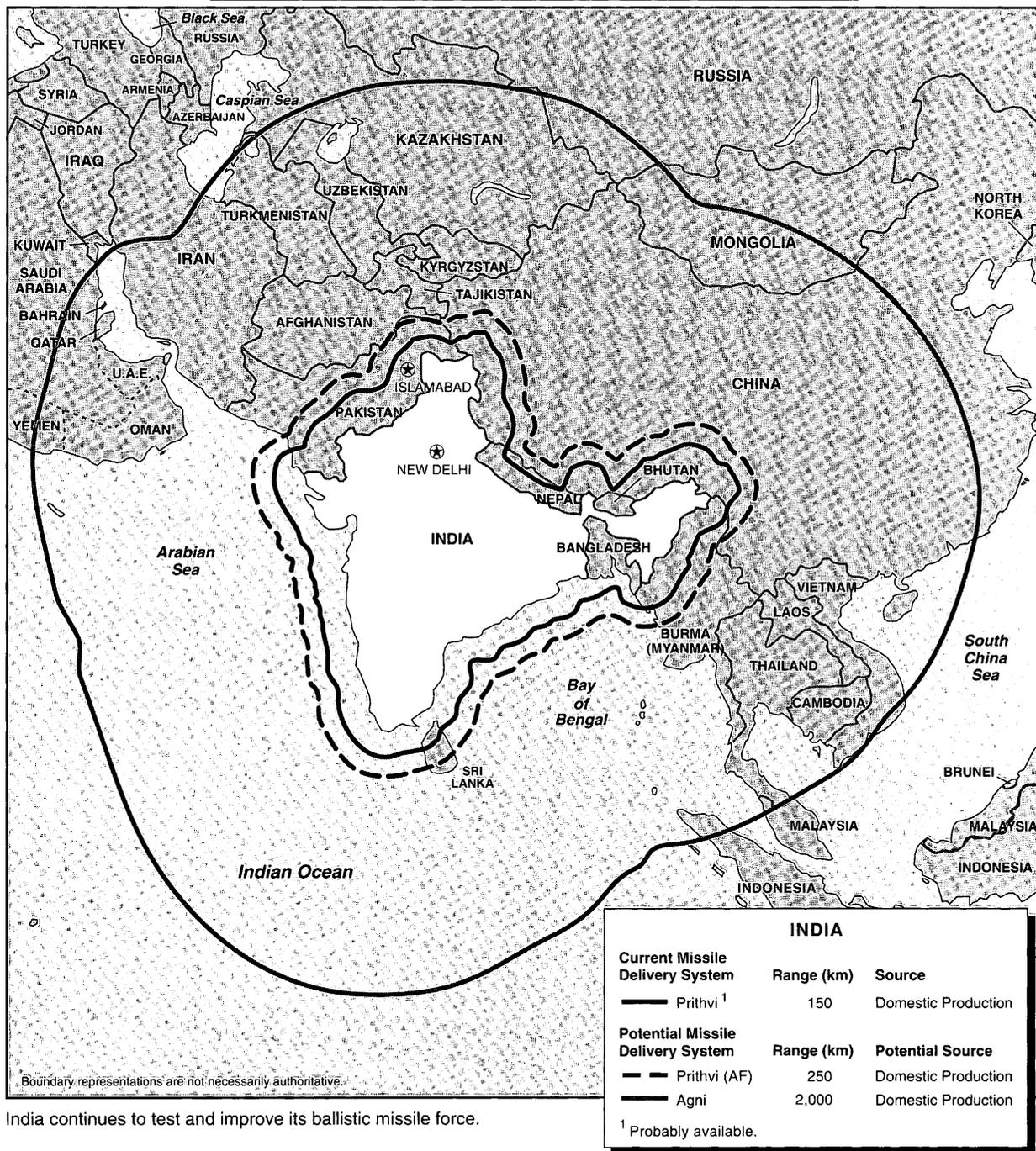
Pakistan has imported a number of chemicals that can be used to make chemical agents and is moving slowly toward a commercial chemical industry capable of producing all precursor chemicals needed to support a chemical weapons stockpile. Pakistan has also ratified the CWC. Both India and Pakistan have a wide variety of delivery means available for chemical agents, including artillery, aerial bombs, and missiles.

Biological technology generally is well developed in both countries. India has many well-qualified scientists and numerous biological or pharmaceutical production facilities, as well as biocontainment facilities for research and development for dangerous pathogens. At least some of these facilities are being used to support research and development for biological defense work. Pakistan has a capable, but less well developed, biotechnology infrastructure and may be seeking to upgrade hardware for selected biotechnology facilities. Nonetheless, Pakistan is believed to have the resources and capabilities to support a limited biological warfare research and development effort. Both India and Pakistan have ratified the BWC.

BALLISTIC MISSILES

India has an extensive, largely indigenous ballistic missile program, including development and production infrastructures for both solid- and liquid-propellant missiles. By striving to achieve independence from foreign suppliers, India is hoping to alleviate problems caused by the MTCR. India also has been trying to develop a submarine-launched missile for many years.

Estimated Ranges of Current and Potential Indian Ballistic Missiles

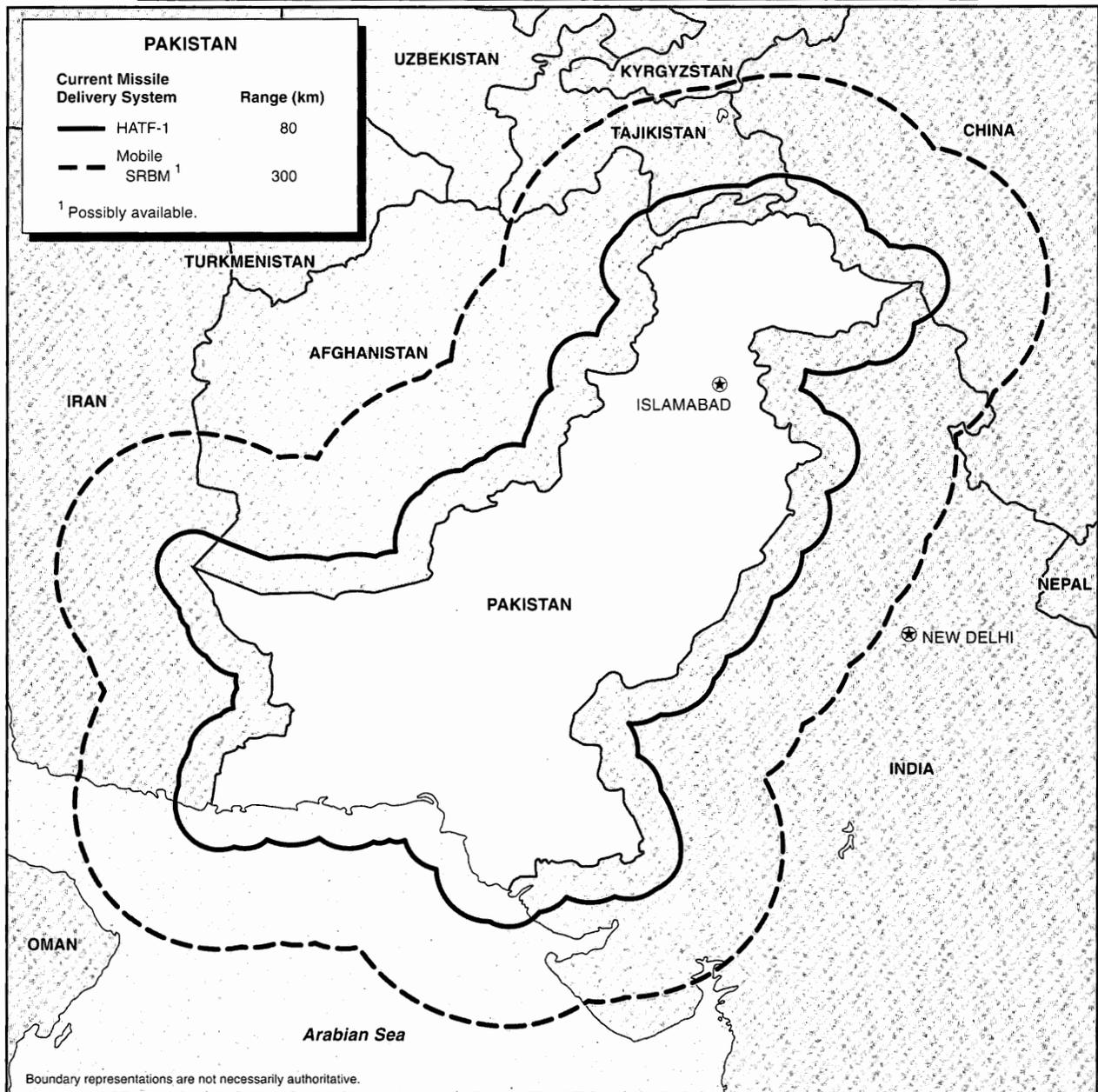


India continues to test and improve its ballistic missile force.

India's Prithvi SRBM and its developmental Agni MRBM will provide New Delhi with two mobile ballistic missile platforms. The Army's version of the Prithvi is being produced now; it has a payload

of 1,000 kilograms and range of 150 kilometers. India has also conducted two flight tests of an Air Force version of the Prithvi with a 250-kilometer range and a 500-kilogram payload.

Estimated Ranges of Current Pakistani Ballistic Missiles



Pakistan has received Chinese technology and other assistance for its ballistic missile program.

Claiming the project was intended to demonstrate missile technological advancements, India conducted three flight tests of the Agni missile, which had an intended range of 2,000 kilometers, with a 1,000-kilogram payload. The last launch occurred in early 1994. The Indian Defense Minister has recently stated that the Agni program is “very much

on.” India may continue this flight test program and likely is planning a follow-on to the Agni.

India has a well-developed space program, with three space launch vehicles (SLVs) that can carry payloads from 150 to 3,000 kilograms. While India may have the ability to convert these SLVs into

either intermediate range ballistic missiles (IRBMs) or intercontinental ballistic missiles (ICBMs), it has shown no indication of making the required modifications. Nonetheless, the space program supports New Delhi's missile efforts through shared research, development, and production facilities. These assets provide a ready conduit for SLV technology acquired from the former Soviet Union and the West. India has launched an SLV about every other year since 1979.

Islamabad has two ballistic missile systems—the Pakistani-produced Hatf-1 with an 80-kilometer range and a 300-kilometer-range mobile SRBM. A third missile, the Hatf-2, was based on two Hatf-1 stages, but appears to have been discontinued. Pakistan received SRBMs and associated equipment from China during the early 1990s. In 1991 and 1993, the United States imposed economic sanctions, based on U.S. law, against both China and Pakistan for China's transfer of M-11 missile-related equipment. The sanctions were lifted against China in 1992 and 1994, when China reaffirmed its 1992 commitment to adhere to the MTCR. The sanctions against Pakistan were not lifted until they expired in 1995. However, China remains Pakistan's principal supplier of missile-related technology and assistance.

Pakistan currently produces only the Hatf-1. For the future, Pakistan, like India, hopes to achieve independence from foreign sources and produce long range missiles. It has made strong efforts to acquire an indigenous capability in missile production technologies. For example, it is believed to be constructing a facility for the production of a 300 kilometer range ballistic missile. However, it likely will continue receiving significant foreign assistance in key technologies for several years.

CRUISE MISSILES AND OTHER MEANS OF DELIVERY

India has sea-launched and airborne short range anti-ship cruise missiles, while Pakistan has sea- and submarine-launched short range anti-ship cruise missiles. Both have a variety of short range air-launched tactical missiles. All were purchased from foreign sources, including Russia, China, the United Kingdom, France, and the United States.

Both India and Pakistan also have fighter aircraft, artillery, and rockets available as potential means of delivery for NBC weapons.

CONCLUSION

Both sides' apparent ability to employ nuclear weapons greatly magnifies the potential costs of a fourth Indo-Pakistani war. Resorting to nuclear weapons would not only bring devastation, particularly to the densely populated subcontinent, but would establish a new and dangerous threshold for their use elsewhere. While acknowledging these risks, some observers credit Indian and Pakistani nuclear capabilities with helping to sustain the peace. In making the case that nuclear deterrence is operative, these strategists point to both countries' willingness to step back from the brink during heightened tensions in 1987 and 1990 and to the restraint shown since then. Nonetheless, unresolved disagreements, deep animosity and distrust, and the continuing confrontation between their forces in disputed Kashmir make the subcontinent a region with a significant risk of nuclear confrontation.

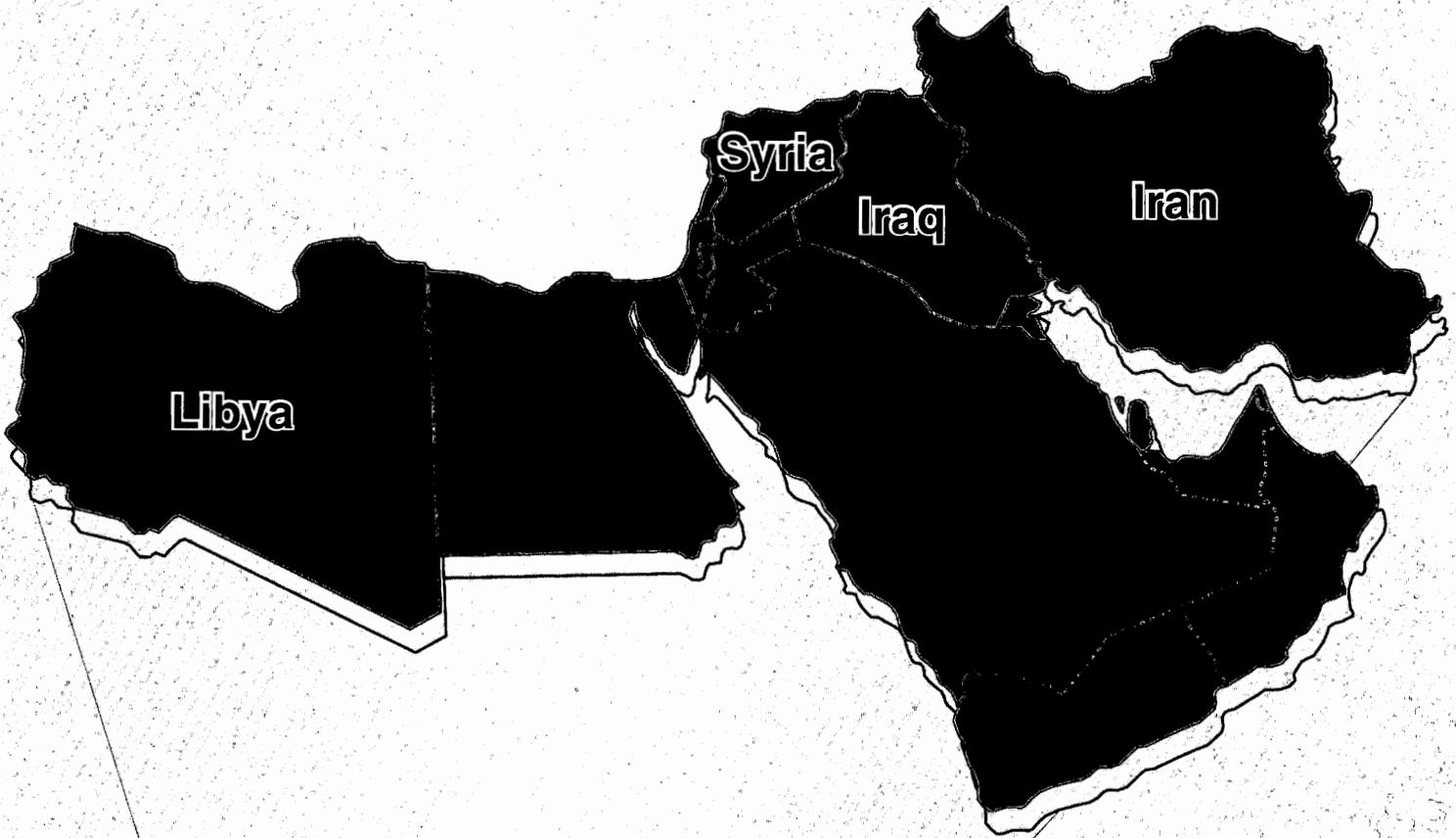
The advent of ballistic missiles in both countries also is cause for concern. Deployment of these weapons would raise the risk of miscalculation. When fielded with military units, both sides probably will assume that the other's missiles can deliver nuclear warheads. As a result, leaders will be alarmed at evidence that their rival's mobile SRBMs have moved from their garrisons. This would raise fears that conflict may be imminent or, during a conflict, that a missile attack—possibly a nuclear strike—may be planned. Compressed decision making cycles and a tendency to assume the worst could lead to a dangerous overreaction. Both countries' apparent pursuit of longer range missiles will only compound this problem.

The CTBT debate and reports of Indian test preparations in 1995 and 1996, along with Indian public support for a test, have elevated the risk that one or both countries could take tangible steps to advance their nuclear posture. Although both governments have denied plans to conduct nuclear tests, should India test a nuclear device, Islamabad would be under immense pressure to test as well.

Indian and Pakistani approaches to nonproliferation regimes are also cause for concern. Although neither state has demonstrated any intent to proliferate, as they make progress with their indigenous production programs, they could become suppliers of related equipment, technology or expertise to other countries of proliferation concern. Further,

their continued refusal to sign the Comprehensive Test Ban Treaty will prevent its entry into force, although widespread international support already has established a de facto test ban. Reluctance to support the CTBT also could presage problems in upcoming negotiations over a fissile material cutoff treaty.

The Middle East and North Africa



THE MIDDLE EAST AND NORTH AFRICA

GOALS AND INTERESTS

U.S. goals in the Middle East and North Africa include securing a just, lasting, and comprehensive peace between Israel and all Arab parties; maintaining a steadfast commitment to Israel's security and well-being; building and maintaining security arrangements that assure the stability of the Gulf region and unimpeded commercial access to its petroleum reserves; combating terrorism; ensuring fair access for American business to commercial opportunities in the region; and promoting more open political and economic systems and respect for human rights and the rule of law. In this volatile region, the proliferation of NBC weapons and the means to deliver them poses a significant challenge to the ability of the United States to achieve these goals. Iran, Iraq, Libya, and Syria, which are aggressively seeking NBC weapons and increased missile capabilities, constitute the most pressing threats to regional stability.

Iran is actively attempting to acquire or produce a full range of NBC weapons and missiles. The United States believes Iran is committed to acquiring nuclear weapons, either through indigenous development or by covertly acquiring enough fissile material to produce them. During its eight-year war with Iraq, Tehran initiated biological and chemical warfare programs, the latter in direct response to Iraq's use of chemical weapons. In addition, Iran is expanding its ballistic missile programs.

Iraq has long had NBC weapons and missile efforts. The challenges these weapons pose in time of conflict became clear during the Gulf War, when U.S. and allied forces had to deal with real and potential complications posed by Iraq's arsenal of NBC weapons and missiles. Iraq entered the Gulf War with a known chemical warfare capability and a demonstrated willingness to use it (Iraq used chemical weapons against Iranian troops and its Kurdish population during the 1980s); a known biological warfare capability; and a developing, complex nuclear weapons program despite intense non-proliferation and export control efforts by the United States and the international community (for example, the IAEA). During the Gulf War, Iraq

attempted to weaken the cohesion and resolve of the U.S.-led coalition by using its ballistic missiles as weapons of terror against Saudi Arabia and Israel. Iraq did not use its SCUDs with chemical or biological warheads, even though it had the capability to do so.

Iran and Iraq have each demonstrated their intent to dominate the Gulf and to control access to critical oil supplies. In their pursuit of regional hegemony, Iran and Iraq probably regard NBC weapons and missiles as necessary to support their political and military objectives. Possession of nuclear weapons would likely lead to increased intimidation of their Gulf neighbors, as well as increased willingness to confront the United States.

Libya remains a significant proliferation concern. Libyan leader Muammar Qadhafi has shown that he is willing and capable of using chemical weapons and missiles against his enemies. Libya sees the United States as its primary external threat, owing especially to U.S. support for United Nations sanctions against Tripoli for its refusal to turn over suspects in the terrorist bombing of Pan Am 103. Although Libya's capabilities to use chemical agents and missiles are limited, Qadhafi could provide these weapons to states or terrorist groups he supports and that support him in return.

Syria possesses a substantial force of ballistic missiles capable of reaching targets throughout Israel and has an active chemical weapons program. Syria views Israel as its primary external threat and sees its chemical weapons and ballistic missiles as means to counter Israel's conventional superiority.

The U.S. defense commitment, military presence, and demonstrated ability to defend U.S. and allied interests against such threats are vital to achieving U.S. goals in the region.

CAPABILITIES, INTENTIONS, AND TRENDS

Introduction

The Middle East and North Africa have the highest concentration of emerging NBC weapons and

missile programs of any region in the world. This region also has a long history of conflict based on territorial disputes as well as ethnic, cultural, and religious rivalries. While intense negotiating efforts over the past two decades have resulted in a number of positive steps toward a comprehensive peace settlement of the Arab-Israeli dispute, at the present time virtually every major power in the region retains at least one of these dangerous programs. NBC weapons or missiles have been acquired through direct purchase, domestic development, or a combination of the two.

There are several dangerous trends in the Middle East and North Africa regarding NBC weapons and missiles. Several states, including Iran, Iraq, and Libya, have employed chemical weapons, ballistic, or anti-ship cruise missiles within the last 10 years. Several states have developed, or are attempting to develop, NBC warheads for their missiles. Iraq is a case in point, having admitted, after the Gulf War, to possession of operational chemical and biological missile warheads.

Further, many states are seeking some measure of production self-sufficiency for one or more types of NBC weapons and their means of delivery. This trend is dangerous because as states become self-sufficient, they become less susceptible to outside pressure. In addition, they become potential suppliers themselves and could provide weapons to other proliferant states.

Iran

OBJECTIVES, STRATEGIES, AND RESOURCES

Iran's national objectives and strategies are shaped by its regional political aspirations, threat perceptions, and the need to preserve its Islamic government. Tehran strives to be a leader in the Islamic world and seeks to be the dominant power in the Gulf. The latter goal brings it into conflict with the United States. Tehran would like to diminish Washington's political and military influence in the region. Iran also remains hostile to the ongoing Middle East peace process and supports the use of terrorism as an element of policy. Within the framework of its national goals, Iran continues to give high priority to expanding its NBC weapons and

missile programs. In addition, Iran's emphasis on pursuing independent production capabilities for NBC weapons and missiles is driven by its experience during the 1980-1988 war with Iraq, during which it was unable to respond adequately to Iraqi chemical and missile attacks and suffered the effects of an international arms embargo.

Iran perceives that it is located in a volatile and dangerous region, virtually surrounded by potential military threats or unstable neighbors. These include the Iraqi government of Saddam Hussein, Israel, U.S. security agreements with the Gulf Cooperation Council (GCC) states and accompanying U.S. military presence in the Gulf, and instability in Afghanistan and the Central Asian states of the former Soviet Union.

Iran still views Baghdad as the primary regional threat to the Islamic Republic, even though Iraq suffered extensive damage during the Gulf War. Further, Iran is not convinced that Iraq's NBC programs will be adequately restrained or eliminated through continued UN sanctions or monitoring. Instead, the Iranians believe that they will face yet another challenge from their historical rival.

Tehran is concerned about strong U.S. ties with the GCC states because these states have received substantial amounts of modern Western conventional arms, which Tehran seeks but cannot acquire, and because U.S. security guarantees make these states less susceptible to Iranian pressure. While Tehran probably does not believe GCC nations have offensive designs against the Islamic Republic, it may be concerned that the United States will increase mistrust between Iran and the Arab states. It also likely fears that the sizable U.S. military presence in the region could lead to an attack against Iran. Iran may also be concerned by Israel's strategic projection capabilities and its potential to strike Iran in a variety of ways. For all these reasons, Tehran probably views NBC weapons and the ability to deliver them with missiles as decisive weapons for battlefield use, as deterrents, and as effective means for political intimidation of less powerful neighboring states.

In recent years, Iran's weak economy has limited the development of its NBC weapons and missile programs, although oil price increases in 1996 may

have relieved the pressure at least temporarily. Tehran's international debt exceeds \$30 billion, although Iran is meeting its debt repayment obligations. Iran also is facing a rapidly growing population which will exact greater future demands from its limited economy. Despite these internal problems, Iran assigns a high priority to attaining production self-sufficiency for NBC weapons and missiles. Therefore, funding for these efforts is likely to be a high priority for the next several years.

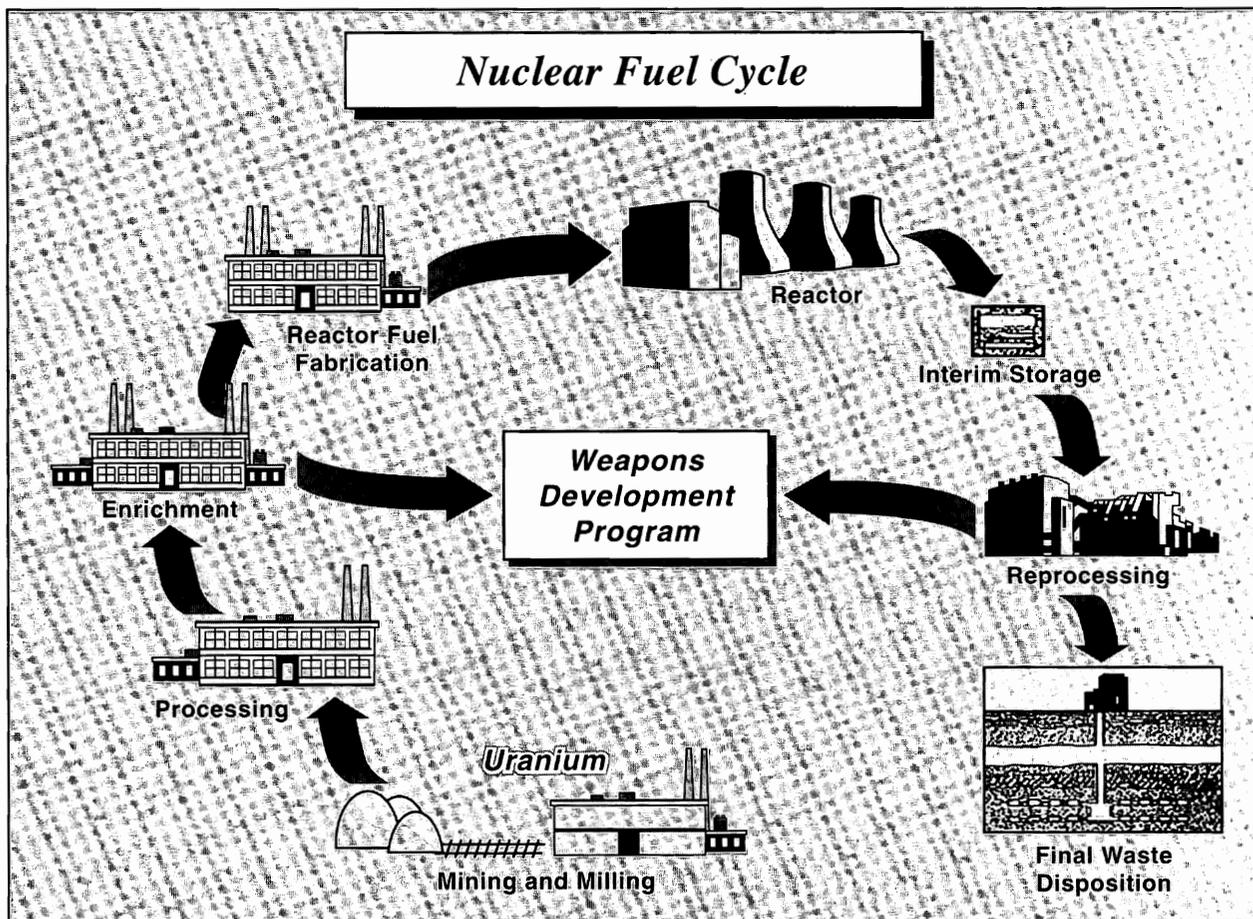
Tehran has attempted to portray U.S. containment efforts as unjust, in an attempt to convince European or Asian suppliers to relax export restrictions on key technologies. At the same time, foreign

suppliers must consider the risk of sanctions or political embarrassment because of U.S.-led containment efforts.

