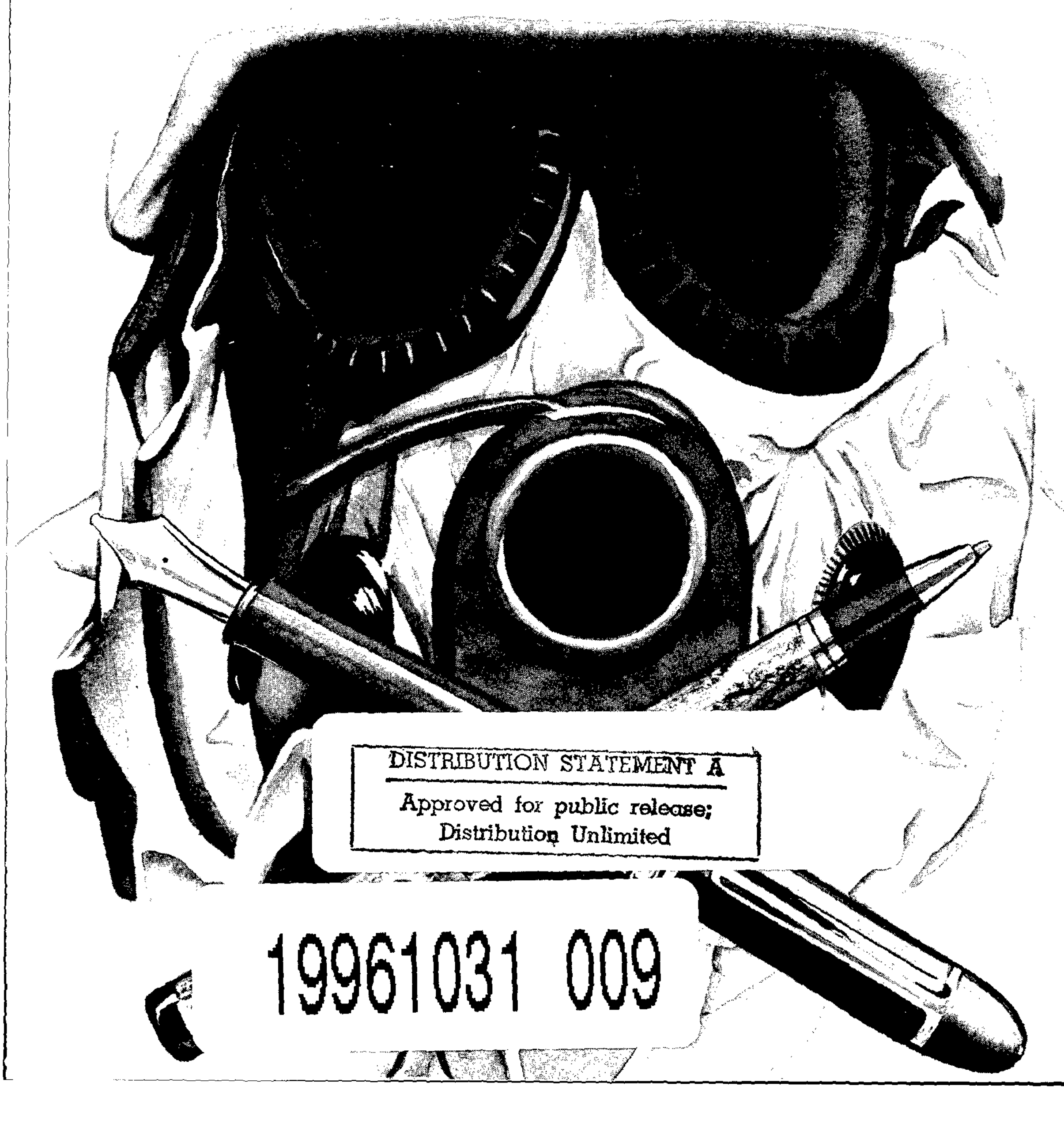
FIGHTING PROLIFERATION

New Concerns for the Nineties

Henry Sokolski



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Foreword

Proliferation of dangerous weapons has been a problem for American foreign policy for many years, at least since the first and worst case of proliferation—the Soviet acquisition of nuclear capability in 1949. For most of the time, however, the issue was never near the top of the policy agenda. Either it appeared to be just an element of the overall cold war competition, in which policymakers were preoccupied with other threats, or it seemed to be disjoined from that competition and was a lower priority for that reason.

The first cycle of concern, peaking in the 1960s, was mainly about the diffusion of nuclear capability within the two blocs of the East-West conflict. France and China, not small third world countries, were the proliferants that caused the most distress. Worried speculation about potential proliferants centered on developed countries such as the Federal Republic of Germany and Japan. The Nuclear Nonproliferation Treaty (NPT) was in large part a response to that perceived danger.

The second cycle occurred in the 1970s, during the period both of détente between the superpowers and the energy crisis. Concern then focused primarily on the danger that the spread of nuclear power for generating electricity in underdeveloped countries would lead to the spread of capabilities for building weapons to governments that would otherwise be unable to do so. In contrast to those countries that were the main source of attention in the 1960s, these nations were not tightly integrated in the cold war alliance systems.

Throughout these earlier periods of concern, however, events usually moved more slowly than anticipated. Surprisingly few countries that had capabilities or incentives for acquiring independent capabilities for mass destruction actually did so. Many countries seemed to realize that trying to get such weapons could bring more trouble than they were worth.

In the 1990s, we are now in the third cycle. Although it is possible that we might continue to be happily surprised by a

modest pace of proliferation, there are significant reasons to see the problem in a different light this time around. One difference is technological: ongoing modernization throughout the world steadily diffuses expertise in or access to science, engineering, information systems, and sources of supply. Barriers to proliferation erode slowly and are still far from insignificant, but over time the erosion becomes telling.

The biggest difference, however, is political: the end of the cold war, which solved old security problems in some places but created new ones in others. It also produced messy uncertainties like the huge "loose nukes" problem of keeping the vast pool of weapons, materials, and trained scientists in the former Soviet Union under control. Not least of all, it relieved American strategists of their main preoccupation—the worldwide struggle with Soviet power—thus allowing them to make proliferation a much higher priority on the security agenda.

In terms of immediate national security, it is not hard to argue now that proliferation of nuclear, biological, and chemical weapons is the *top* priority problem for the United States. No superpower or great power currently threatens important US interests. This happy situation may change in the future, but until then, the threats to American interests are mainly peripheral or indirect. Significant threats to home territory—the core issue for any national security policy—are now most likely from weapons of mass destruction smuggled in by radicals who see the United States as their enemy. No other country's conventional military forces are currently strong enough or properly positioned to pose the danger of defeat to US conventional forces in a confrontation abroad. The one thing that could do so would be a nuclear or biological capability. Overall, Americans have good reason to feel more secure than they did during the cold war. At the same time, they also have good reason to see the spread of weapons of mass destruction as the principal security problem they face at present.

The volume that follows calls attention to many of the novel issues that mark the current phase of concern, such as proliferation of modern systems apart from nuclear weapons themselves (for example, cruise missiles or space reconnaissance) that might enhance the threats posed by such weapons.

Rather than spreading itself thin and surveying everything, as so many books on this subject do, it also focuses in depth on the most important current cases—North Korea and Iran.

The collection also offers new interpretations about long-standing questions, such as the evolution and function of the NPT. It addresses the various issues in particularly lively and useful ways, with punch and directness, but without the polemical passion that characterized much campaigning against proliferation in the past. For example, rather than presenting a single brief on the North Korean nuclear threat, the book offers contrasting assessments by Walter Slocombe, Victor Gilinsky, and Paul Wolfowitz. On satellite export controls, it features a debate between Brian Dailey and Edward McGaffigan.

There is none of the arid detachment here that marks some academic writing on the subject. The book focuses on the question in terms of issues and implications for US policy—not slippery global perspectives. In some respects, such as the effects of weapons of mass destruction that can transcend borders (radioactive fallout, epidemics from biological warfare, ecological damage, and so forth), proliferation is indeed a collective global problem. In many other respects, however, it is a conceptual mistake to think of the problem primarily as undifferentiated and worldwide.

Profound effects on the global ecosystem are less likely from the first post-Nagasaki use of nuclear weapons and become more probable only when the parties using them have large numbers to unleash. For a long time, the main danger will be the use of limited numbers of low-yield weapons by weak states against each other. If the weapons are a threat in those terms, they will be a specific rather than a generalized threat—a threat because they might blow up in some country in particular. Some countries are more likely to suffer than others. Moreover, although the spread of awesome weapons may threaten many countries, it will also benefit others (such as those who consider their security or political leverage enhanced by possessing them). The effects of proliferation, in short, will not be uniform. That, in turn, underlines the point that strategies for combatting proliferation will have to be varied and attuned to particular cases.

Although more realistic and hardheaded in its approach than much antiproliferation literature of earlier times, this volume does not indulge in the unorthodox and blithe optimism about the consequences of proliferation that became fashionable in the past decade among some theorists, such as Kenneth Waltz and John Mearsheimer. The book is forthrightly in the mainstream of opposition to proliferation and the search for practical, policy-relevant approaches to dealing with it. That combination of strategic realism and policy orientation is the right one—and rare enough that it highlights the usefulness of this collection.

Proliferation is a new priority but an old issue. Some strategists are discovering it for the first time. So it is not surprising that to some seasoned observers, much current literature on the subject seems to reinvent the wheel. This book does not. Readers interested in fresh approaches to the problem that could, at any time, turn into the principal crisis facing American foreign policy will do well to turn to this volume.

Richard K. Betts
New York, New York
January 1996

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Henry Sokolski
Washington, D.C.
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Introduction

The Proliferation Challenges Ahead

Henry Sokolski

Iraq's threatened chemical missile strikes against US forces, combined with its efforts to build nuclear weapons, have quite literally put issues about the proliferation of strategic weapons on the map. Indeed, after Operation Desert Shield, both the Bush and Clinton administrations focused considerable attention on the need to dismantle Iraq's strategic weapons capabilities and to assure that the strategic weapons complex in the former Soviet Union doesn't end up helping future Iraqs. Since Operation Desert Storm, though, additional proliferation concerns—devising an effective strategy against proliferation, coping with the spread of space technology, and curbing Iran's and North Korea's strategic programs—have emerged. *Fighting Proliferation* examines these challenges and their implications for US policy.

The first of these concerns—how best to reform existing nonproliferation efforts—is examined in part 1. With the Nuclear Nonproliferation Treaty (NPT) indefinitely extended, just exactly how the treaty will be implemented remains unclear. The Clinton administration is on record arguing that the NPT is a model for how the US will curb the proliferation of not only nuclear but all other kinds of strategic weapons. But what does the NPT and its obligations actually mean? Its key proscriptions in Articles 1, 2, and 3 are ambiguous. The treaty also lacks any clear enforcement measures and is nearly impossible to amend.

Can the NPT be interpreted in some fashion that could address these weaknesses? The answer given in *Fighting Proliferation*'s opening essay, "What Does the History of the Nuclear Nonproliferation Treaty Tell Us about Its Future?" is yes. Tracing the negotiating history of the NPT, Henry Sokolski—executive director of the Nonproliferation Policy

Education Center—argues that the NPT's original objectives are still sound and sufficiently present in the treaty's text to redeem its currently lax implementation. Len Weiss, Senate staff author of the Nuclear Nonproliferation Act of 1978, details precisely what ambiguities such a reinterpretation would have to consider. Yet, without an effort to address these concerns, both authors argue, the NPT and the "model" it represents could fail or—worse—compound the very proliferation they were supposed to prevent.

Demonstration of this point is offered in an essay by Richard Speier, consultant to RAND and the Pacific Sierra Corporation and a US negotiator of the Missile Technology Control Regime (MTCR). In his essay "A Nuclear Nonproliferation Treaty for Missiles?" Speier shows what can happen in attempting to turn technology-denial efforts, such as the MTCR, into an intent-based nonproliferation regime like the NPT. Using the example of Brazil, Speier shows how including countries with a troubled past and a desire to develop strategic weapons capabilities in nonproliferation regimes can actually accelerate proliferation.

This leads directly to the issue of what new threats the US will face if its nonproliferation policies fail. Part 2 covers this issue in four essays. The first, "How to Defeat the United States: The Operational Military Effects of the Proliferation of Weapons of Precise Destruction" by David Blair, a professor at Air University's Air War College, focuses on how smaller nations may use high-leverage conventional weapons in the coming decade to defeat US expeditionary forces. The other essays in this section examine two specific weapons capabilities—improved satellite imagery and highly precise conventional cruise missiles. The second essay, by Steve Berner of B and L Associates in Washington, D.C., details the significant military implications of the continued spread of commercial satellites and satellite services to other nations. His analysis carefully explains how space imagery can be used to develop strategic intelligence, military maps, and precise targeting for crude cruise missiles in a manner previously not possible. This threat of cruise missile proliferation is detailed more closely in part 2's third essay, by Dennis Gormley, vice president of Pacific Sierra and consultant to DOD's Policy

Advisory Board, and K. Scott McMahon, national security analyst for Pacific Sierra, who examine the emerging cruise missile efforts in the third world and end with a set of policy recommendations for how to control cruise missile technology more carefully.

A similar concern over what, if anything, should be done to control advanced nations' export of commercial satellites and their related products and services is considered in part 2's final offering—a debate between Brian Dailey, Lockheed's vice president for congressional affairs and former director of Vice President Dan Quayle's Space Council, and Edward McGaffigan, administrative assistant to Sen Jeff Bingaman (D-N.Mex.) and former Office of Science and Technology staffer in the Carter administration. As all these experts note, the policy challenges in these two areas will receive additional attention no matter who sits in the White House in 1996.

Technological advances, though, are only part of the emerging set of proliferation threats. In addition, two new truculent proliferators—North Korea and Iran—have emerged since Desert Storm. These two regional concerns are the focus of parts 3 and 4. Three essays are dedicated to North Korea. The first of these, written by Walter Slocombe, undersecretary of defense for policy, makes the case for the nuclear deal struck with North Korea in Geneva on 21 October 1994—the Clinton administration's current approach to the North Korean nuclear threat.

This analysis is followed by two different analyses. The first, by Victor Gilinsky, former nuclear regulatory commissioner (1975–84), examines the problems that the deal's nuclear reactor offer is likely to present to the South Koreans. The second, by Paul Wolfowitz, dean of the Johns Hopkins University's School of Advanced International Studies and undersecretary of defense for policy in the Bush administration, analyzes the deal in the broader context of US–East Asian security and concludes that the deal could undermine regional security unless its implementation is properly conditioned.

This, then, brings us to the book's consideration of Iran in part 4. It consists of three offerings. The first is an analysis of the threats Iran is likely to present to US interests; its author is Geoffrey Kemp, former Reagan National Security Council

(NSC) staffer and currently the Nixon Center's resident Near East expert. The second—"Opportunities for Change in Iran"—is by Ken Timmerman, director of the Iran Data Project; he argues that the US should support efforts to overthrow the current Iranian government. The third—"The Stalemate in US-Iran Relations"—is by Gary Sick, former NSC staffer and currently professor of Near Eastern politics at Columbia University; he makes the case for the US increasing its cooperation with the current Iranian regime.

The debate over what sort of regime the US wants to see in Tehran and how likely such a regime is to emerge points toward the more general need for US officials to develop a long-term diplomatic, political, economic, and military strategy against proliferation. This is the focus of the book's last three essays in part 5. The first of these evaluates our current effort to devise a military response to proliferation under the Defense Department's Counterproliferation Initiative (DCI). Announced by Secretary of Defense Les Aspin on 7 December 1993, the DCI was supposed to neutralize these threats. But as Chris Williams—House National Security Committee nonproliferation staffer—explains in his analysis, the DCI has had a number of difficulties. He suggests that the DCI can overcome its detractors but only if it adopts a more competitive approach than merely preempting other nations' use of strategic weapons or limiting damage.

As Williams points out, if the US is to win against proliferators, it will have to get beyond the negative goal of limiting possible damage and pit its comparative advantages against proliferators' comparative weaknesses. What this more competitive strategy will entail is explained by David Andre, who helped develop and implement DOD competitive strategies against the Soviet Union during the Reagan administration. The key questions US policy planners must answer in devising such strategies are presented in his essay "Competitive Strategies: An Approach against Proliferation." Finally, the intelligence requirements for pursuing such an approach are spelled out in Henry Sokolski's essay "Fighting Proliferation with Intelligence." In it, he argues that we need to work backwards from the most likely and most threatening scenarios involving the proliferation of strategic weapons to determine what can be

done to mitigate or eliminate such threats. Working backwards from these futures, we should be able to prevent the worst.

PART 1

Rethinking the Nuclear Nonproliferation Treaty Model

Chapter 1

What Does the History of the Nuclear Nonproliferation Treaty Tell Us about Its Future?

Henry Sokolski

When experts discuss the prospects of the Nuclear Nonproliferation Treaty (NPT), they naturally focus on impending events. Will nonaligned nations tie their continued adherence to reaching a comprehensive test ban? Will North Korea, Algeria, Iraq, and Iran live up to their NPT obligations? Will NPT's inspectorate, the International Atomic Energy Agency (IAEA), strengthen its inspection procedures?

The answers to these questions—like the future itself, however—are necessarily speculative. In contrast, the NPT's history is known. More important, it is arguably more relevant to gauging the treaty's chances for future success. To understand the NPT's past, after all, is not only to understand what the treaty's original intentions were but to consider how practical and relevant these aims are today and how viable they are likely to be.

In general, of course, we already know what the NPT is supposed to do: limit the spread of nuclear weapons. What we are less clear on, though, is exactly how the NPT is supposed to achieve this end. Was the goal of curbing the transfer of nuclear weapons technology to be subordinated to the NPT's stated aim of ending the arms race between Washington and Moscow? Did smaller nations, in fact, have a right—as the NPT's 10th article suggests—to withdraw from the treaty if, in their estimation, neither Washington nor Moscow had taken effective measures to end the nuclear arms race or if a neighboring adversary acquired nuclear weapons of its own? Did the NPT, in fact, reflect the view that nuclear proliferation was less of an evil than either of these two outcomes?

What of nuclear safeguards? Were nuclear activities and materials that were quite close to bomb making or nuclear

weapons themselves to be allowed if they were claimed to be for "peaceful purposes" and were acquired or transferred under international inspections? Did the drafters of the NPT's provisions for safeguards consciously limit the intrusiveness of inspections in order to protect any and all transfers of civilian nuclear energy?

Certainly, if the answer to these historical questions is yes, the NPT's future as an effective nonproliferation agreement would be in doubt. At a minimum, it would suggest that the prospects for strengthening the IAEA and NPT and for getting near-nuclear or undeclared-nuclear nations to join were distant.

The NPT's history, though, is not that clear. Certainly, it is true that the NPT's framers finally opposed intrusive IAEA inspections, encouraged the sharing of "peaceful" nuclear energy, described the greatest proliferation threat as being the superpowers' continued buildup of nuclear arms, and even claimed that nations had the right to acquire nuclear weapons under "extraordinary events." Yet, each of these propositions was debated and arguably balanced by the NPT's first two articles prohibiting the transfer or acquisition of nuclear weapons "directly or indirectly." These articles, first suggested by the Irish in 1958 as an intermediate step toward superpower nuclear arms control, presumed that the further spread of nuclear weapons threatened accidental and catalytic nuclear war and instability both for states with and those without nuclear weapons.

These "Irish" articles are important, then, if only because they seem at odds with the NPT's other provisions. These include language—backed by a substantial negotiating record—that provides for NPT members' rights under Articles 3, 4, and 10 to (1) withdraw from the treaty (and, thus, legally acquire nuclear weapons), (2) engage in the "fullest possible exchange" of nuclear technology, and (3) keep nuclear inspections under the NPT from "hampering [NPT members'] economic or technological development."

Critics of the NPT argue that Articles 1 and 2 should rule over the interpretation and implementation of the rest of the treaty.[1] However, this is neither the way the NPT is popularly understood nor the way most of the NPT's framers saw the treaty when they finalized it in 1968. Then, as now, the

predominant nuclear threat in the eyes of the treaty's supporters was not accidental or catalytic war, but the possibility that nuclear competition between major nations might get out of hand, start a war, or—short of this—encourage nonweapons states to go nuclear. As the NPT's framers saw it, the best way to prevent this would be to agree to total nuclear disarmament, while mutual nuclear deterrence at very low levels of nuclear armament among nations would be second best. Indeed, smaller nations might prefer to acquire their own nuclear forces rather than allow an ever-escalating and threatening nuclear arms race between the major nuclear states go unchallenged or have to depend on unreliable superpower guarantees of nuclear security alliance.

From this perspective, asking states without nuclear weapons to forgo acquiring nuclear weapons is asking them to forgo exercising a "right" that could be in their national security interest. As such, forswearing nuclear weapons required a quid pro quo: encourage the superpowers to take "effective measures" to end the nuclear arms race and facilitate the fullest possible transfer of civilian nuclear technology (which the nuclear powers gained by developing weapons) from the nuclear haves to the nuclear have-nots.

Such deal making, however, is unnecessary if one focuses on the security concerns highlighted in the Irish's original United Nations (UN) resolution of 1958. Curbing the threat of accidental and catalytic nuclear war would be a good that both states with and without nuclear weapons would benefit from—a good worth subordinating all other aspects of the NPT to achieve and having effective (and even discriminatory) safeguards to achieve.

This, then, is the challenge facing today's supporters of the NPT. They must recognize that there are two different ways to interpret the treaty: through the lens of the Irish resolutions (i.e., Articles 1, 2, and—arguably—3) or through the articles that follow. For the policymaker, making this choice is critical to determining just how viable the NPT is likely to be and what, if anything, remains to be done.

To choose wisely requires an understanding of what sort of proliferation threat the NPT was originally intended to address; how and why this original concern was largely displaced by

the new concerns noted above; how much of a tension between these views remained at the time of the NPT's signing in 1968; and which of these views makes more sense today. In short, we must go back to NPT's origins.

1958–65: The Irish Resolution and Preventing Catalytic Nuclear War and the Further Spread of Nuclear Weapons

Although the proliferation of nuclear weapons is now synonymous with the spread of know-how, nuclear materials, and specialized equipment to rogue states such as Iran, this was not the central worry animating those who first suggested the need for an international nonproliferation agreement in the late 1950s. Instead, their concern was the actual and proposed American transfers of nuclear weapons to Germany and the North Atlantic Treaty Organization (NATO).

Starting with the Eisenhower administration in 1953, the US began to deploy nuclear artillery in Europe for use by NATO forces under a "dual key" control arrangement. The US had custody of the nuclear-artillery warheads, while US and NATO armies had nuclear-capable artillery tubes integrated into their ground forces. If an occasion arose when the US president deemed use of the nuclear artillery necessary, he could order the release of the nuclear warheads to the NATO commander, and the commander of the NATO ally would give authority to release use of the nuclear-capable artillery tubes. Following this model, the US was able to deploy nuclear weapons not only to NATO ground forces but to US and allied air forces in Europe without losing control of the weapons themselves.