NUCLEAR PROGRAM

Iran's nuclear program, focusing on electric power production, began during the 1970s under the Shah. Research and development efforts also were conducted on fissile material production, although these efforts were halted during the Iranian revolution and the Iran-Iraq war. However, the program has been restarted, possibly in reaction to the revelations about the scope of Iraq's nuclear weapons program.

IRAN: NBC WEAPONS AND MISSILE PROGRAMS	
Nuclear	<p>Attempting to acquire fissile material for weapons development.</p> <p>Chinese and Russian supply policies are key to Iran's success; Russia has agreed to build power reactor.</p> <p>Ratified the Nuclear Non-Proliferation Treaty and signed the Comprehensive Test Ban Treaty.</p>
Chemical	<p>Employed chemical agents on limited scale during Iran-Iraq war.</p> <p>Produces chemical agents and is capable of use on limited scale.</p> <p>Seeking future independent production capability; Chinese assistance will be critical to Iran's success.</p> <p>Ratified the Chemical Weapons Convention.</p>
Biological	<p>Possesses expertise and infrastructure to support biological warfare program.</p> <p>May have small quantities of agent available; seeking larger capability.</p> <p>Ratified the Biological and Toxin Weapons Convention.</p>
Ballistic Missiles	<p>Maintains and is capable of using SCUD B/Cs and CSS-8s.</p> <p>Produces SCUDs with North Korean help.</p> <p>Seeks to produce longer range missiles (1,000 kilometers or more).</p> <p>Not a member of the Missile Technology Control Regime.</p>
Other Means Of Delivery Available	<p>Land-, sea, and air-launched anti-ship cruise missiles; air-launched tactical missiles; none have NBC warheads.</p> <p>Aircraft (fighters).</p> <p>Ground systems (artillery, rocket launchers).</p>



This diagram depicts the typical nuclear fuel cycle for a nuclear energy program. There are two points in the process where material could be diverted to support a nuclear weapons program. One would be at the enrichment stage where uranium being enriched for fuel purposes (typically 3 to 5 percent U-235) would be converted to weapons-grade material (typically 90+ percent U-235). The other point would be during the reprocessing of spent reactor fuel. Plutonium recovered during this process could be used for a plutonium-based nuclear weapon.

Iran is trying to acquire fissile material to support development of nuclear weapons and has set up an elaborate system of military and civilian organizations to support its effort. Barring outright acquisition of a nuclear weapon from a foreign source, Iran could pursue several other avenues for weapon development. The shortest route, depending on weapon design, could be to purchase or steal fissile material. Also, Iran could attempt to produce highly enriched uranium if it acquired the appropriate facilities for the front-end of the nuclear fuel cycle. Finally, Iran could pursue development of an entire fuel cycle, which would allow for long-term production of plutonium, similar to the route North Korea followed.

Iran does not yet have the necessary infrastructure to support a nuclear weapons program, although is actively negotiating for purchase of technologies and whole facilities to support all of the above strategies. Iran claims it is trying to establish a complete nuclear fuel cycle to support a civilian energy program, but this same fuel cycle would be applicable to a nuclear weapons development program. Iran is seeking foreign sources for many elements of the nuclear fuel cycle. Chinese and Russian supply policies are key to whether Iran will successfully acquire the needed technology, expertise, and infrastructure to manufacture the fissile material for a weapon and the ability to fashion a usable device. Russian or Chinese supply of nuclear power

reactors, allowed by the NPT, could enhance Iran's limited nuclear infrastructure and advance its nuclear weapons program.

CHEMICAL PROGRAM

Iran has had a chemical weapons production program since early in the Iran-Iraq war. It used chemical agents to respond to Iraqi chemical attacks on several occasions during that war. Since the early 1990s, it has put a high priority on its chemical weapons program because of its inability to respond in kind to Iraq's chemical attacks and the discovery of substantial Iraqi efforts with advanced agents, such as the highly persistent nerve agent VX. Iran ratified the CWC, under which it will be obligated to eliminate its chemical program over a period of years. Nevertheless, it continues to upgrade and expand its chemical warfare production infrastructure and munitions arsenal.

Iran manufactures weapons for blister, blood, and choking agents; it is also believed to be conducting research on nerve agents. Iran has a stockpile of these weapons, including artillery shells and bombs, which could be used in another conflict in the region.

Although Iran is making a concerted effort to attain an independent production capability for all aspects of its chemical weapons program, it remains dependent on foreign sources for chemical warfare-related technologies. China is an important supplier of technologies and equipment for Iran's chemical warfare program. Therefore, Chinese supply policies will be key to whether Tehran attains its long-term goal of independent production for these weapons.

BIOLOGICAL PROGRAM

Iran's biological warfare program began during the Iran-Iraq war. The pace of the program probably has increased because of the 1995 revelations about the scale of Iraqi efforts prior to the Gulf War. The relative low cost of developing these weapons may be another motivating factor. Although this program is in the research and development stage, the Iranians have considerable expertise with pharma-

ceuticals, as well as the commercial and military infrastructure needed to produce basic biological warfare agents. Iran also can make some of the hardware needed to manufacture agents. Therefore, while only small quantities of usable agent may exist now, within 10 years, Iran's military forces may be able to deliver biological agents effectively. Iran has ratified the BWC.

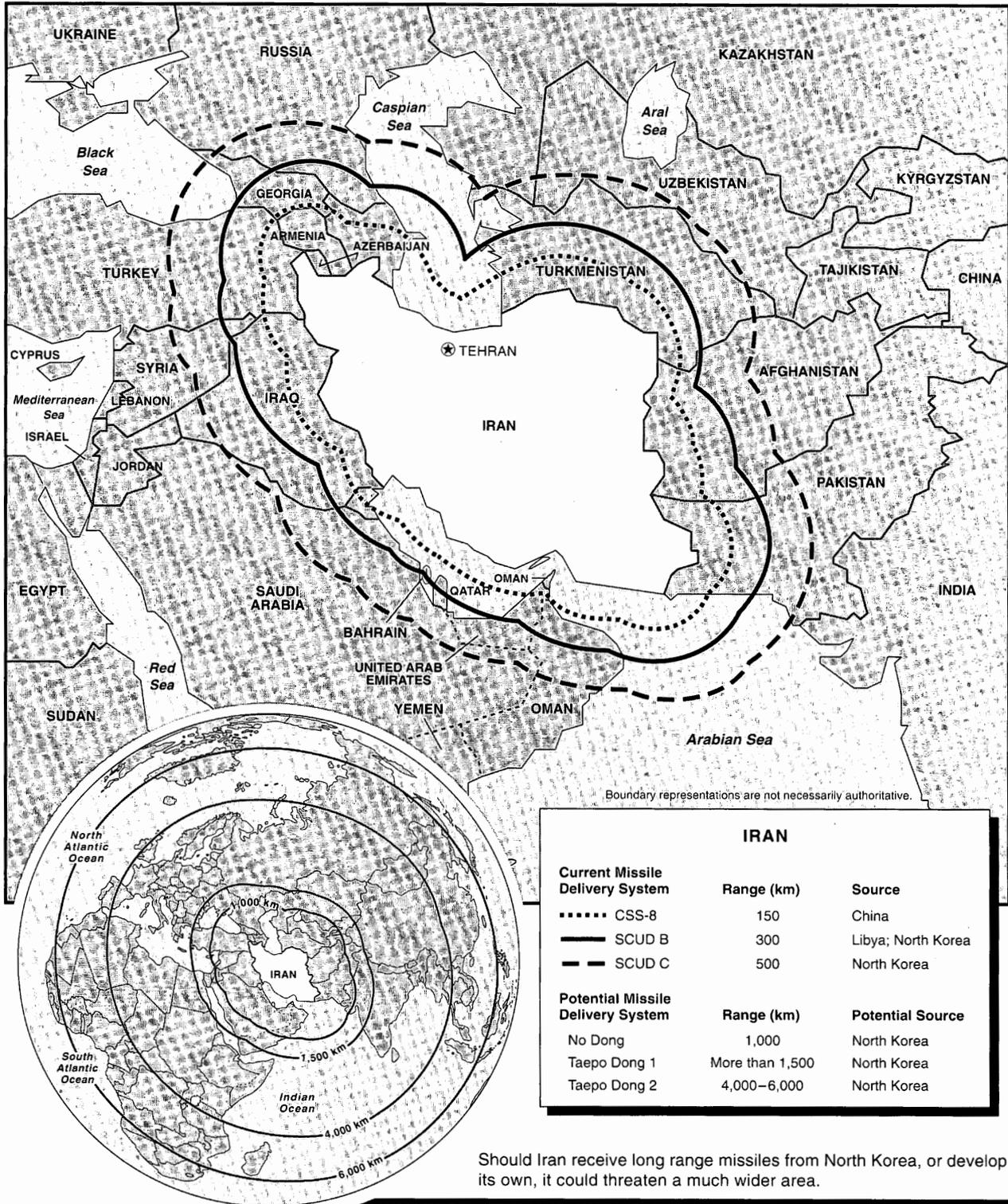
BALLISTIC MISSILES

Iran has an ambitious missile program, with SCUD B, SCUD C, and CSS-8 (a Chinese surface-to-surface missile derived from a surface-to-air missile) missiles in its inventory. Having first acquired SCUD missiles from Libya and North Korea for use during the Iran-Iraq war, the Iranians are now able to produce the missile themselves. This has been accomplished with considerable equipment and technical help from North Korea. Iran has made significant progress in the last few years toward its goal of becoming self-sufficient in ballistic missile production.

Iran produces the solid-propellant 150 kilometer range Nazeat 10 and 200 kilometer range Zelzal unguided rockets. Iran also is trying to produce a relatively short-range solid-propellant missile. For the longer term, Iran's goal is to establish the capability to produce medium range ballistic missiles to expand its regional influence. It is attempting to acquire production infrastructure to enable it to produce the missiles itself. Like many of Iran's other efforts, success with future missile capabilities will depend on key equipment and technologies from China, North Korea, and Russia.

Iran's missiles allow it to strike a wide variety of key economic and military targets in several neighboring countries, including Turkey, Saudi Arabia, and the other Gulf states. Possible targets include oil installations, airfields, and ports, as well as U.S. military deployment areas in the region. All of Iran's missiles are on mobile launchers, which enhance their survivability. Should Iran succeed in acquiring or developing a longer range missile like the North Korean No Dong, it could threaten an even broader area, including much of Israel.

Estimated Ranges of Current and Potential Iranian Ballistic Missiles



Should Iran receive long range missiles from North Korea, or develop its own, it could threaten a much wider area.

CRUISE MISSILES AND OTHER MEANS OF DELIVERY

Iran has purchased land-, sea, and air-launched short range cruise missiles from China; it also has a variety of foreign-made air-launched short range tactical missiles. Many of these systems are deployed as anti-ship weapons in or near the Gulf. Iran also has a variety of Western and Soviet-made fighter aircraft, artillery, and rockets available as potential means of delivery for NBC weapons.



POTENTIAL AS A SUPPLIER

In the future, as Iran becomes more self-sufficient at producing chemical or biological agents and ballistic missiles, there is a potential that it will become a supplier. For example, Iran might supply related equipment and technologies to other states trying to develop capabilities, such as Libya or Syria. There is precedent for such action; Iran supplied Libya with chemical agents in 1987.

Iraq

OBJECTIVES, STRATEGIES, AND RESOURCES

Saddam Hussein appears to retain the same national objectives as prior to his defeat in the Gulf War.

These include establishing Iraq as the leading Arab political and military power and as the dominant power in the Gulf region. The Iraqi leadership also retains its territorial aspirations on Kuwait and the Shatt al Arab waterway and remains opposed to the Middle East peace process. However, Iraq's ability to achieve its goals is limited by a weak economy and continuing UN sanctions.

UN Security Council Resolution (UNSCR) 687, in force since 1991, calls for Iraq to eliminate its NBC weapons and missiles and forbids it from developing, producing, or possessing any NBC weapons or missiles with ranges greater than 150 kilometers. However, Saddam Hussein's government endeavors to conceal and protect these weapons and related equipment, technology, or documentation from UN Special Commission on Iraq (UNSCOM) inspections and monitoring. Its actions against UNSCOM in the fall of 1997 are further evidence of this policy.

The August 1995 defection of Saddam Hussein's son-in-law, Hussein Kamel, caused the Iraqi ruler to release a large cache of documents which the Iraqis previously claimed did not exist. These disclosures revealed many more extensive NBC weapons and missile efforts than Iraq had previously admitted. These efforts included an intensive 1990 crash program to develop a nuclear device using IAEA safeguarded nuclear fuel, the manufacture of advanced chemical agents (i.e., VX), a very sizable biological agent production and weaponization program, and a sophisticated missile production and testing program.

In addition to Iraqi noncompliance with UNSCR 687, other activities during the last several years show that Iraq has expended considerable resources rebuilding, and in some cases expanding, facilities previously dedicated to its chemical and biological weapon or missile programs. In addition, Iraq is believed to retain documentation, some equipment, and substantial expertise to provide a basis for renewed efforts. Iraq has also continued covert procurement efforts, attempting to acquire a variety of technologies prohibited under UN resolutions. All these actions indicate Iraq's clear intent to rebuild its NBC weapons and missile programs, should UN sanctions and monitoring end or be substantially reduced.

IRAQ: NBC WEAPONS AND MISSILE PROGRAMS	
Nuclear	<p>Suffered considerable damage from Coalition bombing and IAEA monitoring; all fissile material removed.</p> <p>Retains considerable expertise (scientists); possibly hidden some documentation, infrastructure.</p> <p>Could manufacture fissile material for nuclear device in 5 or more years, if sanctions were lifted, or substantially reduced, and considerable foreign assistance provided.</p> <p>Ratified the Nuclear Non-Proliferation Treaty; has not signed the Comprehensive Test Ban Treaty.</p>
Chemical	<p>Suffered considerable damage from Coalition bombing and UNSCOM destruction.</p> <p>Probably has hidden precursor chemicals, agents, munitions, documentation for future effort; has rebuilt key portions of production facilities for commercial use.</p> <p>Could restart agent production and have small usable stockpile in several months, if sanctions and monitoring were lifted or substantially reduced.</p> <p>Has not signed the Chemical Weapons Convention.</p>
Biological	<p>Prior to Operation Desert Storm, had largest and most advanced program in Middle East.</p> <p>Despite Coalition bombing, UNSCOM destruction, and UN sanctions and monitoring, Iraq may retain elements of its old program, including some missile warheads.</p> <p>Could restart some limited agent production quickly, if sanctions and monitoring were lifted or substantially reduced.</p> <p>Ratified the Biological and Toxin Weapons Convention.</p>
Ballistic Missiles	<p>Suffered considerable damage from Coalition bombing and UNSCOM destruction.</p> <p>Allowed to maintain 150-kilometer missile program (Ababil) under UNSCR 687; likely using this effort to support future long range missile effort.</p> <p>Continues to conceal a number of SCUD missiles and launchers.</p> <p>Could restart limited missile production within one year, if sanctions and monitoring were lifted or substantially reduced.</p> <p>Not a member of the Missile Technology Control Regime.</p>
Other Means of Delivery Available	<p>Land-launched anti-ship cruise missiles; air-launched tactical missiles; none have NBC warheads; stockpile likely is very limited.</p> <p>Aircraft (fighters, helicopters).</p> <p>Ground systems (artillery, rockets).</p>

Iraq has an international debt of about \$100 billion, including debt to Arab states, and owes reparation payments of at least \$100 billion. Gross domestic product is estimated at about \$18 billion for 1996,

about a third that of 1989, with imports down to 10-15 percent of pre-war levels. The UN allows Iraq to export up to \$2 billion of oil every six months. Some of the revenue from these sales can

be used to fund humanitarian imports. A new resolution must be passed every six months for this program to continue. (UNSCR 986, implemented in December 1996, and UNSCR 1111, implemented in June 1997, are the first two of these resolutions; a third will be required at the end of 1997 for the program to continue.)

Despite these ongoing economic conditions, the related shortages, and UN inspections and monitoring, the Iraqi government continues to devote scarce resources to rebuilding key portions of its chemical and missile industries, including entire facilities, further evidence of Iraqi intentions for the future.

NUCLEAR PROGRAM

Iraq's nuclear weapons program suffered a very significant setback both from the Gulf War bombing of nuclear-related facilities and IAEA monitoring since the war. All fissile material was removed from Iraq by the IAEA, but considerable expertise (scientists and technicians) and possibly some documentation and infrastructure, survived. Disclosures in 1991 revealed that Iraq had explored virtually all the viable uranium enrichment techniques; 1995 disclosures revealed a crash program to build a weapon, which was curtailed by the war.

Since the end of the Gulf War, Iraq may have conducted research on nuclear weapons, although UNSCR 687 prohibits this type of research. In late 1996, former Director of the IAEA, Hans Blix, publicly expressed concern that, although the actual weapon production and research apparatus had been destroyed, "The know-how and expertise acquired by Iraqi scientists and engineers could provide an adequate basis for reconstituting a nuclear weapon-based program." He added, "A continuing high-level of vigilance is therefore necessary." He requested a broader scope for the UN monitoring regime, to include universities and research facilities not declared as nuclear-associated and thus not within IAEA's current purview.

Baghdad retains the scientists needed to reconstitute its nuclear weapons program when conditions permit. Iraq, however, does not currently possess the necessary infrastructure to produce the fissile material for a nuclear weapon and would have to

rely heavily on foreign assistance and supplies for any post-UN sanction nuclear weapons effort. Even so, it would take Iraq five or more years on its own to manufacture the fissile material for a nuclear weapon. This is why the United States has concerns that Iraq would seize any opportunity to purchase fissile material or nuclear technology.

CHEMICAL PROGRAM

The Iraqis had a wide variety of chemical warfare agents available before the Gulf War, including blister (mustard) and nerve (tabun and sarin) agents, as well as several means of delivery, including artillery, rockets, mortars, spray tanks, aerial bombs and SCUD-type missiles. Although Iraq's chemical warfare program suffered extensive damage from Coalition bombing during the Gulf War and from UNSCOM destruction and monitoring activities after the war, Iraq retains a limited ability to reconstitute its chemical warfare program. Equally important, Iraq retains the technical knowledge to reconstitute and improve the chemical warfare capability it had prior to the Gulf War. Information released as a result of Hussein Kamel's defection revealed that Iraq had hidden from the UN other more sophisticated chemical warfare capabilities which had not heretofore been discussed, despite the intrusive UNSCOM inspections. These included:

- A program to develop the nerve agent VX begun in May 1985 and continued without interruption until December 1990.
- Production of large amounts of precursors sufficient to produce 400 tons of VX per year.
- Development of a binary sarin-filled artillery round, as well as rockets and aerial bombs in quantities well beyond prototype level.
- Testing of an Al Hussein variant of the SCUD missile with a chemical warhead and a range of 600-650 km.

The depth and breadth of Iraq's previous chemical warfare efforts, the rebuilding of key facilities since 1991, and the consistent pattern of trying to deceive UNSCOM about the scope of its previous efforts and remaining capabilities clearly indicate Iraq's intent to rebuild this capability, should it be given the opportunity.

Iraq has rebuilt key portions of its chemical production infrastructure for industrial and commercial use. The facilities are currently subject to UN scrutiny, but they could be converted fairly quickly, allowing Iraq to restart limited agent production. Even though some foreign assistance for equipment and material would be required for all but a minimum effort, Iraq would need several months to produce a usable stockpile of agents and several years to return to pre-Gulf War stockpile levels.

BIOLOGICAL PROGRAM

EFFECTS OF BIOLOGICAL AGENTS PRODUCED BY IRAQ		
Agent	Symptoms	Untreated Effect
Botulinum toxin	Weakness, gastro-intestinal distress	Respiratory paralysis; lethal
Anthrax	Flu-like respiratory distress, fever	Respiratory failure; lethal
Aflatoxin	Headache, jaundice, gastro-intestinal distress	Liver disease, internal bleeding; often lethal

During the 1980s, Iraq developed the largest and most advanced biological warfare program in the Middle East. A variety of biological agents were studied, including bacteria, viruses, and fungal toxins. Anthrax, botulinum, and aflatoxin were declared to be weaponized. The Iraqis maintained that the projects to manufacture weapons using viral agents were unsuccessful but the 1995 defection of Hussein Kamel revealed otherwise.

Coalition air strikes destroyed or damaged many of Iraq's biological warfare facilities, including those at Al Kindi and Salman Pak. However, before Coalition operations began, the Iraqis had relocated virtually all of their agent production equipment to Al Hakam and other facilities and had buried all biological agent-filled munitions and agent stockpiles in areas likely to escape bombing. In June 1996, all bioproduction equipment at the Al Hakam

facility and some equipment at Daura facility were destroyed and the Al Hakam facility was razed.

Iraq claims that all biological agents and munitions were unilaterally destroyed after the Gulf War. However, Iraq's record of misrepresentation and the lack of documentation to support these claims leave the status of Iraqi biological warfare stockpile in doubt. Iraq may still retain some biological agents and weapons. It also has a number of medical, veterinary, and university facilities where biotechnical research and development can be carried out. Some of these facilities likely are staffed by former members of Iraq's biological warfare program. Much of the laboratory equipment is dual-use and could be used for biological agent development.

Like its other programs, Iraq clearly intends to re-establish its biological warfare effort. It is well positioned to do this because of the assets it retains and could resume limited agent production fairly quickly, if UN sanctions and monitoring end.

BALLISTIC MISSILES

Like its other programs, Iraq's ballistic missile efforts suffered severe damage from Coalition bombing during the Gulf War and from destruction activity by UN inspectors after the war. However, Iraq has rebuilt substantial portions of its missile production infrastructure. The 1995 disclosures revealed a much broader and more sophisticated missile effort, raising serious questions about the number of missiles and missile launchers Iraq had hidden but claimed it had destroyed. These disclosures revealed:

- 1990 testing activity with SCUD missile warheads filled with sarin nerve agent.
- Research and testing of more energetic liquid propellants.
- Significant design studies for advanced rocket engines for use with extended range missiles.
- Research of a missile design intended to deliver a nuclear weapon.

KEY ELEMENTS OF IRAQI BIOLOGICAL WARFARE PROGRAM REVEALED BY IRAQ AFTER 1995 DEFECTION OF HUSSEIN KAMEL	
Production Locations	Al Hakam. Daura Foot and Mouth Disease Institute. Taji. Salman Pak.
Biological Warfare Agents Produced	19,000 liters of botulinum toxin. 8,500 liters of anthrax. 2,400 liters of aflatoxin.
Testing	Field trials of anthrax and botulinum toxin using aerial bombs. Effects on animals observed—March 1988. Live firings of 122-mm rockets with agent—May 1990.
Weaponization	Begun on large scale in December 1990. Aerial bombs—166 filled with biological warfare agent. SCUD missile warheads—25 filled with biological warfare agent. Efforts made in December 1990 to modify spray tanks to deliver 2,000 liters of anthrax; planned for use on aircraft or remotely piloted aircraft; not successful. Biological weapons deployed to operational delivery sites in December 1990.

In 1996, former UNSCOM Executive Chairman Rolf Ekeus publicly stated several times that Iraq continues to conceal a number of SCUD missiles. He also expressed concern that Iraq may be hiding chemical and biological warheads for these missiles.

Despite sanctions, Iraq continues to seize any opportunity to advance its missile program. In late 1995, Jordanian authorities intercepted a shipment of sophisticated Russian-produced missile guidance instruments bound for Iraq. Much of Iraq's post-Gulf War missile activity is conducted under the auspices of the Ababil program. This program is developing solid- and liquid-propellant missiles with ranges of less than 150 kilometers, an activity allowed under UNSCR 687. UNSCOM is concerned, however, about the growing evidence that Iraq is using this program to maintain a knowledge base to support future development of long range missiles.

It is clear from its actions that Iraq fully intends to reestablish and broaden its ballistic missile pro-

gram should UN sanctions and monitoring end or be substantially reduced. Iraq could start initial production efforts within one year. It would take considerably longer for Iraq to return to its pre-Gulf War capabilities.

CRUISE MISSILES AND OTHER MEANS OF DELIVERY

Iraq may have a very limited stockpile of land-launched short range anti-ship cruise missiles and air-launched short range tactical missiles that it purchased from China and France prior to the Gulf War. It also has a variety of fighter aircraft, helicopters, artillery, and rockets available as potential means of delivery for NBC weapons, although only a limited number of these systems likely are operational due to the effects of the UN arms embargo.

Libya

OBJECTIVES, STRATEGIES, AND RESOURCES

Libyan leader Qadhafi is a leading advocate of Pan-Arabism and views himself as a revolutionary voice

for developing countries and defender against Western imperialism and Zionist influences. His ideology has led to numerous unsuccessful attempts to form unions with other Arab states, support to insurgent and opposition movements in developing countries, and an extended period of confrontation with the United States and, more recently, the United Nations. Although Qadhafi has retreated from supporting subversion, destabilization, and terrorism in hopes of having the UN sanctions against Libya lifted, Libya has retained a significant infrastructure to support terrorist activities against Western interests.

Qadhafi's major limiting factor is Libya's lack of a sufficient technological infrastructure to support domestic development of NBC weapons and missiles. All Libyan programs must rely on significant infusions of foreign equipment, technology, and expertise. Only Libya's chemical warfare program has made any demonstrable progress developing

facilities capable of supporting large-scale indigenous programs.

Despite ongoing UN embargos and an unsettled domestic situation, Qadhafi supports development of NBC weapons and missile capabilities. His view apparently is that these weapons can advance his international position, can serve as deterrents against the West's sophisticated weaponry, can be used to intimidate neighboring states, and can serve as cheaper alternatives to more expensive conventional systems.

In addition to an inadequate infrastructure, Libya has serious economic problems that threaten the regime and complicate its long-term goal of establishing domestic production capabilities. Libya's economic problems result from insufficient economic development outside the oil sector, economic and financial mismanagement, the absence of private enterprise, and corruption.

LIBYA: NBC WEAPONS AND MISSILE PROGRAMS	
Nuclear	Has long standing goal of acquiring or developing a nuclear weapon. Suffers from mismanagement; little foreign assistance. Ratified the Nuclear Non-Proliferation Treaty; has not signed the Comprehensive Test Ban Treaty. Signed the African Nuclear Free Zone Treaty.
Chemical	Employed chemical agents against Chadian troops in 1987. Produced blister and nerve agents in 1980s at Rabta. Began construction of underground chemical agent production facility at Tarhunah. Has not signed the Chemical Weapons Convention.
Biological	Lacks scientific and technical base. Remains in research and development stage. Ratified the Biological and Toxin Weapons Convention.
Ballistic Missiles	Fired SCUD missiles at an Italian island in 1987. Maintains aging SCUD B force but remains capable of limited missile use. Has made little progress acquiring or developing long range missiles. Not a member of the Missile Technology Control Regime.
Other Means of Delivery Available	Land- and sea-launched anti-ship cruise missiles; none have NBC warheads. Aircraft (fighters, bombers, helicopters, transport planes). Ground systems (artillery, rocket launchers).

The Libyan economy also suffers from years of socialist-oriented policies and the use of financial resources for unnecessarily large inventories of conventional weapons and other large projects. Despite its economic problems and associated internal unrest, funds for Libya's NBC and missile programs probably will remain adequate to support continued research and development.

NUCLEAR PROGRAM

Over the years, Libya's nuclear program's progress has suffered from mismanagement, lack of spare parts, and the reluctance of foreign suppliers to provide assistance, particularly since the UN embargo went into effect in 1992. However, Qadhafi has not abandoned his goal of acquiring a nuclear weapon. He will no doubt continue to try to develop a Libyan nuclear weapons infrastructure by whatever means available.

Despite a 25-year effort to acquire or develop a nuclear weapon, Libya's nuclear program remains in the embryonic stage. It has succeeded only in providing some training to a number of students and technicians and the establishment of a nuclear

research center, which includes a small nuclear research reactor under IAEA safeguards. This facility, located at Tajura, southeast of Tripoli, was provided by the former Soviet Union. As noted in press reports, however, recent discussions between Libya and Russia indicate possible renewed Russian support for Libya's nuclear effort at Tajura, including refurbishment and long-term maintenance. Since it is unlikely that Tripoli could produce a weapon without significant and sustained foreign technical assistance, Qadhafi reportedly is trying to recruit nuclear scientists to assist in developing nuclear weapons.

CHEMICAL PROGRAM

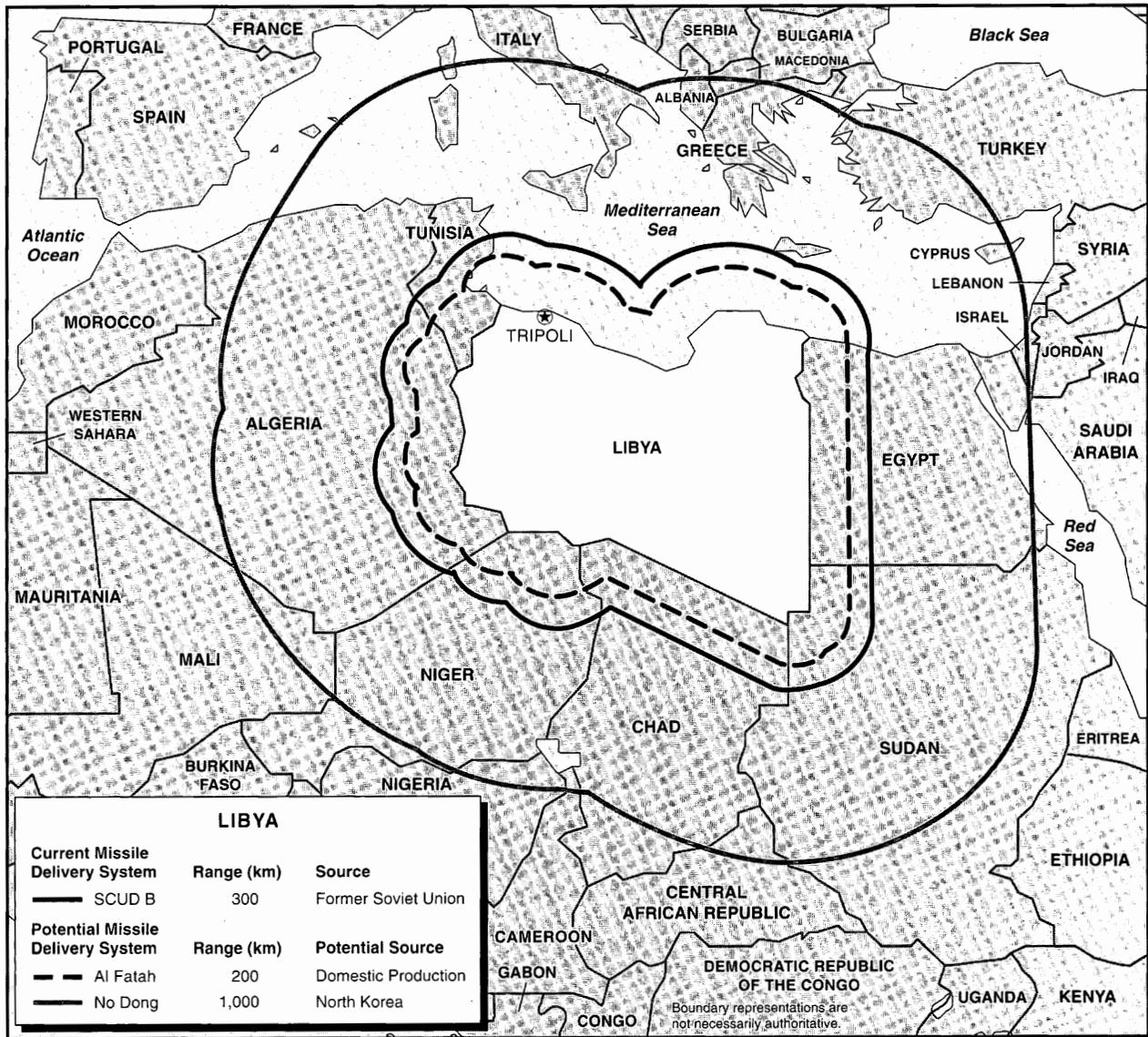
Libya has had the most success with its chemical warfare program. During the 1980s, it succeeded in producing up to 100 tons of blister and nerve agent at its Rabta facility, built with foreign assistance. After intense media attention was focused on the facility, it was closed in 1990, although the Libyans announced its reopening in September 1995 as a pharmaceutical facility. The Rabta facility remains capable of producing chemical agents.

[I]f some nation were to attack the United States with chemical weapons, then they would have to fear the consequences of a response from any weapon in our inventory . . . We are forswearing through the Chemical Weapons Convention . . . chemical weapons ourselves. And I believe that was the right decision for the United States Government. And I would not think that any nation should feel that they can use chemical weapons against us without receiving a devastating response. In every situation that I have seen so far, nuclear weapons would not be required for response. That is, we could make a devastating response without the use of nuclear weapons, but we would not forswear that possibility.

*Secretary of Defense William J. Perry
Statement on Libyan Chemical Warfare Facility at Tarhunah
Air War College Conference on Nuclear Proliferation Issues
Maxwell Air Force Base, Alabama*

April 26, 1996

**Estimated Ranges of Current and Potential
Libyan Ballistic Missiles**



Should Libya receive long range missiles from North Korea, or develop its own, it could threaten a much wider area.

After the media attention at Rabta, Libya shifted its emphasis to construction of an underground chemical warfare facility at Tarhunah, southeast of Tripoli. In response to international attention, Qadhafi claimed that Tarhunah was part of the Great Man-made River Project, a nationwide irrigation effort.

Qadhafi has not given up the goal of establishing his own offensive chemical weapons capability and Libya continues to pursue an independent produc-

tion capability for the weapons. Qadhafi is not likely to sign or ratify the Chemical Weapons Convention. However, Libya remains heavily dependent on foreign suppliers for precursor chemicals and other key equipment. UN sanctions have severely limited that support. Finally, while Libya's ability to deliver any of its existing stockpile of chemical agents is not great, the threat to Egypt, U.S. forces in the region, or NATO cannot be dismissed out of hand.

BIOLOGICAL PROGRAM

While Libya has had a biological warfare program for many years, it remains in the early research and development stages, primarily because Libya lacks an adequate scientific and technical base. The program also suffers from the difficulty Libya has acquiring needed foreign equipment and technical expertise, partly due to current UN sanctions. However, Libya is trying to develop an indigenous capability and may be able to produce laboratory quantities of agent. Given the overall limitations of the program, it is unlikely that Libya will be able to transition from laboratory work to production of militarily useful quantities of biological warfare agent until well after the turn of the century. Libya ratified the BWC in 1982.

BALLISTIC MISSILES

Libya continues to maintain a SCUD missile force, although that force is aging and suffers from maintenance problems. Despite the UN embargo, Libya continues to aggressively seek ballistic missile-related equipment, materials, and technology from a variety of sources in Europe, the former Soviet Union, and Asia. Libya's strategy has been to acquire or develop long range missiles (greater than 1,000 kilometers), but it has made little progress in recent years. For example, Libya's efforts to acquire the North Korean No Dong missile have been unsuccessful. Such a missile would allow Libya to threaten Egypt, Israel, NATO countries in southern Europe, and U.S. forces in the Mediterranean region. Similarly, Libyan efforts to develop its own missile have met with only limited success. Its Al Fatah missile program remains in the testing stage. This developmental effort uses a rocket with a fairly small payload. Libya's lack of progress with its missile program is directly related to its inability to gain adequate foreign assistance for its efforts, again partly due to UN sanctions.

CRUISE MISSILES AND OTHER MEANS OF DELIVERY

Libya has land- and sea-launched short range anti-ship cruise missiles that it purchased from Soviet and European sources. Many of the systems are old and likely are suffering from maintenance prob-

lems. Libya also has a variety of fighter aircraft, some old bombers, helicopters, artillery, and rockets available as potential means of delivery for NBC weapons. Libya used transport aircraft in its attempt to deliver chemical agents against Chadian troops in 1987.

Syria

NATIONAL OBJECTIVES, STRATEGIES, AND RESOURCES

Syria's primary national objective is to ensure that the regime of President Hafez al Asad remains in power. In addition, Syria seeks to regain the entire Golan Heights, retain hegemony over Lebanon, deter Israeli activities against Syria or Lebanon, prevent its own regional isolation, and assume a leadership role in the Arab world. To support these national goals, President Asad has acted to maintain capable military forces to defend his regime, conducted negotiations with Israel for the return of the Golan Heights, continued Syria's military presence in Lebanon, and formed a strategic alliance with Iran.

Syria also has vigorously pursued the development of chemical weapons and ballistic missiles, and to a lesser extent, biological weapons as a means to counter what it perceives as Israel's superior conventional forces and presumed possession of nuclear weapons. Syria believes that its chemical and missile forces act as deterrents against Israeli attacks. Asad apparently regards his ability to inflict unacceptable damage on Israel through the use of these weapons—and Israeli awareness of his willingness to do so under extreme circumstances—as a safeguard of the utmost importance.

Since abandoning its 1980s policy of achieving conventional parity with Israel, Syria has focused much of its developmental efforts on achieving a strategic deterrent to Israel. Syria has a sufficient technological base to support short range ballistic missile and chemical agent production and may be able to produce biological weapons at some point in the future. Syria does not appear to be pursuing nuclear weapons development. Although Syria faces severe financial constraints over the next decade, the strategic importance of ballistic missile and chemical programs will ensure a high priority during this time period.

SYRIA: NBC WEAPONS AND MISSILE PROGRAMS	
Nuclear	Is not pursuing development of nuclear weapons. Ratified the Nuclear Non-Proliferation Treaty; has not signed the Comprehensive Test Ban Treaty.
Chemical	Produces and is capable of using chemical agents. Seeking independent chemical warfare capability. Has not signed the Chemical Weapons Convention.
Biological	Possesses adequate biotechnical infrastructure to support biological warfare program. May be conducting research related to biological warfare. Signed the Biological and Toxin Weapons Convention.
Ballistic Missiles	Maintains and is capable of using SCUD B, SCUD C , and SS-21 missiles. Nearing production of SCUD missiles with North Korean help. Not a member of the Missile Technology Control Regime.
Other Means of Delivery Available	Land- and sea-launched anti-ship cruise missiles; none have NBC warheads. Aircraft (fighters, helicopters). Ground systems (artillery, rockets).

Syrian leaders have acted rationally and, in general, have been unwilling to take significant political or military risks. In the future, Syria will not likely use chemical weapons or ballistic missiles (or biological weapons if developed) against Israel, or another enemy, unless the regime's survival is at stake.

NUCLEAR PROGRAM

Syria has not pursued development of nuclear weapons and is not likely to do so for the foreseeable future due to systemic financial and technical constraints. However, Syria continues to be interested in nuclear technology. Through its long-term relationship with the IAEA, Syria has established a basic nuclear research capability, adequate for elementary work in agriculture and medicine. As part of an IAEA technical assistance project, Syria has acquired a small, safeguarded research reactor from China. This miniature neutron source reactor can be used for neutron activation analysis, radioisotope production, education, and training purposes. However, because of its small fuel loading and low power level, it represents no direct proliferation threat. Syria became an IAEA member state in

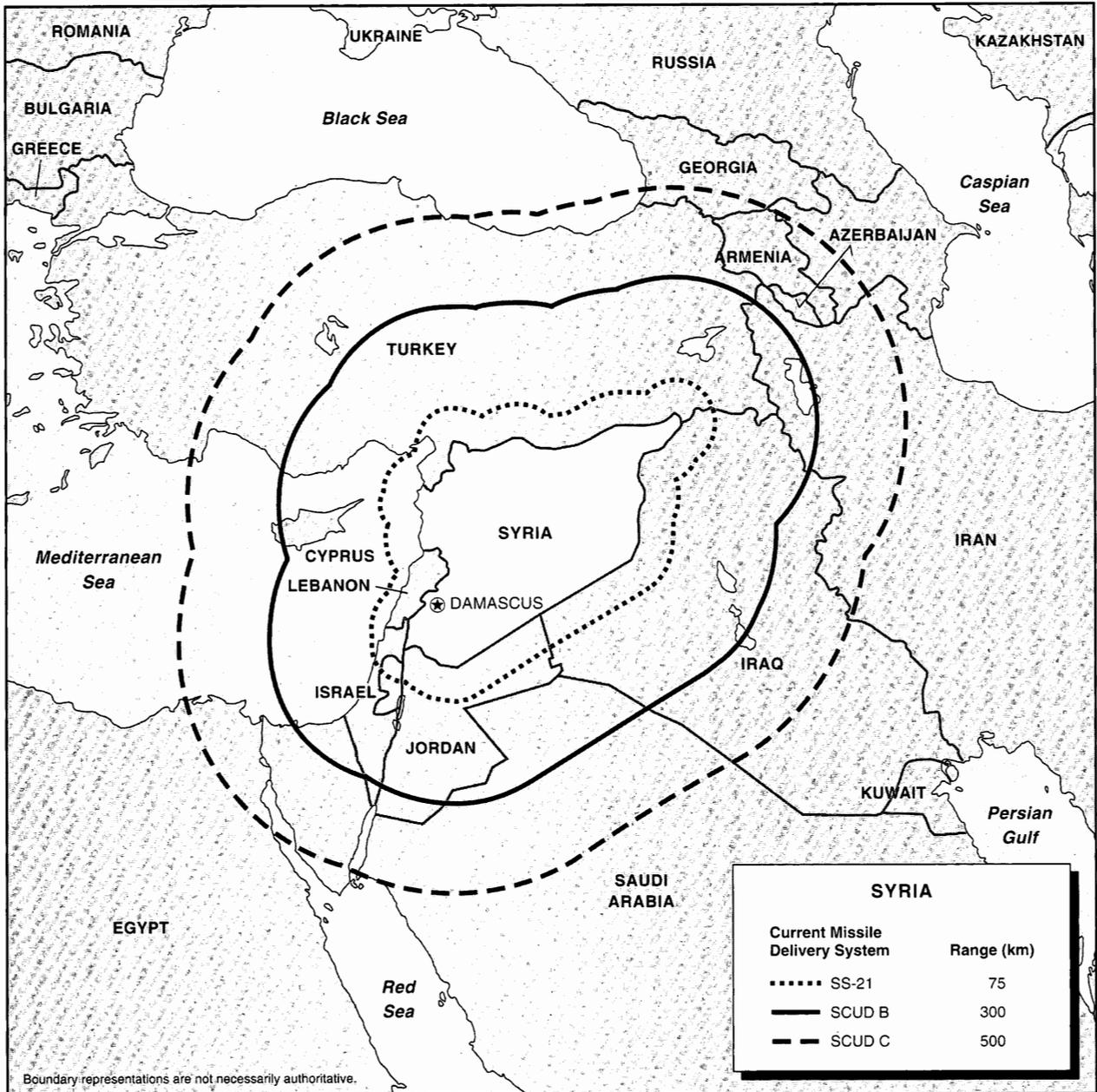
1963, ratified the NPT in 1969, and agreed to NPT-required IAEA safeguards in 1992.

CHEMICAL PROGRAM

Syria has a long-standing chemical warfare program, first developed in the 1970s. Unlike Iran, Iraq, and Libya, Syria has never employed chemical agents in a conflict. Syria has a stockpile of the nerve agent sarin and may be trying to develop advanced nerve agents as well. In future years, Syria will likely try to improve the infrastructure for producing and storing chemical agents. At this point, it probably has weaponized sarin into aerial bombs and SCUD missile warheads, which gives Syria the capability to employ chemical agents against targets in Israel. Syria has not signed the CWC.

Syria remains dependent on foreign sources for key elements of its chemical warfare program, including precursor chemicals and key production equipment. Acquisition of such materials has become more difficult in recent years as a result of stricter export controls in many countries, which is coordinated through the Australia Group.

Estimated Ranges of Current Syrian Ballistic Missiles



Syria's missiles allow it to threaten all of Israel.

BIOLOGICAL PROGRAM

Syria is pursuing the development of biological weapons. Syria probably has an adequate biotechnical infrastructure to support a small biological warfare program, although the Syrians are not

believed to have begun any major weaponization or testing related to biological warfare. Without significant foreign assistance, it is unlikely that Syria could advance to the manufacture of significant amounts of biological weapons for several years. Syria has signed the BWC.

BALLISTIC MISSILES

Syria acquired SCUD B ballistic missiles from the former Soviet Union in the mid-1970s, followed by shorter range SS-21s in the 1980s. These missiles likely are maintained for use in any future conflict with Israel. While the SS-21s likely would be employed primarily against military bases and forces in northern Israel, the SCUD's longer range and larger warhead suggests that it could be used against Tel Aviv and other cities or against other regional states. Syria may have chemical warheads available for a portion of its SCUD missile force, enhancing this force's value as either a strategic deterrent or an actual weapon.

Syria has received important supplies of SCUD-related equipment and materials from North Korea and Iran. Parallel with the production program for the liquid-propellant SCUD, Syria, with foreign support, also has devoted significant resources to establishing a solid-propellant rocket motor development and production capability. Combined with foreign support in other technical areas, Syria is laying the groundwork for a future option to develop a modern, solid-propellant SRBM.

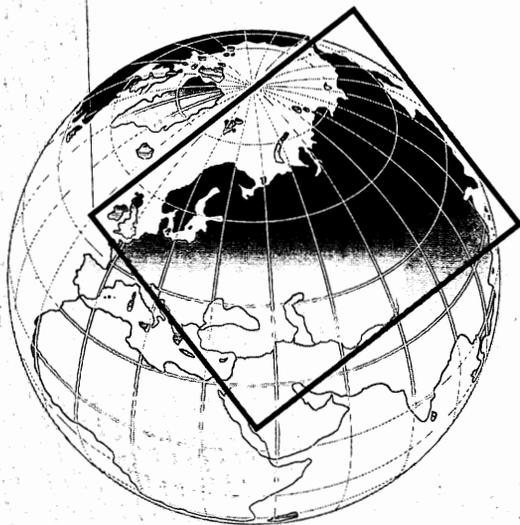
CRUISE MISSILES AND OTHER MEANS OF DELIVERY

Syria has a variety of Soviet-made land- and sea-launched short range anti-ship cruise missiles and air-launched short range tactical missiles. Syria also has numerous fighter aircraft, helicopters, artillery, and rockets available as potential means of delivery for NBC weapons.

CONCLUSION

As the states of the Middle East and North Africa continue to make progress toward an independent production capability for NBC weapons and missiles, they will become less susceptible to efforts to stem proliferation. Further, as their capabilities to employ the weapons improve, some countries may be more willing to use them in a conflict, especially since the threshold for chemical weapons and ballistic missile use has been crossed in recent years. Should conflict again occur in this region, particularly in the Gulf area, use of some form of NBC weapons or missiles seems likely.

Russia, Ukraine, Kazakhstan, and Belarus



RUSSIA, UKRAINE, KAZAKHSTAN, AND BELARUS

GOALS AND INTERESTS

The United States has a tremendous stake both in the democratization and reform of Russia, Ukraine, and the other New Independent States (NIS) and in the further normalization of U.S. relations with NIS governments, militaries, and other institutions. Given the Soviet weapons arsenal legacy, these states are key to ensuring that the security environment remains favorable and stable. Through increasing ties to these countries, the United States is contributing to continued and lasting reductions in and effective Russian control over the former Soviet nuclear arsenal and other weapons of mass destruction.

Through its various programs and activities with the NIS, the United States seeks to ensure that Russia, Ukraine, and the other nations of the region become stable market democracies that are cooperative partners in promoting regional stability and arms control in Europe and other regions. Integral to this goal is U.S. support of efforts to eliminate, or return to Russia, any Soviet nuclear weapons and associated delivery systems remaining in the other New Independent States. The United States also seeks to deter strategic nuclear threats against its citizens and territory. The United States desires Russia to play a constructive role in European affairs, in partnership with NATO, and to maintain strong relations with an independent Ukraine. Ultimately, the United States hopes the NIS will resolve any ethnic and regional tensions through peaceful means.

In its bilateral interactions with all the NIS, the Department of Defense seeks to impart the principles of civilian leadership, defense transparency, and military reform and restructuring. The Department will continue to broaden military and civilian defense contacts and support the ongoing reduction of former Soviet weapons of mass destruction and related infrastructure.

CAPABILITIES, INTENTIONS, AND TRENDS

Introduction

With the breakup of the USSR, Russia has inherited the largest stockpile of weapons of mass destruction and delivery systems in the world. While its public statements and actions regarding the safety, security, and dismantlement of this massive inventory have been positive, some actions indicate Moscow is not yet fully committed to all nonproliferation regimes. Nevertheless, as of November 1996, all of the strategic nuclear weapons that remained outside Russia after the breakup of the Soviet Union had been transferred from Ukraine, Kazakhstan, and Belarus to Russia. Collectively, Russia, Ukraine, Kazakhstan, and Belarus have eliminated or deactivated about 1,300 operational strategic launchers equipped with approximately 4,100 warheads and are more than a year ahead of schedule in meeting the first phase of reduction limits of the Strategic Arms Reduction Treaty (START I).

Serious concerns remain about the status of Russian chemical and biological warfare programs, the accuracy of the information provided by Russia in its declarations, and the willingness of the Russian defense establishment to eliminate these capabilities. Further, with serious economic and political challenges and the large number of weapons involved, the threat of proliferation of NBC systems and technologies from former Soviet states continues to exist.

Objectives, Strategies, and Resources

Russia is still developing a national political identity and corresponding foreign and security policies. In Europe, Moscow seeks to retain a voice in security issues by cooperating with NATO through the new Permanent Joint Council and by promoting the Organization for Security and Cooperation in Europe (OSCE) as the central European institution. At the same time, Moscow strongly opposes NATO membership for the Baltic states or any former Soviet state.

RUSSIA, UKRAINE, KAZAKHSTAN, BELARUS: NBC WEAPONS AND MISSILE PROGRAMS	
Nuclear	Operational strategic nuclear warheads reduced by about 40 percent since 1991. All strategic and tactical nuclear warheads consolidated in Russia. Ukraine, Kazakhstan, Belarus are nuclear weapons free. All states have ratified the Nuclear Non-Proliferation Treaty and signed the Comprehensive Test Ban Treaty.
Chemical	Russia has declared the world's largest chemical agent stockpile: 40,000 metric tons. Russia may be developing new generation of chemical agents. Ukraine, Kazakhstan, and Belarus have no chemical warfare programs. Russia and Belarus have ratified the Chemical Weapons Convention. Ukraine and Kazakhstan have signed it.
Biological	Key components of the former Soviet Union's biological warfare program remain intact in Russia. Russia may be continuing some research related to biological warfare. Ukraine, Kazakhstan, and Belarus have no biological warfare programs. Russia, Ukraine, and Belarus have ratified the Biological and Toxin Weapons Convention; Kazakhstan has not signed it.
Ballistic Missiles	Operational strategic nuclear delivery vehicles have been reduced by nearly half since 1991. No operationally deployed ICBMs remain in Ukraine, Kazakhstan, or Belarus. Russia has a large SRBM force and reportedly is marketing SRBM-related technology. Ukraine, Kazakhstan, and Belarus also have SRBM forces. Russia is a member of the Missile Technology Control Regime; Kazakhstan and Belarus are not. While Ukraine is not a member of the MTCR, it has committed to unilaterally adhere to the MTCR Guidelines and Annex.
Other Means Of Delivery Available	Russia and Ukraine have land-, sea-, and air-launched cruise missiles; some are anti-ship; some have longer ranges. Kazakhstan and Belarus have air-launched tactical missiles. Only Russia has any land-attack, nuclear-capable cruise missiles. All have a variety of combat aircraft and ground systems.