Unfortunately, Warsaw Pact members and the world's neutral powers believed that US authority over these weapons was less than complete. In 1956 and 1957, the Soviet Union was so concerned about the US's stationing of nuclear weapons in Germany that it proposed a ban on the employment of nuclear weapons of any sort in Central Europe.[2] The US, meanwhile, submitted a draft disarmament plan before the UN Disarmament Commission in which transfer of control

of US nuclear weapons to NATO allies was permitted if their use was necessary to fend off an armed attack.[3]

In 1958 concern with controls over such nuclear transfers was heightened further when the US Congress passed an amendment to the US Atomic Energy Act that permitted the transfer of weapons materials, design information, and parts to nations that had "made substantial progress in the development of nuclear weapons."[4] Also, with the continued transfer of nuclear weapons to NATO, US control arrangements became less rigid: one congressional investigation discovered German aircraft that were fueled, ready to take off at a moment's notice, and loaded with US nuclear weapons.[5]

This trend toward laxer US restraints on authority for the transfer of nuclear weapons came at the same time as progress toward disarmament negotiations in the UN had reached an impasse. The US and the Soviet Union had agreed to a voluntary moratorium on nuclear testing in the fall of 1958, but the US and its allies tied their continued adherence to this test ban to progress toward disarmament and a general easing of tensions. Last, but hardly least, the US had threatened or considered using nuclear weapons on at least six separate occasions since Eisenhower had assumed the presidency in 1953.[6]

Against this backdrop, the Irish offered their draft resolution concerning the "Further Dissemination of Nuclear Weapons" before the First Committee of the General Assembly of the UN on 17 October 1958. This resolution was quite modest, recognizing that "an increase in the number of states possessing nuclear weapons may occur, aggravating international tensions" and making disarmament "more difficult." It went on to recommend that the General Assembly establish an ad hoc committee to study the dangers inherent in the further dissemination of nuclear weapons.

The Irish offered to amend the resolution to urge parties to the UN's disarmament talks not to furnish nuclear weapons to any other nation while the negotiations were under way and to encourage other states to refrain from trying to manufacture nuclear weapons, but Western support for the amendment was thin. On 31 October 1958, the Irish withdrew the

resolution when it became clear that no NATO nation was yet ready to endorse the initiative.[7]

The Irish, however, pursued the idea. The following year their foreign minister resubmitted yet another version of the resolution to the General Assembly and made it clear that the proposal was a minimal proposition which all parties ought to accept. It was "hardly realistic," he argued, to expect any "early agreement on the abolition of nuclear weapons." But "what we can do," he argued, "is to reduce the risks which the spread of these weapons involves for this generation, and not to hand on to our children a problem even more difficult to solve than that with which we are now confronted." Indeed, the Irish foreign minister argued that "if no such agreement is made, they [the nuclear powers] may well be forced by mutual fear and the pressure of their allies, to distribute these weapons, and so increase geometrically the danger of nuclear war."[8]

Why was such nuclear proliferation so dangerous and likely? First, without an international nonproliferation agreement, "a sort of atomic *sauve-qui-peut*" was likely in which states, "despairing of safety through collective action," would seek safety for themselves by getting nuclear weapons of their own.[9] This trend was likely to get worse, the Irish argued, since there was "no conceivable addition" to the list of countries possessing nuclear weapons which would not cause a change in the pattern of regional and world politics that could be "great enough to destroy the balance of destructive weapons . . . which has given the world the uneasy peace of the last few years."[10] As the Irish foreign minister later explained,

> the sudden appearance of nuclear weapons and their almost instantaneous long-range delivery systems in a previous nonnuclear state may be tantamount, in the circumstances of the world today, to be pushing a gun through a neighbor's window. . . . It may even be regarded as an act of war by neighboring countries who have not the second strike nuclear capacity possessed by great nuclear powers [who] may be able to eliminate the threat by taking limited measures.[11]

Second, faced with these threats, nations without nuclear weapons would try to acquire them from their nuclear-armed allies, who, out of a misguided sense of political convenience, were likely to be cooperative. All this would do, however, is give these smaller nations "the power to start a nuclear war, or to

engage in nuclear blackmail—conceivably against a former ally." In short, without an international agreement against further transfers of nuclear weapons, accidental and catalytic wars would become more likely, and nations would drift into "a nightmare region in which man's powers of destruction are constantly increasing and his control over these powers is constantly diminishing."[12]

Finally, nuclear weapons technology itself was becoming more available. As the Irish foreign minister explained, weapons-usable plutonium was a direct by-product of nuclear electrical-power reactors, and these generators were being built in states without nuclear weapons. It would become increasingly difficult, he believed, for the governments of these countries to "resist domestic pressure to take the further step of producing nuclear weapons [on the] grounds of economy and security, if not for considerations of prestige."[13]

These considerations were all factored into the original bargain inherent in the Irish resolution. The states with nuclear weapons would forgo relinquishing control of their weapons to their allies, and states without nuclear weapons would refrain from manufacturing or acquiring them and accept inspection of their "reactors and territories" to ensure that they were living up to their undertakings. This was the full extent of the bargain. All states—with or without nuclear weapons—would be better off because the possibility of accidental or catalytic war would be reduced. Beyond this, nonweapons states would be spared the expense of having to develop strategic weapons, and the weapons states would have less reason to advance the qualitative development of their own strategic systems.

The Irish insisted on no direct linkage with progress on capping or reversing the arms rivalry between Moscow and Washington. Nor was there any notion that the nuclear nations should offer "peaceful" nuclear technology to the nonweapons states to get them to open their territories to inspection. In fact, as the Irish foreign minister later made clear, nonweapons nations ought to welcome having their nuclear facilities inspected or, at least, not object since they might later serve as arms control test beds. Nor, he argued, should the inequity of nonweapons states opening their

nuclear facilities to inspections (from which nuclear states would be exempt) be seen as involving any "loss of prestige." After all, several nonweapons states had already endorsed the idea of regional disarmament and European nuclear-weapons-free zones that required asymmetrical inspections. Nonproliferation inspections were only an extension of the same idea.[14]

The US and other states with nuclear weapons, however, initially had misgivings about the Irish resolutions. As has already been noted, most NATO nations abstained when the Irish resolution was first put to a vote in 1958. In 1959, though, the Soviet Union also opposed the resolution, complaining that it was too permissive: it would allow the US to transfer nuclear weapons to European soil so long as the US "retained control" of the weapons. Meanwhile, France abstained, arguing that the transfer of fissionable materials and nuclear weapons was difficult to control and that the real problem was ending manufacture of these items. At the time, France was itself getting ready to test its first nuclear weapon and was assisting the Israelis in their nuclear weapons efforts.[15]

As for the US, it supported the 1959 Irish resolution after abstaining in 1958, arguing that it permitted serious study of critical issues. Yet, when the resolution was modified in 1960 to call upon the weapons states to declare at once their intention to "refrain from relinquishing control of such weapons to any nation not possessing them and from transmitting to it the information necessary for their manufacture," the US again objected. Although the Soviets decided to reverse themselves and support the draft, the US at the time was pushing the idea of giving NATO nuclear submarine missile boats for a multilateral force (MLF). As such, the US representative to the UN complained that the resolution failed to recognize the critical responsibility of the nations with nuclear weapons. The US representative went on to ask how the Irish could expect other nations to forgo nuclear weapons if the weapons states refused to end their own nuclear buildup. Besides, he argued, a commitment of indefinite duration of the sort the resolution called for was unverifiable.[16]

The US again objected in 1961, when the Swedes resubmitted a similar resolution recommending that

> an inquiry be made into the conditions under which countries not possessing nuclear weapons might be willing to enter into specific undertakings to refrain from manufacturing or otherwise acquiring such weapons and to refuse to receive, in the future, nuclear weapons in their territories on behalf of any other country.[17]

The resolution's new language worried the US. The resolution was no longer focused on restraining weapons nations from "relinquishing control" of nuclear weapons but on getting nonweapons nations to refuse receiving nuclear weapons in their territories. In short, it appealed to all of NATO to stop hosting US nuclear weapons. This point was hardly lost on the Soviets, who immediately incorporated the Swedish language (i.e., "refrain from transferring control [and] refuse to admit the nuclear weapons of any other states into their territories") into their own draft treaty for general and complete disarmament in 1962.[18]

The US objected to the Swedish resolution, complaining that it effectively called "into question the right of free nations to join together in collective self-defense, including the right of self-defense with nuclear weapons if need be." Yet, the US representative was equally insistent that the US supported the goal of nonproliferation. His proof was that the US draft program for general and complete disarmament—like the Irish resolution—required states with nuclear weapons to "refrain from relinquishing *control*" (emphasis added) of nuclear weapons to nonweapons states.[19]

1965–68: Bargaining to Keep States from Exercising Their "Right" to Acquire Nuclear Weapons

For the next four years, the US continued to insist that it was interested in promoting nuclear nonproliferation.[20] However, it opposed a variety of nonproliferation resolutions backed by the Soviets, Swedes, and others, which, if accepted, would have jeopardized existing nuclear-sharing arrangements with NATO or the possibility of creating a multilateral nuclear force for a

"United States of Europe." Ultimately, the US focused on reaching an international nuclear nonproliferation agreement only when it became clear that Germany and other NATO nations were not keen on reaching an MLF agreement. With the MLF disposed of and the Soviets willing to accept language that would allow the US to deploy nuclear weapons in NATO—assuming they were kept under US control—the US was ready to negotiate a nonproliferation agreement.[21]

By early 1966, though, the terms of UN debate over proliferation had changed. Whereas in 1958, nonproliferation was seen as a good in itself—equally beneficial to states with and without weapons—by the early 1960s, smaller nations perceived nuclear nonproliferation as a potential obstacle to assuring their national security, while the US and Soviet Union continued to refine and expand their own nuclear arsenals.

Another key difference in the debate was how nations viewed superpower nuclear deterrence. In 1959 the Irish downplayed the threat presented by nuclear superpower rivalry: "That situation, fraught with danger as it is, is nonetheless one with which we have managed to live for a number of years. Techniques have been evolved to deal with it." The key concern wasn't with this set of dangers but with those "likely to flow with the wider dissemination of nuclear weapons."[22]

By the mid-1960s, however, faith in the stability of the superpower nuclear "balance" and concerns about the threat of accidental and catalytic war had begun to wane. In their place, worries about the superpower "arms races" and the threat of the superpowers' "nuclear imperialism" over non-nuclear nations gained popularity. As India's UN representative explained in 1966,

> [the] dangers of dissemination and independent manufacture [of nuclear weapons] pale into the background when one views the calamitous dangers of the arms race which is developing today as a result of the proliferation of nuclear weapons by the nuclear weapon Powers themselves, large and small. For many years now, the superPowers have possessed an over-kill or multiple-destruction capacity and even their second-strike capabilities are sufficient to destroy the entire world. They have hundreds of missiles of varying ranges which are capable of devastating the surface of the earth. They

> are continuing to test underground, miniaturizing warheads, improving penetration capabilities and sophisticating their weapons and missiles. The other nuclear weapons powers are also following the same menacing path, conducting atmospheric weapons tests, proceeding from manned-bomber delivery systems to missile systems and submarines. Only four days ago, the People's Republic of China conducted yet another weapons test, firing an intermediate-range guided missile with a nuclear warhead. When we talk of the dangers of the arms race, therefore, we face the dangers of the most titanic proportions. It is here that the proliferation of nuclear weapons has its most catastrophic consequences.[23]

Egypt's representative to the UN disarmament talks made the same point somewhat differently:

> The nonnuclear countries will in law renounce their right to nuclear weapons, but nuclear stockpiles and the threat of a nuclear confrontation will in fact continue to exist indefinitely. . . . This de facto situation could always constitute an incitement to manufacture or acquire nuclear weapons. To diminish this risk still further it will be necessary, pending the complete elimination by radical measures of nuclear stockpiles and the nuclear threat, to include in the treaty a formal and definite indication of what the nuclear Powers propose to do with the existing nuclear armament.[24]

Why did this shift occur? First, nonnuclear nations who were eager for a nonproliferation treaty in the very early 1960s but frustrated by the impasse created by the Soviet Union, US, and NATO nations over the issue decided to work without the superpowers' cooperation. As has already been noted, in 1961 the Swedes submitted a resolution before the UN General Assembly calling for an inquiry as to the conditions under which nonweapons states might be willing to refrain from acquiring nuclear weapons. The idea here was to force the nuclear states' hand by demonstrating the popularity of nuclear nonproliferation and threatening to promote it without the superpowers. However, the very premise of the inquiry—that nonweapons nations would naturally acquire nuclear weapons unless certain "conditions" were met—was at odds with the idea that nonproliferation was equally a security imperative for both weapons and nonweapons states.

Second, beginning in the late 1950s, an intellectual shift occurred in the way nuclear arms and deterrence were viewed. During this period, a new nuclear theory—finite deterrence—emerged. According to this view, smaller nations could keep

larger nuclear powers from threatening them militarily by acquiring a small number of nuclear weapons of their own. With their limited nuclear arsenal, the smaller nations might not be able to prevail in war against a larger power but could effectively "tear an arm off" by targeting the larger nation's key cities and thus deter such nations from ever attacking.[25] Closely related to this point was a critique of the superpowers' constant quantitative and qualitative improvement of their strategic forces. This buildup was considered unnecessary and provocative because a nation needed only a small nuclear arsenal to threaten to knock out an opponent's major cities.[26]

In 1962 this view was reflected in replies to the UN secretary-general's inquiry about the conditions under which nonweapons states "might be willing to enter into specific undertakings to refrain" from acquiring weapons. Sixty-two nations replied, most of them wanting specific neighbors or all the states within their region to forswear acquiring nuclear weapons as a condition for their doing likewise. Other nations, such as Italy, wanted the nuclear powers to halt their nuclear buildup.[27] Meanwhile, the three nuclear powers that answered the inquiry indicated that general and complete disarmament was the best solution.[28]

For the next two years, the debate over the merits of establishing a European MLF made it impossible for the Soviet Union, US, and most NATO nations to reach any agreement over nuclear nonproliferation.[29] At the very least, no progress in nonproliferation seemed likely until moves toward disarmament made progress. The world's nonaligned nonweapons states, on the other hand, were eager to secure a separate nonproliferation treaty and called on the UN to convene an international conference to negotiate such an agreement.[30] In June of 1965, India and Sweden suggested a new approach to the UN Disarmament Commission: a nonproliferation agreement combined with measures that would begin to cap the arms race between the superpowers. Italy also suggested imposing a time limit on the nonnuclear nations' agreement to refrain from acquiring nuclear weapons. Advocates of this limit—a threat of coercive leverage *in potentia*—argued that it would serve as an "inducement" to the superpowers to disarm. With

support from the world's nonaligned nations, the resolution passed overwhelmingly.[31]

From this point on, the debate over reaching a nuclear nonproliferation agreement presumed that nonweapons nations had a right to acquire nuclear weapons and that the only question was what they should get in exchange for not exercising it. Each nation expressed this right in a different fashion. For China, it was essential that nonnuclear nations not be "deprived of their freedom to develop nuclear weapons to resist US-Soviet nuclear threats."[32]

For Brazil, the prerogative of nonnuclear nations to go nuclear was nothing less than their right to self-defense. As Brazil's representative explained,

> if a country renounces the procurement or production by its own national means of effective deterrents against nuclear attack or the threat thereof, it must be assured that renunciation—a step taken because of higher considerations of the interests of mankind—will not entail irreparable danger to its own people. The public could never be made to understand why a government, in forswearing its defense capability, had not at the same time provided reasonable and lasting assurances that the nation would not be, directly or indirectly, the object of total destruction or of nuclear blackmail.[33]

For Brazilians this meant that any nuclear nonproliferation agreement had to include guarantees that states with nuclear weapons would not use or threaten to use them against states without such weapons.

Other states, however, thought that nothing less than nuclear disarmament was necessary. Tunisia, like Brazil, was "not happy about renouncing [its] right to acquire nuclear weapons" but thought that it was too poor ever to try to acquire them and thus could be truly secure only in a disarmed world.[34] Sweden, which was still developing a nuclear weapons option of its own,[35] shared Tunisia's views but saw giving up "the most powerful weaponry that has ever been produced by man" as something it—as one of the "smaller and more defenseless nations"—could do only if the superpowers disarmed.[36]

India, which was also developing a nuclear weapons option,[37] was the most outspoken in defending its "right" to "unrestricted" development of nuclear energy. This stance, in

part, was simply a reflection of India's established opposition to international safeguards, which—it had argued since the early 1950s—would interfere with its economy's development and its "inalienable right [to] produce and hold the fissionable material required for [its] peaceful power programs."[38] After China exploded its first nuclear device in May of 1964, though, protecting this right became even more imperative. As the Indian minister of external affairs explained in 1967,

> most of the countries represented at the disarmament committee appreciated India's peculiar position with regard to the nonproliferation treaty. . . . China would be a nuclear state which would not be called upon to undertake any obligations. India could have become a nuclear country if it had exploded the bomb as China did. But because India had shown restraint, a desire for peace, and opposition to the spread of nuclear armaments, under this treaty it would find itself in a much worse position than China. . . . The result of our restraint is that we are a nonnuclear power which will have to suffer all the disadvantages. On the other hand, China, which has shown no restraint, will not suffer from any disadvantage even if it signs the treaty, as it is already a nuclear power.[39]

What were the Indians talking about? The minister of external affairs left little doubt that they were referring to every nuclear "advantage" the weapons nations enjoyed—including nuclear testing. After all, he noted, the draft nonproliferation treaty would "seriously hamper and impede" peaceful nuclear research since it would prevent nonnuclear countries from undertaking underground explosions for the purpose of carrying out nuclear research while imposing no such obligation on states with nuclear weapons.[40] The ability to produce weapons-usable materials free from intrusive and discriminatory international safeguards and the freedom to develop all aspects of nuclear energy—including nuclear explosives, the minister continued—was critical to secure India's "sovereign right of unrestricted development" of nuclear energy.[41]

If it were just India making these arguments, they might be dismissed as being peculiar to a nation "exposed to nuclear blackmail."[42] Yet, Brazil's representative shared India's views, arguing that

> nuclear energy plays a decisive role in [the] mobilization of resources. We must develop and utilize it in every form, including the explosives

> that make possible not only great civil engineering projects but also an ever-increasing variety of applications that may prove essential to speed up the progress of our peoples. To accept the self-limitation requested from us in order to secure the monopoly of the present nuclear-weapon powers would amount to renouncing in advance boundless prospects in the field of peaceful activities.[43]

At the time, Brazil was developing a nuclear weapons option of its own.[44]

It would be wrong, however, to dismiss Brazil's and India's interest in peaceful nuclear explosives (PNE) and sensitive nuclear activities as a cynical move. The US, after all, had been touting the possible advantages of PNEs since the early 1960s as why it opposed reaching a comprehensive nuclear test ban with the Soviets. The US also was enthusiastic about the need to develop fast-breeder reactors that would use reprocessed plutonium fuels.[45] Thus, Nigeria, Mexico, and Ethiopia, who had no nuclear programs, were every bit as insistent as India and Brazil that any treaty on nonproliferation not place them "in a position of perpetual inferiority in any field of knowledge."[46] Nigeria's recommendation to solve this problem was

> that non-nuclear weapons powers would not only have nuclear explosives, through an international organization, for their peaceful projects but also have opportunities for their scientists to develop to the full their intellectual capabilities in all fields, including that of nuclear-explosive technology.[47]

These nations were just as adamant that whatever international safeguards the NPT required not interfere with their development of new power reactors and fuels. In this, they were joined by Japan and Germany, who feared that the US and Soviet Union would sue the NPT's safeguard provisions to steal industrial nuclear secrets from their civil nuclear programs. As Germany's foreign minister explained in 1967,

> The unhindered civilian utilization of the atom is a vital interest of the Federal Republic. . . . It is known that German scientists are working with the prospect of success on the development of the second generation of reactors, the so-called fast breeders. . . . We go on the assumption that the placing into effect of controls does not interfere with the economic operations of factories, does not lead to the loss of production secrets, but counters the dangers of misuse. For this purpose it is adequate to control the end-product points, and to have a

control which possibly could be exercised by automated instruments.[48]

Germany's foreign minister argued that nations like his own were already apprehensive of states with nuclear weapons trying to monopolize the civilian nuclear field by dint of their commanding lead in military nuclear technology.[49] At least as great a worry, he argued, was the extent to which inspections under the proposed NPT might compromise the pace and commercial confidentiality of civil nuclear developments by nonweapons states.

In the end, the NPT's preamble and Article 3 stipulated that nations like Germany could meet their safeguards obligations through somewhat less threatening but "equivalent" procedures under EURATOM (Western Europe's nuclear safeguarding organization), that inspections would be restricted to monitoring the flows of source and fissionable materials at "certain strategic points," and that they would be designed "to avoid hampering the economic or technological development of the Parties."

The NPT also emphasized in Articles 4 and 5 that nothing in the treaty should be "interpreted as affecting the inalienable right of all the Parties to the Treaty to develop research, production and use of nuclear energy for peaceful purposes without discrimination." Indeed, the treaty called on all parties to "undertake to facilitate [the] fullest possible exchange of equipment, materials and technological information for the peaceful uses of nuclear energy." The treaty established procedures for sharing the benefits of peaceful nuclear explosives, although it prohibited the direct transfer of explosive devices to or development by nonweapons states.

Finally, in Article 6 the treaty called on the weapons states to "pursue negotiations in good faith on effective measures relating to the cessation of the nuclear arms race at an early date and to nuclear disarmament." Even the Italians' suggestion to leverage the superpower nuclear reductions (i.e., six months before the end of a fixed duration, nations could give notice of their intent to withdraw from the treaty) was retained after a fashion in Article 10. The six-month option was rejected along with Nigerian demands that the NPT explicitly empower members to withdraw if the treaty's disarmament aims were "being frustrated."[50] But it was agreed

that the treaty would not be of indefinite duration. Instead, it would last 25 years and be reviewed as to whether or not it should be extended and, if so, how. As the Swiss noted, it was "preferable" that the treaty be "concluded for a definite period" so as to avoid "tying" the hands of nonweapons states who could not be expected to wait indefinitely on the weapons states to disarm.[51] Thus, any party to the treaty, under Article 10, retained the right to withdraw if it "decides that extraordinary events, related to the subject matter of this treaty, have jeopardized the supreme interests of its country."[52]

Which Past as Prologue?

Reading the NPT today, one can easily forget that the original bargain of the Irish resolutions of the late 1950s and early 1960s is present in the final version of NPT. Indeed, Articles 1 and 2, which prohibit the direct or indirect transfer and receipt of nuclear weapons, nuclear explosives, or control over such devices, read very much like the original Irish resolutions themselves. In Article 3, the treaty also calls on parties to accept and negotiate a system of safeguards that would prevent "diversion of nuclear energy from peaceful uses to nuclear weapons or other nuclear explosive devices." Finally, the treaty makes it clear in Article 4 that parties to the NPT could exercise their right to develop peaceful nuclear energy only "in conformity with Articles I and II."

Nor did the NPT's framers abandon their original concerns about the threat of catalytic or accidental nuclear war. The Germans in 1967, for example, defended the NPT aims "because it is frightening to think what would happen if possession of nuclear weapons were spread chaotically through the world, if some adventurous state were one day irresponsibly to use such a weapon." Echoing this view, Germany's foreign minister argued that "even only one additional nuclear power would start a chain reaction that would be hard to control."[53] The Canadians made essentially the same point, arguing that some discrimination against nonweapons states was "the only alternative to allowing the continued spread of nuclear weapons . . . and such a process

in the end would have no other result than nuclear war . . . on the greatest scale."[54] The British representative to the General Assembly was just as emphatic:

> We are concerned not only that new possessors of nuclear weapons may employ them against each other, or against a non-nuclear state; we see an even greater danger in the possibility that the use of nuclear weapons by a third country could precipitate a war which would end in a nuclear exchange between the two so-called Superpowers. In our view, and I would think in that of the Soviet Union as well, each additional nuclear power increases the possibility of nuclear war, by design, by miscalculation, or even by accident.[55]

Competing against these concerns, however, was the view expressed by the Indian delegation

> that further proliferation is only the consequence of past and present proliferation and that unless we halt the actual and current proliferation of nuclear weapons, it will not be possible to deal effectively with the problematic danger of further proliferation among additional countries.[56]

This alternative view, along with the idea that nonnuclear nations had inalienable rights to develop civilian nuclear energy and to withdraw from the NPT (and thus acquire nuclear weapons legally) if the superpowers did not disarm (or their security interests were at serious risk), became the NPT consensus view and was captured in Articles 4, 5, 6, and 10 as well as most of the NPT's preamble.

Articles 1 and 2, in contrast, reflected the original bargain of the Irish resolutions, which were concerned about the threat of accidental and catalytic nuclear war, whereas the NPT's other articles (with the possible exception of Article 3) generally reflected the finite deterrence theorizing of the time.

The problem is that these two views are at odds. Certainly, it's difficult to argue that the further spread of even small numbers of nuclear weapons to other nations will significantly increase the risk of accidental or catalytic nuclear war, and at the same time recommend that nonweapons states threaten to acquire such weapons to get weapons states to limit their own nuclear arsenals. Yet, this is precisely the tension present in the negotiations leading up to the NPT and is reflected in the treaty's text (i.e., Articles 1, 2, 6, and 10).

More important, this tension continues to be reflected in the debate over what constitutes "peaceful" nuclear development in conformity with Articles 1 and 2 under Article 4. Nations who subscribed to the notion that the superpower arms race was a key cause of horizontal proliferation believed that nonweapons states deserved access to any and all civilian nuclear energy transfers to compensate them for their restraint and to assure them equal access to technology that the states with nuclear weapons already had.

For most of these nations, any civilian nuclear transfer made under safeguards was automatically "in conformity with Articles I and II." Indeed, for the Dutch, Belgians, and Luxembourgians—and, at times, even the Americans—the line between safeguarded and unsafeguarded activities under the NPT was, as one nonproliferation expert recently noted, "quite bright."[57] In May of 1968, the representative of the Netherlands government, for example, urged the superpowers to live up to their disarmament obligations under Article 6 and explained that the obligation of nonweapons states to forgo the acquisition of nuclear weapons should "in no way" restrict their access to civil nuclear technology:

> My delegation interprets Article I of the draft treaty to mean that assistance by supplying knowledge, materials and equipment cannot be denied to a non-nuclear-weapon State until it is clearly established that such assistance will be used for the manufacture of nuclear weapons or other nuclear devices. In other words, in all cases where the recipient parties to the treaty have conformed with the provisions of Article III, there should be a clear presumption that the assistance rendered will not be used for the manufacture of nuclear weapons and other explosive devices.[58]

The Americans were just as insistent that "peaceful applications of energy derived from controlled and sustained nuclear reactions—that is, reactions stopping far short of explosion [had] nothing to do with nuclear weapons" and, thus, development of such applications would not be affected by the NPT's prohibitions.[59]

Yet, other evidence indicates that the NPT's framers felt uncomfortable about obligating the nuclear powers to provide any and all forms of nuclear-energy technology or materials, save nuclear explosives themselves. In the final debates over

the NPT, Spanish and Mexican attempts to create a duty on the part of the nuclear haves to provide nuclear-energy aid to the nuclear have-nots and to reference "the entire technology of reactors and fuels" in the NPT's text were rejected.[60] This rejection, it has been argued, suggests that the NPT's framers understood that some forms of civil nuclear energy (e.g., weapons-usable nuclear fuels and their related production facilities) were so close to bomb making that sharing them might not be in "conformity" with Articles 1 and 2.

More important, safeguarding such dangerous activities and materials was probably impossible. Certainly, inspections that lived up to Article 3's requirement to "avoid hampering" nations' "technological development" and that remained in accordance with the NPT's concern—registered in its preamble—of focusing on the "flow" of source and special fissionable materials at "certain strategic points" would have difficulty accounting for significant quantities of weapons-usable materials at enrichment and reprocessing facilities, at reactors that used weapons-usable fuels, and at their respective fuel-fabrication plants. Nor would timely warning of diversions be likely. As ostensible "safeguards," such materials and activities would only mask the probable transfer or acquisition of nuclear weapons and thus violate the NPT's prohibitions in Articles 1 and 2 and Article 3's stricture that safeguards serve the purpose of verifying member nations' fulfillment of their NPT obligations.[61]

It would be nice if the NPT's negotiating record could settle such disputes. Unfortunately, it only raises them. Indeed, tension between the first three articles and those that follow in the NPT still exists today. Unaligned nations such as Indonesia and Mexico still argue that weapons states must go much further in reducing their nuclear arsenals and in sharing the benefits of peaceful nuclear energy to keep nonweapons states from abandoning the NPT. And the issue of just what constitutes effective safeguards under the treaty for trouble nations such as North Korea, Libya, Iran, Algeria, and Iraq and for dangerous nuclear activities such as reprocessing in Japan is as much a concern as ever.

A number of things, however, have changed since 1968. Instead of a superpower rivalry, only one superpower

remains—the United States. Rather than an ever-escalating nuclear arms race, the US and former Soviet republics are cooperating in reducing the number of nuclear weapons.

As for the promised benefits of peaceful nuclear power, these too seem less compelling. Certainly, few—if any—nations now believe that PNEs promise any economic benefits. The US, India, and Russia—the only nations to experiment with such devices—no longer use them, and even Brazil and Argentina, who initially rejected the NPT because it would not allow them to acquire such devices, have renounced their development. Economically viable nuclear electricity, meanwhile, has been limited to uranium-fueled thermal reactors operating only in the most advanced economies of North America, Europe, and East Asia. The economical use of weapons-usable plutonium or mixed-oxide fuels in thermal or fast reactors is, at best, still many decades away.[62]

Meanwhile, the security dangers of certain types of civilian nuclear power and of reactor development in certain regions have become all too apparent. Iraq, Iran, North Korea, and Algeria all have nuclear energy programs that are monitored by the IAEA. Yet, all harbor a desire to develop nuclear weapons and have attempted to evade IAEA inspections and proper import procedures. It is unclear if even special IAEA inspections could provide sufficient warning of dangerous activities in these politically turbulent nations.[63] IAEA monitoring of plutonium fabrication and reprocessing activities in such stable nations as Japan has also been criticized as being dangerously deficient. In fact, the amount of weapons-usable materials produced by such plants threatens to exceed the amount of fissile material present in the arsenals of weapon states.[64]

Finally, there is a newfound awareness that finite deterrence and the supposed stability that might come from threatening to attack an opponent's cities are nowhere near as sound as once supposed—either in theory or practice. The release of new information on the cold war suggests that nuclear deterrence even between the superpowers was anything but automatic or guaranteed. Indeed, a nuclear incident in Cuba and/or possible war over intermediate-range nuclear force

(INF) deployments in Europe was far more likely than many people imagined.[65]

Nor has finite deterrence proved to be as cheap or easy as originally promised. In the case of the French—the original innovators of finite deterrence—developing and maintaining a *force de frappe* has required spending billions of dollars annually to field several generations of strategic forces that have never seemed quite credible (or survivable enough) to other members of NATO—even against a limited Soviet attack. Smaller nations aiming to deter their near-nuclear neighbors or existing weapons states are likely to face similar challenges that proportionally will be at least as stressful.

These developments, of course, do not change the NPT's negotiating history. But they do suggest the relative risks of emphasizing NPT framers' concerns of the late 1960s over those they originally had in 1958. More important, by focusing on the NPT's original concerns, we are more likely to correct for its current deficiencies, which are themselves rooted in views that were all too popular at the time of its signing. Indeed, how well we focus on these concerns today will determine what worth the NPT will have in the decade ahead.

Notes

1. See, for example, Frank Barnaby and Shaun Burnie, *The Nonproliferation Treaty: A Critical Assessment* (Amsterdam, the Netherlands: Greenpeace International, 17 January 1994).

2. See "Soviet Proposal Introduced in the Disarmament Subcommittee: Reduction of Armaments and Armed Forces and the Prohibition of Atomic and Hydrogen Weapons, May 18, 1957," in US Department of State, *Documents on Disarmament, 1945–1959* (Washington, D.C.: Government Printing Office, 1960), 756–57.

3. Ibid. See "Western Working Paper Submitted to the Disarmament Subcommittee: Proposals for Partial Measures of Disarmament, August 29, 1957," in *Documents on Disarmament, 1945–1959*, 870.

4. The Atomic Energy Act of 1954, US Code secs. 54, 64, 82, 91(c), 92 as amended (1954).

5. See George Bunn, *Arms Control by Committee: Managing Negotiations with the Russians* (Stanford, Calif.: Stanford University Press, 1992), 62.

6. The Eisenhower administration had threatened to use or considered using nuclear weapons to end the Korean War in 1953, to save the French in Vietnam in 1954, to save the Republic of China in 1954, 1955, and 1958, and to prevent any invasion of Kuwait in 1958. Atomic howitzers also were

deployed by US forces landing in Lebanon in 1958. The Russians, meanwhile, threatened the use of nuclear weapons to end the Suez crisis in 1956. See Peter Lyon, *Eisenhower: Portrait of the Hero* (Boston: Little, Brown and Company, 1969), 534, 541, 583, 606, 610, 624, 639–40, 719, 775–76, 784.

7. The resolution initially passed with 37 affirmative votes, but 44 nations—including the US, United Kingdom, Italy, Japan, France, Greece, Belgium, Turkey, and the Netherlands—abstained. See "Irish Draft Resolution Introduced in the First Committee of the General Assembly: Further Dissemination of Nuclear Weapons, October 17, 1958," in *Documents on Disarmament, 1945–1959,* 1185–86.

8. See "Address by the Irish Foreign Minister [Aiken] to the General Assembly, September 23, 1959 [extract]," in ibid., 1474–78.

9. Ibid.

10. See "Statement by the Irish Foreign Minister [Aiken] to the First Committee of the General Assembly, November 13, 1959," in ibid., 1520–26.

11. See "Statement of Irish Foreign Minister [Aiken] to the First Committee of the General Assembly, November 6, 1962," in US Arms Control and Disarmament Agency, *Documents on Disarmament, 1962* (Washington, D.C.: Government Printing Office, 1963), 1025–28.

12. See "Statement by the Irish Foreign Minister, November 13, 1959," in *Documents on Disarmament, 1945–1959,* 1520–26. In this speech, Foreign Minister Aiken attributes these views to Howard Simons, "World-Wide Capabilities for Production and Control of Nuclear Weapons," *Daedalus* 88, no. 3 (Summer 1959): 385–409, which was a summary of "The Nth Country Problem: A World-Wide Survey of Nuclear Weapons Capabilities," a study by the American Academy of Arts and Sciences, which would be published by the National Planning Association in 1959.

13. "Statement by the Irish Foreign Minister, November 13, 1959," in *Documents on Disarmament, 1945–1959,* 1520–26.

14. See "Statement of Irish Foreign Minister . . . November 6, 1962," in *Documents on Disarmament, 1962,* 1025–28.

15. See Lawrence Scheinman, *Atomic Energy Policy in France under the Fourth Republic* (Princeton, N.J.: Princeton University Press, 1965), 183ff.; and Avner Cohen, "Stumbling into Opacity: The United States, Israel, and the Atom, 1960–63," *Security Studies* 4, no. 2 (Winter 1994): 199–200.

16. See United Nations Department of Political and Security Council Affairs, *The United Nations and Disarmament, 1945–1970* (New York: United Nations Publications, 1971), 260–61.

17. The Swedes submitted this resolution, 1664 (16), 4 December 1961. See ibid., 265.

18. Ibid.

19. See "Statement by the United States Representative [Yost] to the First Committee of the General Assembly: Spread of Nuclear Weapons, November 30, 1961," in US Arms Control and Disarmament Agency, *Documents on Disarmament, 1961* (Washington, D.C.: Government Printing Office, 1962), 691–92.

20. See, for example, "Statement by ACDA Director Foster to the Eighteen Nation Disarmament Committee: Nondissemination of Nuclear Weapons, February 6, 1964," in US Arms Control and Disarmament Agency, *Documents on Disarmament, 1964* (Washington, D.C.: Government Printing Office, 1965), 32–33, in which restraint in international nuclear nonproliferation was urged since without it there "would be no rest for anyone . . . no stability, no real security and no chance of effective disarmament." It was also argued that because the acquisition of nuclear weapons by smaller countries would "increase the likelihood of the great Powers becoming involved in what would otherwise remain local conflicts," both the security of weapons and nonweapons states in US eyes was at stake.

21. See Bunn, 66–75.

22. See "Statement by the Irish Foreign Minister, November 13, 1959," in *Documents on Disarmament, 1945–1959,* 1520–26.

23. See "Statement by the Indian Representative [Trivedi] to the First Committee of the General Assembly: Nonproliferation of Nuclear Weapons, October 31, 1966," in US Arms Control and Disarmament Agency, *Documents on Disarmament, 1966* (Washington, D.C.: Government Printing Office, 1967), 679.

24. See "Statement of the Egyptian Representative [Khallaf] to the Eighteen Nation Committee on Disarmament, March 3, 1966," in ibid., 156–57.

25. One of the earliest expressions of this idea can be found in Jacob Viner, "The Implications of the Atomic Bomb for International Relations," in *International Economics: Studies by Jacob Viner* (Glenco, Ill.: Free Press, 1951), 300–309. For the earliest popular presentation of finite deterrence theory, see Pierre M. Gallios, "Nuclear Aggression and National Suicide," *The Reporter,* 18 November 1958, 22–26.

26. See, for example, P. H. Backus, "Finite Deterrence, Controlled Retaliation," US Naval Institute *Proceedings,* March 1959, 23–29; and George W. Rathjens, Jr., "Deterrence and Defense," *Bulletin of the Atomic Scientists,* September 1958, 225–28.

27. In fact, Italy first voiced reservations about agreeing not to acquire nuclear weapons unless the nuclear weapons nations promised to disarm in a NATO gathering held in February of 1962. Later that year, however, it acquiesced and supported a US draft resolution that would allow the use of US weapons by a multilateral NATO naval force. For details, see George Bunn, Roland M. Timerbaev, and James F. Leonard, "Nuclear Disarmament: How Much Have the Five Nuclear Powers Promised in the Non-Proliferation Treaty?" in *At the Nuclear Crossroads: Choices about Nuclear Weapons and Extension of the Non-Proliferation Treaty,* ed. John B. Rhinelander and Adam M. Scheinman (Lanham, Md.: University Press of America, Inc., 1995), 15.

28. See *The United Nations and Disarmament, 1945–1970,* 266.

29. See, for example, the exchange between the Soviet and US representatives to the Eighteen Nation Disarmament Committee, 2 July 1964, in *Documents on Disarmament, 1964,* 241–56.

30. For a review of the nonaligned nations' actions along these lines, see "Statement by the U.A.R. Representative [Fahmy] to the First Committee of the General Assembly: Nonproliferation of Nuclear Weapons, October 22, 1965," in ibid., 485–90.

31. See *The United Nations and Disarmament, 1945–1970*, 269. Italy and others continued to promote this idea through 1967. See, for example, "Statement by the Burmese Representative [Maung Maung] to the Eighteen Nation Disarmament Committee: Nonproliferation of Nuclear Weapons, October 10, 1967"; and "Statement by the Italian Representative [Caracciolo] to the Eighteen Nation Disarmament Committee: Draft Nonproliferation Treaty, October 24, 1967," in US Arms Control and Disarmament Agency, *Documents on Disarmament, 1967* (Washington, D.C.: Government Printing Office, 1968), 463 and 529.

32. See, for example, "Chinese Communist Comment on Draft Nonproliferation Treaty, September 3, 1967," in *Documents on Disarmament, 1967*, 381.

33. See "Statement by the Brazilian Representative [Azeredo da Silveira] to the Eighteen Nation Disarmament Committee: Draft Nonproliferation Treaty, August 31, 1967," in ibid., 370.

34. See "Address by President Bourguiba of Tunisia to the General Assembly, September 27, 1967 [extract]," in ibid., 429.

35. See Steve Coll, "Neutral Sweden Quietly Keeps Nuclear Option Open," *The Washington Post*, 25 November 1994, A1.

36. See "Statement by the Swedish Representative [Alva Myrdal] to the Eighteen Nation Disarmament Committee: Nonproliferation of Nuclear Weapons, October 3, 1967," in *Documents on Disarmament, 1967*, 444.

37. For a brief history of India's nuclear weapons program, see Leonard S. Spector, *Nuclear Proliferation Today* (New York: Vintage Books, 1984), 23ff.

38. See Roberta Wohlstetter, *The Buddha Smiles: Absent-minded Peaceful Aid and the Indian Bomb*, Energy Research and Development Administration, Monograph 3, contract no. (49-1)-3747 (Marina del Rey, Calif.: Pan Heuristics, 30 April 1977), 30–75.

39. See "Extract from News Conference Remarks by the Indian External Affairs Minister [Chagla], April 27, 1967," in *Documents on Disarmament, 1967*, 204–5.

40. Ibid.

41. See "Statement by the Indian Representative [Trivedi] to the Eighteen Nation Disarmament Committee: Nonproliferation of Nuclear Weapons, May 23, 1967," in ibid., 235.

42. Ibid.

43. See ibid.; and "Statement by the Brazilian Representative [Correa da Costa] to the Eighteen Nation Disarmament Committee: Peaceful Uses of Nuclear Energy, May 18,1967," in ibid., 226.

44. For a description of Brazil's attempt to secure a safeguarded military production reactor during this period, see Spector, 236–38.

45. See Albert Wohlstetter et al., *Swords from Plowshares: The Military Potential of Civilian Nuclear Energy* (Chicago: University of Chicago Press, 1979), 85–86; and idem, *Can We Make Nuclear Power Compatible with Limiting the Spread of Nuclear Weapons?* vol. 1-1, *The Spread of Nuclear Bombs: Predictions, Premises, Policies*, ERDA contract no. E(49-1)-3747 (Los Angeles: Pan Heuristics, 15 November 1976), 9–32, 89–108.

46. See, for example, "Statement by the Ethiopian Representative [Zelleke] to the Eighteen Nation Disarmament Committee: Nonproliferation of Nuclear Weapons, October 5, 1967"; and "Statement by the Mexican Representative [Castaneda] to the Eighteen Nation Disarmament Committee: Latin American Nuclear-Free Zone, May 18, 1967," in *Documents on Disarmament, 1967*, 228, 449–50.

47. See "Statement by the Nigerian Representative [Sule Kolo] to the Eighteen Nation Disarmament Committee: Draft Nonproliferation Treaty, August 31, 1967," in ibid., 377. The Germans also shared this view. See, for example, "Statement by Foreign Minister Brandt to the Bundestag: Nonproliferation of Nuclear Weapons, February 1, 1967 [extracts]," in ibid.

48. See "Statement by Foreign Minister Brandt to the Bundestag on Proposed Nonproliferation Treaty, April 27, 1967," in ibid., 211–12.

49. See, for example, "Statement by Foreign Minister Brandt to the Bundestag: Nonproliferation of Nuclear Weapons, February 1, 1967 [extracts]," in ibid., 53.

50. See "Statement by the Nigerian Representative [Sule Kolo] to the Eighteen Nation Disarmament Committee: Draft Nonproliferation Treaty, November 2, 1967 [extract]," in ibid., 557–58.

51. See "Swiss Aide Memoire to the Co-Chairmen of the Eighteen Nation Disarmament Committee: Draft Nonproliferation Treaty, November 17, 1967," in ibid., 573.

52. On the point that this language meant that nonweapons nations might be compelled to withdraw if the weapons states did not live up to their pledge to disarm, see, for example, "Statement by the Swedish Representative [Alva Myrdal] to the Eighteen Nation Disarmament Committee: Nonproliferation of Nuclear Weapons, February 8, 1968"; "Statement by the Ethiopian Representative [Makonnen] to the First Committee of the General Assembly: Nonproliferation of Nuclear Weapons, May 6, 1968"; and "Statement by the Indian Representative [Husain] to the Eighteen Nation Disarmament Committee: Nonproliferation of Nuclear Weapons, February 27, 1968," in US Arms Control and Disarmament Agency, *Documents on Disarmament, 1968* (Washington, D.C.: Government Printing Office, 1969), 45, 293–94, and 116.

53. See "Television Interview with Chancellor Kiesinger: Nonproliferation Negotiations, February 17, 1967 [extract]"; and "Statement by Foreign Minister Brandt to the Bundestag on Proposed Nonproliferation Treaty, April 27, 1967," in *Documents on Disarmament, 1967*, 91 and 215.

54. See "Statement by the Canadian Representative [Burns] to the Eighteen Nation Disarmament Committee: Nonproliferation of Nuclear Weapons, August 3, 1967," in ibid., 315.

55. "Statement by the British Representative [Hope] to the First Committee of the General Assembly, December 14, 1967," in ibid., 458.

56. See "Statement by the Indian Representative [Trivedi] to the Eighteen Nation Disarmament Committee: Nonproliferation of Nuclear Weapons, September 28, 1967," in ibid., 432.

57. See, for example, Eldon V. C. Greenberg, *The NPT and Plutonium: Application of NPT Prohibitions to "Civilian" Nuclear Equipment, Technology and Materials Associated with Reprocessing and Plutonium Use* (Washington, D.C.: Nuclear Control Institute, 1993), 18–19.

58. See "Statement by the Dutch Representative [Eschauzier] to the First Committee of the General Assembly: Nonproliferation of Nuclear Weapons, May 6, 1968 [extract]," in *Documents on Disarmament, 1968*, 295–96.

59. See "Statement by ACDA Director Foster to the First Committee of the General Assembly: Nonproliferation of Nuclear Weapons, November 9, 1966," in ibid., 721.

60. See "Spanish Memorandum to the Co-Chairmen of the Eighteen Nation Disarmament Committee, February 8, 1968," in ibid., 40; and "Mexican Working Paper Submitted to the Eighteen Nation Disarmament Committee: Suggested Additions to Draft Nonproliferation Treaty, September 19,1967," in *Documents on Disarmament, 1967*, 394–95.

61. For this interpretation, see Greenberg; and Arthur Steiner, "Article IV and the 'Straightforward Bargain,' " PAN Paper 78-832-08, in Wohlstetter et al., *Towards a New Consensus on Nuclear Technology*, vol. 2, Supporting Papers, ACDA Report no. PH-78-04-832-33 (Marina del Rey, Calif.: Pan Heuristics, 1977).