Russia has stated publicly that it is opposed to the proliferation of NBC weapons. Its arms control priorities include updating the Conventional Armed Forces in Europe Treaty to match its view of the changed situation in Europe and ensuring strict observance of the Antiballistic Missile Treaty. Because of its economic situation and serious financial shortfalls, Russia remains concerned about the costs of implementation of key arms control agreements. This is particularly true for the destruction of its large chemical weapons stockpile, where it believes Western aid is critical.

Regardless of the ultimate disposition of START II, or follow-on arms reduction talks (START III), the overall number of Russian strategic nuclear warheads will likely decline over time. START III limits proposed at Helsinki will set new limits for deployed warheads in the 2,000 to 2,500 range and include measures relating to the transparency of strategic nuclear warhead inventories and the destruction of strategic nuclear warheads.

The recent Friendship and Cooperation Treaty and agreement on the Black Sea Fleet could lead to

constructive and more stable relations between Ukraine and Russia. Kiev seeks good relations with Russia, upon which it is economically dependent, and with Ukraine's other neighbors and seeks to integrate itself into Euro-Atlantic security structures.

Ukraine has lived up to its commitment to move all nuclear weapons to Russia. By June 1996, it had completed removal of roughly 1,900 strategic nuclear weapons from its territory and had deactivated all of its 176 ICBM silos. Kiev is working with the United States to facilitate its accession to the MTCR; a presidential decree was issued in December 1996 to further improve export controls.

Kazakhstan's policies are heavily influenced by Russia, which is concerned about the large ethnic Russian population that remains in Kazakhstan. Russia also has a sizable number of troops in the country related to its control of the Baikonur Cosmodrome. Kazakhstan has demonstrated its commitment to denuclearization and nonproliferation in several important ways. It returned to Russia all the nuclear warheads on its territory by April 1995. Also, by fall 1996, Kazakhstan had eliminated all 104 of its deployed SS-18 silos, returned all SS-18 missile airframes to Russia, and continued working with the United States on destruction of remaining silos.

Belarus has sought closer ties with Russia to compensate for its lack of political and economic reform and its growing financial needs, but it has been surprised by Russia's insistence that Belarus abide by international human rights norms and pursue market reform. Nevertheless, Belarus has lived up to its commitment to become nuclear weapons free. All strategic offensive arms and their associated warheads were withdrawn from Belarus to Russia by December 1996. Further, in efforts to provide evidence of its commitment to nonproliferation, Minsk has cooperated with the United States on improving the Belarus export control system.

Nuclear Programs

As of January 1997, the stockpile of Russian strategic and tactical nuclear warheads was estimated at 25,000 warheads, a reduction of more than 5,000 warheads since a major elimination program began

in 1992. This gradual reduction took place as a result of tactical nuclear warhead reduction initiatives and bilateral agreements involving strategic warheads.

If carried out, the Russian tactical warhead reduction initiatives, announced in 1991, could result in the elimination of a total of about 15,000 tactical warheads. Also, strategic arms agreements could result in the retirement and eventual disassembly of a total of more than 7,000 strategic warheads. The process of eliminating strategic warheads began in earnest in 1994. Russia is believed to be dismantling warheads, but Moscow has not divulged specific information on warhead reductions. The economic situation in the country probably has slowed the reduction effort; many retired warheads slated for elimination are awaiting dismantlement. However, the U.S. government assesses that strategic warheads constitute the majority of the warheads eliminated so far.

The START II Treaty would require a reduction in accountable warheads to 3,000-3,500 by December 31, 2007. Even if the START II Treaty is not ratified by the Russian Duma and Federation Council, the Russian strategic forces are likely to decline to fewer than 3,000 operational warheads by the middle of the next decade as a result of economic constraints and system obsolescence. Strategic nuclear forces remain a critical priority for Moscow. Strategic nuclear forces have received a higher funding priority than the conventional forces, allowing them to maintain operational readiness, but they also have been a victim of budgetary constraints and their future modernization will be slow. At the same time, however, production of additional warheads will continue into the 21st century as new strategic missile systems are deployed and obsolete warheads replaced.

The logistic system supporting the nuclear weapons stockpile has changed considerably since 1991. With the consolidation of tactical nuclear warheads and the transfer of strategic warheads, the number of storage sites holding warheads has been reduced from over 500 facilities to fewer than 100. This consolidation has improved nuclear warhead security. However, the current resource shortages in

Russia have subjected the nuclear security system to new stresses and risks.

Chemical Programs

Moscow has declared the world's largest stockpile of chemical agents: 40,000 metric tons of chemical agent, mostly weaponized, including artillery, aerial bombs, rockets, and missile warheads. U.S. estimates of the Russian stockpile generally are larger. The inventory includes a wide variety of nerve and blister agents in weapons and stored in bulk. Some Russian chemical weapons incorporate agent mixtures, while others have added thickening agents to increase the time of contamination on the target.

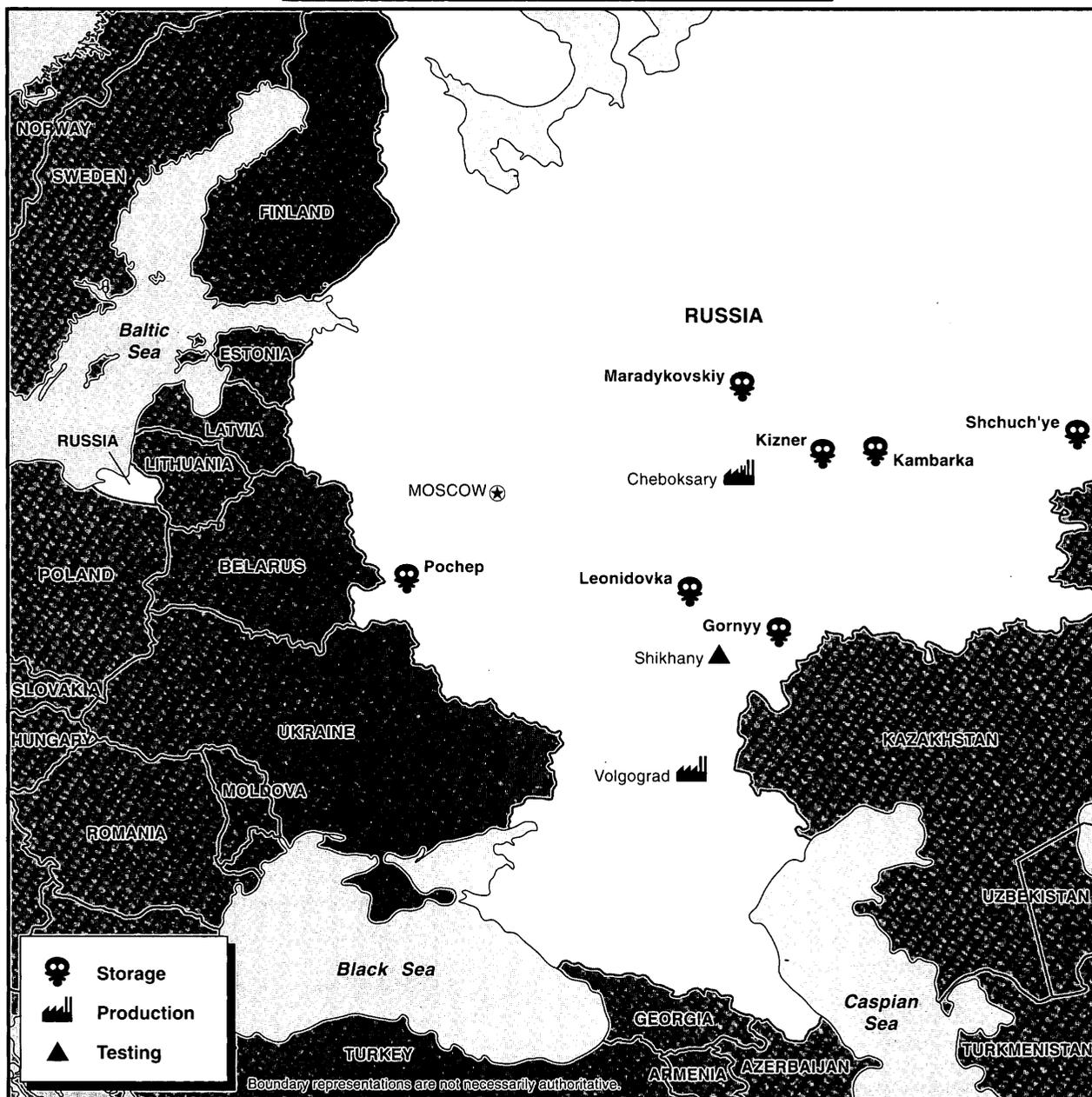
According to official Russian statements, all former Soviet chemical weapons are stored at seven loca-

tions in Russia, mostly in the Volga/Ural section of the country. An extensive consolidation process of chemical warfare material, both from sites within Russia and from non-Russian locations, was carried out during the late 1980s and early 1990s.

Russian officials do not deny research has continued but assert that it is for the purpose of developing defenses against chemical weapons, a purpose that is not banned by the CWC. Many of the components for new binary agents developed by the former Soviet Union are not on the CWC's schedules of chemicals and have legitimate civil applications, clouding their association with chemical weapons use. However, under the CWC, all chemical weapons are banned, whether or not they are on the CWC schedules.

REASONS FOR WARHEAD ELIMINATION	
Tactical Nuclear Warheads	<p>In accordance with tactical nuclear warhead reduction initiatives declared by Presidents Gorbachev and Yeltsin in 1991 and 1992, respectively, Moscow pledged to:</p> <ul style="list-style-type: none"> Consolidate ground-launched tactical nuclear warheads and eliminate all of them by 2000 (nuclear mines by 1998). Eliminate 50 percent of tactical air-launched nuclear warheads by the end of 1997. Consolidate all naval tactical warheads and eliminate one-third of them by the end of 1996. Consolidate air defense warheads and eliminate half of them by the end of 1996.
Strategic Nuclear Warheads	<p>Under START I, the former Soviet Union must reduce its strategic nuclear force to 1,600 launchers having 6,000 accountable nuclear warheads by December 5, 2001. START II, if ratified, would reduce U.S. and Russian levels to between 3,000 and 3,500 accountable warheads by December 31, 2007. (The 1997 Helsinki Joint Statement extended the START II reduction period from January 1, 2003, to December 31, 2007.) Neither treaty requires that warheads be eliminated.</p> <p>The 1994 Russia-Ukraine-U.S. Trilateral Statement stipulated that strategic warheads from Ukraine would be returned to Russia for elimination.</p> <p>The Lisbon Protocol obligated Russia, Ukraine, Kazakhstan, and Belarus to comply with all terms of the START agreement.</p> <p>In 1995, Russia and Kazakhstan agreed to withdraw nuclear warheads from Kazakhstan to Russia. The agreement does not require elimination of the warheads, but Kazakhstan will be compensated for the amount of highly enriched uranium contained in them.</p>

Russian Chemical Warfare Facilities



The outlook for timely Russian elimination of its chemical warfare stockpile appears unclear despite President Yeltsin's signing of the federal law on the destruction of chemical weapons in May 1997. Russia's efforts to destroy its chemical stockpile remain slowed by a number of technical, ecological, financial, and political problems. Further, the unique nature of some Russian weapons compli-

cates their destruction. For example, destruction of thickened agent and of arsenic-containing Lewisite presents a serious challenge because technology for their large-scale destruction has yet to be certified as safe and reliable. No permanent Russian destruction facilities have been built. According to preliminary Russian estimates, the destruction of Russia's large stockpile will cost the equivalent of \$5 billion.

Because of current economic conditions in Russia, Moscow will continue to look to the United States, Europe, and others for substantial financial and technical assistance to implement a timely and effective destruction program.

Generally, other countries are reluctant to spend large sums to assist Russian destruction of chemical agents while Russia apparently is not spending its own funds to establish a destruction program. U.S. Cooperative Threat Reduction chemical weapons destruction assistance is described in Section II of this document.

Moscow ratified the CWC on November 5, 1997. Now that it is a party to the CWC, it is obligated to destroy its chemical stocks within 10 years, unless it asks for, and is granted, a five-year extension by the CWC's organization in The Hague.

Ukraine has signed the CWC and has no chemical weapons program, although some remnants of the Soviet chemical warfare infrastructure still remain in Ukraine. The chemical warfare-related facility that Kazakhstan inherited is being demilitarized and converted to peaceful purposes. Kazakhstan also has signed the CWC. Belarus has no chemical warfare program and has already ratified the CWC. A former Soviet chemical warfare test range in Uzbekistan has been abandoned and Uzbekistan has ratified the CWC.

Biological Program

The former Soviet offensive biological program was the world's largest and consisted of both military facilities and nonmilitary research and development institutes. This program employed thousands of scientists, engineers, and technicians throughout the former Soviet Union, with some biological warfare agents developed and weaponized as early as the 1950s. The Russian government has committed to ending the former Soviet biological weapons program. Plants outside the Russian Federation have been closed or abandoned. Nevertheless, serious concerns about Russia's offensive biological warfare capabilities remain.

Key components of the former Soviet program remain largely intact and may support a possible

future mobilization capability for the production of biological agents and delivery systems. Moreover, work outside the scope of legitimate biological defense activity may be occurring now at selected facilities within Russia. Such activity, if offensive in nature, would contravene the Biological and Toxin Weapons Convention of 1972, to which the former Soviet government is a signatory. It would also contradict statements by top Russian political leaders that offensive activity has ceased.

The United States remains concerned at the threat of proliferation, both of biological warfare expertise and related hardware, from Russia. Russian scientists, many of whom either are unemployed or have not been paid for an extended period, may be vulnerable to recruitment by states trying to establish biological warfare programs. The availability of worldwide information exchange via the Internet or electronic mail facilitates this process.

While former Soviet biological warfare facilities existed in Ukraine, Kazakhstan, and Uzbekistan, none are active now and the current governments in these new republics have no plans to establish any such program. Also, Belarus has no program and no intention of establishing one. Ukraine and Belarus have ratified the BWC, while Kazakhstan has not yet signed it.

Ballistic Missiles

Russia retains a significant strategic missile force of some 1,200 operational ICBM and SLBM launchers. By the end of 1996, there were no longer any operationally deployed ICBMs in Ukraine, Kazakhstan, and Belarus. Roughly 1,200 former Soviet ICBMs and SLBMs have been removed from the overall force since 1990. On the other hand, Russia is developing a new ICBM and a new SLBM within the limitations of existing arms control treaties and also has programs underway to use ICBMs and SLBMs as space launch boosters. Russia, Ukraine, Kazakhstan, and Belarus continue to have inventories that together total hundreds of launchers and thousands of SCUD and SS-21 SRBMs. Russia retains the great preponderance of these systems, as well as large amounts of aircraft and naval launch platforms capable of delivering NBC weapons. Russia also is developing a new

battlefield missile to replace the SCUD. Russia's industrial base can support production of the full range of both solid- and liquid- propellant ballistic missiles and all associated technologies.

Ukraine plans to eliminate all of its 130 SS-19 airframes at an elimination facility built with U.S. Cooperative Threat Reduction assistance. Also, Ukraine has signed an agreement to sell 43 non-deployed SS-19s to Russia. About 55 SS-19 missile airframes and about two-thirds of Ukraine's SS-19 silos have been eliminated. In May 1997, President Kuchma announced that Ukraine would also eliminate all SS-24 silos and missiles. Ukraine has accepted an offer of U.S. technical assistance for elimination of its 55 SS-24 solid-propellant ICBM airframes and 46 SS-24 silos.

Ukraine manufactures some of the guidance and control components used in current Russian ICBMs and SLBMs. It also has the infrastructure to design, develop, and produce both liquid- and solid-propellant ICBMs and space launch vehicles and related components.

Kazakhstan retains the capability, with Russian assistance, to produce ballistic missiles and launchers but has no plans to do so. In Belarus, all 81 SS-25 ICBMs originally deployed there were returned to Russia by December 1996. Belarus has no capability to produce missiles but does produce the chassis for road-mobile missile launchers.

Cruise Missiles and Other Means of Delivery

Russia and Ukraine have a variety of land-, and sea, and air-launched cruise missiles. Many are designated as short range anti-ship weapons, although other tactical cruise missile systems have ranges of up to 500 kilometers. Kazakhstan and Belarus also have a variety of short range air-launched tactical missiles. All of these systems were produced by the former Soviet Union and many were exported to numerous countries worldwide. Only Russia has any long range land attack nuclear capable cruise missiles. All four states have a variety of fighter aircraft, helicopters, artillery, and rockets available as potential means of delivery for NBC weapons.

Role as Supplier

Despite official statements by the governments of Russia, Ukraine, Kazakhstan, and Belarus that they are opposed to proliferation of NBC weapons and missiles, some sales have and are taking place. Whether these are officially sanctioned or efforts by local entities to ignore or circumvent controls is unclear. Further, the controls in place now are not yet adequate or enforced to the degree to prevent proliferation of components or technical expertise. Some officials may turn a blind eye to such activity because of the critical need for revenues.

Nuclear cooperation between Russia and China includes the sale of nuclear weapons-related technologies. Because Russia and China are nuclear weapons states, as defined under the NPT, there are no NPT-related restrictions on their nuclear weapons-related trade. There is concern, however, that Russian nuclear exports to China may enhance China's ability to complete existing, or sign new, contracts with countries of proliferation concern, such as Iran or Pakistan.

Russia also has contracts for the sale of nuclear power reactors to Iran and India. While the sale to Iran is not prohibited by the NPT, it will enhance Iran's currently limited nuclear infrastructure and thus advance Tehran's nuclear weapons program. India has not signed the NPT and many of its reactors are not under IAEA safeguards. Therefore, the sale of Russian reactors should not be allowed under the terms agreed upon by the Nuclear Suppliers Group (NSG). The Russians contend their contracts predate export controls adopted by the NSG and are therefore unaffected by it.

There are indications that Moscow is not fully capable of controlling personnel and institutions involved in chemical warfare. If this situation continues, Russian entities could become a major source for advanced chemical warfare-related material and technology. There is similar evidence that Russian technologies and expertise related to biological warfare may be reaching countries of proliferation concern.

Russia has been a member of the MTCR since 1995. However, activities of Russian companies remain a significant proliferation concern. For example,

Russian entities reportedly have aided missile programs in China, the Middle East, and South Asia. Given Russia's sophisticated missile production capabilities, it is likely Russian technological support or training will continue to find its way to such countries, sometimes without necessarily gaining Moscow's approval.

Because Ukraine and to a lesser extent Kazakhstan have missile production infrastructures, there is potential for both these countries, or entities within them, to supply missile-related equipment, components or technology to states trying to develop missile capabilities. Similarly, Belarus produces missile launcher-related equipment, which could be marketed.

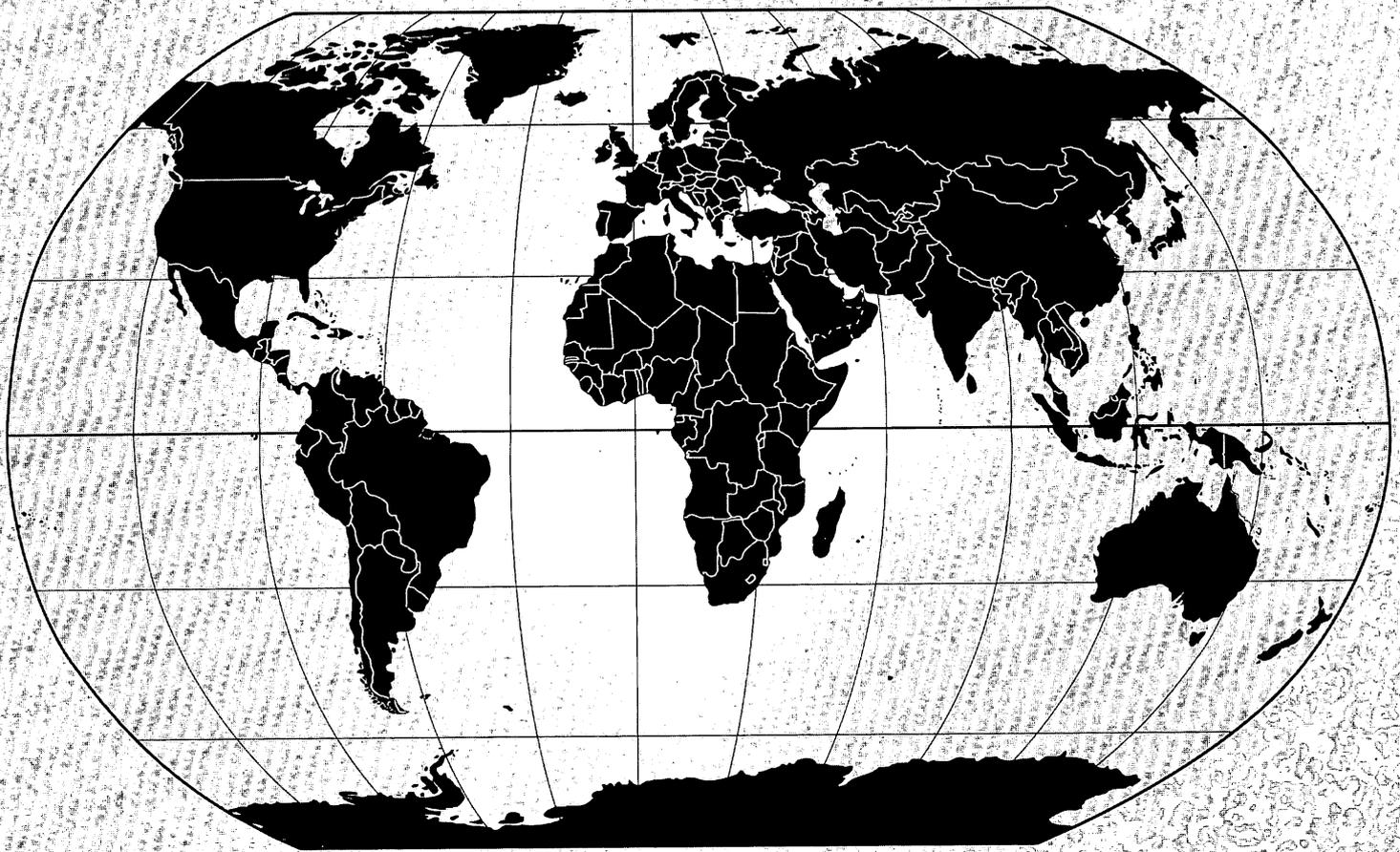
CONCLUSION

The steady decline in the number of operational strategic nuclear warheads and delivery systems

over the last five years is a strong indication of the adherence of Russia, Ukraine, Kazakhstan, and Belarus to arms control regimes. All states are meeting their commitments regarding strategic weapons and delivery systems. At the same time, however, the threat of possible diversion of nuclear material, some from the very weapons that have been deactivated, remains a serious security challenge. The possible continued presence of large chemical and biological warfare programs remains a serious concern.

The poor economic conditions in the former Soviet Union, where large stockpiles of weapons of mass destruction related material still exist, combined with continued shortfalls in the ability of regional states to control and protect sensitive materials, contribute to this region remaining a proliferation concern. The same is true for production technology and expertise in the form of knowledgeable scientists and technicians, related to the weapons, as well as to missile delivery systems.

The Transnational Threat



THE TRANSNATIONAL THREAT

Transnational proliferation includes those NBC threats that cross national or regional boundaries or are not otherwise easily categorized. Threats from terrorism and the lack of security of nuclear material in the states of the former Soviet Union are two issues that greatly concern the United States and its allies.

TERRORISM

Many of the technologies associated with the development of NBC weapons, especially chemical and biological agents, have legitimate civil applications and are classified as dual-use. The increased availability of these technologies, coupled with the relative ease of producing chemical or biological agents, has increased concern that use of chemical or biological weapons may become more attractive to terrorist groups intent on causing panic or inflicting large numbers of casualties. In addition, the proliferation of such weapons raises the possibility that some states or entities within these states could provide chemical, biological, or radiological weapons to terrorists.

The likelihood of a state sponsor providing such a weapon to a terrorist group is believed to be low. It is possible, however, that groups, especially extremist groups with no ties to a particular state, could acquire and attempt to use such weapons in the future. The March 1995 attack on the Tokyo subway by the religious group Aum Shinrikyo using the nerve agent sarin was the most glaring example of terrorist use of these kinds of weapons. This attack crossed a psychological boundary and showed that the use of NBC weapons was no longer restricted to the traditional battlefield. As a result of the Tokyo subway attack, government authorities became concerned about the potential use of NBC agents by non-state groups and have placed such groups under increased scrutiny. However, this increased scrutiny is no guarantee of thwarting a potential terrorist attack.

SECURITY OF NUCLEAR MATERIALS

Security for nuclear materials is a major proliferation problem, particularly in Russia. The Russians

have made substantial efforts to consolidate and secure nuclear weapons. A similar effort in cooperation with the United States to secure Russia's vast quantities of nuclear materials has made substantial progress, although it is far from complete. The combination of lax security at some nuclear facilities, poor economic conditions in Russia and other states of the former Soviet Union, and the continuing presence of organized criminal groups has increased the potential for theft or smuggling of this material.

Reported incidents of nuclear-related smuggling from the former Soviet Union increased dramatically during the early 1990s but have declined since 1994. News reports about smuggling, however, generally overstate the potential impact of the particular theft. For example, most incidents have not involved weapons-usable materials, but rather radioactive isotopes, natural or low enriched uranium; other incidents have been outright scams. On the other hand, small amounts of weapons-usable plutonium and highly enriched uranium have been diverted, probably from Russian nuclear facilities. The largest seizures involved 2.7 kilograms of highly enriched uranium seized in the Czech Republic and 360 grams of plutonium seized in Germany. It is important to emphasize, however, that all known highly enriched uranium and plutonium stolen to date is still insufficient to make a single nuclear weapon and that reports of thefts of weapons-grade material have declined in the last three years.

Nevertheless, the trend is dangerous and likely will continue because of the deteriorating economic conditions in the former Soviet Union and the associated poor security at various nuclear facilities. In the longer term, however, U.S. and Russian efforts to improve security procedures, such as instituting material protection, control, and accountability procedures, will help reduce the diversion of nuclear materials.

Nuclear research reactors and nuclear materials production facilities are some of the most vulnerable in Russia. Former Soviet Union accounting and control procedures were insufficient for the

tons of weapons-grade nuclear materials produced and distributed over the last 40 years.

The additional material being recovered from ongoing nuclear weapons elimination adds to the security and accounting problem. To properly store

some of this material, the governments of Russia and the United States, in a joint effort, are building a new long-term secure storage facility, with help from the DoD Cooperative Threat Reduction program.

Aum Shinrikyo—A Closer Look

Japan's Aum Shinrikyo was formed in 1987 by Shoko Asahara as an apocalyptic religious organization that prophesied an Armageddon-type conflict between Japan and the United States in the last years of this century. The group had intended to hasten the conflict by interceding with the use of chemical and biological weapons. Recruitment of members focused on socially disaffected individuals with technical and scientific backgrounds, many of whom also possessed or had access to substantive economic resources. Some worked for the Japanese government, including the military. All apparently were seeking spiritual fulfillment.

Aum Shinrikyo personnel involved in developing weapons were assigned to internal subelements that acquired materials, constructed production facilities, produced agents, and engaged in weaponization, storage, and operational training. The group established front companies for legal chemical acquisition, then closed them down when sufficient quantities of precursor chemicals had been purchased. The group researched, developed, tested, and practiced employment of lethal chemical and biological weapons. Funding came from legitimate businesses that Aum Shinrikyo had established, as well as from funds generated from donations received when members turned over their bank accounts and properties to the group. At its height, the group's financial base may have had as much as \$2 billion in assets.

Japanese authorities were constitutionally restricted from investigating the group because Aum Shinrikyo was a religiously chartered organization. It was only when lawsuits were brought against the group by local communities and individuals that official concerns were raised. Subsequent law enforcement plans to conduct searches of facilities apparently led to the group's decision to conduct the subway attack, revealing Aum Shinrikyo's capabilities and intentions. Until that time little was known regarding the internal operations of Aum Shinrikyo.

Press coverage of Aum Shinrikyo's activities revealed that Shoko Asahara directed the organization to produce lethal chemicals in 1993 and that a plant became operational in 1994. Other group activities included:

- *Chemical tests on sheep on a ranch owned by the group in Western Australia.*
- *Preparations to use lethal chemical agents against a large Japanese city and acquisition of the means to disseminate lethal agents. Aum Shinrikyo had purchased a large Russian helicopter and two remotely piloted vehicles. All could have disseminated chemical or biological agents.*
- *Establishment of chapters in a number of European cities and in the United States. The Group claimed membership in Russia of some 30,000, triple the Japan membership.*
- *Employment of sarin at two locations. In addition to the March 1995 subway attack, the group had used the same chemical agent nine months earlier in Matsumoto, Japan. The alleged purpose was to halt or slow judicial proceedings in civil litigation brought against the group. Two of the three judges in that case were critically injured by the chemicals and the legal case remains unresolved.*
- *Japanese police suspect that members of the group placed five cyanide-based devices in Tokyo subway facilities (subsequent to the March 1995 attack), in an attempt to force the release of cult leader Asahara, who remains under arrest.*

Even nonfissile radiological material could be used to by a terrorist group to contaminate an area or to serve as a psychological weapon. For example, in November 1995, Chechen rebels placed cesium-137, a radiological material used for many industrial and medical purposes, in a heavily used Moscow park. The Chechen leader, Shamir Basayev, directed members of the Russian press to the site of the radiological material and indicated that his group was in possession of seven similar containers. While the material was contained in a protective canister and posed no hazard, the Russian government suffered embarrassment over this incident. The incident further demonstrated the potential use of such material for contamination purposes. No additional containers have been recovered.

OTHER CONCERNS

Concerns about inadequate security are not confined to nuclear materials. This could also be the case for facilities in the former Soviet Union that house chemical or biological warfare-related materials. In addition, numerous scientists or technicians previously involved in key programs face severe salary reduction or loss of employment.

States seeking to establish their own weapon capabilities may try to exploit the situation by attempting to recruit such individuals.

There are other potential sources for nuclear materials or expertise other than the states of the former Soviet Union. For example, personnel that once had been involved in programs that are no longer active in states like South Africa, Brazil, or Argentina also could be sources of technical expertise. Therefore, given the goal of acquiring NBC weapons capabilities by several states described earlier, the security of these materials and personnel is a key proliferation concern for the United States and its allies.

CONCLUSION

Most terrorist organizations have shown little proclivity to develop and use NBC weapons. The case of Aum Shinrikyo, however, illustrates the potential threat posed by terrorist groups when they have access to the requisite material to assemble NBC weapons, have personnel knowledgeable in NBC technologies in their ranks, and possess sufficient financial resources to procure NBC materials.

Section II

Department of Defense Response



DEPARTMENT OF DEFENSE RESPONSE

The United States leads international efforts to develop and sustain global norms against the proliferation of nuclear, biological, or chemical (NBC) weapons and their delivery means (NBC/M), often referred to as weapons of mass destruction (WMD). It actively engages in dialogues with states around the world to persuade them not to acquire these NBC weapons capabilities or to eliminate capabilities already developed. The United States also works with states to combat proliferation by assisting them in gaining and assuring greater control over sensitive dual-use equipment and technology.

The Gulf War experience showed the implications of NBC proliferation for defense planning. As noted in the 1997 National Security Strategy, the United States must plan and prepare to fight and win under conditions where an adversary may use unconventional approaches that avoid U.S. strengths while exploiting U.S. vulnerabilities. Because of U.S. conventional military dominance, adversaries who might challenge the United States are likely to do so using unconventional means, including NBC weapons. As a result, DoD must continue to prepare for the potential NBC dimension of future conflicts. U.S. forces must be trained and equipped for all potential missions, including those in which opponents might use or threaten to use NBC weapons.

To meet these challenges and implement guidance contained in a Presidential directive, Secretary of Defense Aspin launched the Defense Counterproliferation Initiative in December 1993. The Counterproliferation Initiative contributes greatly to U.S. government efforts to prevent or reverse the acquisition of NBC weapons. It also calls for the development of the capabilities needed to deter and defend against the use of NBC weapons if prevention fails. The Initiative ensures that U.S. forces are equipped and trained to prevail in future major theater wars that may involve NBC threats.

The United States' primary goal continues to be stopping proliferation. Because efforts to prevent,

stop, or reverse proliferation may not always succeed, DoD is undertaking a variety of programs and activities to deter the use of NBC weapons against U.S. and allied forces, as well as against the territories of the United States and its friends and allies. The effectiveness of these efforts will depend on the perceptions and assessments of potential aggressors who possess NBC weapons regarding the resolve of the United States to deal with such threats. Indeed, the knowledge that the United States has a powerful and ready nuclear capability is a significant deterrent to the use of these weapons.

Effective deterrence will depend on a range of nuclear and conventional response capabilities, as well as active and passive defenses and supporting command, control, communications, and intelligence. In particular, military preparations for operations in an NBC environment will make clear that threats or use of NBC weapons will not deter the United States from applying military power in defense of its national interests. The United States will be prepared to fight and win under conditions where an adversary may use asymmetric means, thereby demonstrating to any potential aggressor that the risks incurred from using NBC weapons would far outweigh any advantages gained.

DoD plays a vital role in supporting all facets of national counterproliferation policy. Many capabilities developed to deal with NBC proliferation on the battlefield—especially intelligence, surveillance, and reconnaissance means—effectively support international regimes, export controls, and other international monitoring efforts to prevent the spread of NBC weapons and related technologies.

This section outlines steps the Department is taking to respond to the challenges of proliferation and to deal with the military threats posed by NBC weapons. DoD's response to proliferation takes three forms: international proliferation prevention; protection of U.S. civilians and military forces if faced with the threat or use of NBC weapons; and counterforce capability to eliminate NBC targets.

PREVENTION

Proliferation prevention is the United States' primary objective. DoD's contributions are part of a coordinated national and international effort involving many U.S. government departments and agencies, allied nations, and international organizations. DoD support includes the Cooperative Threat Reduction (CTR) Program; DoD/Federal Bureau of Investigation (FBI) counterproliferation program; export control activities; and DoD inspection, verification, and enforcement support for the treaties and arms control regimes that limit or prohibit NBC weapons and associated delivery systems.

The President's 1997 National Security Strategy points out the importance of shaping the international environment to enhance U.S. and global security, as well as preventing and reducing threats stemming from proliferation. The United States has a range of tools at its disposal to accomplish this. These tools include the use of diplomacy, international assistance, arms control agreements and regimes, nonproliferation initiatives, and military activities. DoD's efforts to respond to proliferation through prevention utilize each of these tools.

International norms, rules, and standards make an important contribution to proliferation prevention. In addition to creating common social and moral standards and an atmosphere of restraint, they often provide the preconditions, e.g., inspections, that impede proliferation. These international norms, rules, and standards can be specifically incorporated into export control and arms control agreements or they can result from informal arrangements between states.

The Cooperative Threat Reduction Program

When the Soviet Union collapsed in 1991, the nuclear weapons and associated infrastructure of the Soviet Union remained in four of the New Independent States—Russia, Ukraine, Kazakhstan, and Belarus. An estimated 30,000 tactical and strategic nuclear warheads remained in the former Soviet

Union, with approximately 6,000 of them in Ukraine, Kazakhstan, and Belarus. The breakup of the Soviet system heightened the belief that the former Soviet republics would not be able to safeguard these nuclear weapons. Potential international consequences posed by this situation included diversion or unauthorized use of weapons, diversion of fissile materials, and possible participation of former Soviet weapons scientists in proliferation efforts in other countries.

While this situation posed potentially serious threats to U.S. and international security, the demise of the Soviet Union also created unique opportunities for cooperative reduction of the threat. Therefore, in 1991, Congress enacted the Soviet Nuclear Threat Reduction Act and designated DoD as executive agent for the CTR Program created by the Act.

CTR ACTIVITIES, OBJECTIVES, AND ACCOMPLISHMENTS

CTR activities have contributed significantly to the reduction of the proliferation threat over the past four years. U.S. offers of assistance under the program were instrumental in convincing Russia, Ukraine, Kazakhstan, and Belarus and that they could shoulder the economic, political, and technical burdens of weapons dismantlement and demilitarization. Since the dissolution of the Soviet Union, the CTR Program has assisted these four states with the elimination (or, in the case of Russia, reduction) of weapons of mass destruction and their delivery systems, proliferation prevention efforts, and the dismantlement and transformation of infrastructure associated with these weapons.

By providing equipment, facilities, logistical and operational support, and technical expertise, the CTR Program helped Ukraine, Kazakhstan and Belarus meet their commitments to become non-nuclear weapons states (in accordance with the Lisbon Protocol to the Strategic Arms Reduction Treaty (START I) and the Nuclear Non-Proliferation Treaty). CTR is also assisting Russia in both meeting and accelerating completion of its START obligations and in beginning to destroy the world's largest chemical weapons stockpile.



The CTR Program is assisting in the elimination of submarine launched ballistic missile (SLBM) launchers in Russia.

In addition to eliminating actual weapons and weapons delivery systems, the CTR Program is addressing nuclear weapons transportation and storage security, as well as the safety and security of weapons-derived fissile material. CTR has also sought to reduce the threat to the United States and its allies by working with Russia, Ukraine, Kazakhstan, and Belarus to convert former WMD and delivery system production facilities and personnel to peaceful commercial pursuits. CTR projects are converting 17 of those factories to civilian use. Science and Technology Centers, funded initially by the CTR Program, have created opportunities for over 17,000 former Soviet weapons scientists and engineers in peaceful civilian research. Approximately 15,000 of these scientists were in the four CTR-recipient countries. All these projects reduce the threat while also contributing to the development of free-market economies.

In Russia, CTR assistance helped remove about 1,500 strategic nuclear warheads from deployment sites. Additionally, all strategic warheads (about 3,400) have been transported from Ukraine, Kazakhstan, and Belarus to Russia. (These included both operational warheads and warheads in storage.) The CTR Program is helping Russia to centralize fissile materials derived from dismantled nuclear weapons, in limited numbers of safe, secure, and ecologically sound storage areas by providing assistance in the design and construction of a Fissile Material Storage Facility at Mayak, Russia, and the design and fabrication of fissile

material storage containers. The CTR Program also provides assistance to strengthen safety, security, control, and accounting of nuclear weapons during movement and while in interim storage, pending their dismantlement.

The CTR Program is providing assistance in the form of a Nuclear Weapons Automated Inventory Control and Management System which will provide an architecture to monitor and track nuclear weapons destined for dismantlement. DoD is also providing an ASSESS computer model to help the Russian Ministry of Defense assess nuclear weapons storage sites and guard force vulnerabilities. DoD and the Ministry of Defense have held meetings to share information on personnel reliability program concepts and screening training methods. This assistance has included over 4,000 armored blankets, 115 modification kits for weapons transportation railcars, supercontainers for transporting nuclear weapons, and emergency response training and equipment in the event of a nuclear weapons transportation incident. In addition, CTR is providing comprehensive physical security enhancements for up to 50 nuclear weapons storage sites. A joint U.S.-Russian contractor team will establish a technical training base that will be used to install, test, and evaluate security equipment.

To support Russian chemical weapons destruction, the CTR Chemical Weapons Destruction (CWD) program validated the Russian neutralization technology that will be used in the CWD facility at Shchuch'ye, Russia. This neutralization technology will destroy Russia's declared chemical weapons stockpile, consisting of 40,000 metric tons (MT) stored at seven sites. U.S. CWD support focuses on elimination of the 32,000 MT nerve agent stockpile because that stockpile is fully weaponized, meaning that the nerve agent sits in projectiles, bombs, and rocket and missile warheads ready for immediate use. In addition, the CTR Program provided a concept design for a central chemical analytical laboratory; procured and delivered over \$5.4 million worth of analytical instrumentation, laboratory and office equipment, and supplies; and provided three mobile laboratories to support on-site monitoring during storage and CWD operations.

In Ukraine, CTR assistance enabled the early deactivation (removal of warheads) of all 46 deployed SS-24 intercontinental ballistic missiles (ICBMs) (460 nuclear warheads) and of all 130 SS-19 ICBMs (780 nuclear warheads). CTR assistance also enabled nearly 2,000 ICBM and air launched cruise missile (ALCM) warheads from Ukraine to be returned to Russia for dismantlement.

CTR assistance provided safe and secure storage of approximately 3,500 MT of fuel resulting from defueling the 130 SS-19 ICBMs in Ukraine. The CTR Program also helped construct an SS-19 ICBM neutralization and dismantlement facility at Dnipropetrovsk for cleaning missile propellant tanks, thereby allowing the missiles to be eliminated in accordance with START I procedures. As of September 1997, 55 of the 130 SS-19 missiles have been eliminated. Plans for eliminating additional nuclear weapon infrastructure include demilitarizing four nuclear weapon storage areas, as well as two unified fill facilities (one at each SS-19 division in Ukraine) used to store temporarily SS-19 fuel and oxidizer and to maintain the equipment necessary to load/unload propellant into missiles. Elimination of all SS-24 silos and missiles is also planned.

In Kazakhstan, the CTR Program is helping to eliminate 120 SS-18 launchers and launch control silos and 28 test launchers. CTR also aided the return of 104 SS-18 missiles to Russia. Another CTR project has closed and sealed the first 59 tunnels of 181 nuclear test tunnels at the Degelen Mountain Test Site Complex, where more than 220 nuclear tests were conducted between 1963 and 1989. The CTR Program will also assist in the dismantlement of the former Soviet Biological Weapons (BW) Production Facility at Stepnogorsk, Kazakhstan.

In Belarus, the CTR Program assisted in the removal of the 81 SS-25 ICBM missiles, their launchers, and their nuclear payloads from Belarus to Russia. The CTR Program plans to provide assistance to destroy launch facilities, equipment storage facilities, former command posts, fueling storage facilities, and nuclear weapons maintenance support structures at the three former missile bases. DoD has contracted with an American firm

to eliminate the 81 launch pads that provide the foundation for SS-25 missile launchers in Belarus, although the contractor has had difficulties with the government of Belarus in obtaining site access. Finally, DoD plans to provide Belarus with the support necessary to dispose of its 1,000 MT supply of liquid rocket fuel.

DoD/Federal Bureau of Investigation Counterproliferation Program

Congress provided authority in the FY 1995 National Defense Authorization Act for up to \$10 million in reprogrammed DoD funds to develop a joint program with the FBI to expand and improve efforts to deter, prevent, and investigate incidents involving the trafficking of NBC weapons and related material. The result is the Department of Defense/FBI Counterproliferation Program. This program trains and equips the community of officials responsible for NBC interdiction in Eastern Europe, the Baltic states, and the former Soviet Union.

As developed jointly by DoD and FBI, the program's objectives are:

- To assist in the continuing establishment of a professional cadre of law enforcement personnel and other officials capable of interdicting and investigating NBC threats and incidents.
- To assist in developing appropriate legislation, laws, regulations, and enforcement mechanisms for deterring, preventing, and investigating NBC threats and incidents.
- To assist in building a solid, long-lasting bureaucratic and political framework in participating nations capable of implementing the above two objectives.

The program consists of three basic elements: policy consultations and assessments; training and technical assistance; and equipment procurement. Initially, the program will provide assistance to the community of officials responsible for NBC interdiction in the southern tier of the former Soviet Union, particularly in Kazakhstan, Uzbekistan, and Kyrgyzstan.

Program activities include a two-week basic course for officials responsible for NBC interdiction. Mid-senior-level Kazakhstani officials completed this course in June 1997 at the International Law Enforcement Academy in Budapest, Hungary. In August 1997, Uzbek officials completed a similar course. Also planned are specialized courses, practical exercises, and legislative seminars in the participating countries.

DoD/U.S. Customs Service Counterproliferation Program

The International Border Security counterproliferation program authorized by the FY 1997 National Defense Authorization Act is operated by DoD in consultation with the U.S. Customs Service. Its purpose is to train and equip customs officers and border guard officials in the former Soviet Union, Eastern Europe, and the Baltic states to prevent, deter, and investigate incidents involving the trafficking of NBC weapons and related materials.

This three-year DoD/Customs program will focus initially on Southeastern Europe, including Slovenia, Romania, Bulgaria, and Moldova and will support temporary duty customs advisors in several nations. Bringing the program into these nations complements work carried out by U.S. Customs and other agencies elsewhere in Eastern Europe. It also complements activities under the DoD/FBI Counterproliferation Program. In future years, the program may expand to other nations in the region.

The objectives of the International Border Security program are:

- To assist in the continuing establishment of a professional cadre of border enforcement personnel.
- To enhance the ability of customs and border guards officials to interdict NBC weapons and NBC-related materials.
- To establish a long-term and mutually beneficial working relationship between U.S. government agencies and customs/border guard officials in participating states.

DoD/Office of Secretary of Defense Critical Technology Program

The DoD/Office of the Secretary of Defense Critical Technology Program develops and publishes the congressionally mandated Militarily Critical Technologies List (MCTL). The MCTL is a detailed compendium of the technologies that DoD assesses as critical to maintaining superior U.S. military capabilities. It applies to all mission areas, especially counterproliferation. The MCTL is used as a technical foundation for U.S. export control proposals, especially the Wassenaar Arrangement, for licensing and export control officials and for intelligence collection. The MCTL has been divided into three parts for easier handling:

- Part I, Weapons Systems Technologies, includes technologies whose technical performance parameters are at or above the minimum level necessary to ensure continuing superior performance of U.S. military systems.
- Part II, Weapons of Mass Destruction, addresses technologies required for the development, integration, or employment of WMD and their means of delivery.
- Part III, Developing Technologies, covers technologies which when fully developed will produce increasingly superior military performance or maintain a superior capability more affordably.

Technologies that a proliferant might use and might need to be countered are addressed in Part II of the MCTL. Parts I and III cover those technologies that U.S. forces could use to thwart a WMD program or fight in an NBC environment. The MCTL is updated regularly to ensure key technologies are included, thus capturing new technologies applicable to counterproliferation.

Denial

Denial involves carefully targeted export controls and the disruption of weapons and technology trade which would assist the potential proliferant in obtaining NBC weapons and delivery systems. U.S. export control policy has two principal objectives. First, stop—or at least retard—the transfer of

those technologies that could permit potential proliferant states to design, manufacture, or acquire NBC weapons, their delivery systems, and other dangerous armaments. Second, monitor the flow of dual-use technologies that have legitimate commercial applications, but which if diverted or applied to military end uses could have a negative impact on U.S. national security interests.

DoD's security-related activities in the area of international technology transfer are coordinated by DoD's primary agent, the Defense Technology Security Administration (DTSA). These efforts are intended to prevent the acquisition of dangerous and sensitive technologies by countries that pose threats to regional or global security. When technology is transferred to a country which does not pose a threat, DoD ensures the transfer is done in a manner that does not endanger U.S. interests or compromise U.S. national security. In addition to controlling transfers of destabilizing conventional weapons and associated dual-use technologies, DoD's technology security activities support the Department's Counterproliferation Initiative. These activities also help preserve critical U.S. military technological advantages while supporting legitimate defense cooperation with U.S. allies and friends.

DoD and other U.S. government agencies develop export control lists that take full account of choke-points (goods and technologies important at critical stages of manufacture and application of military and dual-use items). The MCTL, which is developed by DoD in consultation with other agencies, is used to help identify those products and technologies which must be subject to export controls. DoD and the U.S. Intelligence Community actively support the export review process by identifying the key technologies that enable NBC proliferation.

Intelligence provides critical information on how proliferants acquire technologies and materials through the use of complicated covert procurement networks. Because many of these networks include maritime transport, the U.S. Navy is deploying the Specific Emitter Identification System to improve DoD's capabilities to identify and track ships at sea suspected of transporting NBC weapons, delivery systems, and NBC related materials. Intelligence

provides important information on pending or ongoing foreign shipments of critical materials, including technical assessments of materials and whether they are intended for legitimate civilian use or for military applications.

These and other intelligence capabilities will help the United States maintain and strengthen controls on critical technologies. Such controls can have a dramatic effect on slowing the pace of proliferants' programs and on raising their costs. Intelligence capabilities also contribute to ongoing efforts to focus and strengthen key international export control regimes, as well as support diplomatic communications and international inspections. Accurate and timely information on a proliferant's activities and intentions can be used to build a global consensus that international norms have been violated.

DoD also plays a leadership role in the implementation of many arms control and nonproliferation regimes. For example, the Defense Special Weapons Agency (DSWA) conducts research to identify technologies that will ensure verification technologies used to implement arms control agreements meet stringent DoD safety and operational requirements. DoD's On-Site Inspection Agency (OSIA) is responsible for implementing inspection, escort, and monitoring requirements under the verification provisions of several U.S. treaties and agreements.

ENHANCED PROLIFERATION CONTROL INITIATIVE

The Enhanced Proliferation Control Initiative (EPCI) enables the U.S. government to require an export license for all items, even those not on the control list in the Export Administration Regulations, if the exporter knows, has reason to know, or has been informed that the item will be used directly or indirectly in a nuclear, missile, chemical or biological weapons project. This year, the United States continued to strengthen this catch-all control by adding to the published list of entities involved in such projects, thereby informing exporters that they are required to seek licenses for exports of all dual-use items to these end-users.

This action was prompted, in part, by information that a limited number of more capable computers had been exported to Russian nuclear weapons

laboratories without a U.S. license. These cases are currently under investigation by the Departments of Justice and Commerce and they underscore the importance of the catch-all control provision. (Indeed, the United States strongly supports and is encouraging other like-minded states to institute similar catch-all provisions tailored appropriately to their national laws and regulations.) Current export controls on computers require a license beginning at 2,000 MTOPS (million theoretical operations per second) to end-users involved in military work in nonallied countries that either possess or have active programs to develop nuclear, biological, chemical weapons, or that do not have a sufficiently developed export control capability, or that raise other national security concerns. The EPCI regulations supplement these tight controls on computers, since they provide the capability to require a license for any computer, irrespective of its performance level, to any country, if destined for an end-user involved in NBC weapons and/or missile development activities. Additionally, the U.S. government requires a license beginning at six MTOPS—and in fact, maintains a virtual embargo on exports—for all computers to pariah states like as Iran, Iraq, Libya, and North Korea.

WASSENAAR ARRANGEMENT ON EXPORT CONTROLS FOR CONVENTIONAL ARMS AND DUAL-USE GOODS AND TECHNOLOGIES

Following nearly three years of international negotiations, the Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies received final approval from 33 co-founding states in July 1996. The principal objectives of the new regime are to promote transparency, responsibility and, where appropriate, restraint in the transfer of conventional weapons and sensitive dual-use goods and technologies, particularly to countries and regions of concern. These regions include areas where U.S. and allied forces might face hostile military action. Wassenaar, comprised of 33 member nations, including Russia and several other former Warsaw Pact states, represents the first-ever global effort to control transfers of conventional armaments and sensitive dual-use goods and technologies.

Often compared to its predecessor, the Coordinating Committee for Multilateral Export Controls (COCOM), Wassenaar differs in that it does not formally target any particular country or group of countries. However, members agree to prevent the acquisition of armaments and sensitive dual-use items for military end-use if the situation in a state is, or becomes, a cause for serious concern to the participating states. States considered to be in this category are Iran, Iraq, Libya, and North Korea.

Wassenaar's Initial Elements constitute the building blocks of the new regime. They include:

- Lists of significant arms and dual-use commodities that warrant multilateral scrutiny.
- Procedures for sharing information on exports and export requests.
- Provisions to meet regularly to consult on export controls and related export policies.

DoD played a key role in the negotiations leading up to the establishment of Wassenaar and continues to figure prominently in the consultation sessions where problematic transfers and trends are discussed. DoD believes that Wassenaar is destined to fill a significant gap in multilateral export controls. As such, it will complement—not duplicate—nonproliferation regimes such as the Missile Technology Control Regime (MTCR), the Australia Group, and the Nuclear Suppliers Group (NSG).

MISSILE TECHNOLOGY CONTROL REGIME

The MTCR is a voluntary nonproliferation arrangement of 29 states, including the United States, Canada, NATO and European Union countries, Russia, Japan, Australia, New Zealand, Argentina, Brazil, and Hungary. Member states undertake to establish controls on exports of equipment and technology—both military and dual-use—that are relevant to long range missile development, production, and operation. DoD provides intelligence and operational expertise for the national-level decisions that are made, on a case-by-case basis, concerning implementation of this regime's controls.