62. For the latest economic forecast as to when such fuels might make economic sense, see, for example, Brian G. Chow and Kenneth A. Solomon, *Limiting the Spread of Weapon-Usable Fissile Materials* (Santa Monica, Calif.: RAND, October 1993), 25–54.

63. See David Kay, "Detection and Denial: Iraq and Beyond" (Washington, D.C.: Consortia for the Study of Intelligence, June 1994).

64. See, for example, Chow and Solomon, xiv–xv; and Paul Leventhal, "IAEA's Safeguards Shortcomings—A Critique" (Washington, D.C.: Nuclear Control Institute, 12 September 1994).

65. See, for example, William T. Lee, "The Nuclear Brink That Wasn't—and the One That Was," *The Washington Times*, 7 February 1995, A19.

Chapter 2

The Nuclear Nonproliferation Treaty: Strengths and Gaps

Leonard Weiss

The evolution of a strong nonproliferation ethic in the world is, ultimately, the best stable, long-term tool to prevent the spread of nuclear weapons. Such an ethic can stimulate and is, in turn, stimulated by the creation of international institutions incorporating the notion of nonproliferation at their core. The Nuclear Nonproliferation Treaty (NPT),[1] despite the confused philosophy of its provenance, has become such an institution and has demonstrated its value—especially during the past few years. It remains, however, a flawed institution that requires considerable tending to, including constant efforts to obtain a consensus of its parties concerning evolving interpretations of its provisions in order to maintain its effectiveness as a nonproliferation tool—if not its survival altogether.

One should not be surprised to learn that the treaty is an imperfect nonproliferation instrument. It was created in response to nonproliferation concerns arising from burgeoning nuclear trade accelerated by a misguided Atoms for Peace policy. This trade was promoted aggressively by nuclear policymakers, technocrats, and diplomats whose visions of prosperity, generated by nuclear technology, obscured the very real national and international security problems being created. Those problems, when they emerged, seem to have been viewed as much in terms of the threat to future nuclear commerce as they were in terms of the threat to life. Accordingly, the treaty was designed to endorse and encourage the spread of nuclear technology for peaceful purposes at the same time it was to constrain—indeed prevent—the development and manufacture of nuclear weapons.

The incompatibility of these aims became apparent after the treaty went into effect in 1970 as some nuclear suppliers—

particularly Germany and France (one an NPT party and the other pledged at the time to act as an NPT party)—prepared to export technology and equipment for production of fissionable material, albeit under safeguards administered by the International Atomic Energy Agency (IAEA), to certain countries. These nations either were not NPT parties and were embarked on secret military programs to develop nuclear weapons (Pakistan and Brazil) or were NPT parties whose nonproliferation credentials were suspect at the time (South Korea).

What followed over the next few years (and continues today) was a development of other institutions outside the NPT—a development designed to patch the omissions, ambiguities, ill-conceived constraints, and other flaws in the treaty. Thus, we now have nuclear-supplier agreements, bilateral agreements, national and multinational export controls, national technical means of surveillance and international intelligence links, and positive and negative security assurances to assist us in keeping the nuclear genie in the bottle. These tools, along with the NPT and the associated IAEA safeguards system, are referred to collectively as the nuclear nonproliferation regime. This regime is still evolving in the direction of greater effectiveness but is not yet at the point where any of the states with nuclear weapons would be prepared to put their nuclear arsenals aside with confidence.

Why is this so? And why has it been necessary to create all these auxiliary tools to combat proliferation? What have we learned over the past 25 years that, had we known it in the 1960s, would have enabled us to construct a better NPT and a better safeguards system? In the end, does it matter? That is, would a stronger NPT enable us to rely on it for our security? The following review of the major elements of the treaty seeks to answer these questions.

Articles 1 and 2

Article 1 mandates that each state with nuclear weapons that is party to the treaty may not transfer nuclear weapons or explosive devices or control over such weapons or devices to any recipient, directly or indirectly, and may not in any way assist, encourage, or induce any state without nuclear

weapons to manufacture or otherwise acquire these weapons or other nuclear explosive devices or to obtain control over such weapons or devices. Article 2 prohibits states without nuclear weapons from receiving those things which weapon states are prohibited in Article 1 from giving and specifically prohibits nonweapon states from manufacturing or otherwise acquiring nuclear explosive devices.

The first problem with Articles 1 and 2 is that it is unclear what constitutes "assistance," "encouragement," or "inducement" to a nonweapon state; the second problem is that it is unclear what constitutes "manufacture" of a device; the third problem is that it is unclear what constitutes a nuclear explosive device because no consensus exists on the definition of a nuclear explosion; and the fourth problem is that no prohibition exists regarding a nonweapon state's assisting another nonweapon state with acquiring nuclear weapons.

George Bunn and Roland Timerbaev, two of the negotiators of the text of the NPT, have written on the question of what constitutes "manufacture" and quote the testimony of William C. Foster, chief of the American delegation, before the Senate Foreign Relations Committee: "The construction of an experimental or prototype nuclear explosive device would be covered by the term 'manufacture' as would be the production of components which could only have relevance to a nuclear explosive device."[2] He also makes reference to "activities" by a nonweapon state that would "tend" to put that state in noncompliance with Article 2 if the purpose of those activities was the acquisition of a nuclear explosive device.[3]

In order to allay concerns about how one would determine the purpose of certain fuel-cycle activities that could be either peaceful or weapons-related, Foster added that "neither Uranium enrichment nor the stockpiling of fissionable material in connection with a peaceful program would violate Article II so long as those activities were safeguarded." The reference to safeguards in his statement is immaterial because if a program is indeed peaceful, then there is no violation of Article 2—even if the activity is unsafeguarded. (In that case, the party would be in noncompliance with Article 3, but that is another matter.) This points up a problem that runs throughout the NPT: lack of definitive interpretation. Bunn

and Timerbaev write that the Foster criteria for manufacture have generally been accepted as authoritative interpretations by historians of the NPT negotiations, but the issue of whether all the current parties to the NPT would agree with those interpretations is unclear. It is important to note that until the Iraq situation arose, there was no indication that many of the parties to the NPT viewed the IAEA as an appropriate verification instrument to ensure that nonnuclear weaponization activities weren't being carried out. Indeed, in the past, there were debates over whether IAEA inspectors were obligated to report any untoward activities they observed that were unrelated to the negotiated safeguards agreement (e.g., noting the presence of bomb components such as machined hemispherical metal shells somewhere on the premises).

However, the Iraq situation and South Africa's decision to abandon its nuclear weapons program have allowed the IAEA to put its toe in the water on nonnuclear weaponization activities. In the case of Iraq, the United Nations Special Commission (UNSCOM) provided the agency information regarding the Iraqi program, and in the case of South Africa, the IAEA was invited to examine with full transparency the scope, nature, and facilities of that country's weapon program after dismantlement, including some nonnuclear weapon components. These developments, coupled with the acceptance by NPT members of the IAEA's ability to do "special inspections" in the wake of the Gulf War, constitute a start toward significant reform.

By contrast, one may also note that the US/North Korea Framework Agreement makes no mention of any nonnuclear weaponization activities or the disposition of any weapon components that North Korea may have manufactured, and the IAEA considers North Korea not in compliance with its safeguards obligations because of its failure to allow inspection of two nuclear waste sites. Ostensibly, if North Korea were to allow these inspections and the result were to show that all the plutonium in that country can be accounted for, then IAEA would consider North Korea an NPT party in good standing since there are no other allegations officially pending regarding its NPT commitments.

Since the existence of a North Korean nuclear weapons program is an assumption shared by most observers of the scene, it is hard to believe that *some* weapon components have not been manufactured by North Korea. However, the IAEA apparently will ignore this possible violation of the NPT, at least for the time being, until it can account for all the nuclear material in North Korea.

Another issue concerning manufacture is that of research and development (R&D), particularly design information. In 1975 Japan submitted a paper to the Geneva Disarmament Conference arguing that the NPT does not explicitly prohibit weapons-oriented R&D short of actual production of nuclear explosive devices.[4] In rebuttal, much has been made of a statement made by the drafters during the NPT negotiations that receipt by a nonweapon state of "information on design" of nuclear explosives is barred by virtue of the prohibition on assistance in the "manufacture" of such explosives;[5] however, it is unclear whether this restraint can be extended to prohibit a nonweapon state from doing its own design without external assistance.

It stretches credulity to argue that the Foster criteria bar such activity, based on an assumption that the only purpose of design is to acquire a nuclear explosive device. Some years ago, Los Alamos National Laboratory asked some recently hired young physicists with no weapons background to design a weapon based on the open literature to see if it could be done and thereby to gauge the possible extent of proliferation by this route. The purpose of the activity was not to manufacture nuclear weapons. The treaty's vague language on "manufacture," unless appropriately interpreted, would appear to allow anyone to design weapons, using the Los Alamos experiment and rationale, without violating the treaty. Once again, however, even if the treaty were airtight on this issue, verification of compliance would be virtually impossible.

Evidently, the Foster criteria do not settle the question of what constitutes "manufacturing." Neither do they settle some other important questions that arise from consideration of the safeguards regime. Such consideration will also reflect on the question of what constitutes direct or indirect assistance or

encouragement to manufacture or otherwise acquire nuclear weapons—discussed in a later section.

Article 3

Article 3 has four parts. Article 3.1 begins by requiring non-weapon states to accept safeguards, "as set forth in an agreement to be negotiated and concluded" with the IAEA in accordance with that agency's statute and safeguards system "for the exclusive purpose of verification of the Parties' NPT obligations with a view to preventing diversion of nuclear energy from peaceful uses to nuclear weapons." The remainder of Article 3.1 states that safeguards procedures shall be followed with respect to all source or special fissionable material in all peaceful nuclear activities within the territory of the state, under its jurisdiction, or under its control anywhere.

Although there is nothing in this language explicitly referring to the effectiveness of safeguards, one may infer effectiveness from the context, because the treaty cannot be an effective nonproliferation instrument if it allows equipment, material, and technology that could be used for nuclear explosive purposes to be transferred with ineffective safeguards attached. Unfortunately, this point was not explicitly addressed by the drafters, and the question of the relationship of trade to effectiveness of safeguards (as opposed to the mere attachment of safeguards) has accordingly become a contentious issue.

In their deconstruction of the language of Article 3.1, Bunn and Timerbaev argue that 3.1 authorizes the IAEA to verify that nonnuclear components for nuclear weapons are not being manufactured. Their case would not be difficult to make if the article did not contain so much emphasis in connecting safeguards to nuclear materials rather than equipment (either nuclear or nonnuclear). As a result, Bunn and Timerbaev lean part of their argument on an interpretation of a phrase which states that the purpose of safeguards is "verification of the fulfillment of [the state's] obligations assumed under this Treaty with a view to preventing diversion of nuclear energy." Bunn and Timerbaev connect the phrase "with a view to preventing diversion" to the state's obligations under the treaty not to manufacture weapons,[6] but an equally—if not more—

plausible interpretation is that the antecedent of this phrase is "safeguards" and that the phrase has been added to provide focus on how safeguards relate in a practical way to the state's NPT obligations. (Indeed, under the Bunn/Timerbaev interpretation, Article 3.1 would put states under an NPT obligation to establish effective physical security over nuclear materials. The fact that it does not was recognized and remedied by the *voluntary* Physical Security Convention developed by the IAEA and adopted by many [NPT and non-NPT] countries with nuclear programs.)

This is not to say that a case can't be made for safeguards applying to nonnuclear weaponization activities, and Bunn and Timerbaev have made the best case possible. It is just that the emphasis in Article 3 on material safeguards, along with the history of safeguard negotiations and agreements, provides no confidence that a majority of members of the IAEA that are state parties to the NPT share this broad view of safeguards. Taking the broadest view of the stated purpose of safeguards as "verification of the fulfillment of a [nonweapon state's] obligations" under the NPT could arguably subject to inspection the agreements and arrangements by which nonweapon states allow weapon states to place nuclear weapons on their territory. (Inspections of the agreements could ensure that no protocols exist under which transfer of authority or control over the weapons could take place.) Whether the weapon states would agree to have the IAEA inspectors examine these arrangements is, one suspects, more than problematical.

Article 3.2 provides that suppliers party to the treaty shall not provide nuclear materials or equipment for processing, use, or production of such materials to a nonweapon state unless safeguards are attached. Over a period of years, it became apparent that a more detailed and finer screen for nuclear transfers than this had to be devised in order to ensure uniformity of compliance by suppliers. The result was the so-called Zangger list of nuclear items to which safeguards must be attached and, more recently, a list of dual-use items requiring safeguards as well. In addition, the Nuclear Suppliers Group (NSG) has identified nuclear export items requiring consideration of "restraint" and "consultation" before the item is sent.[7]

Article 3.3 is designed to ensure that safeguards arrangements will not intrude on the ability of nonweapon states to obtain assistance for or otherwise develop their nuclear-energy activities. It references Article 4, which has been the basis for many complaints over the years regarding the policies of the suppliers—particularly the United States. Article 3.3 reflects the mind-set of the nuclear establishments and the nonweapon states at the time of the drafting of the treaty—that is, the treaty was also to be an instrument for facilitating international nuclear commerce. This mind-set resulted in a safeguards system that was designed more for its nonintrusiveness than for its effectiveness. This is still a problem, despite the improvements in the wake of the Gulf War.

Article 3.4 provides for a timetable by which states party to the treaty must enter into appropriate safeguards arrangements. This timetable has not been met many times in the past, but the most egregious example was that of North Korea, which took six years to enter into a safeguards agreement with the IAEA. No sanction was imposed on North Korea or other violators of this provision.

The Safeguards System of the IAEA

The IAEA was established in 1957 in the wake of the US Atoms for Peace initiative and began operating an inspection program in the early sixties designed to detect diversions of significant quantities of nuclear material. The NPT expanded the scope of the agency's work significantly, and, in response, the IAEA developed a model safeguards agreement for NPT parties contained in the document known as Information Circular (INFCIRC)/153.

In this document, the IAEA states that the goal of safeguards is the prevention of proliferation by the "timely detection of diversion of significant quantities of nuclear material from peaceful nuclear activities to the manufacture of nuclear weapons or of other explosive devices or for purposes unknown, and the deterrence of such diversion by the risk of detection."

This goal was adopted in 1970 at a meeting of the so-called Committee of the Whole, which deliberated for 11 months

before the text of INFCIRC/153 was approved. Rudolph Rometsch was the head of the IAEA's Department of Safeguards at the time; he recently said that the 1970 committee meeting led to "a sort of dogma for field work—if not to a taboo. It was a question of whether inspection should be designed also to detect undeclared facilities. The conclusion was clear at the time: looking for clandestine activities was out of the question and the inspection system was designed accordingly."[8]

Thus, inspectors paid attention only to activities or structures within defined strategic points and were discouraged from asking questions about anything else lest they become persona non grata with the state (which had the right to refuse an inspector) and perhaps ultimately at IAEA headquarters.

INFCIRC/153, in addition to laying out the obligation on the part of the state to have safeguards apply to all its peaceful nuclear activities (so-called full-scope safeguards), also stresses the importance of protecting industrial and commercial secrets, not interfering in peaceful nuclear activities, and not hampering economic and technological development in the safeguarded state. This stance is in keeping with the agency's dual role. Its charter makes it a promoter of nuclear energy at the same time it verifies that no diversions have taken place.

As a result, much negotiation follows the signing of the main safeguards agreement between the IAEA and the state to be inspected. The main agreement is followed (ostensibly within 90 days) by subsidiary arrangements that specify what the agency and the state have to do in order for safeguards to be applied: nuclear installations must be listed, and requirements for reporting to the agency are specified in negotiated detail. These subsidiary arrangements are not published.

The most specific safeguards documents are the facility attachments to the subsidiary arrangements. These state exactly what will be done at each facility containing nuclear material and lay out the "material balance areas" the agency will establish for accounting purposes. The flow of nuclear material across these areas must be reported to the agency. The facility attachments also specify the points at which measurements can be taken or samples withdrawn, installation of cameras, access afforded to inspectors, records to be kept,

and anticipated frequency of inspections. Like the subsidiary arrangements, these negotiated arrangements are not published.[9]

Some years ago, the agency developed internally a set of technical objectives that provide a guideline for determining the level of inspection and reporting that would ensure that—at least for declared facilities in an NPT state—the goal of timely detection of any diversion of a significant quantity of nuclear materials would be met. Concern by inspected states about intrusiveness has resulted in negotiated safeguards agreements that do not come close to meeting these technical objectives and therefore cannot be said to be producing effective safeguards by any objective criterion. Inspected states have even leaned on the agency not to exercise its full rights under the agreements. In some cases, the agency itself refrains from exercising its full rights in order to conserve resources.

This is a basic problem in that the IAEA's safeguards agreements do not provide for the agency to inspect any location—declared or undeclared—at any time (outside of regularly scheduled routine inspections) without some evidence that the site should be subject to inspection. Nor do the agreements provide for IAEA inspectors to verify use of any material formally exempted from safeguards. Thus, when inspectors doing a routine inspection in Iraq before the war asked about buildings adjacent to an Iraqi reactor, the Iraqis said they were for nonnuclear research. Since they were undeclared sites and IAEA had no evidence of suspect activity, the agency had no basis to inspect the buildings, which, as it turned out, contained a radiochemical laboratory used for research on plutonium separation.

Furthermore, the safeguards agreements effectively eliminate surprise inspections, even though, in principle, IAEA has the right to make "unannounced" or short-notice inspections. Routine inspections must provide the state with at least 24 hours' notice, and IAEA must advise the state periodically of its general program of announced and unannounced inspections, specifying the general period when inspections are foreseen. Hence, states generally know when and where inspections will occur and, in any case, have control over the

timing of admission of inspectors to the country and to the facility.

The Gulf War produced a situation in which the IAEA has successfully used its authority to conduct special inspections in Iraq, backed up by UN authority, and has received voluntary offers from a number of states to allow such inspections of declared or undeclared facilities. One of those states was North Korea, which withdrew its offer after the agency demanded to inspect two sites that the North Koreans didn't want inspected. Those sites will be inspected at some time in the future (at least five years) under the US/North Korea Framework Agreement, which has the unfortunate effect of leaving the agency holding the bag, despite its claims of access.

The IAEA also has not resolved the problem of being unable to verify the peaceful use of nuclear materials that it has exempted from inspection. Such materials may involve (1) special fissionable material in gram quantities used for instrumentation, (2) nuclear material for production of alloys or ceramics in nonnuclear applications, (3) plutonium (Pu) of a certain isotope concentration (e.g., high in Pu-238), or (4) limited quantities ranging from one kilogram of Pu to 20 tons of depleted uranium. Iraq used an exemption for a spent-fuel assembly to conduct research on separating plutonium without informing the agency, which had no authority to routinely verify what Iraq said it was doing with the assembly.

It should be emphasized that the IAEA's problems are not only with the Iraqs of the world. The agency has problems with many states that are not suspected of weapons development. As Lawrence Scheinman has pointed out, "Over the past twenty years, the Agency has experienced restraints on its right of access, on the intensity and frequency of inspection efforts, and even on the extent to which it could exercise its discretionary judgement in planning, scheduling, and conducting inspections."[10] One should add that the agency's technical objectives are themselves unrealistic because they are based on "significant quantities" of fissionable material that are at least twice as large as the amounts that a nonweapon state might need to construct its first nuclear explosive device.

Why doesn't the IAEA lower the amount it considers a "significant quantity"? The answer is that inspections would then have to be more frequent and more intrusive, and the agency currently has neither the financial nor the political support to make this move.

Raising the financial question exposes the agency's "dirty little secret." Because safeguards are supposed to be applied nondiscriminatively, much of the agency's safeguards budget goes to safeguards in Germany, Japan, and Canada, while the largest *current* proliferation concerns are elsewhere. The agency, which has been on a zero-growth budget for the better part of a decade, attempts to address its budget problems by slacking off on some inspections of facilities it considers not of proliferation concern. But in so doing, it converts its nondiscriminatory character to the status of myth and risks internal political turmoil. It cannot help this because the cost of safeguarding bulk-handling nuclear facilities such as enrichment, reprocessing, or fuel-fabrication plants is enormous, requiring, in most cases, on-site location of inspectors and much better instrumentation and measurements. While the IAEA has been required to safeguard only small reprocessing plants thus far, the ability of the agency to safeguard effectively (leaving aside the expense) a commercial-scale reprocessing plant, such as the one being built at Rokkasho in Japan, has been called into question by many people over the years.

A very interesting analysis by Marvin Miller for the Nuclear Control Institute shows that, for a reprocessing plant with a capacity of 800 metric tons per year and an average plutonium content of 0.9 percent, with a ±1 percent uncertainty in the input measurement of plutonium (assuming this dominates the error in measuring material unaccounted for [MUF]) and with a material-balance calculation done once a year, the absolute value of the MUF variance (i.e., the error in measuring MUF) will be 72 kilograms per year. In that case, the minimum amount of diverted plutonium that could be distinguished from this measurement "noise" with detection and false-alarm probabilities of 95 percent and 5 percent, respectively, is 246 kilograms—more than 30 significant quantities.[11]

The only admissible conclusion is that "timely detection" of plutonium diversion from a reprocessing plant is an oxymoron. This problem was recognized during consideration of the Nuclear Nonproliferation Act (NNPA) of 1978, when the concept of timely detection of a diversion was translated into the concept of "timely warning"[12] of weapons development or construction. The intent of the authors was that, from a technical point of view, timely warning was unavailable in the case of plutonium diversion if it is assumed that the non-nuclear elements of the bomb have been constructed or assembled a priori. The NNPA provided that the president could still allow spent fuel of US origin to be reprocessed in a foreign country if political factors make the risk of proliferation sufficiently low, even though timely warning of weapons construction would not be available to the United States. Not wanting to admit that reprocessing—especially commercial-scale reprocessing—was a dangerous, not effectively safeguardable activity, Reagan administration officials boldly and falsely interpreted the NNPA language as incorporating political factors into the definition of timely warning, thereby depriving the concept of any objective meaning.

In like manner, the IAEA insists that bulk-handling facilities can be effectively safeguarded, but Miller's analysis shows that this is not the case. If the definition of a "significant quantity" of plutonium were to be changed (i.e., the amount lowered), the inability to do "timely detection" would become still worse.

The response to these practical problems from within the agency has been dismaying. Some people have advocated lowering the technical objectives—that is, moving the goalposts so that the effectiveness of safeguards couldn't be so easily challenged.

To be sure, the agency has been chastened by its Iraq experience and is currently crafting a new safeguard approach that aims to detect tiny amounts of fissile material through environmental monitoring techniques such as wall swabs and water samples. These innovations will undoubtedly raise the cost of safeguards, and it remains to be seen how well such proposals will be received by members of the IAEA and signatories of the NPT.

Back in 1981, when the Reagan administration was formulating its nonproliferation policy, the Department of Defense (DOD), in an interagency memo, expressed concern about the IAEA's "susceptibility to Third World . . . politics, its lack of an intelligence capability and the limits of its scope and jurisdiction."[13] While some of this complaint is being addressed in the wake of the Gulf War (the IAEA is considering how to use intelligence information brought to it by member states), the Pentagon's 1981 warning "against undue reliance on the IAEA by those responsible for national security"[14] within the US government has as much resonance today as in 1981 and will continue—especially for as long as production of fissile materials continues.

Article 4

Article 4 incorporates, in paragraph 2, one aspect of the "NPT bargain" in which nonweapon states party to the treaty, in return for their adherence, "have the right to participate in the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful use of nuclear energy." The same paragraph also calls on parties to the treaty to cooperate in contributing "to the further development of the applications of nuclear energy for peaceful purposes, especially in the territories of nonnuclear-weapon States Party to the Treaty, with due consideration for the needs of the developing areas of the world."

In past years, the major complaints about the NPT by nonweapon states have concerned this article. These complaints range from a generic one that the technologically advanced states have not provided technical assistance or have not sufficiently shared their nuclear know-how with others, to specific complaints that the NSG (especially the United States), in seeking to control nuclear and dual-use exports or to exercise consent rights in nuclear agreements, is engaged in willful and systematic violation of Article 4.

There are a number of things to say about this. First, Article 4 does not modify the requirements of Articles 1 and 2 not to assist or receive assistance, respectively, in the manufacture of nuclear explosive devices. Second, as indicated earlier,

verification of NPT obligations under Article 3 "with a view to preventing diversion of nuclear energy from peaceful uses to nuclear weapons" cannot be *effectively* carried out at this time for enrichment and reprocessing facilities under the safeguards system that is the instrument for the implementation of Article 3.

Accordingly, the transfer of facilities, equipment, or technology to a nonweapon state for the production of highly enriched uranium or plutonium should be interpreted as not in keeping with Article 3's implicit qualification that *effective* safeguards must be applied to all peaceful nuclear activities. Otherwise, states with nuclear weapons that make such transfers could find themselves in violation of Article 1, and the NPT would become an instrument for proliferation.

Indeed, it is apparent that some states—Iraq and Libya among them—signed the NPT because they saw Article 4 as a possible route to obtaining nuclear weapons-related technology and equipment.

To date, there has been no formal resolution of the argument over Article 4, but one can interpret the Nuclear Suppliers Agreement, which calls for exercising restraint in nuclear trade involving export of reprocessing or enrichment technology, as recognition that Article 4 should not be interpreted as liberally as it appears to read. Unfortunately, the potential recipients of such trade do not accept this tightened interpretation, and—were it not for the fact that the economics of the back end of the fuel cycle have become so egregious—the argument might well be as loud today as it was in 1977, when the Carter administration began moving away from the earlier policy of relatively unrestricted nuclear trade.

Ironically, the Carter administration and the US Congress were roundly denounced in 1978 for requiring, in the NNPA, that full-scope safeguards be a criterion for nuclear export. With few exceptions, the nuclear suppliers refused to go along, despite the inference that their opposition meant they put export profits above support for the NPT. Eventually, all suppliers adopted the criterion, but it took the Gulf War to do it.

Finally, it is unfortunate—if understandable—that Article 4 is so fixated on nuclear-technology cooperation. Assuming the need for tangible incentives to produce NPT signatories in the first place, a much better NPT would have resulted if Article 4

had made cooperation in energy development (not just nuclear) the quid pro quo for an NPT signature. That way, the fight over Article 4 might have been avoided, and it would have made the phrase "with due consideration for the *needs* of the developing" (emphasis added) world more trenchant.

Article 6

Article 6 expresses the second part of the "NPT bargain" (Article 4 expresses the first part). In this article, "each of the Parties to the Treaty [especially including the weapon states] undertakes to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament under strict and effective international control."

Let us begin by noting that, at least in quantitative terms, the nuclear arms race—as usually defined—which included the US, the former Soviet Union, Great Britain, and France, is over. None of these countries is increasing its stockpile of nuclear arms. (That may also be true of China, but evidence is not forthcoming.) If one defines the nuclear arms race as including weapons modernization—even if the numbers aren't going up—then the race may not yet be over. It is to this issue that a Comprehensive Test Ban Treaty (CTBT) is most relevant—not to mention the fact that a CTBT is referenced in the preamble to the NPT. Without testing, radical new designs of nuclear weapons are problematical, although simulation codes are now very highly advanced. Therefore, some nonweapon states that are parties to the NPT insist, not unreasonably, that a CTBT be a short-term goal of the NPT weapon states to fulfill part of their responsibilities under Article 6. A CTBT would have other nonproliferation benefits in that it would raise the political barriers to overt testing by nuclear states not party to the NPT.

Thus, the NPT is playing a useful role by providing a forum and a rationale for those countries interested in having a CTBT to push the weapon states—particularly the US—into a serious negotiation to formalize the current moratorium. Some members of the treaty have raised serious questions about the treaty's future if further progress is not made toward nuclear

disarmament. Despite this implied threat, it is hard to escape the conclusion that if the cold war hadn't ended, the prospect of a CTBT being completed in the near future—let alone substantial progress toward nuclear disarmament—would be poor.

But the cold war *is* over, and the US now finds itself in the ironic position of being pressured by a group of countries who want progress in nuclear disarmament, who perhaps don't mind at the same time discomfiting the weapon states, and who perhaps also enjoy the fact that many of them were asked by the US to sign the NPT during the eighties, despite their having no nuclear energy program or prospects whatsoever.

Could the NPT unravel over this issue? Hardly. There is no serious current prospect of any NPT party's leaving the treaty or organizing a movement to terminate the treaty.

Some people believe that linking the future of the treaty to specific progress toward nuclear disarmament is a risky strategy. The latter is based on the threat of lowering political barriers to proliferation if the weapon states don't take their obligations under Article 6 more seriously, and there is no doubt that the weapon states do not wish to see those barriers lowered. However, one can argue that an indefinite life for the treaty provides confidence that allows the weapon states to continue reducing their weapons stockpile, while threats to withdraw from the treaty designed to push the weapon states into faster progress could have—if other political factors make accelerated progress impossible—the perverse effect of putting a ceiling on progress. This result stems from the fear that the treaty might unravel and new nuclear powers might then emerge.

Article 8

Article 8 lays out the procedures for amending the treaty. For a proposed amendment to be adopted, one must first submit the text to the depositary governments (US, United Kingdom, Russia) for circulation to all parties to the treaty. Then, if requested by at least one-third of the parties to the treaty, a conference is convened to consider the amendment. Adoption occurs only if the amendment is approved by (1) a majority of the parties to the treaty, (2) all states with nuclear weapons that are party to the treaty, and (3) all parties who,

on the date of circulation of the proposed amendment, are members of the Board of Governors of the IAEA.

The amendment then goes into force *for those parties who have ratified it* when a majority of the parties to the treaty have filed their instrument of ratification. Thus, approved amendments to the treaty apply only to those parties who wish to have them apply and have so indicated via ratification. The remainder of this article provides for the five-year review conferences that have taken place since 1970.

Article 10

This next-to-last article of the NPT provides that, after giving three months' notice and an explanation, each party has the "right to withdraw from the Treaty if it decides that extraordinary events, related to the subject matter of the Treaty, have jeopardized the supreme interests of its country." The article also provides for the 25th-year review conference to decide, by majority vote, whether the treaty shall be extended indefinitely or for an additional fixed period or periods.

Saddam Hussein would have employed the first paragraph of Article 10 to leave the NPT after putting into place the infrastructure to build nuclear weapons. Since the article contains no presumption of sanctions for leaving the treaty, the only real protection against the use of the treaty to gain technology, equipment, and materials that could be useful for weapons is to impose a set of multilateral (and unilateral) export controls on appropriate items, with sanctions for violations of those controls. This action, of course, flies in the face of the philosophy of laissez-faire technology transfer embodied in Article 4 but is necessary if the nonproliferation regime is to be worthy of its name.

Strengthening the Safeguards System

We have already discussed the deficiencies of the system in conjunction with the discussion of Article 3. To remedy those deficiencies would require the following (nonexhaustive) changes to the system:

1. The IAEA must require more transparency in the nuclear activities of its members. Among other things, this should include a complete list of sensitive or dual-use items requiring export controls and registry of trade in such items. This list should contain the union—not the intersection—of those items brought to the table by IAEA members and should cover all sensitive technologies, whether obsolete, current, or advanced.

2. The IAEA must have access to intelligence information obtained through national technical means concerning sites that may require inspection and must have an unequivocal right to inspect such sites at short notice.

3. Safeguards should apply to nuclear plants and equipment as well as materials. INFCIRC/153 safeguards, which apply to the entire fuel cycle of a nonweapon state that is a party to the NPT, should be combined with the INFCIRC/66 safeguards, which address plants and equipment as well as material for non-NPT parties. Any nuclear facility, whether it contains material or not, should be subject to inspection on short notice.

4. Safeguards should also apply to uranium concentrates such as U_3O_8—not just to UO_2—and to nuclear wastes containing fissionable material.

5. A definition of effective safeguards should be adopted, based on agreed measures of performance embodying appropriate technical objectives. That is, the agency must be able to say that with a specified (high) degree of probability and a specified (low) false-alarm rate, the diversion of a significant quantity of specified nuclear material will be detected within a specified amount of time (depending on the material) that is well in advance of the time needed by the diverter to convert the material into a nuclear explosive device, assuming that all activities relating to nonnuclear weapons have been carried out.

6. The amount of nuclear material in a "significant quantity" should be reduced by at least a factor of two in the case of both uranium and plutonium.

7. All states with safeguarded nuclear activities should be required to post a bond with the IAEA, based on that state's gross domestic product (GDP) and the size and sensitivity of its nuclear program. Violations of safeguards, IAEA regulations,

and NPT commitments—as well as a decision to leave the NPT—should result in forfeiture of part or all of the bond.

8. Safeguards should be imposed on nonnuclear materials—such as tritium, lithium-6, and beryllium—useful in manufacturing weapons.

9. Safeguards should be established over nuclear R&D activities and facilities.

10. The annual safeguards implementation report of the agency should be a public document.

Interpreting the NPT to Strengthen the Regime

The NPT, negotiated among many people from different nations with different political objectives and constraints, is inevitably a document of compromises, laced with imprecise language, nuanced meaning, and cognitively dissonant passages. Depending on how the treaty is interpreted, it is either—as claimed—the core of the world's nonproliferation regime, or it is a tool for proliferants to hide their ambitions and legitimize their activities.

In at least two main areas, an interpretation of the language of the NPT can strengthen the nonproliferation regime. The first involves Article 1's requirement that each weapon state that is party to the NPT in no way assist a state without nuclear weapons in the manufacture of nuclear explosive devices.

As Eldon Greenberg has pointed out, the negotiating history of the NPT does not permit one to conclude that the application of safeguards to a nuclear transfer means that the transfer is legitimate.[15] (Transfer of the components of an explosive device is prohibited, even if safeguards are attached.) Moreover, the very real possibility that an NPT party may be a proliferator in disguise makes it incumbent upon suppliers to judge the ultimate use of exported technology and equipment. Such judgments could take into account the economic and technical need for the exported items. Accordingly, it is at least arguable that the transfer of reprocessing equipment or technology to a nonweapon state constitutes prohibited assistance under Article 1, because such technology cannot be effectively safeguarded and exhibits no compelling economic need anywhere in the world.

Article 1's language prohibiting indirect assistance by a weapon state may also be interpreted as prohibiting nuclear assistance of any kind by weapon states to nonweapon states not party to the NPT, on the grounds that such assistance releases resources by those states that may be used in unsafeguarded nuclear programs—perhaps devoted in part to weapons development.

Some Flaws in the Treaty That Ought to Be Fixed

1. The NPT does not forbid a nonweapon state from possessing nuclear weapons. (It forbids the acquisition, but—in theory—a country with weapons could sign the NPT as a nonweapon state and not give up weapons already made.)
2. Nothing in the treaty prohibits a nonweapon state that is party to the treaty from assisting another nonweapon state in manufacturing or otherwise acquiring the bomb.
3. The treaty should be clarified to prohibit challenges to the notion that safeguards include the ability to search for nonnuclear activities relevant to bomb making—including R&D. To ensure that this doesn't convert the IAEA into a university on weapons design, only inspectors from current or former weapon states should be involved in this activity.
4. The treaty does not require the IAEA to verify the obligation of a nonweapon state to refrain from receiving assistance in the manufacture or acquisition of nuclear weapons.
5. The treaty does not require the IAEA to verify that exports of nuclear hardware by NPT suppliers to nonweapon states are carrying safeguards.
6. The treaty does not define the point at which one can say that construction of a nuclear explosive device has begun. The Foster criterion relating "manufacture" to construction of a component having relevance only to a nuclear explosive device could constitute such a definition. In that case, activities involving machines capable of creating such components could become subject to special inspections.
7. The treaty does not prohibit a nonweapon state from using nuclear energy for military purposes but is unclear as to permitted "military uses" that are exempt from safeguards. In

his recent book, David Fischer poses questions as to whether a nonweapon state could build a reactor and claim it to be the prototype of a naval reactor, thereby exempting its fuel from safeguards.[16] Likewise, a state could withhold material from safeguards upon becoming an NPT party by claiming (to itself—it has no obligation to inform the IAEA) that the material is for a permitted military purpose. Finally, the treaty not only appears to waive the safeguarding of a "military" enrichment plant whose output is only for naval reactors, but also appears to allow unsafeguarded nuclear exports for permitted military use.

8. The treaty's language in Article 3.3 has been used to support arguments against making safeguards more intrusive. The treaty should state as a principle that whenever a conflict occurs between the effective application of safeguards and compliance with Article 4, resolution in favor of effective safeguards shall govern.

9. The treaty does not embargo transfers of sensitive equipment, materials, or technology—but it should do so whenever effective safeguards do not apply.

10. The treaty has no sanctions for violators or for withdrawal from the treaty.

11. The treaty is difficult to amend; even worse, only those parties ratifying the amendment are subject to it.

12. The treaty does not preclude possession and stockpiling of plutonium or highly enriched uranium by a nonweapon state, regardless of economic or technical justification or the effectiveness of safeguards.

13. The treaty does not preclude nuclear trade with states not party to the NPT.

14. The treaty's provision on withdrawal does not provide for any disposition of nuclear assets or payment for nuclear assistance received by the withdrawing state by virtue of its NPT membership.

What Should Be Our Level of Reliance on the NPT as a Security Measure?

As stated at the outset, the NPT unquestionably has been a valuable institution. It has helped create a nonproliferation ethic that has raised the political barriers—at least in

democratic states—to overt proliferation. It has played a useful role as an anchor or central element in all the discussions about security with the newly independent states and other states in Eastern Europe. By providing an outlet for US/Soviet cooperation during the days of the cold war that made it more difficult for each side to demonize the other, the treaty lowered the risk of war. It has provided an outlet for countries desiring to play a role on the world stage in disarmament to do so without becoming weapon states themselves. It provided a way for South Africa to give up its weapons program with a minimum of lingering doubt and suspicion because of IAEA verification, and it provided a basis for dealing with the North Korean weapons program.

On the other hand, the NPT also has been a convenient political cover for countries known to be interested in acquiring nuclear weapons, has played no essential role in turning around the past South Korean and Taiwanese clandestine-weapons programs, produced no appropriate response to Iraq's weapons program until after Saddam Hussein invaded Kuwait and was militarily defeated, and provides no restraint on the stockpiling of weapons materials by any state as long as the materials are under safeguards.

Since many of its adherents joined because of the promise of technical assistance and technology transfer, the treaty does not incorporate any restrictions on nuclear trade, leaving only the suppliers to decide what should or should not be transferred.

In the end, the ability to leave the treaty with 90 days' notice means that a country may proceed to build nuclear weapons, as long as it has the technological know-how and is convinced that such weapons are its best option for enhancing its security.

Even if the treaty and the safeguards system had been originally constructed with the needed reforms discussed in this essay, its implementation would still ultimately depend on the resolve of the international community, acting through the Board of Governors of the IAEA (which occasionally has a proliferator as chair) and the UN Security Council.

Nonetheless, the warts exhibited by the treaty and its still-evolving safeguards system do not vitiate the political

value of the nonproliferation norm that has been nurtured by the treaty and the rest of the nonproliferation regime: the zones free of nuclear weapons, the Tlatelolco and Rarotonga Treaties, the export control laws and agreements (both multilateral and unilateral), and other instruments.

In sum, the treaty cannot be a substitute for measures one might otherwise take in protecting one's security. Without reform, it does not provide a good model for dealing with proliferation threats other than nuclear (e.g., chemical, biological, or missile), but it is an important adjunct whose absence would raise current anxiety levels about the spread of weapons of mass destruction.

Notes

1. "Treaty on the Nonproliferation of Nuclear Weapons," opened for signature 1 July 1968, 21 UST 483, 729 UNTS 161.
2. George Bunn and Roland M. Timerbaev, *Nuclear Verification under the NPT,* Program for Promoting Nuclear Nonproliferation (PPNN) Study no. 5 (University of Southampton, England: Mountbatten Centre for International Studies, 1994), 4–5.
3. Senate Committee on Foreign Relations, *Remarks Submitted by William C. Foster,* 89th Cong., 2d sess., 10 July 1968.
4. "Arms Control Implications of Peaceful Nuclear Explosions," working paper submitted to Geneva disarmament conference by Japan, CCD/454, 7 July 1975 (Arms Control and Disarmament Agency [ACDA] Documents on Disarmament, 1975).
5. Bunn and Timerbaev, 4.
6. Ibid., 11.
7. See *Nuclear Export Guidelines Adopted by 15 Governments, January 11, 1978,* IAEA document INFCIRC/254 (Vienna, February 1978).
8. "Interview with Rudolph Rometsch," *IAEA Bulletin* 36, no.3 (1994): 14.
9. See "Nuclear Nonproliferation and Safety: Challenges Facing the International Atomic Energy Agency," Report GAO/NSIAD/RCED-93-284 (Washington, D.C.: General Accounting Office, September 1993).
10. Lawrence Scheinman, "Assuring the Nuclear Non-Proliferation Safeguards System" (Washington, D.C.: Atlantic Council, October 1992), 26.
11. Marvin Miller, "Are IAEA Safeguards on Plutonium Bulk-Handling Facilities Effective?" (Washington, D.C.: Nuclear Control Institute, August 1990).
12. Leonard Weiss, "The Concept of Timely Warning in the Nuclear Nonproliferation Act of 1978," *Congressional Record,* 21 March 1988, S2639 and S2646; see also Senate Foreign Relations Committee, *Testimony of Sen John Glenn,* appendix, 15 December 1987, in *Nuclear Nonproliferation Factbook*

(Washington, D.C.: Library of Congress, Congressional Research Service, December 1994), 155–78.

13. As quoted in the *Wall Street Journal*, 17 July 1981.

14. Ibid.

15. Eldon Greenberg, "The NPT and Plutonium" (Washington, D.C.: Nuclear Control Institute, May 1993).

16. David Fischer, *Towards 1995: The Prospects for Ending the Proliferation of Nuclear Weapons* (Brookfield, Vt.: Dartmouth Publishing Co., 1993), 61.

Chapter 3

A Nuclear Nonproliferation Treaty for Missiles?

Richard H. Speier

The Nuclear Nonproliferation Treaty (NPT) is a powerful archetype for efforts to prevent proliferation. Over the years, many arms controllers have proposed adapting the NPT's provisions to control the proliferation of chemical and biological weapons, missiles, and even conventional arms. This essay examines the possibilities—and the dangers—of applying the NPT model to the current international policy that controls exports for missiles capable of delivering weapons of mass destruction.

The policy, called the Missile Technology Control Regime (MTCR), was announced by seven governments in 1987 to limit the spread of nuclear-capable missiles. By 1993 the concern had broadened to missiles capable of delivering chemical and biological as well as nuclear weapons, and today the membership in the MTCR has expanded to 26 governments—most recently Russia. Beyond these 26, other governments—including Brazil, China, Israel, Romania, South Africa, and Ukraine—have declared their support for the regime. Indeed, among major missile-exporting nations, only North Korea stands aloof from the principles of the MTCR.

Given the growth of the MTCR into an international standard for restraint in missile proliferation, proposals have been made to "strengthen" it with the features of the NPT. The proposals would convert it from a mere policy applying only to missile exporters to a *treaty* that is *global* (i.e., that binds missile "haves" and "have-nots" alike). Three versions of the proposals are the Global Intermediate-range Nuclear Forces (INF) Treaty, Zero Ballistic Missiles (ZBM), and a recent Canadian proposal for a ban on ballistic missiles.

All of these proposals offer the advantages of a treaty: they can stabilize international rules and provide for enforcement and verification. The proposals also offer the advantages of

global coverage: they develop equitable, legitimate, and international rules or "norms" supported by the have-nots because the have-nots have a role in negotiating them. Further, these proposals build on existing international regimes for missile disarmament—the INF Treaty, Strategic Arms Limitation Treaty (SALT), and Strategic Arms Reduction Treaty (START)—so that their implementation would be an extension of existing practice rather than a leap into the utopian unknown.

That is the good news. The bad news is that the mechanics of the treaty process will almost certainly weaken the MTCR. The negotiation period will be prolonged, and strong export-control actions will be difficult to take during this period. Moreover, the dynamics of the negotiation process will require assurances that anything not specifically prohibited is permitted—weakening rather than strengthening the limits on missile proliferation. The global coverage of these proposals will also work in favor of the proliferator. In order to attract the have-nots, all the proposals would allow the proliferation of "peaceful" versions of proscribed missile systems—even though the "peaceful" and the "military" versions are fully interchangeable. The existing missile-disarmament regimes on which these proposals would be based turn out to be poor models for nonproliferation regimes because they ban systems of greatest relevance to the US-Russian strategic relationship rather than systems likely to be exploited by proliferators.

The central problem turns out to be the conflict between nonproliferation and disarmament. Nonproliferation seeks to stop the arms spread where it is now; it can accept differences among nations, and it can work within flexible structures other than treaties. Disarmament seeks reductions in force structures. To make its rules stick, it must write them into treaties; and to apply those rules on a global basis, it must offer "compensation" to some parties—often in the form of just the technologies that nonproliferation would seek to restrict. The global MTCR proposals that we examine are disarmament rather than nonproliferation.

This essay addresses the issues of an NPT for missiles in four parts: first, the advantages and problems of any global treaty to control missile proliferation; second, the recent specific proposals for a global treaty; third, the example of

Brazil as the kind of participant in missile nonproliferation that a global treaty might encounter; and fourth, some general conclusions.

Advantages and Problems of a Global Treaty

Two features characterize all proposals for a global MTCR: the treaty and global coverage.

Treaty

A treaty, because it is the most binding of international undertakings, can give durability and stability to international rules. Moreover, it can provide for enforcement and verification. Thus, a treaty stands in contrast to the MTCR, which is only a common policy—with no formal mechanism for enforcement or verification.

The greatest problem with the treaty approach is that it will almost certainly weaken the supplier restraints of the MTCR. This difficulty occurs for several reasons. First, the dynamics of treaty negotiations almost invariably lead to assurances that anything not specifically prohibited is permitted. That is, participants want to be assured that they are not bound by more restraints than are spelled out in the treaty. This limitation is not a problem if the treaty prohibits everything that needs to be prohibited. But the discussion below of global coverage and of specific proposals suggests that a treaty is unlikely to go that far.