AUSTRALIA GROUP

The Australia Group is an informal arrangement among 30 countries that have developed harmonized export controls over materials and equipment that can be used to produce chemical or biological weapons. The Australia Group includes the United States, Canada, most of Western and Eastern Europe, Japan, Australia, New Zealand, South Korea, and Argentina. The group meets once a year to exchange information on the status of national export controls; to share enforcement experiences; to discuss attempts to obtain export controlled commodities; to share information on the status of worldwide chemical and biological weapons programs; to discuss additions to the harmonized export control list on such items as chemical precursors, microorganisms, and related equipment; to conduct regional outreach seminars; and to consider the addition of new members.

NUCLEAR SUPPLIERS GROUP

The NSG, comprised of 30 countries, seeks to control exports of nuclear materials, equipment, and technology, both nuclear-specific and dual-use. Russia is a member of this group. Other former Soviet republics—notably Belarus and Kazakhstan—are not. China, a major potential supplier of nuclear resources, is also not a member. The United States' position is that observance of NSG guidelines for nuclear exports by all potential suppliers, irrespective of their decision to join the group, is crucial for controlling the flow of nuclear materials and technologies.

BIOLOGICAL AND TOXIN WEAPONS CONVENTION

The Biological and Toxin Weapons Convention (BWC), signed in 1972, entered into force in 1975; it prohibits the development, production, stockpiling, and transfer of biological weapons. The United States was an original State Party to the BWC. The BWC has no provisions for verification or enforcement, but now States Parties are engaged in a multilateral effort to develop a legally binding protocol to strengthen the treaty. The United States is promoting measures that provide increased transparency of potential biological weapons-related activities

and facilities in an effort to deter violations of and enhance compliance with the BWC. DoD participates in BWC Ad Hoc Group negotiations, the multilateral forum in which the protocol is being developed.

CHEMICAL WEAPONS CONVENTION

The Chemical Weapons Convention, which entered into force on April 29, 1997, outlaws an entire class of weapons by banning their use, development, production, acquisition, stockpile, and transfer. The Convention's verification regime requires declarations and systematic and short notice challenge inspections of chemical weapons (CW) related facilities.

The nonproliferation aspects of the Convention restrict trade in CW precursor chemicals outside of member states. The Department's views have been influential in developing the verification procedures being implemented by the international Inspectorate charged with ensuring compliance. As of October 28, 1997, declarations have been made by 69 member states, and 86 inspections have been conducted at CW-related facilities in the United States, India, the United Kingdom, and 17 other member states. The CWC was instrumental in getting India to publicly declare its CW stockpile and subject it to verification and eventual destruction. Through its arms control and nonproliferation aspects, the CWC generates international pressure for those states, not yet parties to the treaty, to ratify the Convention and to declare and destroy their chemical weapons. The eradication of these weapons stocks will lower the probability that the military of the United States or its allies will face this threat on a future battlefield.

PROTECTION

DoD recognizes that a country determined to obtain NBC weapons and their delivery systems, and willing to violate global nonproliferation norms, might succeed despite the strongest prevention efforts. Because experience has shown that countries armed with NBC weapons can use these weapons to challenge U.S. security interests, U.S. forces must be fully prepared to deal with the military threats posed by NBC proliferation.

Protection against chemical and biological agents must provide an effective defense against the complete spectrum of new or novel agents in gaseous, liquid, or solid aerosolized form that may be produced or acquired by potential enemies. This would include any agents that circumvent the provisions of the CWC.

The Quadrennial Defense Review

The May 1997 *Report of the Quadrennial Defense Review* (QDR) noted that DoD has made substantial progress in preparing to deal with an adversary's use of NBC weapons. The QDR underscored two key challenges that DoD must meet to ensure future preparedness:

- Institutionalizing counterproliferation as an organizing principle in every facet of military activity.
- Internationalizing these efforts to encourage allies and coalition partners to train, equip, and prepare their forces to operate under NBC conditions.

To advance the institutionalization of counterproliferation concepts, DoD is developing an integrated counter-NBC weapons strategy that includes both offensive and defensive measures, as well as regular individual, unit, joint, and combined training and exercises that incorporate realistic NBC threats. Such training and exercises are the best means for evaluating operational concepts and doctrine, assessing readiness, and fostering innovation and adaptation.

In addition to changes in planning and procedures, the Secretary of Defense has directed an increase in planned spending on counterproliferation by approximately \$1 billion over the FY 1998-2003 program period, particularly for protective measures against chemical weapons. This additional investment will allow DoD to acquire new equipment and protective systems that will significantly enhance existing U.S. capabilities for dealing with chemical and biological weapons threats.

Given the likelihood that U.S. forces will fight in coalition with others in the future, DoD also is encouraging allies and friends to make similar

adaptations, because combined readiness is a key concern. Unless allies and future coalition partners are properly prepared to deal with NBC threats or attacks, they could present vulnerabilities for a U.S.-led coalition. As noted elsewhere in this report, to minimize such vulnerabilities, DoD has initiated bilateral counterproliferation dialogues with many key friends and allies around the world, as well as through the NATO Senior Defense Group on Proliferation, to explore opportunities for cooperative counterproliferation planning and program activities.

Integration of and Responsibilities for Counterproliferation Missions Within DoD

DoD has made substantial progress toward fully integrating the counterproliferation mission into its military planning, acquisition, intelligence, and international cooperation activities. The Under Secretary of Defense for Policy has been assigned responsibility for the development and implementation of DoD's counterproliferation policy.

One of the most important activities toward fully integrating counterproliferation into the functions of the Department has been the implementation of the 1995 Chairman of the Joint Chiefs of Staff (CJCS) Missions and Functions Study. The study concluded that the regional commanders in chief (CINC) should be responsible for implementing DoD counterproliferation policy within their respective areas of responsibility. This study led to two more significant documents regarding counterproliferation policy. The first was the CJCS Counterproliferation Charter, an instruction providing overarching strategic-level policy and guidance for the employment of U.S. forces to counter the proliferation of NBC weapons. The second, a CJCS Counterproliferation Concept Plan, tasked the regional CINCs to prepare for and to develop plans for counterproliferation operations.

Counterproliferation Council

The Counterproliferation Council (CPC), chaired by the Deputy Secretary of Defense, monitors DoD-wide efforts to train, exercise, and equip U.S. forces for the counterproliferation mission. It also oversees DoD counterproliferation activities in

interagency and international fora. The CPC meets on a regular basis, focusing on the potential impact of NBC/M proliferation on DoD's strategic requirement to fight and win two nearly simultaneous major theater wars; on joint and service counterproliferation doctrine; and on exercising and training for integrated operations in an NBC environment. In this connection, the CPC identified the importance of understanding the likely NBC employment concepts and plans of proliferants. It also took steps to ensure that focused intelligence assessments in these areas affect the development of regional military plans, doctrine, and exercising policies. Future meetings will address specific issues within the broad areas of adversary use concepts, counterproliferation doctrine, training and exercising, and allied counterproliferation issues.

NATO Counterproliferation Efforts: Senior Defense Group on Proliferation

Since U.S. forces are likely to fight in coalition with other nations' forces when faced with a future combat situation, combined readiness of the coalition to deal with NBC threats or use is of utmost importance. Allies and friends who are not prepared to confront NBC threats or attacks may increase the vulnerability of a U.S.-led coalition. Furthermore, potential coalition partners cannot depend on U.S. forces to provide passive and active defense capabilities against NBC threats or attacks.

The Department is continuing to work with America's long-standing allies in Europe and elsewhere to develop common approaches on counterproliferation. Notably, DoD played the leading role in moving counterproliferation to the top of NATO's agenda.

The NATO Senior Defense Group on Proliferation (DGP), co-chaired by the United States and a European ally (currently Germany), was established in 1994 to prioritize Alliance and national capabilities and to recommend improvements for NATO's defense posture to counter emerging threats from NBC/M. NATO's counterproliferation initiative is an integral part of the Alliance's adaptation to the post-Cold War environment. As part of NATO's strategic reorientation toward greater secu-

rity responsibilities beyond Europe, the DGP has recommended ways of improving the protection of deployed allied forces, which may operate beyond NATO's periphery where the military dangers posed by NBC proliferation are greatest. The DGP has recommended steps to accelerate the development of critical defenses and response capabilities for countering chemical and biological weapons. In June 1996, the DGP presented recommendations to NATO defense and foreign ministers for improving Alliance capabilities. It stressed the importance of developing a core, integrative set of capabilities that will provide a basis for continuing capability enhancements and force improvements as proliferation risks evolve. This core set of capabilities includes:

- Strategic and operational intelligence, including early warning data.
- Automated and deployable command, control, and communications (C3).
- Continuous, wide-area ground surveillance.
- Standoff and point BW/CW detection, identification, and warning.
- Extended air defenses, including theater ballistic missile (TBM) defense for deployed forces.
- NBC individual protective equipment for ground forces.

In many of these areas, NATO already has, or is developing, the requisite capabilities. DGP findings are intended to give impetus and added rationale for fielding such capabilities, as well as to demonstrate how supplementing this nucleus of capabilities with other means—including layered defenses against TBM attack, special munitions for NBC agent defeat and hardened NBC targets, computer modeling and simulation, and medical countermeasures—would strengthen the Alliance's overall ability to discourage NBC proliferation, deter the threat of use of NBC weapons, and protect against NBC attacks.

In June 1996—for the first time in 12 years—NATO's defense ministers launched a special out-of-cycle force planning process focusing on counterproliferation, through which allies are

making resource commitments to develop and field needed capabilities. Defense ministers approved new counterproliferation force planning targets in December 1996. This extraordinary effort demonstrates how counterproliferation has become a top priority for NATO in the post-Cold War era.

However, capability improvements alone are not enough. NATO is also taking steps to improve other aspects of its defense posture. It is reorienting NATO and national intelligence collection and analysis toward emerging NBC weapons threats. The Alliance is incorporating NBC weapons risks into its exercises and training. Recently, the DGP provided recommendations to NATO defense ministers to adapt NATO's operational doctrine, plans, training standards, and exercises and thereby ensure effective military operations despite the presence, threat, or use of NBC weapons.

NATO's counterproliferation initiative has also provided context for discussions with Partnership for Peace (PFP) countries, including Russia, on security challenges of mutual concern. Through these consultations and the PFP Planning and Review Process, NATO is working to ensure interoperability and coalition effectiveness in future operations that include Partner countries.

Cooperation with Other Countries

Countries outside NATO have also recognized the growing security risks posed by proliferation. The United States has bilateral or collective defense arrangements with many nations and conducts combined operations with their military forces. Many countries also have participated, and likely will continue to participate, in international coalition operations in which the presence of NBC weapons has been a factor. For these reasons, DoD has held discussions with long-time friends and allies to forge common approaches for improving military capabilities in the face of NBC risks. The Technical Cooperation Program with Australia, Canada, New Zealand, and the United Kingdom pursues defense research collaboration to facilitate cooperation in R&D in several technology areas, including chemical defense. In addition, the Tri-Partite Memorandum of Understanding with Canada and the United

Kingdom seeks to enhance cooperation in research, development, testing, and evaluation of chemical and biological defense programs.

DoD counterproliferation efforts in the Asia-Pacific region focus on the Republic of Korea, Japan, and Australia. These efforts are aimed at establishing an ongoing dialogue with each of these allies to discuss proliferation concerns in the region, improve military capabilities in the face of NBC threats, and identify areas for cooperation in counterproliferation programs and activities. DoD places a high priority on counterproliferation cooperation with the Republic of Korea, in particular, since it faces the greatest military threat of NBC use in the form of North Korea's considerable inventory of chemical weapons and means of delivery.

In the Middle East and Persian Gulf regions, DoD has held discussions with long-time friends and allies, including Israel and Kuwait. DoD hopes to expand these bilateral discussions to include other friends and potential coalition partners in the region.

ACQUISITION

The objective of the DoD chemical/biological (CB) defense program is to ensure that U.S. forces are equipped to survive, fight, and win in CB warfare environments. Numerous rapidly changing factors influence the program and its management.

DoD's acquisition strategy develops and accelerates programs that field military systems and capabilities to meet the CINCs' requirements, redress operational capability shortfalls, and sponsor research and development (R&D) activities providing enhanced capabilities that cannot be met with current systems and technologies.

DoD has budgeted nearly \$4.9 billion in FY 1998 for R&D and acquisition activities and programs directly related to countering proliferation. These investments are focused in seven key functional areas: proliferation prevention; strategic and tactical intelligence; battlefield surveillance; passive defense; active defense; counterforce; and countering paramilitary, covert delivery, and terrorist NBC threats.

At the heart of the Counterproliferation Initiative is the Counterproliferation Support Program, established in 1994 specifically to address DoD shortfalls in counterproliferation capabilities. This program uses its budget to leverage ongoing R&D and acquisition programs to meet the counterproliferation priorities of the CINCs and to accelerate the deployment of enhanced capabilities to the field. The program also conducts technology development activities with the Department of Energy (DOE) National Laboratories, the Intelligence Community, and several DoD agencies and organizations. Approximately 80 percent of the Counterproliferation Support Program's budget is invested in two key areas: the detection, identification, and characterization of biological warfare agents; and the detection, characterization, and defeat (with minimal collateral effects) of NBC weapon support facilities and hardened underground facilities. Advanced Concept Technology Demonstrations (ACTDs) are under way in each of these critical mission areas and are described later in this section.

The Counterproliferation Program Review Committee (CPRC) was established by the 1994 National Defense Authorization Act (NDAA) to review and coordinate R&D and acquisition efforts within DoD, DOE, and the Intelligence Community. The Secretary of Defense is the designated chair of the CPRC. It is chartered to make and implement recommendations regarding interdepartmental activities and programs addressing shortfalls in existing and programmed capabilities. It also ensures the coordinated development and fielding of technologies and capabilities to counter both NBC/M proliferation and NBC terrorism. Congress recently extended the authority of the CPRC until the year 2000.

In 1996, the CPRC established the CPRC Standing Committee, which meets regularly and which implements the recommendations of the CPRC. The findings and recommendations of the CPRC's 1997 annual program review are presented in the *Report on Activities and Programs for Countering Proliferation and NBC Terrorism*, its fourth annual report to Congress, publicly released in May 1997.

For additional information on DoD R&D and acquisition activities and programs, consult the

reports and websites listed in the section on Further Reading.

Ballistic Missile Defense

Within DoD, the Ballistic Missile Defense Organization (BMDO) is responsible for managing, directing, and executing the Ballistic Missile Defense (BMD) Program. The program focuses on three areas: Theater Missile Defense (TMD), National Missile Defense (NMD), and advanced ballistic missile defense technologies.

The requirement for BMD flows from a strategy that requires the United States to maintain a credible overseas presence and the capability to respond to major theater wars despite the increasing danger posed by the proliferation of ballistic missiles. In a world of regional threats, BMD affords the United States greater freedom of action to protect its interests and uphold its security commitments without fear of coercion. BMD can bolster the solidarity of coalitions and alliances (as it did in Desert Storm in 1991). It can also provide a response to crises without having to resort to offensive measures. Finally, BMD can strengthen the credibility of U.S. deterrent forces and provide an essential hedge against the failure of deterrence.

TMD is designed to protect deployed troops, allies, and friends. TMD systems must be able to deploy rapidly and move with the troops. Since the TMD threat is diverse with respect to range and capability, no single system can perform the entire TMD mission. This leads to a family of systems approach to defeat successfully the theater missile threat. The family of systems approach will ensure a defense in depth, utilizing both lower-tier systems—those that intercept at relatively low altitudes within the atmosphere, and upper-tier systems—those that intercept missile targets outside the atmosphere and at longer ranges. TMD programs include:

- Patriot Advanced Capability-3 (PAC-3).
- Navy Area Defense.
- Theater High Altitude Area Defense (THAAD) System.
- Navy Theater Wide Defense.

- Medium Extended Air Defense System (MEADS).
- HAWK Air Defense System.

The Department is continuing to explore concepts, such as the Air Force airborne laser for intercepting theater ballistic missiles in the boost phase.

Some BMD activities, specifically Joint Theater Missile Defense Programs, provide direct support to many separate programs. They introduce greater efficiency by accomplishing efforts that otherwise would have to be achieved separately by each program. These include interoperability in Battle Management/Command, Control, Communications and Intelligence (BM/C3I), which is essential for joint TMD operations.

BMDO takes an aggressive approach to establishing an architecture upon which all the Services can build. This includes improving early warning and dissemination, ensuring communications interoperability, and upgrading command and control centers. In addition to BM/C3I, the other activities include test and evaluation, modeling and simulation support, CINC's TMD Assessment program, the U.S.-Israeli Arrow Deployability Project, and Cooperative Engagement Capability analysis. These activities are critical to the success of the overall U.S. TMD system. They are the glue that holds the architecture together and will ensure that the whole is greater than the sum of its parts.

The primary goal is to provide the warfighter with an integrated TMD capability by building in the interoperability and flexibility to satisfy a wide range of threat scenarios. From its joint perspective, BMDO oversees the various independent weapon systems development efforts and provides guidance, standards, equipment and system integration, and analysis to integrate the multitude of sensors, interceptors, and tactical command centers into a joint theater-wide TMD architecture.

The National Missile Defense 3-plus-3 program is designed to conduct three years of development and test activities, leading to an integrated system test of the NMD elements in FY 1999. If the threat at the time warrants, a decision to deploy could be made

in 2000 to achieve operational capability in another three years (by the end of 2003). If the threat has not emerged, the United States would not need to deploy an NMD system in the near term. Therefore, DoD could continue to enhance the technology of each element and the concomitant capability of the NMD system that could be fielded on a later deployment schedule. The overarching goal of the 3-plus-3 program is to remain within a three-year window of deployment so the United States can respond effectively to an emerging threat. DoD is pursuing a fixed, land-based architecture for the NMD program. The NMD system DoD is developing includes six fundamental building blocks: the ground-based interceptor; ground-based radar; upgraded early warning radars; forward-based X-band radars; Space Based Infrared System (SBIRS); and BM/C3.

BMDO's technology investment strategy is straightforward, anticipating the future missile threat and pushing technologies in response. DoD leverages other federal and industry R&D investments where appropriate to aid missile defense and integrates emerging technologies in modest systems demonstrations that seek to identify their merits. With this approach, DoD ensures that BMD technology thrusts help develop near-term improvements or technology insertions to current acquisition programs, or provide an advanced BMD capability to address evolving missile threats. BMDO's technology efforts include:

- Advanced sensor technology (focal plane arrays, laser radar, image processing algorithms) to improve detection and tracking of missiles.
- Advanced interceptor technology (improved sensor windows, projectile structures, guidance and control, and seekers) to improve hit-to-kill capabilities.
- Directed energy (chemical laser) to provide an option of space-based, global coverage with a powerful boost phase intercept defense capability.
- Phenomenology and missile plume signature measurements to assist in readily identifying and tracking missile threats.

The Department of Defense Chemical and Biological Defense Program

As the 1997 National Security Strategy notes, while building coalitions of allies and friends to defend against NBC threats is important, these efforts are not sufficient by themselves. Accordingly, DoD continues to strengthen the capabilities of U.S. forces to defend against and counter NBC threats or use, whether as part of an international coalition of forces or whether the United States is compelled to act on its own.

ISSUES/SHORTFALLS

Following Operation Desert Storm, DoD identified many issues and shortfalls in supporting operations in a CB warfare environment. In its 1992 report, *Conduct of the Gulf War: Final Report to Congress*, DoD identified the following requirements related to CB defense capabilities:

- Lightweight CW/BW protective clothing and defensive equipment to reduce degradation, especially in desert climates.
- Integration of CW/BW protection and cooling systems into combat vehicles and procurement of stand-alone transportable collective protective shelters for sustained operations in a CW/BW environment.
- Greater emphasis of BW defenses in DoD programs. Inadequacies exist in detectors, vaccines, and protective equipment.
- To ensure effective contamination avoidance on future battlefields, additional NBC reconnaissance vehicles and early warning of CB contamination.
- Continued efforts to replace the water-based decontamination system.
- Continued force modernization in individual and collective protection, medical support, detection, identification, warning, and decontamination systems to ensure survivability and mission accomplishment under CW/BW battlefield conditions.

The ability of U.S. equipment to survive and operate in an NBC environment on future battlefields continues to be a major item of concern. DoD regulation 5000.2-R requires all mission essential systems to be survivable to those threat levels anticipated in their operating environment. The intent of this requirement is to ensure that the use of NBC weapons on a future battlefield will not disarm U.S. forces. All force modernization efforts should continue to incorporate NBC survivability in equipment designs. Failure to field NBC survivable equipment would significantly impact the ability to fight and win future conflicts. U.S. forces must be able to continue their assigned missions even in the event of a contaminated battlefield.

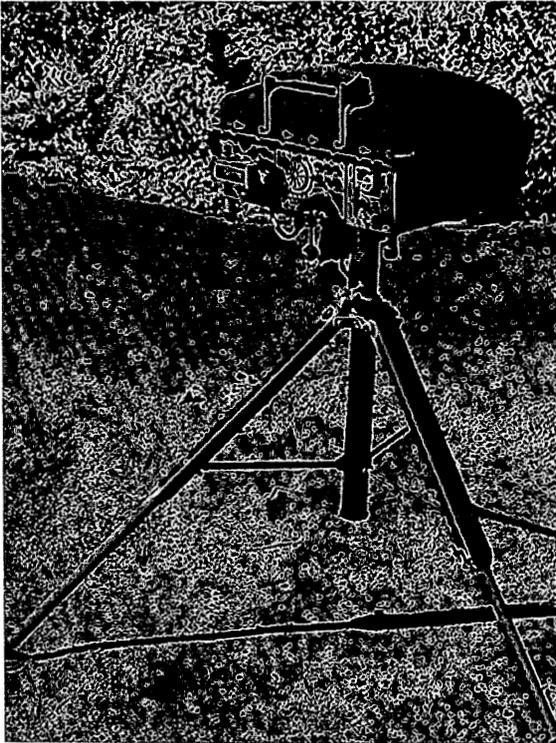
In March 1996, the General Accounting Office (GAO) issued its assessment of DoD's readiness to operate in a CB warfare environment. GAO found that DoD had taken steps to improve the readiness of U.S. forces to operate in CB contaminated environments, but that equipment, training, and medical shortcomings persisted and could cause needless casualties and a degradation of U.S. combat capability. There has been significant progress in addressing the issues identified by DoD and GAO. A review of accomplishments, existing shortfalls, and initiatives follows.

CHEMICAL AND BIOLOGICAL DEFENSE: ACCOMPLISHMENTS AND INITIATIVES

Chemical and biological defenses are conducted within the framework of three operational concepts: avoidance, protection, and decontamination. These concepts provide the basis for an integrated and balanced CW/BW defense program. Contamination avoidance consists of capabilities and procedures to detect, identify, and warn forces of CW/BW threats so commanders may determine the appropriate protective posture to assume and provide the necessary information to avoid contamination. When contamination cannot be avoided, protection provides capabilities to survive, fight, and win in an NBC contaminated environment. Protection consists of individual protection, collective protection, and medical programs. Finally, decontamination provides critical capabilities to allow the sustainment of operations in a contaminated environment. Detailed descriptions of the capabilities described

in the following sections are provided in the *DoD NBC Defense Annual Report to Congress*.

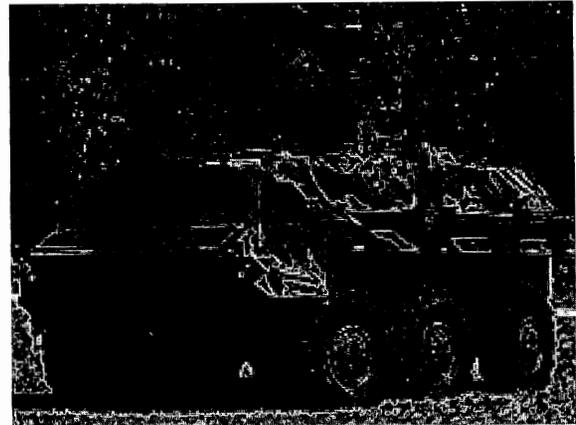
CONTAMINATION AVOIDANCE



The M21 RSCAAL gives U.S. forces the capability to avoid contamination by providing standoff detection of nerve and vesicant (blister) agents.

Multiple systems are in development, production, or in the field for early warning or point detection of CW/BW threats. Since 1991, there have been several critical technological and operational advances. The Army and Marine Corps have fielded the M21 Remote Sensing Chemical Agent Alarm (RSCAAL) to provide standoff detection of nerve and blister agents. The hand-held Chemical Agent Monitor (CAM) provides all deployable units with a rapid and easy-to-use chemical agent monitoring and identification capability for nerve and blister agents. In October 1996, the Army fielded its first-ever biological defense unit equipped with state-of-the-art biological detection capabilities, including the Biological Integrated Detection System (BIDS). In addition, the Army has fielded the Long Range Biological Standoff Detection System

(LR-BSDS), used for remote detection of aerosols and particulates. Also, the Interim Biological Agent Detector has been installed on selected Navy ships to provide a mobile biological point detection capability.



The M93A1 NBC Reconnaissance System is a fast, highly-mobile armored carrier with sophisticated equipment for detecting, sampling, and warning of radiological and chemical contamination.

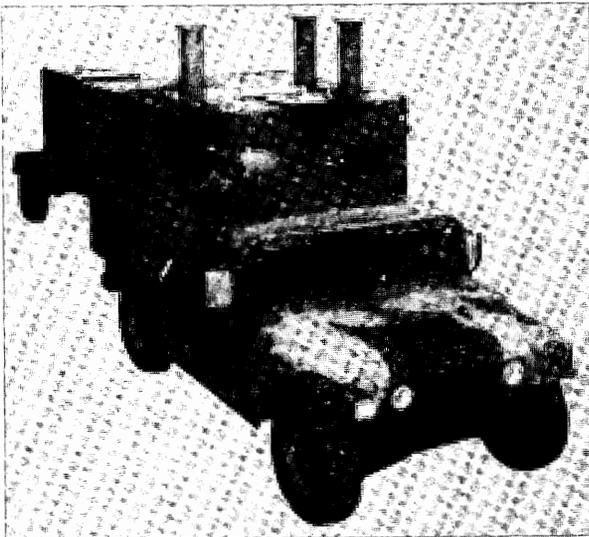
The M93A1 NBC Reconnaissance System (NBCRS), used by the Army and the Marine Corps, is a dedicated system for NBC detection, warning, and sampling equipment integrated into a high-speed, high-mobility armored carrier capable of performing NBC reconnaissance on primary, secondary, or cross-country routes throughout the battlefield. The NBCRS can find and mark chemical and nuclear contamination. Its crew is protected by an on-board overpressure system. It also can detect chemical contamination vapors within 5 kilometers using the M21 RSCAAL standoff detector. The NBCRS automatically will integrate contamination information from sensors with input from on-board navigation and meteorological systems. It then rapidly transmits hazard warnings via a central data processor and integrated digital jam-resistant communications.