If differences exist between the restraints prescribed in the treaty and in the MTCR, nations will face a temptation to engage in "venue shopping." A 300-kilometer-range threshold in the MTCR versus a 500-kilometer threshold in a Global INF will make missile transfers of 300–500 kilometers easier to excuse on the grounds that they comply with the more binding of the two international rules. This problem is not theoretical. Already, some members of the nonaligned movement, especially Iran, are objecting to the Nuclear Suppliers Group (NSG) and the Australia Group (AG) as inconsistent with their respective treaties—the NPT and the Chemical Weapons Convention (CWC). Moreover, a continuing tension exists

between long-term agreements for nuclear safeguards and the NPT's 90-day withdrawal period.

Treaties present two additional problems: rigidity of rules and effort to negotiate.

Treaties are the laws of the land; their rules are binding. Those rules must be clear enough to be enforceable. Subtle distinctions and case-by-case flexibility are difficult to handle in treaties. If allowed, they usually must be accompanied by the creation of an adjudicatory body with considerable authority. This authority is likely to include intrusive verification because simple verification schemes cannot cope with subtleties. In the missile business, intrusive verification can compromise the security of technical information. The potential compromise of commercial information will increase resistance to ratifying the treaty and will create economic liabilities for the regime; the compromise of sensitive missile technology will undercut the nonproliferation objectives of the treaty. So the enforcement and verification provisions of a treaty can become a two-edged sword.

These features were considered during the negotiation of the MTCR, and they were rejected. Why? For one thing, missiles are not like nuclear or chemical weapons; they cannot all be treated alike. Some missiles—those capable of delivering a payload of 500 kilograms to a range of 300 kilometers and all missiles intended to deliver weapons of mass destruction—are deemed by the MTCR to be so dangerous that their transfer is subject to a strong presumption of denial. But some missiles—antitank and air-defense missiles, for example—fall below these thresholds and are often stabilizing in situations in which aggressive forces would otherwise possess unchallenged offensive power.

Although this distinction among missile types is relatively clear for complete missile systems, it descends into subtlety for components and technologies, which can contribute to a variety of missile types. Controlling the proliferation of complete missile systems is impossible without also controlling the proliferation of components and technologies. Thus, as long as there are "good missiles" and "bad missiles," subtlety is inevitable. The MTCR handles this problem by creating one control list for items such as complete missiles and their major

components—items subject to a strong presumption of export denial—and another list for lesser ingredients that could be put to acceptable as well as unacceptable end uses—items subject to case-by-case review, international assurances when necessary, and exchanges of information "as necessary and appropriate."

How does one implement "as necessary and appropriate" in a treaty? One could do so with a formal organization, such as the Coordinating Committee (COCOM), which reviewed exports to the Soviet bloc during the period in which the MTCR was negotiated. But COCOM consumed enormous bureaucratic resources, and the founders of the MTCR were not about to create another bureaucratic behemoth to police an area that involved such a great deal of acceptable activity.

In sum, the rigidity of a treaty would interfere with the necessary flexibility of the MTCR. Such flexibility is best disciplined not by an international bureaucracy but by active consultations among MTCR adherents.

The other problem posed by a treaty is its cumbersome negotiation process. Although the MTCR took more than four years to negotiate, the NPT took some seven years. The CWC took more than a decade. Unlike the MTCR, the treaties took (or, in the case of the CWC, are taking) additional years to ratify and bring into force.

This is so in part because many more nations were involved, in part because their views were more disparate than those of the seven governments negotiating the MTCR, and in part because the have-nots in treaty negotiations invariably prolong the process by seeking concessions from the haves (more on this below). It is possible, even likely, that "spoiler" governments may use the negotiation process to prevent the emergence of any significant restraints while seeking to gain the advantages of prolonged negotiations. (This tactic arguably occurred in the 12-year negotiation of Mutual and Balanced Force Reductions in Europe, which never resulted in an agreement.)

What is the consequence of an extended negotiation? Without exception (and the original negotiation of the MTCR was no exception), it is to hobble the nonproliferation policy process during the period of the negotiation. Such is the case,

partly because of limited nonproliferation staffs in the United States and, even more, in other nations. The negotiation of a treaty takes priority over the mundane, day-to-day process of reviewing intelligence and exports and of working with other governments on specific proliferation problems. So negotiation displaces implementation.

This displacement results from more than staff limitations. Governments are careful not to offend their negotiating partners, and preventing proliferation requires a willingness to offend. Thus, during a negotiation, there are fewer diplomatic demarches to try to prevent unwise exports. The same may happen to the development of theater missile defenses during the process of negotiation. If the treaty is going to eliminate the threat, why invest massive funds—and offend some negotiating partners—by developing countermeasures to the threat?

Proliferators and exporters out to make a fast buck see what is happening and actually increase their activities during a negotiation in order to take advantage of the low-demarche period and to get their transfers completed before the new regime is implemented. So, in a perverse manner, the negotiation of a new nonproliferation regime—or of any arms control regime, for that matter—actually leads to a short-term increase in the activity to be prevented. If the negotiations are prolonged, the "short-term increase" may be a lengthy one.

Consequently, the difficulties of a negotiation process can lead to counterproductive results. The world with a missile nonproliferation treaty may be more proliferated than the world with a mere missile nonproliferation export policy.

Global Coverage

The proponents of a global MTCR want more than a treaty. They want a broad-based regime combining haves and have-nots. The main argument usually advanced for this requirement is that missile nonproliferation is missing the keystone of the other nonproliferation regimes—a global "norm." Once a principle is shared by nearly all governments, it is much easier to gain common support for action. The proponents argue that a global regime is the best way to

establish such a norm for at least two reasons. First, there will be wide participation in negotiating such a regime, and participation translates into support. This situation stands in contrast to the MTCR; in that case, seven supplier governments negotiated the regime in secret. Second, the rules for such a regime will be widely perceived as equitable; no other rules would be negotiable on a global basis. Consequently, these factors will create a wide perception that the global regime is legitimate, and its principles will become "norms."

To be sure, the MTCR already has a global element. The last paragraph of the MTCR guidelines states that "the adherence of all States to these Guidelines in the interest of international peace and security would be welcome," an invitation to all nations to adopt the MTCR's export controls. It does not, however, invite them into the inner workings—the information sharing—of the regime, and it certainly does not invite them to receive missile technology.

The MTCR is an export-control regime. In its original concept, the common policy among major possessors of missile technology sought to prevent that technology from proliferating. It was not intended to increase the transfer of missile technology—not even among its members.

This concept was slightly stretched by the effort starting in 1989 to bring into the regime some countries that were not major possessors of missile technology. These nations included all members of the North Atlantic Treaty Organization (NATO), the European Space Agency (ESA), and the European Community (EC)—treaties that potentially require sharing some facets of missiles or their technology—and close allies such as Australia and New Zealand. The concept was stretched a little more when Argentina and Hungary became members in 1993 and Russia in 1995. But the concept would be torn to tatters by a global MTCR.

How would one bring the have-nots into such a regime? Why would they want to sign a treaty prohibiting them from acquiring missile technology? The answer could be the one that originally inspired the negotiation of the NPT: to prevent their neighbors from acquiring a threatening capability, the have-nots would agree to forgo such a capability themselves.

This clear objective seems to have been the dominant one in the early 1960s, when India and other smaller nations promoted nuclear nonproliferation in the United Nations.

But once the haves—the US, United Kingdom, and Soviet Union—joined the NPT negotiations, the objective changed. It became the Faustian bargain: the have-nots would forgo the development of nuclear weapons only if compensated by "the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy" (NPT Article 4, paragraph 2). The language elsewhere in the same article—that the right to nuclear energy must be "in conformity with Articles I and II" (the key nonproliferation articles)—has been handily ignored by some NPT parties as they cite the treaty as justification for their pursuit of "peaceful" capabilities that bring them within days or weeks of nuclear weapons.

The analogy with a global missile nonproliferation treaty is clear. The have-nots can be expected to demand "peaceful" missile technology (e.g., that for space-launch vehicles—SLV) as compensation for forgoing proscribed missile technology.

In negotiating the MTCR, the partners wrestled for a year and a half with the question of how to handle SLV technology. Would it not undercut support for missile nonproliferation if the MTCR prevented the export of peaceful SLV technology? Or would it be more important for the effectiveness of the regime to conform to the laws of physics?

In the end, all seven governments yielded to the laws of physics. What goes up can come back down, whether ballistic missile or SLV. The hardware, technology, and production facilities of both are interchangeable. One cannot control the proliferation of ballistic missiles without equally controlling the proliferation of SLVs. Thus, the MTCR places identical restrictions on both. The same is true of other "peaceful" items—sounding rockets and unmanned air vehicles—when they become large enough to be interchangeable with the ballistic and cruise missiles that are subject to the regime's "strong presumption to deny" exports.

How would the laws of physics fare in the negotiation of a global MTCR? Some have-nots might realize that forgoing "peaceful" items that were interchangeable with proscribed

items was the price they had to pay for preventing their neighbors from acquiring the items. They might realize that one can enjoy the benefits of SLVs without possessing the rockets themselves; after all, a competitive international market exists for providing space-launch services.

But not all have-nots would be so wise. They would insist on a Faustian missile bargain. Would the "have" governments resist them? Almost certainly not—if the history of arms control negotiations is any guide. The participation of the Brazils of the world (see below) would be a prime motivation for a global treaty. And the "have" negotiators would exert considerable influence on their home governments to make the necessary accommodations.

Apart from the problem of the Faustian bargain, how can a regime function if some of its members are engaged in activities that the regime seeks to prevent? This is a problem with the NPT—a problem largely dealt with outside of the treaty by the export-control efforts of the NSG and the efforts of some major nonproliferators working with the leadership of the International Atomic Energy Agency (IAEA). But could the export-control and information-sharing aspects of the current missile nonproliferation regime work effectively in a global regime? The odds would be stacked against it.

In sum, global coverage undercuts effectiveness. It leads to pressures to compromise the technical focus of the regime, and it weakens the implementation of the regime. But these problems have not deterred proposals for a global missile nonproliferation treaty.

Three Treaty Proposals

Shortly after the announcement of the MTCR, proposals appeared for a globalization of the US-Soviet INF Treaty—a "Global INF." In recent years, two additional proposals have appeared—a ZBM regime and a Canadian proposal for a global ban on ballistic missiles.

Global INF

The US and the Soviet Union signed the INF Treaty less than eight months after the announcement of the MTCR, and the treaty entered into force in mid-1988. Widely considered a major arms control success, the treaty eliminated an entire class of US and Soviet ground-launched missiles with ranges from 500 to 5,500 kilometers.

It was a short step for the Soviets and some parties in the US to advocate combining the "best" features of the INF and the NPT treaties into a Global INF.[1] Such a treaty would avoid the discriminatory features of the MTCR by placing identical bans on certain types of missiles in all nations. Moreover, the Global INF would enshrine this equitable arrangement in a binding treaty.

But what would such a treaty control? The INF bans only *ground launched* ballistic or cruise missiles *tested or deployed for weapons delivery* and *tested to a range between 500 and 5,500 kilometers (if a ballistic missile)* or *capable of this range (in its "standard design mode") if a cruise missile.* This leaves out a lot of systems:

- Air- and sea-launched missiles.
- "Peaceful" or non-weapons-delivery equivalents of proscribed missiles (e.g., large surface-to-air missiles—for air and missile defense and for antisatellite use—sounding rockets, SLVs, and various unmanned air vehicles—for reconnaissance, communications relay, and use as air-defense practice targets).
- Missiles capable of exceeding the MTCR's 300 kilometer/ 500 kilogram threshold but not the INF's 500-kilometer range (e.g., the unmodified Scud or the unmodified M-11). As Iraq demonstrated, with a modest trade of payload for range, the MTCR—and the INF—thresholds would be exceeded.
- Ballistic missiles capable of ranges over 500 kilometers but tested only to shorter ranges. Lofted trajectories are an easy dodge here; North Korea is reported in the press to have flight-tested its first Nodong missile to a range well below its capability.
- Cruise missiles with a "standard design mode" of less than a 500-kilometer range but easily capable of exceeding

that range by substituting fuel for payload or by other non-"standard" techniques.

The MTCR controls all of these missiles and more. A simple globalization of the INF would make all of them *legitimate.* (Remember, what is not prohibited is permitted.)

Even if a Global INF could be defined to cover all the systems targeted by the MTCR, it would need to apply the same rules to the haves and have-nots—leading to bans on conventionally armed missiles and missile defenses that would be difficult or impossible to negotiate. Verification—intrusive and complex in the US-USSR INF treaty—would be even more so if a Global INF were refined to avoid gaps in coverage. Moreover, the problems discussed in the previous section would remain. Those problems are intrinsic to treaties and to global coverage.

Zero Ballistic Missiles

The ZBM concept, proposed by some American arms controllers in 1992, calls for a treaty banning all ballistic missiles everywhere.[2] It would seek to eliminate weapons that—by virtue of their speed—are regarded by many people as the most destabilizing. A ZBM would have a verification advantage over a Global INF. Obviously, banning all ballistic missiles would mean that proliferators could not disguise tests of an illegal type of ballistic missile as tests of a legal type.

However, the ZBM would not control sounding rockets and SLVs, even though they are interchangeable with ballistic missiles. Further, it would not control cruise missiles.

In some ways, the ZBM proposal is aimed less at preventing proliferation than at completing the process of removing the great powers' ballistic missiles. But by banning the most survivable of the strategic deterrent systems—sea-launched ballistic missiles (SLBM)—the proposal might increase rather than reduce the crisis instability of nuclear forces. (The proposal would replace SLBMs with nuclear-armed bombers and sea-launched cruise missiles, neither of which exists with both survivability and range comparable to the newest SLBMs.)

Moreover, the proponents of ZBM have a most unsettling plan for gaining global acceptance. They would offer SLV

technology to all parties to the treaty, thus greatly increasing the proliferation of long-range ballistic missile capabilities. When the penalties of treaties and global coverage are subtracted from the net effects of a ZBM treaty, its value becomes more one of poetry than of arms control.

Canadian Proposal for a Ballistic Missile Ban

Canada has proposed a scheme that appears to borrow elements from both the Global INF and ZBM. It is a global ban on all ground-launched ballistic missiles with a range of 300 (versus the INF's 500) to 5,500 kilometers. A Canadian official states that "we see the solution to the problem of ballistic missile proliferation as being founded on enduring rules of international law, not technical fixes or *ad hoc* responses like ATBMs (anti-tactical ballistic missiles) or the MTCR. These are not long term answers."[3]

The proposal features many of the loopholes of a Global INF or a ZBM treaty: no coverage of cruise missiles ("we have to be realistic and stick to what is doable")[4] or of SLVs (to avoid discriminatory denials of technology). Verification has not been worked out, and some approaches will likely raise issues of national security and commercial confidentiality.

The dangers of attempting to globalize the MTCR are not limited to future proposals such as those described here. The dangers are unfolding at the present time in the US approach to possible MTCR membership for Brazil.

The Case of Brazil

Brazil is a large nation with large ambitions. In the 1970s, it concluded the "deal of the century" with the Federal Republic of Germany for eight expensive nuclear reactors—plus reprocessing and enrichment facilities. The venture collapsed, not because of the objections of the nonproliferators, but because of its expense. However, a simultaneous venture quietly continued—Brazil's program to build a space-launch vehicle.

According to Brazilian press reports of the early 1980s, the SLV (VLS in Portuguese) program was tied to the nuclear program by more than simultaneity. The VLS was intended to

provide an option for delivery of a nuclear warhead by ballistic missile.[5] Like the nuclear program, the VLS suffered from lack of funds and was a waste of money unless—as a recent RAND report demonstrated—it could enjoy access to foreign technology and produce exports of ballistic missiles on the side.[6]

For nonproliferation reasons, the United States refused to support the VLS program. However, the US government has an astonishingly strong Brazil lobby, so restraint with respect to the VLS was characterized by fits and starts.

There was enough restraint for Brazilian officials publicly to complain in the late 1980s that the MTCR had set the VLS program back several years. There was enough restraint for the French in the early 1990s quietly to drop a potential program of VLS cooperation with Brazil. And there was enough restraint for the US to put the VLS program—and various related ballistic-missile proposals—on a published list that subjected Brazilian importers of missile-related items to special scrutiny.

But fits occurred among these starts. In the mid-1980s, the Brazilophiles in the US government repeatedly sought to pull the teeth of the MTCR as it was being negotiated. In the early 1990s, the US State Department unilaterally approved US technical services for the VLS—an act for which it later apologized to Congress. By and large, however, the US and other nations acted to retard the VLS—until the advent of the Clinton administration.

One of that administration's first decisions was to authorize the National Aeronautics and Space Administration (NASA) to launch a series of large sounding rockets from the Brazilian VLS facility at Alcântara. This action gave an important seal of approval to the pariah program—inviting explorations of support from other governments and more funds from the Brazilian parliament.

The next decision by the Clinton administration had potentially more widespread effects on missile nonproliferation. On 23 September 1993, the president reversed a de facto policy that applicants for membership to the MTCR must terminate programs targeted by the regime. This stance had helped lead Argentina to dismantle its Condor ballistic-missile program. However, the new policy proposed a new distinction among

missiles—one that the drafters of the MTCR found impossible to square with the laws of physics. The new distinction required only "offensive ballistic missiles" to be dropped before a nation could join the MTCR—leaving the applicants free to take their other rockets and all unmanned air-vehicle systems into the regime. The new policy stated that, although "the United States will not support the development or acquisition of space-launch vehicles in countries outside the MTCR," once a nation had joined the regime, things would change. Then, the US would "consider exports of MTCR-controlled items to MTCR member countries for peaceful space launch programs on a case-by-case basis."[7]

This policy left Argentine commentators asking whether they should have been allowed to continue a Condor-based "SLV" program to match their neighbor's VLS. The policy was hardly equitable to South Africa, which was then in the process of dismantling its "SLV" program. In fact, the policy effectively proposed to gerrymander the regime to the immediate benefit of only one nation—Brazil. The Clinton proposal has not yet been accepted by the other members of the regime, but it may come up for a test at the next meeting of regime members.

Meanwhile, according to the press, the Clinton administration learned of Russian assistance to the VLS—assistance sanctionable under US law. Again, according to the press, the administration waived these sanctions—setting the stage for Russian and Brazilian entry into the MTCR.[8]

This victory of the Brazil lobby over the MTCR—and, for that matter, over the laws of physics—holds lessons for the issue of globalizing the MTCR. If a low-priority program like Brazil's VLS can result in a gerrymandering of the MTCR, then the demands of an India or an Israel can lead to even more damaging Faustian bargains in a global regime.

Conclusion

The NPT is a treaty at war with itself. Articles 1, 2, and 3 belong in a treaty devoted to nonproliferation—stopping the spread of nuclear weapons without disarming those countries that already possess them. Article 6 belongs in a treaty for nuclear disarmament—eliminating nuclear weapons globally.

PART 2

Emerging Technologies: New Near-Term Dangers

Chapter 4

How to Defeat the United States: The Operational Military Effects of the Proliferation of Weapons of Precise Destruction

David Blair

This essay explores the *net* change in the military capability of the United States that is likely to occur over the next 25 years or so. To get a handle on such a change, we need to look at the types of weapons likely to be available to the US and possible enemies. Just as importantly, we need to look at the disparity between the missions of the US military and those of other countries' militaries. The danger to the US is not that we will face a peer competitor in the foreseeable future, but that we will face regional powers that are able to keep our military from projecting power into their regions. A key question is whether the technological, organizational, and financial superiority of the US military will translate into a continued ability to carry out its primary mission, which is *intervening easily, far from our homeland and close to the homeland of our enemies*. The thesis of this essay is that technological changes over the next 25 years or so will tend to make strategic offense (that is, power projection) more difficult and regional defense easier.[1]

US Grand Strategy Thwarted

Concerns about dangers that would arise if a rogue state were to get nuclear weapons or other weapons of mass destruction are the main drivers of most US nonproliferation policy. In addition to the almost unthinkable threat of a madman blowing up US cities, the US military has much to fear from less apocalyptic threats of a local power that threatens to use nuclear, biological, and chemical (NBC) weapons solely against military targets.[2] Regional powers'

possession of these weapons changes the calculus of both the US and its opponents to such an extent that predicting how anyone would act becomes impossible. We just do not know whether Iraq's possession of nuclear weapons would have increased or decreased the likelihood of US intervention to protect Kuwait and Saudi Arabia. We do know, however, that the war would have been much more serious because it would have threatened the existence of some US cities *and* because US forces in the region would have been vulnerable to nuclear destruction. This essay does not seek to join the argument about the unknowable question of whether US threats of retaliation or escalation will succeed in deterring local powers from using weapons of mass destruction.[3]

It does argue, however, that the proliferation of a coming generation of *weapons of precise destruction* among regional powers may well prevent the US military from accomplishing its primary strategic goal—projecting power globally. These precise conventional weapons may be able to destroy US power-projection forces with the same military effectiveness as nuclear weapons, but any US threats to retaliate with nuclear weapons in response to such a conventional attack would be absolutely implausible. The key point is that *the US will also find it very hard to solve this problem by responding with its own precise weapons.* US bases and platforms are likely to be more vulnerable to precision weapons than are regional powers operating in their own region. US forces in a region will be asymmetrically vulnerable because a well-prepared regional power can hide and disperse its forces. But effectively hiding and dispersing the bases and other paraphernalia of a major US power-projection force is almost inconceivable.

The US military has two great advantages over all other militaries in the world: money and organizational capability. The US spends eight to 10 times as much on the military as does its nearest competitor. Furthermore, it has a higher defense budget than the entire gross national products of many rogue states we see as our most likely enemies.[4] Though less tangible, the organizational capability of the US military must seem equally imposing to any state thinking of challenging the US. That capability allows the US to operate and maintain air and naval forces that even European

countries can only palely imitate. Further, it allows the US to provide logistics support for large forces around the world and to carry out large, complicated, joint-force operations that no one else can even think of matching. Other US advantages in technology, training, strategic and operational thought, and alliance support flow from advantages in money and organizational capability. Thus, even after reductions in military spending that followed the cold war, US military capability certainly seems sufficient, at least at first glance, to justify bestowing the title of "sole superpower" on the United States.

Such status, however, does not mean that the US can look forward to a future of easy military dominance. Two factors contribute to this problem: (1) the key to US grand strategy is the capability to *project power easily* and (2) some types of weapons systems (precision-guided conventional munitions as well as nuclear, biological, and chemical weapons) are much cheaper and require less organizational skill to use than the expensive, complicated platforms upon which the US depends. The US must have major platforms and bases in order to move and operate its forces around the world. But a regional power, operating on or near its own territory, might create a force consisting of a system of dispersed precision-guided weapons that could make US logistics assets and operating bases very vulnerable.

Whether this problem becomes so serious that it stops the US from intervening in an area important to us obviously depends on choices about the number and type of weapons systems bought by the US and by potential rivals. The usual goal of antiproliferation efforts is to stop bad guys from getting apocalyptic weapons of mass destruction. Clearly, this goal gets the most attention because such weapons in the hands of an evil or irrational dictator or terrorist could destroy US cities. However, the availability of advanced conventional weapons on the international arms market, though much less apocalyptic, could have a profound effect on the US position in the world.

This argument rests on five propositions:

Proposition 1. US grand strategy in the post-cold-war period is based on the assumption that we will have the military capability to project power easily in much of the world.

Proposition 2. In foreseeable future wars, the US military's ability to project power will depend on a rather small number of bases (primarily air bases and seaports) and major weapons platforms.

Proposition 3. Bases and major weapons platforms are increasingly vulnerable to highly accurate, advanced conventional weapons.

Proposition 4. A regional power, fighting near its own territory, will be able to disperse its forces and become less dependent on bases and major platforms than an outside nation trying to project power into the region.

Proposition 5. Advanced conventional weapons and the technology needed to produce them are available on the world market and will be widely available to regional powers in the near future.

The conclusion from this set of propositions is that precise, conventional weapons will spread to regional powers that could use them to thwart the US from projecting power. Thus, instead of a future in which the US is a sole superpower with worldwide interests and military capability, we could move to a future in which the world is split into regions dominated by local hegemons. Far from being to the long-term advantage of the US, the revolution in military affairs (RMA) that follows from the development of precise weapons, powerful sensors, and nearly ubiquitous communications could shift the military balance to regional powers. The centuries-long dominance of Western European and American offense over third world defense could come to an end. Of course, the competition between offense and defense will continue, and the US may well be able to bring its many advantages to bear against some regional powers in the future. However, the long-term trends in technology appear to work against the US.

What is the United States to do about this? Extensions of nonproliferation efforts such as treaties and export controls might be useful, and the US probably should pursue them as long as we do not rely on them to solve the problem. Much more fundamental changes in the US military will be required. If the US is to prevent a slow collapse of its grand strategy, the military needs to start thinking about restructuring itself so

that power-projection assets are not so vulnerable to destruction by precise weapons. This means that all decisions about weapons systems, force structure, and base structure must be made with an eye toward their vulnerability to interdiction by precise conventional weapons. The US military must stop assuming that its major platforms and bases will be secure and thus needs to implement serious changes in its weapons systems and war plans.

Proposition 1: US Grand Strategy in the Post-Cold-War Period Is Based on the Assumption That We Will Have the Military Capability to Project Power Easily in Much of the World

Big turning points in history occur when one country or civilization becomes able to project power against others fairly easily. Much of the history of the Eurasian continent for 1,000 years (roughly A.D. 400 to A.D. 1400) was driven by the fact that nomadic horse peoples developed power-projection capability against more settled civilizations. The history of the last 500 years has been driven by the fact that Western Europeans (primarily the British, French, Dutch, Portuguese, and Spanish) suddenly developed a hitherto unprecedented ability to dominate militarily peoples and militaries very far from the Western European homeland. The Gulf War is the latest example of the capability of Western countries to project power into distant corners of the world. US national strategy assumes that the United States will continue to be able to do so. We will be living through a major historical change if, as this essay argues, technological change gives non-European states the capability to stop Americans/Europeans from projecting power into the so-called third world.

A big debate going on now concerns whether the technological changes we have seen over the last 25 years or so—and are likely to see in the near future—amount to a revolution in military affairs. Not to quibble over definitions, but many changes in the past might be called military revolutions. The development of machine guns changed the way successful armies fought, and the development of the

tank changed it again. In both cases, the changes could have been—and to a great extent were—incorporated into the militaries of all the major European antagonists. These events were largely revolutions in military organization and in tactics, but they did not demand fundamental changes in the strategic balance or in the nature of the societies of the major powers. On the other hand, the really important RMAs fundamentally change the military balance between different types of civilizations. Big changes in history occur when the world's major power loses its fundamental ability to project power or when a new power capable of projecting power arises.[5]

Conventional weapons of the last century or so have been most useful to rich, well-organized, industrialized countries. On the other hand, precise conventional munitions can be purchased and used by third world countries. Paradoxically, new weapons that require high technology for their design and production give less premium to organization, affluence, or technological/industrial capability in their use.

The lessons that the public and, I fear, much of the military learned from the Gulf War were very unfortunate. We saw a very well trained, very technologically sophisticated US military that made power projection look easy. However, war against a well-prepared regional power is unlikely to be easy for the US in the future. The spread of high-precision conventional weapons—not to mention nuclear, biological, and chemical weapons of mass destruction—will make very difficult the task of getting US forces to a region and keeping them alive and operational once they are there.

No direct comparison of the US military with any competitor is meaningful without understanding the extraordinary contrast between the mission of the US military and that of any other country's military. The Clinton administration's strategy, like that of every other administration since World War II, assigns the military the task of being prepared to intervene—to project power—into regions of the world very remote from the US. The primary mission of the US military is, in a strategic sense, extremely *offensive*. Yet, foreseeable technological changes over the next 25 years are likely to make offensive military action much more difficult—so difficult that the US may well decide

that the grand strategy devised by both the Bush and Clinton administrations will not be worthwhile.

These administrations have propounded very similar grand strategies with extremely ambitious agendas for transforming the world. Basically, they see three major tasks in American foreign policy: (1) promoting the transformation of as many countries as possible to democracy and capitalism, (2) intervening diplomatically and, if need be, militarily to stop regional conflicts from getting out of hand, and (3) punishing and containing rogue states such as Iraq, Iran, North Korea, and Libya.

Of course, official US documents on strategy are so voluminous and vague that pinning down any hard choices about strategic direction is difficult. Still, several statements from US leaders illustrate the general thrust of current US national security strategy:

> Our forces must be able to help offset the military power of regional states with interests opposed to those of the United States and its allies. To do this, we must be able to credibly deter and defeat aggression, by *projecting and sustaining U.S. power* in more than one region if necessary. (Emphasis added)—President William J. Clinton.[6]

> I start with this fundamental fact: The United States will remain a global power. . . . Protecting our interests requires us to have security commitments around the world—Secretary of Defense William Perry.[7]

> Accomplishing the specific tasks of the strategy is facilitated by the two complementary strategic concepts of **overseas presence** and **power projection**. (Emphasis in original)—Gen John Shalikashvili.[8]

> The primary responsibility of America's military is to deter potential adversaries or fight and win wars decisively. To improve the way we do business, we must consider this core responsibility in terms of how America's military forces actually *project power*. At the foundation of this approach is *power projection*. (Emphasis added)—Gen Ronald R. Fogleman and Secretary of the Air Force Sheila E. Widnall.[9]

The Clinton administration stresses the need for allies and international organizations to help with these tasks. Superficially, this approach looks like the Nixon doctrine, which sought to create regional allies of the US that could, in effect, manage the region for us. For example, the US considered Iran its dominant ally in the Persian Gulf area. The logical problem with this strategy is that it would have created regional

hegemons that would not be indefinitely beholden to the US. The effect of our current strategy is very different. In contrast to supporting a regional hegemon, we are now attempting to create a balance of power by supporting naturally weak states against potential regional hegemons. Saudi Arabia thus seems to be a nearly perfect ally: it can supply both land and money for US forces in the region but is too weak to dream of being a regional hegemon and too lucrative a target to risk doing without US support. In East Asia, our strategy seems to be drifting toward putting together a coalition of (relatively) small states to prevent China from becoming a regional hegemon. In both East Asia and the Middle East, our allies appear too weak to defend themselves against a regional hegemon without massive US power-projection capability.

The fact is that the goals of spreading democracy, dampening regional conflict, and even containing rogue states are relevant to the US primarily in a very long term and tangential way. To be acceptable to the US people, these goals have to be accomplished fairly easily. The Gulf War set the standard: wars for these goals have to be won quickly, with little loss of American life and no excessive loss of enemy civilian or even military life. In other words, the US must not only be dominant but almost effortlessly dominant.

In a very fundamental sense, the US military is gearing up to be a global policeman. Primarily, policemen break up quarrels and catch bad guys. After they catch the culprit, we expect them to be overwhelmingly dominant in terms of force. Policemen should run no risk of losing a battle with a criminal. Because our grand strategy depends on projecting power easily, it is misleading to say that the US can defeat any country on earth if it is willing to pay the price. The US expects to be able to project power around the world with little loss of life and minimal stress on the polity or the nation. As more countries become able to attack US bases and weapons platforms, the US will increasingly find that interests previously judged vital will no longer warrant intervention. Thus, other countries may well defeat US grand strategy without actual combat.

Proposition 2: In Foreseeable Future Wars, the US Military's Ability to Project Power Will Depend on a Rather Small Number of Bases and Major Weapons Platforms

Even with the most advanced sensors and precision-guided weapons, finding and killing large, fixed bases will remain much easier than doing the same to dispersed, mobile weapons systems. The US relies—and will continue to rely—on a few large, fixed bases in any theater into which it tries to project power. On the other hand, new precision-guidance technologies give regional powers the opportunity to create military forces that can hide and disperse on their own territory.

The general assumption behind the RMA is that we are moving to a world in which "if we can see it, we can kill it." The US is in trouble if regional enemies develop this capability because any power-projection effort will rely on a small number of bases that the enemy can see. The general trend of technology does not favor the survivability of large, visible, relatively fixed assets. On the other hand, a prepared enemy operating on or near his own territory can disperse assets, set decoys to confuse our sensors, and distribute supplies long in advance. Thus, the US task of power projection is inherently much more difficult than the task of a regional defender.

Of course, a wealth of literature analyzes the vulnerability of military assets—air bases, carriers, tank columns, logistics nodes, and so forth. Furthermore, the US military has put some thought into reducing the vulnerability of these high-value assets by passive and active means. Attackers and defenders will continue to make technological advances, and it is impossible to predict in any detail how and when that competition will work out. But the general trend of technology is to make large formations, weapons systems, and bases vulnerable.

The US is not making long-term plans that will solve this problem. For example, despite all these vulnerabilities, the assumption guiding US planning is that its logistics system will remain immune from attack. The Congressionally Mandated Mobility Study of 1980, which still is the basis for

most defense logistics planning, explicitly assumed that one could plan deployment to a theater as if it were a peacetime shipping operation:

> The study would consider *conventional conflicts only;* neither nuclear nor chemical warfare would be examined. The effects of the denial of access to seaports and airfields, or their closure, were not evaluated; *seaports and airfields were assumed to be open and accessible.* Petroleum products, oil and lubricants were assumed to be available as needed; *bases en route to theaters of combat were assumed to be open,* accessible, and hospitable. No detailed analysis would be made of port reception capabilities or in-theater transportation capabilities; after men and materiel arrived at a port, sufficient unloading facilities and transportation to their final destinations were assumed to exist. (Emphasis added)[10]

Perhaps the US can work out ways to make its bases and logistics train less vulnerable. But this will not happen if we continue to plan deployments under assumptions more appropriate to Federal Express.

It is conceivable, though not likely, that the US might develop power-projection capability that does not involve putting major forces on the ground in the area. Many people have speculated about the strategic effect of strikes from B-2s or from some kind of futuristic space weapon.[11] Similarly, naval forces could launch air strikes or cruise missile strikes. We cannot settle here the debate about the military decisiveness of such limited air strikes, but clearly the number of targets we can destroy with such forces is much smaller than the number destroyed by a massive air campaign carried out by land-based planes in-theater, as in Operation Desert Storm. It is also hard to see how such a limited air campaign can be decisive without army troops to finish the war. In any case, current US military planning certainly envisions any power projection as involving the moving of major US forces into the region. The *National Military Strategy* of 1995 says that

> this power projection could ultimately entail the transport of large numbers of personnel and their equipment. Such an effort requires detailed plans to provide the necessary intelligence, logistics, and communications support, as well as capabilities to protect our forces during deployment. We continue to build on the lessons learned in Operation Desert Storm to strengthen our power projection capabilities.[12]

Some people see stealth as a trump card that allows US airplanes (and, conceivably, ships) to go anywhere, anytime, with impunity. The problem is that this conclusion is tactical rather than strategic. Even if the US remains far ahead in stealth technology and even if no one develops effective defensive countermeasures, the bases that stealth fighter planes (F-117s and F-22s) operate from will still be susceptible to disruption or destruction—as will their logistics support system. The bottom line is that the US needs a radical rethinking of its force structure if its power-projection grand strategy is to remain viable in the future.

Proposition 3: Bases and Major Weapons Platforms Are Increasingly Vulnerable to Highly Accurate, Advanced Conventional Weapons

Who gains from the RMA? Will the continuing development of precision weapons and new sensor and communications capabilities usually discussed under the rubric of "the RMA" increase US power-projection capability? Or will the proliferation of weapons around the world reduce the strategic offensive capability of the US? Does the US gain a net advantage from the RMA, or do regional powers trying to stop the US from projecting power gain net capability?

The term *revolution in military affairs* is significant, having been deliberately changed from Marshall Ogarkov's term *military-technical revolution.*[13] US proponents of the RMA do not view it merely as a change in military technology, tactics, or operational art. They see it as a real revolution in the whole nature of warfare. The dream is that an integrated system of precision weapons and intelligence will allow the US to project power very easily—meaning that casualties will be low and there will be no uncertainty about the outcome. Thus, military power projection can be used as an instrument of foreign policy without risking much of the messiness of past wars.

Little in the RMA literature recognizes that the very technological changes that are the basis for enthusiasm about the RMA—highly precise weapons and very good sensors and communications systems—may be more conducive to denying US power-projection capability than making power projection

an easy police action. One major theme of this literature is that new technology will eliminate the fog of war.[14] The hope is that war will become more like a police SWAT-team operation—highly coordinated and leaving no doubt about the ultimate victor. The Gulf War, in retrospect, looks like just such a conflict. War is sometimes defined as "a contest employing violent force."[15] The dream behind the RMA is that the US can develop such a far superior force that future US wars become "no contest"—devoid of the uncertainties and violence inherent in past wars. For example, the official US Air Force strategy document notes that

> we are now reaping the benefits of high payoff investments in a truly revolutionary set of technologies. Investment in these advanced technolgies will provide the United States forces decisive capabilities against potentially well-equipped foes at a minimum cost in casualties.[16]

A closer look at the kinds of forces needed to make an RMA work gives us much more reason to fear for the long-term viability of this dream. A RAND study of the future of the RMA makes the following speculation:

> Suppose that war looked like this: Small numbers of light, highly mobile forces defeat and compel the surrender of large masses of heavily armed, dug-in enemy forces with little loss of life on either side. The mobile forces can do this because they are well prepared, make room for maneuver, concentrate their firepower rapidly in unexpected places, and have superior command, control, and information systems that are decentralized to allow tactical initiatives, yet provide central commanders with unparalleled intelligence and "topsight" for strategic purposes.[17]

This vision entails a number of problems. Even these "highly mobile" forces depend on highly immobile bases in-theater. Furthermore, the US is investing only a small portion of its defense budget on forces that are light and highly mobile. Our precision weapons tend to be based on platforms that either have large signatures or require much support.

It is also unwise to assume that the US will again face large masses of dug-in, heavily armored forces. Will the next enemy be stupid enough to repeat Saddam Hussein's strategy and force structure? A smart enemy would purchase, on the world arms market, lots of missiles and other munitions that he could fire at large US bases and platforms. The Gulf War was lopsided precisely because the US had an extreme asymmetric

advantage, both in precision weapons and in information. We cannot count on being so lucky next time.

Technological trends can tell us something about whether we can realize the RMA dream. None of the technologies we are developing really gives us the capability to insert decisive force halfway around the world without large bases and platforms in the region. But these bases are very likely to be vulnerable in the future.

Traditional wisdom maintains that air bases are very hard to close. For example, even if attacking forces used ballistic missiles with good 1980s-level accuracy (50-meter circular error of probability [CEP]) and optimized runway-cratering munitions, they would need 15 to 48 missiles to close a single air base.[18] Civil engineers could make the base operational again in less than a day. However, one of the tenets of the RMA is that accuracy will continue to increase. With the five-meter CEP missiles that are likely to spread around the world, closing a runway might be possible with three to five missiles—fewer if the attacker can target fuel or repair facilities.

Similarly, most people view US aircraft carrier task forces, especially after the deployment of the Aegis cruiser, as invulnerable. However, the performance of the Exocet missile in the Falklands War in 1982 is a small foreshadowing of the threats to those carriers, especially if they are near the enemy shore. Even worse, missile and other threats increase as carrier task forces move into waters near a country against which the US is trying to project power. Vice Adm James Owens has written that if Iraq had managed to acquire six (diesel) submarines, those vessels "could have made a significant difference in the Persian Gulf War."[19] It is surely no coincidence that Iran and China have been making significant investments in small diesel submarines designed to keep US carriers out of their coastal waters.

Further, the US logistics train includes a host of tempting targets. The two available Persian Gulf points of debarkation would have been destroyed by an enemy only slightly more capable than Iraq. Because enemies can easily see transport air base and materiel prepositioning sites, these places will be vulnerable in the future.

In addition to the vulnerability of US bases and logistics, tactical and operational changes the US military is making to take advantage of the RMA may actually make US forces *more* vulnerable. The very sophistication of the US logistics system may well add to its vulnerability. For example, computer hackers might be able to destroy the highly coordinated logistics plans the US uses to keep track of its shipments.[20]

The US military is now making its war-fighting plans and carrying out its training on the assumption that a very complex command, control, communications, and intelligence (C^3I) system will be available. However, some sensors and communications nodes might be very vulnerable to destruction. For example, airborne warning and control system (AWACS) and joint surveillance target attack radar system (JSTARS) aircraft are the primary sensors the US plans to use to keep track of enemy aircraft and ground-force movement. But both of these large Boeing passenger planes might be vulnerable to destruction by an enemy with precision-guided weapons. Similarly, satellite communications might be vulnerable to saboteurs who could destroy the very limited number of US ground stations.

What would happen to the US military if it plans and trains on the assumption that these sensors and communications systems will be available, and suddenly they are not? A military that believes in "fight the way you train" would be unable to do so. The fog of war would be back with a vengeance. The US has long prided itself—and has contrasted its forces with those of the Soviets—on the fact that its units have the initiative to operate autonomously. Is that still the case? Seemingly, the US has come to pride itself on the ability to carry out extremely complicated maneuvers and air tasking orders. Does this leave the US vulnerable to surprise? A smart enemy may well be able to attack and disrupt the nervous system of the high-tech, RMA-style US military.

Proposition 4: A Regional Power, Fighting Near Its Own Territory, Will Be Able to Disperse Its Forces and Become

Less Dependent on Bases and Major Platforms than an Outside Nation Trying to Project Power into the Region

Suppose you were a military planner for a country that might eventually want to challenge US superiority. How would you develop a competitive strategy? You would not seek to build an air force or blue-water navy. Maintaining a fleet of modern fighter aircraft is beyond the finances and organizational capability of most countries. Even China, Russia, Japan, or a major Western European country can hardly think of building an air force with sufficient size, organizational capability, or technology to challenge the US Air Force. Similarly, no other country could hope to deploy a navy in any way comparable to the US Navy. The US advantage on the ground is less dramatic, but no other nation can match the integrated combined-arms capability of the US Army and Marine Corps. The key to developing a strategy to defeat the US is to develop a military based on weapons that are relatively cheap, that do not require a large infrastructure to maintain or operate, but that nevertheless threaten the ability of the US to project power.

The completely unsuccessful US hunt for Iraqi Scud missiles serves as a warning about the difficulty of finding weapons systems dispersed in an enemy's own territory. In this case, the US was hunting large weapons systems hidden by a minimally prepared and minimally sophisticated enemy. A future enemy will have a long time to prepare spoofs and decoys to make harder the already difficult job of US sensors. Units of smart weapons can operate almost autonomously for long periods, so interdicting their logistics chain will prove unsuccessful. In short, little basis seems to exist for the dream that US systems will be able to find and kill enemy targets easily.

Proposition 5: Advanced Conventional Weapons and the Technology Needed to Make Them Are Available on the World Market and Can Be Expected to Be Widely Available to Regional Powers in the Near Future

Attempts to stop the sale of weapons, particularly conventional weapons, have been remarkably unsuccessful. At the end of the cold war, one might have thought that the end of

the political-military competition between the US and the Soviet Union would have facilitated international agreements to stop the flow of weapons systems. To the contrary, competition among desperate defense companies in the US, Europe, and Russia has made it even harder to place restrictions on weapons sales.

Changes in US criteria for allowing a company to export a weapons system show the openness of the world arms market. The Carter administration mandated that "the United States will only permit arms sales on the basis of policy decisions first made by the Department of State, rather than in reaction to requests from defense manufacturers."[21] The Reagan administration encouraged more arms sales than the Carter administration, but strategic concerns still determined whether particular deals should proceed. On the other hand, the Clinton administration formally changed arms-export review procedures to account officially for their effect on the defense industry. Secretary of State Warren Christopher argued, "Where nations are buying conventional arms and they are responsible buyers . . . we should not see that market fall into the hands of our European or Asian competitors."[22] Certainly, foreign defense manufacturers will not show more restraint than the US.

Furthermore, there is little hope of stopping the spread of near-cutting-edge technology for very long. The Office of Naval Intelligence warns that "the overall technical threat and lethality of the arms being sold has never been higher. [Extremely advanced weapons] are being advertised or exported with seemingly little consideration for their effects on regional political-military balances."[23]

Major weapons platforms (particularly aircraft) give the supplier country some leverage over the recipient. These platforms require many replacement parts, regular maintenance, and frequent software updates. For example, Iran has had a hard time using the aircraft that the US sold the Shah in the 1970s. Unfortunately, the kinds of smart missiles and munitions that may endanger US assets in the future are hard to keep track of and give the supplier little leverage—take for example the Stinger missiles that the US supplied the Afghan rebels.

Secretary of Defense William Perry stresses the fact that civilian and military technology are much more highly related than they were in the past. In many technologies crucial to the RMA, civilian technology is ahead of military technology. This means that the US is very unlikely to maintain a monopoly in RMA technology.

What Is to Be Done?

Martin van Creveld argues that the shift to low-intensity war is reducing the power of the state relative to nonstate groups. He argues that shifts in technology created the modern nation-state by giving central authorities the capability to overcome the defenses of the local lords. Similarly, he argues that current changes in technology are changing the military balance so that nonstate actors will be able to challenge the state with increasing effectiveness.[24] This essay has argued that van Creveld takes his argument a step too far.

It is hard to see how nonstate actors can do more than cause pinprick damage against determined states. Terrorism and regional insurgencies impose high costs on a society and certainly do force states to transform themselves—often into harsher, less liberal governments. But such low-intensity threats are very seldom a real threat to the survival of the state. Even such relatively weak states as El Salvador and Peru were able to organize themselves to overcome guerrilla groups. Guerrillas have not been able to maintain, operate, and develop strategy for new precision-guided weapons. The sole counterexample is the Afghan guerrilla use of Stinger missiles against Soviet helicopters. Even in this special case, the guerrillas had significant outside help, the Afghan communist state was so weak as to hardly have been a state at all, and, furthermore, the effectiveness of the Stingers has probably been exagerrated.

On the other hand, new technology is shifting power to regional states, away from the US and the traditional major powers of Europe. The main problem addressed here is that regional states can use much of the technology now available or on the horizon to eliminate US advantages in airpower and in training and organization. Cruise and ballistic missiles

require much less manufacturing prowess and less well trained troops than are needed to manufacture, maintain, or operate airplanes, but these missiles might be a significant threat to the air bases and carriers upon which US forces depend. The technological revolution that has made US weapons accurate and that has given us the information needed to target them may reduce the tonnage of bombs needed. On net, however, the revolution shows no signs of obviating US dependence on a few fixed air bases, ports, and carriers located close to the battlefield. The US must also contend with the danger that its forces will become so dependent upon air supremacy and information supremacy (not just superiority) that they will not be trained to operate with anything less.