Several new technologies that enhance CB detection and warning have been demonstrated and are in the final stages of development. Key programs include:

- The Lightweight Nuclear Biological and Chemical Reconnaissance System (LNBCRS),

which provides Marine and light division field unit commanders with real-time data that can be used to assess the field for NBC hazards while on the move.

- Joint Service Lightweight Standoff Chemical Agent Detector, which provides chemical agent detection and mapping of chemical agent clouds.
- The Joint Warning and Reporting Network, which automates NBC warning and reporting throughout the battlefield and links digital data into the C3 system.
- The CB Mass Spectrometer, in the final R&D stages, collects and identifies CB agents. It is a potential component for the BIDS Pre-Planned Product Improvement (P3I), the NBCRS, and the LNBCRS.
- The Joint Service Chemical Agent Detector program, which will provide a combined portable monitoring and small point chemical agent detector for aircraft, shipboard, stand-alone, and individual soldier applications.



The Biological Integrated Detection System provides the Army with state-of-the-art biological detection capabilities.

A number of procurement activities are planned within the contamination avoidance mission area:

- The BIDS Phase II P3I will provide technology insertion from concurrent development efforts
- to upgrade the Phase I (4-agent detection capability) core configuration to 8-agent detection capability, automated detectors and computerized integration of detection equipment outputs.
- DoD will procure 28 BIDS P3I systems in FY 1998 to provide an improved detection and identification capability of BW agents within the theater of operations.
- Procurement for the Improved Chemical Agent Monitor (ICAM) continues under a multiyear contract. The ICAM is a hand-held, soldier operated device that detects nerve and blister agent vapors on personnel and equipment. The improved version significantly enhances reliability and maintainability.
- Procurement for the Automatic Chemical Agent Detector/Alarm (ACADA) will continue. The ACADA provides a point detection capability to detect blister agents; provides improved sensitivity, improved response time, and interference rejection; and is programable for all known CW threat agents.
- Funding continues for modifications to the NBCRS that add first-time capabilities for standoff CW agent detection and communications links to the digital battlefield.
- Procurement continues in FY 1998 for the AN/UDR-13 Pocket Radiac, which provides the first-ever capability to both detect and indicate prompt and residual radiation doses received by troops.
- Improved (Chemical Agent) Point Detection System (IPDS) for surface ships will be procured in FY 1998. IPDS replaces the older Chemical Agent Point Detection System and provides on-the-move, expandable point detection of CW vapors, including nerve and blister agents.
- The Shipboard Automatic Liquid Agent Detector (SALAD) provides an automatic ship-board capability for detection of liquid chemical agents.
- The Joint Biological Point Detection System (JBPDS) is currently in the engineering, manufacturing, and development phase and is

a fully funded joint program that will give all four services a point biological detection capability at the unit level during the 2001/2003 time frame.

- The Air Base/Port ACTD Biological Detection System will be conducted during September 1997 and will provide the United States Pacific Command and the United States Central Command with a biological detection capability that is based upon the improved Navy Interim Biological Agent Detector System.

PROTECTION

Several new technologies have been demonstrated to enhance CB protection and are in the final stages of development. The most significant recent accomplishment has been the demonstration of a lightweight chemical protective garment. The Joint Service Lightweight Integrated Suit Technology (JSLIST) is a joint Service program to field a common chemical protective ensemble (suit, boots, and gloves). This garment uses a selectively permeable membrane technology, eliminating the bulkiness inherent with using superactivated charcoal. This will allow the integration of chemical protective clothing as part of the standard duty uniform rather than requiring a separate overgarment. Procurement of JSLIST is scheduled to begin in FY 1998.



The Joint Service Lightweight Integrated Suit Technology individual protective garment provides protection from chemical agents as well as ease of movement.

A number of procurement activities are also planned using FY 1998 funding within the individual protection mission area. They include:

- The M40A1 protective masks will allow continued replacement of the aging masks currently in the field.
- Additional M41 Protection Assessment Test Systems that ensure proper mask fit and functionality are added.
- The Army will purchase a new aircrew mask, the M45 Air Crew Protective Mask. This mask radically improves flight safety and provides full compatibility with night vision goggles and weapon sighting systems while improving aircrew comfort.
- Continued procurement of the CB Respiratory System, a new aircrew respiratory system for Navy and Marine Corps tactical rotary wing and land-based fixed wing aircraft.
- New procurement of the Aircrew Eye/Respiratory Protection mask, a second generation CB oxygen mask, begins again in FY 1998.
- The JSLIST P3I is a follow-on to the JSLIST program. This effort will seek technology insertion and improved gloves and is an accelerated program that will be completed within two years.

Within collective protection, funding supports continued procurement of the Chemical Biological Protective Shelter, a highly mobile, self-contained collective protection system that can provide a contamination-free working area for medical and other units. The Navy has retrofitted the Selected Area Collective Protective System into several ships and has designed collective protection into new construction in four classes of new ships. The Advanced Integrated Collective Protective System (AICPS) is a modular system that will integrate new NBC filtration technologies with environmental controls and power source components for tactical and combat systems. AICPS provides reduced weight, size, and cost, as well as improved maintainability over current capabilities.

MEDICAL PROGRAMS

Over the past year, there have been several accomplishments in the development of medical countermeasures against CW/BW agents. Medical countermeasures fall into three basic categories: prophylactic (preventative), therapeutic (post-exposure), and diagnostic. Key accomplishments of prophylactic countermeasures include the continued development of advanced vaccines for anthrax, botulinum, ricin, Venezuelan equine encephalitis, and plague; studies of biological scavengers for nerve agents; and cyanide pretreatment. Key accomplishments of therapeutic countermeasures include further development of a reactive topical skin protectant for protection against nerve and mustard agents; development of a nerve agent multichambered auto-injector (to replace the multiple injections currently required); and conduction of animal toxicology studies for cyanide pretreatment. Key accomplishments for diagnostic countermeasures include the continued development of a forward deployable diagnostic kit (including a hand-held polymerase chain reaction diagnostic and agent identification capability) that will allow immediate diagnosis of BW-related casualties in the field. This kit will include technologies still in development that will provide rapid identification of BW agents.

BW Threat Agents	
Anthrax	Mycotoxins
Bioregulators	Neurotoxins
Botulinum toxins	Staphylococcal Enterotoxin B
Brucellosis	Plague
Cholera	Q-fever
Clostridium perfringens	Ricin
Encephalomyelitis viruses	Smallpox
Glanders	Tularemia
Hemorrhagic Fever viruses	Typhus

DOD'S MEDICAL BIOLOGICAL DEFENSE ACQUISITION PROGRAM

DoD has made significant progress in the acquisition of biological defense vaccines and related medical products. After the Gulf War, the U.S. Army conducted several studies on different approaches for ensuring an adequate industrial base for the production of biological defense vaccines. Based on industry responses and government studies, a solid acquisition approach was developed—the Joint Vaccine Acquisition Program (JVAP). The JVAP will use a prime systems contract to manage and execute the advanced development, Food and Drug Administration (FDA) licensure, production, storage, and testing of 18 new vaccines that have been discovered through DoD-sponsored basic research.

An FDA-licensed anthrax vaccine is commercially available. Procurement of this vaccine has been ongoing since the Gulf War, and the DoD-prescribed stockpile level will be completed during FY 1997. A follow-on initiative is underway to ensure continued procurement of the anthrax vaccine to fully support U.S. biological defense vaccination policies.

DECONTAMINATION

Over the past year, there have been several accomplishments in decontamination development programs. Procurement is underway or planned for a lightweight decontamination system and a modular decontamination system that will reduce the logistics burden compared to existing systems. Critical shortfalls remain, however, to replace the current decontamination solution with one that is non-aqueous, noncorrosive, and environmentally safe. There have been successful demonstrations of a nonaqueous sorbent decontaminant. Efforts also are being pursued to develop a decontaminant for sensitive equipment (e.g., electronics). New concepts and technologies are being investigated for decontamination of large areas such as ports or airfields. Also, measurable decontamination standards/ levels are being developed for strategic lift aircraft and ship decontamination.

Technology Development Responsive to Counterproliferation Requirements

DoD needs a spectrum of capabilities to accomplish its counterproliferation mission. No single system

or set of systems, current or proposed, can provide all of the operational capabilities needed for the complete counterproliferation mission. Just as counterproliferation has been integrated into planning for military operations, technology development directed at improving counterproliferation capabilities has been integrated into DoD's R&D and other acquisition activities. Most development efforts involve the adaptation of existing systems and technologies to respond to counterproliferation mission requirements.

DoD has established procedures to ensure that its science and technology investments are directed at priority requirements identified by warfighters. To this end, DoD has designated a set of Joint Warfighting Capability Objectives (JWCOs) that focus on critical joint warfighting capabilities. Technology development in support of counterforce/counterproliferation and for chemical-biological defense are two of the ten JWCOs. For additional information on these JWCOs and on DoD technology development responsive to counterproliferation, consult the reports and websites listed in the section on Further Reading.

Counterterror Technical Support Program

The Counterterror Technical Support (CTTS) Program develops technology and prototype equipment that address requirements having direct operational application in the national effort to combat terrorism, to include terrorist use of NBC weapons. It integrates Defense advanced development efforts with government-wide and international efforts. The Assistant Secretary of Defense for Special Operations and Low-Intensity Conflict executes the CTTS Program, which addresses requirements identified by the Technical Support Working Group (TSWG), an interagency forum for combating terrorism. The TSWG was established as a working group of the National Security Council's Interagency Working Group on Counterterrorism and acts as its technology development component. The CTTS and TSWG focus on the rapid development of equipment to address critical multiagency and future threat counter- and anti-terrorism requirements. A significant portion of the CTTS funding and development efforts and TSWG's

technology requirements are directly related to countering NBC weapons.

Counterforce Capability Against Adversary Nuclear, Biological, and Chemical Infrastructure

The combat air forces have issued a standing mission need statement, in response to urgent warfighting CINC requirements, to detect, characterize, and defeat NBC/M facilities with minimal collateral effects. U.S. forces must be able to interdict an adversary's biological and chemical capability during each stage of the agent's employment. Counterforce operations include (but are not limited to) attacking agent production facilities, storage complexes, and deployed mobile weapon platforms.

The U.S. Air Force is conducting the Agent Defeat Weapon (ADW) program to develop the capability to destroy, neutralize, immobilize, or deny an adversary access to biological and chemical agents with little or no collateral damage. The effort is currently in concept exploration. Studies are being performed to identify and evaluate concepts to satisfy the mission need, with the goal of fielding an NBC specific strike capability. All concepts must comply with relevant arms control treaties. Analysis tools being developed to support ADW include Agent Release models, Internal Dispersion and Venting models, and a Lethality model to evaluate inventory and conceptual weapon effectiveness against NBC/M targets.

Advanced Concept Technology Demonstrations

ACTDs, a component of acquisition reform, are programs that focus mature technology on high priority operational needs. From the inception of any ACTD, technologists work closely with warfighters to demonstrate technologies, evaluate military utility, and transition new military capabilities. ACTDs also allow the warfighter to develop and refine operational concepts to take full advantage of the new capability. They are deliberately designed to develop limited numbers of weapons and other systems that are given to the warfighting command partner at the conclusion of the effort. This delivers

initial products to customers in months to a few years, as opposed to the decade-long periods required for some Cold War era system acquisition programs.

Counterproliferation Advanced Concept Technology Demonstration

The Counterproliferation ACTD develops, demonstrates, and delivers improved counterforce capabilities. DSWA serves as the lead for technology development, coordinating the contributions of multiple DoD components, and the United States European Command serves as the primary operational sponsor. Priorities include improved capabilities for characterization and defeat of NBC targets; enhanced capabilities for forecasting and limiting collateral effects that might be associated with such attacks; and assisting the warfighter in the development of operational concepts.

In a conventional attack against an NBC facility, collateral effects may be due primarily to the response of the target, not the direct effects produced by the weapon, e.g., as might occur if a conventional bomb hits a chemical weapon storage bunker. Using the best experimental data available, plus lessons learned during the Gulf War, DSWA developed the munitions effectiveness assessment tool for weapons employment and combat assessments, and the hazard prediction assessment capability for prediction of collateral effects. These products have been transferred to multiple warfighting commands. The Joint Staff has recommended that they be accepted as the NATO standard for planning and assessing NBC facility attacks.

A hard target smart fuze is being evaluated which will optimize weapon detonation location to maximize lethality with minimum collateral effects. The fuze has had several successful tests of varying types, including live drops from both Air Force and Navy aircraft against surrogate targets. An advanced unitary penetrator is also being demonstrated that will increase the penetration capability of a joint Service weapon by two to three times.

Additional development and evaluation efforts involve a new inertial terrain-aided guidance capa-

bility, a weapon-borne sensor, and tactical unattended ground sensors. Improved sensors and guidance are important as enabling conditions for better characterization of targets and more effective and discriminate attacks against NBC facilities.

Dipole Orbit 3 Structural Damage



Test of penetrating munition immediately prior to and following weapon entry into a bermed, above-ground bunker.

ADDITIONAL COUNTERPROLIFERATION ACTDS

- The Airbase/Port Biodetection ACTD is seeking to develop and demonstrate, for the first time, the capability to protect high value fixed sites against biological warfare attacks. This ACTD will develop an interim biological point detection capability at up to seven high value sites overseas. A closely related ACTD is providing similar capabilities and residuals

against chemical agents for the same military customers.

- The Consequence Management ACTD, also called 911-BIO, is evaluating mature agent detection and identification technology and working with the appropriate military response units to develop operational concepts and techniques for technology use as well as integration with other consequence management agencies. The first demonstration at Dugway Proving Grounds, Utah, was successful on all dimensions.
- The Joint Biological Remote Early Warning System ACTD, which networks several sensor types that are remotely deployed to increase warning time and minimize exposure, will begin in FY 1998.

There also are non-ACTD demonstrations that are part of the chemical and biological defense program. Some focus on specific technological needs, and others are open-ended and seek to evaluate any new or emerging technology for potential CB defense application, such as the Annual Joint Field Trials at Dugway Proving Ground.

Improved Capabilities Against Hardened Targets

Hardened targets are facilities that have been designed and constructed to make them difficult to defeat using current conventional weapons. Such facilities increasingly are being used to house NBC weapons, materials, and production capabilities. In some cases, these facilities might be used for other related support activities, e.g., command and control centers.

Hardened, fixed targets fall into two broad categories. Many are hardened by using soil, concrete, and rock boulders atop the structure once it has been built. These cut and cover facilities are often built into an excavation and then covered. The second category includes tunnels and deep shafts, where the protection is provided by existing rock and soil. There is a depth threshold at which it becomes more economical to tunnel rather than to excavate and cover. Below this threshold, costs generally are constant regardless of the depth of the tunnel below

the surface, so tunneled facilities can achieve function depths of hundreds of meters. For this reason, tunnels often are referred to as deeply buried facilities.

The limitations of weapon capabilities during the Gulf War, as well as the increasing availability of advanced tunneling technologies, has brought about a clear worldwide trend in tunneling to protect facilities. Hardened surface and cut and cover facilities may be vulnerable to current air-to-surface conventional penetrators, but remain a substantial challenge when standoff attack is desired. Facilities housed in tunnels, however, are nearly invulnerable to direct attack by conventional means. For most tunneled targets, disruption must come by means other than direct weapon penetration into the facility.

Developing Improved Capabilities for Defeat of Hardened Targets

Responding to mission need statements by Air Combat Command and U.S. Strategic Command, DoD is conducting the Hard and Deeply Buried Target Defeat Capability (HDBTDC) Acquisition activity to develop strike concepts. The effort of concept exploration is supported by Intelligence Community resources directed at finding and characterizing these facilities worldwide. The objective of the HDBTDC effort is to develop new or modified intelligence and conventional weapon systems capable of denying access to, disrupting operations of, or destroying defended hard and deeply buried facilities. Attaining this objective requires the organized efforts of the Services, DoD agencies, the Intelligence Community, and the National Laboratories.

DSWA's Hard Target Defeat projects are a key component of DoD's capability acquisition efforts and are an example of ongoing national technical efforts to develop the capability to defeat hard and deeply buried targets. Examples of research efforts within these DSWA projects include:

- Geomechanical modeling to identify the key aspects of geology impacting strike weapon penetration and damage propagation.

- Advanced simulation and testing to improve understanding of weapon effects and effects-target coupling.
- Development of an operations-friendly automated target planning tool for tunnel defeat.
- Development of improved capabilities to understand target characteristics and functions, facilitating the identification of specific vulnerabilities that may be exploited.

DSWA and the Defense Intelligence Agency (DIA) are embarking on a comprehensive Tunnel Defeat Demonstration Program. The program seeks to develop, assess, and demonstrate end-to-end targeting capabilities (from detecting, identifying, and characterizing facilities to targeting, attacking, and performing damage assessment) across all war-fighting options. A series of tunnel facilities, of varying design and function, will be constructed and operated at the Nevada Test Site as demonstration beds. The program will include the evaluation and demonstration of current and near-term capabilities and longer-term research initiatives.

DOD CAPABILITIES TO RESPOND TO NBC TERRORISM

As pointed out in the National Security Strategy, the end of the Cold War has seen the rise of various transnational threats, including the danger that a transnational terrorist group might seek to acquire NBC weapons. Combating this danger requires far-reaching cooperation within the U.S. government and with other nations, as discussed earlier in this report. However, it also requires that DoD develop the capability to prevent, disrupt, and defeat terrorist operations before they can carry out a threat to use NBC weapons, as well as the capability to respond overwhelmingly if an actual NBC terrorist attack should occur.

U.S. Policy on Counterterrorism

A Presidential Decision Directive (PDD), titled U.S. Policy on Counterterrorism, was signed on June 21, 1995. It states that "The United States shall give the highest priority to developing capabilities to . . . manage the consequences of nuclear, biological, or chemical material or weapons used by

a terrorist." This PDD reinforces the interagency process for combating terrorism, and it directs lead agency responsibilities and support requirements for response to both domestic and overseas terrorist incidents. A significant new requirement identified in this PDD calls for coordination between crisis and consequence management agencies in resolving a terrorist incident involving NBC materials or weapons.

The Department of State is the lead agency for both crisis and consequence management in overseas terrorism incidents. The Federal Emergency Management Agency (FEMA) is made responsible for ensuring the Federal Response Plan is adequate for responding to the consequences of terrorism, including terrorism involving NBC materials or weapons. DoD possesses significant assets that, at the onset of a domestic NBC terrorism incident, will be integrated into a coordinated federal resolution effort. This includes assistance to the FBI for crisis response and to FEMA for consequence management.

DoD Response Capabilities

DoD support of a federal response to a domestic terrorism incident will be personally managed by the Secretary of Defense, with the assistance of the Chairman of the Joint Chiefs of Staff and the Secretary of the Army. The DoD crisis management response will be provided through the national interagency terrorism response system. DoD response forces will be employed either under the operational control of the Joint Special Operations Task Force or a Response Task Force assigned to the appropriate Unified Combatant Commander.

The Department has specially trained and equipped units capable of operating in an NBC environment and tasked to respond to a terrorist crisis. Several DoD elements have expertise which can be tasked. A 24-hour, on-call emergency response capability to respond to biological or chemical incidents with personnel trained in biological, chemical, and explosive ordnance disposal operations is available within DoD. The personnel perform render-safe procedures; provide damage limitation, reconnaissance, recovery, sampling, mitigation, decontamination, and transportation; and perform

or recommend final disposition of weaponized and non-weaponized CW/BW materials.

The U.S. Army Chemical and Biological Defense Command (CBDCOM) develops technological countermeasures and equipment that provide rapid warning and facilitate quick response in the event of a chemical or biological incident. Under CBDCOM, the Edgewood Research, Development, and Engineering Center also maintains a rapidly deployable mobile environmental monitoring and technical assessment system, the Mobile Analytical Response System. This system provides state-of-the-art analytical assessment of chemical or biological hazards at an incident site.

Also under CBDCOM is the U.S. Army Technical Escort Unit, which is a specialized army unit with missions of escorting the movement of chemical or biological material, and finding and destroying chemical or biological munitions. This unit maintains a 24-hour, on-call alert team that will be tailored specifically to a current situation for both the crisis and consequence management responses.

Among the different missions these units perform are:

- Reconnaissance mission—conducts reconnaissance of the incident site; identifies munitions and hazards; performs render-safe procedures on munitions; gathers samples of suspect biological/chemical agents; provides small-area decontamination; and advises the on-scene coordinator on personnel and equipment requirements.
- Hotline mission—conducts decontamination of personnel exiting the incident site; controls entry/exit at the site; and secures clothing/equipment of processing personnel.
- Decontamination mission—operates vehicle-mounted decontaminating apparatus, performs decontamination operations on equipment, structure, and land surfaces.

Under the U.S. Army Medical Research and Materiel Command, the U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID) develops strategies, products, information, proce-

dures, and training for medical defense against agents of biological origin and naturally occurring infectious diseases of military importance that require special containment. USAMRIID has many existing capabilities which can be employed directly for evaluating terrorist incidents from the initial communication of the threat or incident to its resolution. These capabilities include:

- Assisting in the evaluation of threat capability in relation to a specific agent or agents.
- Assisting in the evaluation of delivery methods and their impacts.
- Identifying biological agents (infectious and toxic) in samples from an incident.
- Protecting personnel responding to a terrorist incident or decontaminating personnel and facilities.
- Accomplishing medical and operational planning.
- Providing special vaccines for personnel who respond to or are the target of such incidents.
- Handling specialized transport of limited numbers of biological casualties under containment conditions to a receiving medical facility.

A key capability of the Institute is its staff of physicians, who are experienced clinicians and also understand the unique diagnostic and therapeutic challenges posed by biological warfare agents—information with which most physicians are not familiar.

The Naval Medical Research Institute provides basic and applied research competence in infectious diseases, immunobiology/tissue transplantation, diving and environmental medicine, blood research, and human factors directly related to military requirements and operational needs. The Biological Defense Research Program has designed reagents, assays, and procedures for agents classically identified as biological threats, as well as for nonclassical threat agents, in environmental and clinical specimens. This program has developed rapid, hand-held screening assays and immunoassays for clinical and environmental samples that can be deployed globally.

The Marine Corps' Chemical Biological Incident Response Force (CBIRF) is a deployable force capable of performing chemical or biological consequence management following a terrorist attack. CBIRF is most effective when forward deployed in response to a credible threat to domestic or overseas installations, or to protect events of national significance from the consequences of chemical-biological incidents. CBIRF is supported by a panel of military and civilian experts in chemical and biological agents. These experts assist in the training and development of CBIRF and are linked with CBIRF operationally through electronic communications. CBIRF is capable of deploying on short notice as an element of the Response Task Force to support the Federal Response. CBIRF's capabilities include being able to decontaminate victims into treatable patients, stabilize patients, and treat chemical and biological casualties.

The Air Force is drastically altering the way it thinks about, prepares for, and defends against threats to the safety of its forces. It is building an integrated, well-planned Force Protection program designed to protect its people and warfighting capabilities in any situation. To execute this program, it is standing up a dedicated rapid response unit capable of being the first in to hostile contingencies, including an ability to assess NBC defense requirements for follow-on forces. This unit, under the 820th Security Forces Group, will be trained in NBC defense measures and collocated with a new Force Protection Battlelab, where it will have access to the latest fielded chemical-biological technology improvements and ground tactical intelligence information. Collocated with these units will be the Air Force Security Forces Center, where other experts from the Office of Special Investigation, Intelligence, medical, and security forces staffs are immediately available to provide force protection policy and guidance.

Domestic Terrorism Preparedness Program

The United States will do everything in its power to prevent NBC use from endangering its citizens. However, should an NBC weapon be used against U.S. citizens, the United States must be prepared to

respond effectively to protect lives and property, as well as to ensure the survival of its institutions and national infrastructure. National security emergency preparedness is imperative, and it requires a comprehensive preparation and planning effort by federal, state, and local departments and agencies. DoD plays an important role in these efforts.

The Defense Against Weapons of Mass Destruction Act of 1996, authored by Senators Nunn, Lugar, and Domenici, calls for a program to provide federal resources, training, and technical assistance to federal, state, and local emergency management personnel who would respond to a terrorist incident. The act was passed in response to a growing concern that NBC weapons could be used in terrorist attacks. The cornerstone of the program is the training and exercising of local first responders (fire, law enforcement, and medical) to enhance their response capabilities.

The training program includes two parallel and concurrent efforts. One is the program to train responders in the nation's largest 120 cities. The second program is to develop training modules and establish mechanisms to provide federal expertise to every community in the nation. The training program for the cities begins with interagency teams who meet with city emergency management personnel and responders. The city, in coordination with the interagency team, defines the scope and requirements of its training program. The city's resource commitment depends on the tailored training program worked out in partnership with the interagency assessment team. The training that follows will come from those federal agencies with the required expertise. The training program is based upon a train-the-trainer concept, wherein a small number of federally trained local responders become the trainers for the remainder of the city's responders. The city training program began in April 1997 and the interagency team initiated the program in 27 cities during FY 1997. Concurrently, DoD is developing an exercise program that will evaluate and enhance the responder training program.

The second thrust of the Domestic Preparedness Program includes the development of training modules available through mass media technology,

making federal expertise available to every community in the country to assist in improving their response capability against a terrorist incident involving a nuclear, radiological, chemical, or biological weapon. DoD is designing low-cost training packages for wide dissemination via mass media formats, which may include the Internet, distance learning, video, and CD-ROM. This training initiative will make training packages available to state and local agencies as rapidly and inexpensively as possible. DoD is supporting FEMA in the development of a database that will provide a source of information on chemical and biological agents, munitions characteristics, and safety precautions for civilian use. Concurrently, DoD is also developing a help-line and a hot-line to give local responders immediate access to federal experts with nuclear, chemical, and biological expertise.

CONCLUSION

The proliferation of nuclear, biological, or chemical weapons and their delivery means is not a hypothetical threat. More than 25 countries have—or may be developing—NBC weapons and the means to deliver them; a larger number are capable of producing such weapons, potentially on short notice. In addition, the NBC proliferation threat has become transnational and now has the potential to come from terrorist organizations or organized crime groups. Proliferation of NBC/M presents a daunting challenge. The United States will need perseverance, patience, and imagination to combat this threat. There has been a dramatic reduction in

the threat from the countries of the former Soviet Union. The Nuclear Non-Proliferation Treaty has been extended indefinitely. Since the beginning of the decade, six countries that might have been nuclear powers—Ukraine, Kazakhstan, Belarus, North Korea, South Africa, and Iraq—have been turned away from that path.

This section of the report has described in detail the three components of DoD's response to NBC proliferation—preventing proliferation from occurring, protecting U.S. forces and citizens against NBC weapons, and being able to respond against those who would use NBC weapons against the United States. Prevention of proliferation is the first priority. DoD provides critical support to national and international prevention efforts. However, DoD understands that the United States will not be successful in preventing proliferation all the time and in all places. When proliferation occurs and U.S. interests and commitments are threatened, the United States must be in a position to prevail on the battlefield, even against opponents who possess NBC weapons. DoD has unique responsibilities for the military responses needed if prevention fails: active defense, passive defense, counterforce, and response to paramilitary/covert threats.

Development of a coherent, effective national response has required policy initiatives, adaptation of military planning and operations, acquisition of new capabilities, new intelligence community programs, and international cooperation. Much progress has been made and more remains to be done.

Technical Annex

TECHNICAL ANNEX

PROLIFERATION POTENTIAL

The potential for the proliferation of nuclear, biological, and chemical (NBC) weapons is widespread. Any state with nuclear reactors has the technological resources needed to produce radiological weapons or to start a nuclear weapons program. For chemical and biological weapons in particular, the potential for proliferation is almost unlimited. Any state with a basic chemical, petrochemical, pharmaceutical, biotechnological, or related industry can produce basic chemical or biological agents.

Similar points hold for many of the chemical and biological production facilities found throughout the world. While there has been significant NBC proliferation, all of the available proliferation potential has not been translated into publicly announced or deployed NBC weapon systems.

EXTENT OF PROLIFERATION

Given a decision by national leaders to develop NBC weapons capabilities, a range of outcomes involving different decisions, actions, and political and economic costs can result. The most common situation today is one in which proliferants stop short of announcing their status as an NBC weapons state.

DoD proliferation prevention activities are directed at all stages of proliferation. The absence of directional arrows on the following chart entitled Stages, Decisions, and Actions Involved in NBC Proliferation is deliberate; one of the objectives in proliferation prevention policy is to encourage movement to stages of less capability. This policy involves positive measures that allow leaders of other countries to respond to legitimate national security requirements without engaging in NBC proliferation. It also involves negative measures to impede proliferation. There have been successes in proliferation prevention, including situations in which national leaders have opted to eliminate NBC weapons or to halt work on their development.

SIGNIFICANCE OF PROLIFERATION

Rationale of Nations for Acquiring NBC Weapons

NBC materials are dangerous to process and store, and there are international political costs associated with violations of arms control conventions. Although development of nuclear weapons can be expensive, chemical and biological weapons can be made rather inexpensively, especially if the proliferant does not develop and test its weapons to U.S. standards.

In the United States, rationale for nuclear weapons-related programs is stated in detail and publicly debated. This is not the case in most proliferant states, whose leaders have not been willing to articulate, on the record, the factors that have prompted them to incur the costs involved in NBC proliferation. Hence, motives must be inferred.

In some cases, self-defined security requirements appear to be the motivating factor, particularly if regional adversaries are perceived to have NBC weapons. Some of these situations have been successfully addressed through proliferation prevention policies; other cases have not yet been amenable to such solutions.

States may try to acquire or develop NBC weapons or missiles because of a need to deter hostile neighbors that have similar capabilities. Prestige and the ability to intimidate less powerful states also could be factors. There also are situations where one of the motivations appears to be to develop NBC military capabilities as a means of offsetting the conventional superiority of the United States or other states with more capable conventional forces. The result can be paradoxical, with proliferation resulting in more risks than would otherwise be the case.

Military Effectiveness

MILITARY UTILITY

NBC weapons can have devastating effects, particularly when employed against unalerted, unprotected forces or populations. Some of these effects were explained and compared in the technical

annex provided in the 1996 edition of this report; that information is not repeated here.

RISKS ASSOCIATED WITH POSSESSION OR USE OF NBC WEAPONS

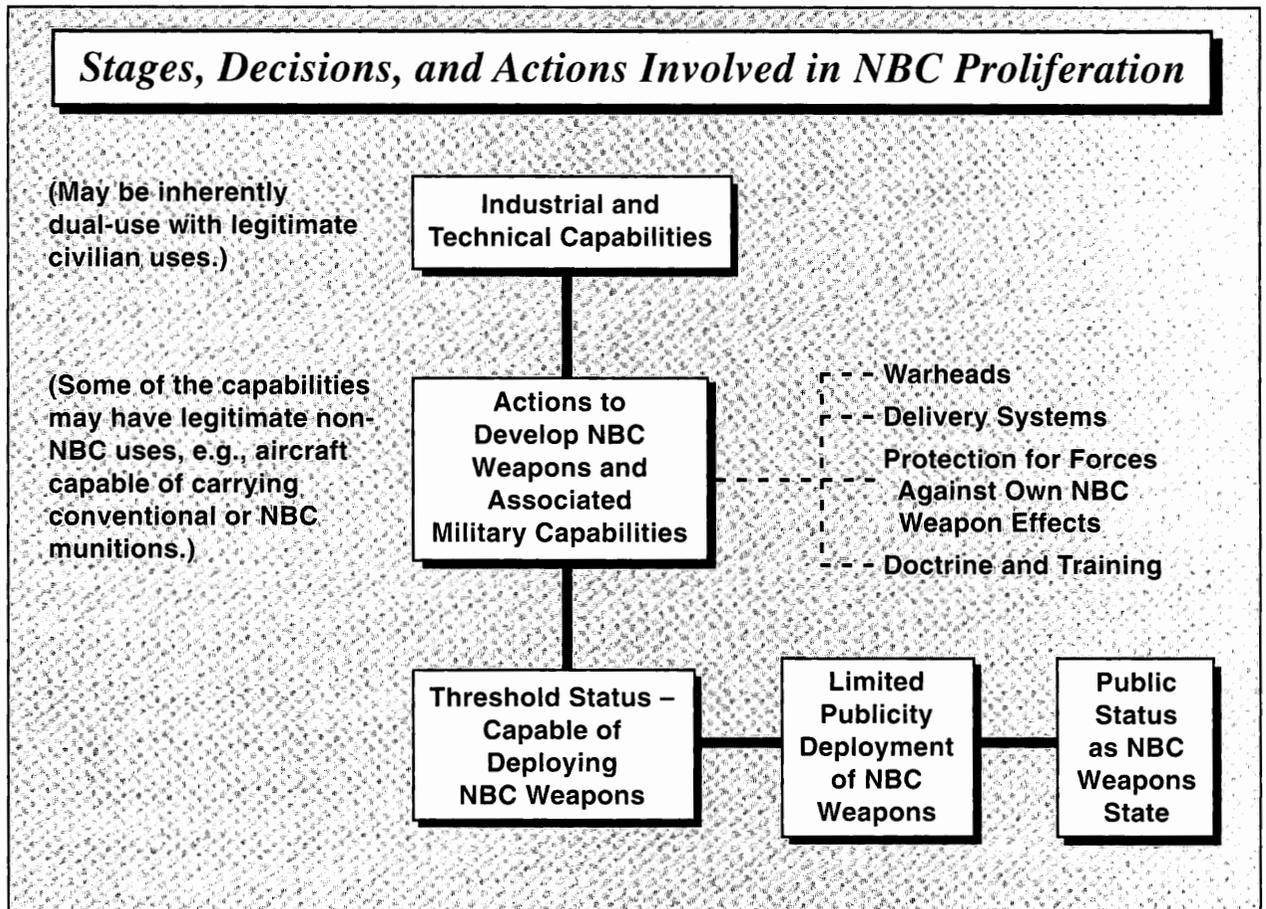
The deployment or use of NBC weapons by a proliferant entails significant strategic risks and costs, particularly in confrontations or conflicts in which opponents have capable conventional forces. A proliferant nation is likely to disperse both the locations of the production facilities and the weapons deployment. This will increase the logistics strain on the proliferant, but also will make targeting of these sites more difficult.

Significant collateral hazards can result if NBC production and storage facilities are attacked with conventional weapons. The spillover effects produced by the NBC targets can be much more dangerous than those induced by the conventional weapons involved in such an attack.

In some cases, it may be possible to ameliorate (but not completely eliminate) such risks by dispersing NBC weapons and delivery systems. This can result in NBC weapon security risks, particularly in regimes in which leaders exercise power based on domination, not shared values and trust.

NBC weapons use can involve significant risks to a proliferant's own forces and population. For example, dispersal of some NBC hazards depends partly on meteorological conditions that can vary unpredictably over time, and partly on other conditions that cannot be controlled.

Notwithstanding the significant risks associated with possession or use of NBC weapons, situations may occur during a regional contingency in which a proliferant considers using such weapons against U.S., allied, or coalition forces and facilities.



RESPONDING TO NOVEL BIOLOGICAL WARFARE THREATS

Novel Threats

Biological weapons have the greatest potential for lethality of any weapon. Biological weapons are accessible to all countries; there are few barriers to developing such weapons with a modest level of effort. The current level of sophistication for many biological agents is low, but there is enormous potential—based on advances in modern molecular biology, fermentation, and drug delivery technology—for making more sophisticated weapons. While there remains a tendency to say biological weapons are too hard to deal with, a vigorous and productive defensive program is possible and will do much to mitigate the risk to the United States and its allies.

Advances in biotechnology and genetic engineering may facilitate the development of potentially new and more deadly biological warfare agents. The ability to modify microbial agents at a molecular level has existed since the 1960s, when revolutionary new genetic engineering techniques were introduced, but the enterprise tended to be slow and unpredictable. With today's more powerful techniques, infectious organisms can be modified to bring about disease in different ways. Many bioengineering companies (both U.S. and foreign) now sell all-in-one kits to enable even high school-level students to perform recombinant DNA experiments. The availability of free on-line gene sequence databases and analytic software over the Internet further simplifies and disseminates this capability. It is now possible to transform relatively benign organisms to cause harmful effects. Genetic engineering gives biological warfare developers powerful tools with which to pursue agents that defeat the protective and treatment protocols of the prospective adversary. Genetically engineered micro-organisms also raise the technological hurdle that must be overcome to provide for effective detection, identification, and early warning of biological warfare attacks.

The future likelihood of infectious agents being created for biological warfare purposes will be

influenced by several technological trends, of which four of the most significant are:

- Genetically engineered vectors in the form of modified infectious organisms will be increasingly employed as tools in medicine and the techniques will become more widely available.
- Strides will be made in the understanding of infectious disease mechanisms and in microbial genetics that are responsible for disease processes.
- An increased understanding of the human immune system function and disease mechanisms will shed light on the circumstances that cause individual susceptibility to infectious disease.
- Vaccines and antidotes will be improved over the long term, perhaps to the point where classic biological warfare agents will offer less utility as a means of causing casualties.

Classic biological warfare threat agents pose the greatest concern for the near and mid-term. Long-term threats are not so easily predicted. Section II of this report includes a chart that lists biological warfare threat agents. Despite revolutionary developments in biotechnology, technological barriers still block the ready development of novel biological warfare agents. A detailed understanding of genetic structures does not automatically convey an ability to control these genetic mechanisms. For example, scientists cloned and sequenced the entire human immunodeficiency virus genome in 1984. However, despite tremendous efforts, an effective vaccine has not yet been developed.

The question of what disease-causing organisms might supplant classic biological warfare agents is critical to understanding future biological warfare threats. Biological warfare agents may emerge in two likely categories: man-made manipulations of classic biological warfare agents and newly discovered or emerging infectious agents that result from natural occurrences. In a 1992 report on emerging infectious diseases, the Institute of Medicine found that "Pathogenic microbes can be resilient, dangerous foes. Although it is impossible to predict their individual emergence in time and place, we can be confident that new microbial diseases will emerge."

CHARACTERISTICS OF BIOLOGICAL AGENTS	
Requirements	Desirable Characteristics
<p>Consistently produce a given effect (death, disability, or crop damage).</p> <p>Be manufacturable on a large scale.</p> <p>Be stable during production and storage, in munitions, and during transportation.</p> <p>Be capable of efficient dissemination.</p> <p>Be stable after dissemination.</p>	<p>Possible for the using forces to protect against.</p> <p>Difficult for a potential enemy to detect or protect against.</p> <p>A short and predictable incubation period.</p> <p>A short and predictable persistency if the contaminated area is to be promptly occupied by friendly troops.</p> <p>Capable of infecting more than one kind of target (for example, man and animals) through more than one portal of entry, being disseminated by various means, producing desired psychological effects.</p>
<p>Source: Adapted from U.S. Departments of Army and Air Force. <i>Military Biology and Biological Agents</i>. Departments of Army and Air Force Technical Manual 3-216/Air Force Manual 355-56, March 12, 1964.</p>	

Examples of recent new pathogens (though not necessarily ideal biological warfare agents) include streptococcus pneumoniae S23F, a recently discovered naturally-occurring strain of pneumonia resistant to at least six of the more commonly used antibiotics. The increasing awareness of new biological diseases prompted the Centers for Disease Control and Prevention (CDC) in 1995 to begin publishing the journal *Emerging Infectious Diseases* as a means to focus awareness on the problem of naturally occurring biological hazards that threaten humans and as a forum for discussing solutions.

CHARACTERISTICS OF BIOLOGICAL AGENTS

Certain characteristics are required for an organism to be an effective biological agent. Additional characteristics that enhance their value under varied conditions of use are desired. The selection of a particular biological warfare agent will be governed not only by the effect desired but also by the agent's characteristics and its ability to withstand environmental conditions. All these conditions cannot usually be fulfilled by any one agent; therefore, in making a selection, some compromise may have to be made.

THE POTENTIAL IMPACT OF BIOTECHNOLOGY AND GENETIC ENGINEERING

The revolution in biotechnology facilitates an evolution in the biological warfare threat. The

revolution in biotechnology began in 1977 with the successful cloning of a protein using a synthetic, recombinant gene. Scientific and technological advances have facilitated the development of genetically engineered agents.

The extreme lethality of biological warfare agents has long been known. The most lethal biological toxins are hundreds to thousands of times more lethal per unit than the most lethal chemical warfare agents. However, lethality is only one of many characteristics necessary to consider in the development, production, and employment of a biological warfare agent. Numerous characteristics need to be controlled for a highly effective biological warfare agent. Historically, the accentuation of one characteristic often resulted in the attenuation of one or more other characteristics, possibly even rendering the modified agent ineffective as a weapon. Advances in biotechnology, genetic engineering, and related scientific fields provide increasing potential to control more of these factors, possibly leading to the ability to use biological warfare agents as tactical battlefield weapons.

The potential types of novel biological agents (microorganisms) that could be produced through genetic engineering methodologies are:

- Benign microorganisms, genetically altered to produce a toxin, venom, or bioregulator.
- Microorganisms resistant to antibiotics, standard vaccines, and therapeutics.

- Microorganisms with enhanced aerosol and environmental stability.
- Immunologically-altered microorganisms able to defeat standard identification, detection, and diagnostic methods.
- Combinations of the above four types with improved delivery systems.

It is noteworthy that each of these techniques seeks to capitalize on the extreme lethality, virulence, or infectivity of biological warfare agents and exploit this potential by developing methods to deliver more efficiently and to control these agents on the battlefield.

Ongoing scientific research into the functioning of disease organisms also should provide insights for the development of advanced medical defenses against new and emerging biological warfare threats. Current examples of infectious organisms that are attracting particular attention are hantaviruses; other hemorrhagic fever-causing agents, such as Ebola; and the bacteria invasive Group A streptococcus (commonly known as flesh-eating bacteria). The streptococcus example is illustrative. While not a new medical problem, the particular strain involved can produce a combination of toxins that results in simultaneous toxic shock and rapid spread of tissue breakdown. Once it is well established, the infection is very difficult to control with antibiotics. Although the natural form of this organism may not have significant potential as an aerosol threat agent, those seeking new infectious agents for military use could investigate its mechanisms of action.

DoD Resources for Responding to Novel Biological Threats

One of the tenets of DoD's science and technology program is the prevention of technological surprise. Technological surprise historically occurs when new technologies are employed to maximize surprise. Countering this requires good intelligence on capabilities and intentions of potential adversaries. It also requires that the U.S. science and technology community maintain a continuing awareness, through its own scientific investigation, of emerg-

ing technologies that could have military applications. Maintenance of a strong biological defense technology base within DoD is essential to ensuring that the nation will be prepared to respond to future biological threats. Defense scientists and engineers must be poised to react rapidly to an innovative use of technology by potential adversaries.

To counter potentially new and more effective biological warfare agents, a broad array of countermeasures is available or being developed. Within the DoD chemical and biological defense program, biological defenses are developed as a system-of-systems architecture. The research, development, and acquisition of non-medical and medical bio-defense capabilities is supported by five capability areas: avoidance, individual protection, collective protection, decontamination, and medical programs. All capability areas are interrelated and critical to the defense of U.S. forces.

Avoidance consists of three essential elements: early warning, detection, and warning and reporting. Early warning enables U.S. forces to avoid contamination or to assume the optimal protective posture. Detector development is the cornerstone for this area. The program is pursuing technological advances in remote detection, miniaturization, increased sensitivity, decreased false alarm rates, and improved logistics supportability. Biological detection capability has the highest priority. To counter novel and previously unknown agents, detectors are being developed that identify methods of delivery (e.g., aerosol and particulate detection) and the toxicity of agent rather than specific structure and genetic make-up of the organism.

When contamination cannot be avoided and units are forced to occupy or traverse contaminated areas, protection provides survivability and continued operational capability in a biological warfare environment. Biological agents pose hazards by the routes of inhalation, ingestion, or direct contact. Diseases are caused by bacteria, viruses, parasites, or toxins. Biological warfare would require intentional exposure to a biological agent in concert with the correct route for maximum effectiveness. Few agents are lethal by contact. Thus, individual protection is focused on the development of lightweight respiratory protection. Technological

advances are being pursued to produce mask systems fully compatible with vision and weapons' sighting systems. Collective protection equipment includes shelters for command posts, rest and relief, vehicular collective protection, and safe zones aboard ship. Technological improvements will reduce weight and size and increase filter lifetime to improve deployability.

When contamination cannot be avoided, forces must decontaminate personnel and equipment to reduce or eliminate contamination hazards. Biological warfare agents are generally highly susceptible to the ultraviolet wavelengths of sunlight and to simple oxidants and disinfectants (e.g., bleach, Lysol, and others). For biological warfare agents, technological improvements focus on the development of systems for disseminating the decontaminant over a large area.

The medical biological defense research program has three broad goals:

- Protect U.S. forces' warfighting capabilities during a biological attack.
- Treat casualties to prevent lethality and maximize return to duty.
- Maintain state-of-the-art research and development efforts to provide timely medical countermeasures.

To meet these three goals, the Army executes the Medical Biological Defense Research Program, which provides medical countermeasures to deter, constrain, and defeat the use of biological threat agents, as well as advanced diagnostics. Research efforts are exploiting advances in biotechnologies and genetic engineering to develop new vaccines and other preventive medicines, including recombinant vaccines and monoclonal antibodies.

The most effective way to protect individuals against biological warfare agents is to immunize combat forces. Current priorities are to develop new or improved vaccines against validated biological warfare threat agents and to increase the vaccine stockpile. Long-term efforts include development

of multivalent vaccines to protect against a broad spectrum of biological agents. Also, improved casualty care practices doctrine will increase the return-to-duty rate for troops exposed to biological agents, thus adding to force sustainment.

The Defense Advanced Research Projects Agency (DARPA) is developing medical countermeasures against biological warfare agents by identifying virulence mechanisms shared by multiple pathogens and developing therapeutics to block these fundamental disease-causing pathways. This high-risk, high-payoff approach complements the more conventional approaches of other DoD programs to develop biological warfare therapeutics. The DARPA approach is expected to be effective against bioengineered pathogens, including seemingly innocuous bacteria that have had a toxin-producing gene inserted into them. The DARPA strategy expects to give DoD therapeutics that work against multiple agents, that work against previously unknown or bioengineered agents, and against which it will be extremely difficult for an adversary to develop resistant strains.

CONCLUSION

The DoD response to novel biological warfare threats, improved capabilities for delivery of NBC weapons, and other technological developments associated with NBC proliferation involves initiatives to provide forces with better defenses against such threats and actions to inhibit the development of such capabilities. Part of the DoD response is to work with other U.S. government agencies and with allies to halt the diversion of technologies needed for indigenous development of NBC programs.

The DoD response also involves capabilities to respond forcefully, effectively and, where appropriate, overwhelmingly against those who might contemplate the use of NBC and their means of delivery so that the costs of such use will be seen as outweighing the gains. To minimize the impact of proliferation on American interests, it is the policy of the United States not only to prevent and deter NBC use, but also to operate and counterstrike successfully when faced with NBC threats or use.

Further Reading

FURTHER READING

Documents relating to counterproliferation, the Counterproliferation Program Review Committee's *Report on Activities and Programs for Countering Proliferation and NBC Terrorism*, May 1997, and the March 1997 *Department of Defense Nuclear/Biological/Chemical (NBC) Defense Annual Report to Congress* may be found at:

<http://www.acq.osd.mil/cp>

The *Joint Warfighting Science & Technology Plan* may be found at:

<http://www.dtic.mil:80/dstp/index.html>

Proliferation: Threat and Response, April 1996, may be found at:

http://www.defenselink.mil/pubs/pr_olif/index.html

Report of the Quadrennial Defense Review, May 1997, may be found at:

<http://www.defenselink.mil/pubs/qdr/>

Information regarding the Department of Defense may be found at:

<http://www.defenselink.mil/>

The *Annual Report to the President and the Congress*, 1995, 1996, and 1997, may be found at:

http://www.dtic.mil/execsec/adr_intro.html

glossary

GLOSSARY

ACADA	Automatic Chemical Agent Detector/Alarm	CTR	Cooperative Threat Reduction
ACTD	Advanced Concept Technology Demonstration	CTTS	Counterterror Technical Support
ADW	Agent Defeat Weapon	CW	Chemical Weapons
AICPS	Advanced Integrated Collective Protective System	CWC	Chemical Weapons Convention
ALCM	Air Launched Cruise Missile	CWD	Chemical Weapons Destruction
BIDS	Biological Integrated Detection System	DARPA	Defense Advanced Research Projects Agency
BM/C3I	Battle Management/Command, Control, Communications, and Intelligence	DGP	NATO Senior Defense Group on Proliferation
BMD	Ballistic Missile Defense	DIA	Defense Intelligence Agency
BMDO	Ballistic Missile Defense Organization	DMZ	Demilitarized Zone
BW	Biological Weapons	DoD	Department of Defense
BWC	Biological and Toxin Weapons Convention	DOE	Department of Energy
C ³	Command, Control, and Communications	DSWA	Defense Special Weapons Agency
CAM	Chemical Agent Monitor	DTSA	Defense Technology Security Administration
CB	Chemical/Biological	EPCI	Enhanced Proliferation Control Initiative
CBDCOM	Chemical and Biological Defense Command	FBI	Federal Bureau of Investigation
CBIRF	Chemical Biological Incident Response Force	FDA	Food and Drug Administration
CDC	Centers for Disease Control and Prevention	FEMA	Federal Emergency Management Agency
CINC	Commander in Chief	GAO	General Accounting Office
CJCS	Chairman of the Joint Chiefs of Staff	GCC	Gulf Cooperation Council
COCOM	Coordinating Committee for Multilateral Export Controls	GDP	Gross Domestic Product
CPC	Counterproliferation Council	HDBTDC	Hard and Deeply Buried Target Defeat Capability
CPRC	Counterproliferation Program Review Committee	IAEA	International Atomic Energy Agency
CTBT	Comprehensive Test Ban Treaty	ICBM	Intercontinental Ballistic Missile (Range: greater than 5,500 kilometers)
		ICAM	Improved Chemical Agent Monitor
		ILEA	International Law Enforcement Academy
		IPDS	Improved Point Detection System
		IRBM	Intermediate Range Ballistic Missile (Range: 3,000 to 5,000 kilometers)

GLOSSARY

JBPDS	Joint Biological Point Detection System	OSD	Office of the Secretary of Defense
JSLIST	Joint Service Lightweight Integrated Suit Technology	OSIA	On-Site Inspection Agency
JVAP	Joint Vaccine Acquisition Program	P3I	Pre-Planned Product Improvement
JWCO	Joint Warfighting Capability Objective	PAC-3	Patriot Advanced Capability-3
km	Kilometer	PDD	Presidential Decision Directive
LNBCRS	Lightweight Nuclear Biological and Chemical Reconnaissance System	PFP	Partnership for Peace
LR-BSDS	Long Range Biological Standoff Detection System	QDR	Quadrennial Defense Review
MCTL	Militarily Critical Technologies List	R&D	Research and Development
MEADS	Medium Extended Air Defense System	RSCAAL	Remote Sensing Chemical Agent Alarm
MRBM	Medium Range Ballistic Missile (Range: 1,000 to 3,000 kilometers)	SALAD	Shipboard Automatic Liquid Agent Detector
MT	Metric Ton	SBIRS	Space Based Infrared System
MTCR	Missile Technology Control Regime	SLBM	Submarine Launched Ballistic Missile
MTOPS	Million Theoretical Operations Per Second	SLV	Space Launch Vehicle
NATO	North Atlantic Treaty Organization	SRBM	Short Range Ballistic Missile (Range: 1,000 kilometers or less)
NBC	Nuclear, Biological, or Chemical	START	Strategic Arms Reduction Treaty
NBC/M	NBC Weapons and Their Means of Delivery	TBM	Theater Ballistic Missile
NBCRS	NBC Reconnaissance System	THAAD	Theater High Altitude Area Defense
NDAA	National Defense Authorization Act	TMD	Theater Missile Defense
NIS	New Independent States	TSWG	Technical Support Working Group
NMD	National Missile Defense	UAV	Unmanned Aerial Vehicle
NPT	Nuclear Non-Proliferation Treaty	UN	United Nations
NSG	Nuclear Suppliers Group	UNSCOM	UN Special Commission on Iraq
OSCE	Organization for Security and Cooperation in Europe	UNSCR	UN Security Council Resolution
		USAMRCD	U.S. Army Medical Research and Material Command
		WMD	Weapons of Mass Destruction