No clear solution exists for any of these problems. A crucial first step entails realizing both the difficulty of maintaining US dominance around the world and the vulnerability of our power-projection forces. This realization should become the prime driver for our procurement and force-structure decisions over the coming decades. The US needs to make a large investment and spend much time thinking about its own vulnerabilities if it wishes to create a military capable of attacking a smart enemy in his own homeland and surviving while doing so. If the US decides not to change proposition 1—the view that US military strategy is based on easy power projection—then it will have to find some way to alter at least one of the other four propositions. US force structure and operational plans should be designed to make bases and platforms less vulnerable, disperse US forces away from those bases, and try to stop the proliferation of advanced conventional munitions around the world. None of these goals will be easy to achieve, but if the US has any hope of maintaining a power-projection strategy, its military must begin to orient itself to take these goals very seriously.

Notes

1. An interesting body of literature addresses the consequences of nonapocalyptic proliferation. See Henry D. Sokolski, "Nonapocalyptic Proliferation: A New Strategic Threat?" *Washington Quarterly*, Spring 1994, 115–27; Patrick Garrity, "Implications of the Persian Gulf War for Regional

Powers," *Washington Quarterly*, Summer 1993, 153–70; John Arquilla, "The Strategic Implications of Information Dominance," *Strategic Review* 22, no. 3 (Summer 1994): 24–30; and Robert G. Spulak, "Strategic Sufficiency and Long-Range Precision Weapons," *Strategic Review* 22, no. 3 (Summer 1994): 31–39.

2. Despite Herman Kahn's attempt to get us to "think about the unthinkable," little agreement exists in either military or academic circles about what the US would do in a limited nuclear war. The usual conclusion is Tom Schelling's argument that a bluff to destroy civilization would be enough to deter an adversary even if he knew that the probability of making good on the bluff was very tiny. It is very hard to imagine that these escalatory threats would deter regional hegemons who are using purely conventional weapons against US military forces.

3. Obviously, the literature on deterrence and limited nuclear war is huge. A good summary is Lawrence Freedman, *The Evolution of Nuclear Strategy* (New York: St. Martin's, 1983). In the Gulf War, Secretary of Defense Dick Cheney explored the use of nuclear weapons to stop Iraqi tank formations. See "Cheney Discussed Nuke Use in Gulf," *Washington Times*, 10 September 1995, 4.

4. The best source on defense budgets remains the annual editions of the *SIPRI Yearbook* (Stockholm: Stockholm International Peace Research Institute). Measures of relative defense budgets vary in accordance with fluctuations in the exchange rate. For example, at 1996 exchange rates, France or Britain spends about 40 billion US dollars per year on defense. At 1985 rates, they spend about $25 billion per year. The statement that the US spends eight to 10 times as much as they do attempts to give a real number adjusted for purchasing-power parity.

5. See Samuel P. Huntington, "The Clash of Civilizations?" *Foreign Affairs*, Summer 1993, 22–49.

6. William J. Clinton, *A National Security Strategy of Engagement and Enlargement* (Washington, D.C.: The White House, July 1994).

7. Secretary of Defense William J. Perry, quoted in Harry Summers, "Military Signs and Portents," *Washington Times*, 5 January 1995, 17.

8. Gen John M. Shalikashvili, *National Military Strategy of the United States* (Washington, D.C.: Government Printing Office, 1995), i.

9. Gen Ronald R. Fogleman and Secretary of the Air Force Sheila E. Widnall, *Global Presence* (Washington, D.C.: Department of the Air Force, 1995), 1.

10. Schuyler Houser, "The Congressionally Mandated Mobility Study," Case Program C16-87-789.0 (Cambridge, Mass.: Kennedy School of Government, 1987), 10.

11. Spulak, 31–39.

12. Shalikashvili, 13.

13. Primary credit for forcing the US to think about the RMA concept should go to Andrew Marshall, director of the Department of Defense Office of Net Assessment.

14. Jeffrey Cooper, for example, argues that US "coherent operations" can be so fast-paced and coordinated that the enemy will be unable to respond. Jeffrey R. Cooper, "Another View of the Revolution in Military Affairs" (Paper presented at the Fifth Annual Conference on Strategy, US Army War College, April 1994), especially 46–51. For contrary views, see John F. Harris, "In Electronic Battlefield Training Exercise, 'Fog of War' Remains Thick," *Washington Post*, 24 April 1994, 18.

15. See, for example, Grant T. Hammond, "Future War," presentation to Air Force 2025, Air War College, Maxwell AFB, Alabama, 26 September 1995.

16. Secretary of the Air Force Donald B. Rice, *The Air Force and U.S. National Security: Global Reach—Global Power* (Washington, D.C.: Department of the Air Force, June 1990), 2.

17. John Arquilla and David Ronfeldt, "Cyberwar Is Coming!" *Comparative Strategy* 12 (April–June 1993): 141–65.

18. See, for example, Benoit Morel and Theodore A. Postol, "A Technical Assessment of the Soviet TBM Threat to Europe," in Donald L. Hafner and John Roper, eds., *ATBMs and Western Security: Missile Defenses for Europe* (Cambridge, Mass.: Ballinger Publishing Co., 1988), 21–56.

19. Quoted in Leslie Alan Horvitz, "Cold War's End Has Little Effect on Arms Sales," *Washington Times*, 7 December 1994, 10.

20. See Comdr Frank C. Borik, "Sub Tzu and the Art of Submarine Warfare," Defense Analytical Study (Maxwell AFB, Ala.: Air War College, April 1995).

21. "Practical Morality," *Interavia/Aerospace World*, June 1993, 13.

22. Ibid.

23. Horvitz, 10.

24. Martin van Creveld, *The Transformation of War* (New York: Free Press, 1991).

Chapter 5

Proliferation of Satellite Imaging Capabilities: Developments and Implications

Steve Berner

This assessment examines the proliferation of space technology from traditional centers such as the United States, Western Europe, and the former Soviet Union to nontraditional areas in the Far East, South Asia, the Middle East, Africa, and South America. It evaluates the direction, content, and potential impact of this technology flow and in so doing challenges conventional wisdom on satellites and proliferation, including the following:

1. Civilian satellites and space programs represent peaceful technology—they are not militarily significant.
2. The few satellites that are militarily significant are made by the US; the few other nations that can field military satellites are our North Atlantic Treaty Organization (NATO) allies and Japan.
3. Even if third world countries want to use space for military purposes, we needn't worry because it will cost them billions of dollars to make systems of their own, and access to others' systems will not help them achieve a military capability.

By way of preliminary observations, one may note the following:

1. Critical parameters and performance figures for the major subsystems and components frequently overlap or are identical in civil and military space systems; civil space systems have already demonstrated substantial military utility; imaging systems are moving toward higher resolution and faster data delivery; and communications satellites (COMSAT) have a high degree of crossover.

2. The US and its Western allies no longer hold an exclusive monopoly on space technology; the proliferation of space technologies will pose an increasing problem for policymakers.

3. Several factors are serving to mitigate the cost barriers to acquiring significant space capabilities: foreign government spending on space has already reached substantial levels; cooperative and cost-sharing agreements have reduced individual countries' cost of access to space; the cost of acquiring some capabilities is declining rapidly; and the proliferation of many space technologies and their inherent dual-use capability will pose problems for US strategic and tactical forces and will complicate US planning in future military engagements.

Proliferation of Systems

The US recently relaxed policy limits on the resolution of commercial remote-sensing systems. In response, several commercial imagery systems will be launched in the next several years with resolution in the range of one to three meters (table 5.1).* These systems will also possess substantial tasking capability, allowing a region of particular interest to be imaged every two days—or more frequently. One result is that, in future military crises, US and allied troop deployments can be imaged on a near-daily basis. So-called shutter control of US systems may reduce this threat, but as we will demonstrate, a number of non-US systems may not be subject to the same shutter control.

With stereo capability and geodetic accuracy of 15 to 100 meters, the imagery from commercial systems can also support non-time-critical military applications such as developing a target set for ballistic missiles. Here, the activity may take place over a long time period prior to any crisis or outbreak of hostilities. For such applications, shutter control does not appear to provide a useful solution.

Even if current policy guidelines mitigate the threat posed by US commercial imagery systems, a growing number of

*Unless otherwise noted, all tables and illustrations courtesy Berner, Lanphier, and Associates, Inc., 105A West Edmonston Drive, Rockville, Maryland 20852 (1995).

Table 5.1

Characteristics of Planned US Commercial Imagery Systems

SYSTEM	LAUNCH	RESOLUTION	SWATH	TASKING	STEREO	REVISIT	GEODETIC ACCURACY
World View	1995	15 meters (m) (multispectral) 3 m panchromatic (pan)	3 X 3 kilometers (km)	±30° (along and x-track)	Yes	20 days (no tasking) five days (tasking, equatorial)	50 m
Eyeglass	1997	1 m (pan)	15 km	±45° (along and x-track)	Yes	two days or less	100 m
Space Imaging System	1997	4 m (multispectral) 1 m (pan)	15 km	±30° (along and x-track)	Yes	two days or less	15 m

foreign imagery systems are not subject to US control (table 5.2). France, Russia, the European Space Agency, Canada, Israel, China, India, Brazil, and Japan all will be operating space-based imagery systems during the second half of this decade. Other countries have sought to purchase imagery systems from US or European suppliers. This is a fundamental change from the situation in the early 1980s when the US and Soviet Union were the only countries with any meaningful satellite-imagery capability.

France was the next country after the US and Soviet Union to field a significant space-imagery capability. The French *satellite pour l'observation de la terre* (SPOT) system (table 5.3) was the first civil/commercial system to use solid-state charge-coupled devices (CCD) as detectors. This was an important advance because CCDs improve the sensitivity of the sensor and thus allow the ground resolution to be improved. SPOT 1's 10-meter panchromatic imagery was a marked improvement relative to land satellite's (LANDSAT) 30-meter resolution and represented the best resolution available from a civil/commercial electro-optical imagery system.

The greatest interest is in electro-optical systems and, as we discuss later, synthetic aperture radar (SAR) systems. However, the Russians continue to provide film-based imagery for commercial use (table 5.4). Some of these systems actually provide the best spatial resolution available today from civil/commercial systems. They are well matched to such applications as mapping or targeting of fixed targets. With a typical on-orbit life of one month and revisit time of 14 days, however, each satellite provides only two passes over a given area. Thus, multiple satellite launches are needed to provide ongoing coverage of a continuing crisis or conflict.

A key factor that increases the tactical military utility of satellite imagery is the ability to obtain imagery under all types of weather and illumination conditions. Electro-optical systems cannot provide day/night, all-weather imagery, but SAR systems can. The Russian ALMAZ is one example of a SAR system (table 5.5). ALMAZ advertised a resolution of 10 to 15 meters, but with its 15-meter-long antenna, it was capable of achieving 7.5-meter resolution. ALMAZ was capable of imaging any point on earth within one to four days under any

Table 5.2
Current and Planned Foreign Remote-Sensing Systems

FRANCE	SPOT 1 .5–.89 μm (micrometer) 10m (pan)	SPOT 2 .5–.89 μm 10m (pan)	SPOT 3 .5–.89 μm 10m (pan)	SPOT 4 .5–1.75 μm 10m (pan)	SPOT 5 VISIBLE 5 m
EUROPEAN SPACE AGENCY	ERS-1 C-BAND SYNTHETIC APERTURE RADAR (SAR) 30 m	ERS-2 C-BAND SAR 30 m	ENVIRONMENTAL SATELLITE (SAR, *electro-optical*)		
RUSSIA	(FILM SYSTEMS .5–.9 μm 5–50 m)	ALMAZ C-BAND SAR 10–30 m	ALMAZ-1B C-BAND SAR 5 m		
CANADA	RADARSAT C-BAND SAR 10–100 m	RADARSAT-2 N/A N/A			
CHINA	CHINASAT 1/2 N/A 80 m	CBERS 1 and 2 .45–12.5 μm 20 m			
BRAZIL	Missâo Espacial Completa Brasileira (MECB)-SSR1 .63–.9 μm 200 m	MECB-SSR2 .63–.9 μm 200 m			
INDIA	IRS-1A .45-.86 μm 36 m	IRS-1B .45-.86 μm 36 m	IRS-1C visible (VIS), shortwave infrared (SWIR) 10 m pan, 20 m visible/near infrared, 70 m SWIR		
JAPAN	Marine Observation System (MOS)-1 .5-1.1 μm 50 m	MOS-1B .5-1.1 μm 50 m	JERS-1 VIS 18 m SAR L-BAND (1GHz) 25 m	ADEOS .4–.92 μm 8 m (pan)	ADEOS-2 N/A N/A

1985 — 1990 — 1995 — 2000

OTHER EMERGING CAPABILITIES: South Korea; Israel; Pakistan; South Africa; Taiwan; Argentina; United Arab Emirates (UAE)

Table 5.3

SPOT 1, 2, 3, and 4

WEIGHT (KILOGRAMS [kg]):	1,2,3-1,750; 4-2,500
POWER (WATTS [w]):	1,2,3-1,900 END OF LIFE; 4-2,200 END OF LIFE
DESIGN LIFE (YEARS):	1,2,3-2 YEARS; 4-5 YEARS
LAUNCH DATE:	1-1986; 2-1990; 3-1993; 4-1995
STABILIZATION ACCURACY (DEGREES):	1,2,3-0.1; 4-0.03
ALTITUDE (km)	832
GROUND-TRACK REPEAT (DAYS):	26 NADIR (369 ORBITS); 2-5 OFF NADIR
INCLINATION (DEG.):	98.7

SENSOR:	HIGH RESOLUTION VISIBLE (HRV) MULTISPECTRAL	HRV PANCHROMATIC
POWER (w):	95	95
WEIGHT (kg):	241	241
SPECTRAL REGIONS (MICRONS):	(A) .50–.59 (B) .61–.68 (C) .79–.89 (D) 1.58–1.75 (SPOT 4 ONLY)	.51–.73
SWATH WIDTH (km)	60	60
GROUND RESOLUTION (m)	20	10
NUMBER OF DETECTORS:	1,728/CHIP 3,000/LINE	1,728/CHIP 6,000/LINE
DETECTOR TYPE:	SILICON CHARGE-COUPLED DEVICES (CCD)	SILICON CCD
DETECTOR SIZE (MICRONS):	13 x 13	13 x 13
QUANTIZATION LEVELS:	256	64
RADIOMETRIC SENSITIVITY:	(A) 10 < SIGNAL/NOISE RATIO (S/N) < 212 (B) 5 < S/N < 230 (C) 5 < S/N < 214	6 < S/N < 233
BAND-TO-BAND REGISTRATION (m):	6	
SENSOR DATA RATE (MEGABITS PER SECOND [Mbps]):	25	25
STEREO IMAGING:	YES	YES
OFF-NADIR VIEWING:	YES	YES

Table 5.4

Russian Film-Retrieval Systems

PLATFORM	COSMOS (VARIANT I)		COSMOS (VARIANT 2)	MANNED ORBITAL STATION	
REVISIT (DAYS)	14		14	14	
LIFE (MONTHS)	1		1	1	
ALTITUDE (km)	230–240		180–450	300	
INCLINATION (DEGREES)	82		82	51.2	
CAMERA TYPE	KFA-1000	KATE-200	MK-4	KATE-140	MKF6M
WIDTH (km) (200 km ALTITUDE)	120	180	120	380	190
F (MILLIMETERS [mm])	1,000	200	300	140	125
FRAME SIZE (mm)	300 x 300	180 x 180	180 x 180	180 x 180	56 x 81
NUMBER OF BANDS	2	3	4 OF 6	1	6
BANDS	570–580 680–810	500–600 600–700 700–900	635–690 515–565 580–580 810–900 460–505 400–700	VISIBLE	460–500 520–560 580–620 640–680 700–740 780–860
RESOLUTION (m)	5–10	15–30	5–8	50	20–50
% OVERLAP	60	20–80	60	20–80	20–80
MAP SCALE	1:200,000	1:100,000	1:600,000–1:150,000	1:210,000	1:240,000

Table 5.5

ALMAZ

WEIGHT (kg):	18,300
POWER (w):	
DESIGN LIFE (YEARS):	2–3
LAUNCH DATE:	1991
ALTITUDE (km)	300
REVISIT PERIOD (DAYS):	1–4 (WITH TASKING)
INCLINATION (DEGREES.):	73

SPATIAL RESOLUTION (m):	10–15
POLARIZATION:	HORIZONTAL
PULSE LENGTH (MICROSECONDS):	70, 100
AVERAGE POWER (w):	80
ANTENNA COMPOSITION:	SLOTTED WAVEGUIDE
SWATH WIDTH (km):	45
PULSE REPETITION FREQUENCY (PRF) (HERTZ [Hz]):	3,000
FREQUENCY	3 GIGAHERTZ (GHz) (C-BAND)
PEAK POWER (w):	5,000
LOOK ANGLE (DEGREES):	30–60 OFF NADIR
BANDWIDTH (MEGAHERTZ [MHz]):	17.32
ANTENNA LENGTH (m):	15
ANTENNA WIDTH (m):	1.6

weather or illumination condition. The Russians currently are looking for commercial partners to field the next ALMAZ system.

The Canadian RADARSAT (table 5.6) is another example of a civil/commercial SAR imagery system. RADARSAT can image large areas under all types of weather conditions at a resolution of up to 10 meters. At northern latitudes, RADARSAT can provide imagery of a given location every three days. The combination of day/night, all-weather imagery and timely revisit capability makes SAR systems attractive for tactical imagery applications.

Japan's Advanced Earth Observation System (ADEOS) (table 5.7) is an example of a non-US electro-optical system that combines fairly high resolution (eight meters, panchromatic) with very rapid revisit capability. ADEOS also provides imagery in a swath 80 kilometers wide, as opposed to the 15-kilometer-wide swath of US commercial systems, thus providing wider-area coverage than that available from US systems. Should the Japanese opt to lower ADEOS's orbit for selected higher-resolution imagery, they can obtain resolution of about three meters. It is thus misleading to assume that foreign systems cannot match the performance of US commercial systems should they so choose.

Proliferation of Technologies

A comparison of civil/commercial parameters with military parameters for the same components reveals that no significant differences exist between figures of merit for the major segments of civil versus military remote-sensing systems (table 5.8). The figures of merit typical for such systems and components of civil and military imaging systems are virtually identical. The two types are distinguishable primarily by their configurations and orbits.

For example, civil imaging systems are not required to slew rapidly from target to target to meet military tasking requirements. They therefore would not normally make use of control moment gyros (CMG), whereas military imagers would. Fuel loads for attitude control and orbital maneuvers would also be larger for military systems than for their civil variants,

Table 5.6

Canadian RADARSAT

WEIGHT (kg):	4,000 (LAUNCH)
POWER (w):	5,500 EOL
DESIGN LIFE (YEARS):	5
LAUNCH DATE:	1995
STABILIZATION ACCURACY (DEGREES):	0.1
ALTITUDE (km)	777–804
GROUND-TRACK REPEAT CYCLE:	16 DAYS
GROUND COVERAGE CYCLE:	1 - ARCTIC; 3 - CANADA; 16 - GLOBAL
INCLINATION (DEGREES.):	98.5
DATA RATE (Mbps):	85 RECORDED - 105 DOWNLINKED

SPATIAL RESOLUTION (m):	10–100
WEIGHT (kg)	385
POLARIZATION:	HORIZONTAL/HORIZONTAL (HH)
PULSE LENGTH (MICROSECONDS):	42
AVERAGE POWER (w):	300
ANTENNA COMPOSITION:	400–600 10w PEAK OUTPUT TRANSMIT/RECEIVE (T/R) MODULES
SWATH WIDTH (km):	45–500 (ACCESSIBLE = 500–700)
PRF (Hz):	1,270–1,390
FREQUENCY	5.3GHz (C-BAND)
PEAK POWER (w):	5,000
LOOK ANGLE (DEGREES):	20–50 - 50–60 EXPERIMENTAL
BANDWIDTH (MHz):	11.6, 17.3, 30
SAMPLING RATE (MHz):	12.9, 18.5, 32.3
ANTENNA LENGTH (m):	15
ANTENNA WIDTH (m):	1.6

OTHER SENSORS: ADVANCED ALONG-TRACK SCANNING RADIOMETER
ADVANCED RADAR ALTIMETER/OCEAN-WAVE SPECTROMETER

Table 5.7

ADEOS

WEIGHT (kg):	3,000
POWER (w):	3,500
DESIGN LIFE (YEARS):	3
LAUNCH DATE:	1996
STABILIZATION ACCURACY (DEGREES):	
ALTITUDE (km)	799.8 - SUN SYNCHRONOUS
GROUND-TRACK REPEAT (DAYS)	41
INCLINATION (DEGREES.):	98.6
EQUATOR CROSSING TIME:	10:30 A.M.

SENSOR:	ADVANCED VISIBLE NEAR INFRARED (AVNIR)	OCEAN COLOR TEMPERATURE SENSOR (OCTS)	
POWER (w):	250	300	
WEIGHT (kg):	200	260	
SPECTRAL CHANNELS:	(1) .4–.5	.402–.422	.510–.530
	(2) .53–.62	.433–.453	.555–.575
	(3) .62–.72	.480–.500	.655–.675
	(4) .82–.92	.745–.785	.845–.885
	(5) .52–.72 pan	3.55–3.85	8.25–8.75
		10.5–11.5	11.5–12.5
SWATH WIDTH (km):	80	1,500	
GROUND RESOLUTION (m):	(1–4) 16 : (5) 8	700	
POINTING (DEGREES):	+/– 40 CROSS TRACK (XT)	+/– 20 IN TRACK (IT)	
EARTH COVERAGE (DAYS):	1	3	

OTHER SENSORS: NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA) SCATTEROMETER (NSCAT) AND TOTAL OZONE MAPPING SPECTROMETER (TOMS)

Table 5.8
Overlap of Subsystems and Technologies for Civil and Military Imaging Systems

COMPONENT	TYPICAL CIVIL/ COMMERCIAL PARAMETER	TYPICAL MILITARY PARAMETER
BUS		
ATTITUDE CONTROL SYSTEM		
• ACCURACY	1-5 SECONDS (sec)	1-5 (sec)
• MOMENTUM WHEELS	0.1-0.3 NAUTICAL MILES (NM)	0.1-0.3 (NM)
INDICATOR → • CONTROL MOMENT GYROS	NA	200-700 NM
• SLEWING	LIMITED	EXTENSIVE
ELECTRICAL POWER SYSTEM		
• SOLAR	< 7 kw	< 7 kw
INDICATOR → • NUCLEAR	NA	> 7 kw
AUXILIARY PROPULSION		
INDICATOR → • POUNDS PROPELLANT	300 kg (SPOT 4)	9,000 kg
• ORBIT CHANGE	LIMITED	EXTENSIVE
ELECTRO-OPTICAL SENSOR		
OPTICS	1-5 m (SCIENCE, GROUND) 0.3-1 m (SPACE)	1-3 m
DETECTORS		
• VISIBLE (VIS)	< 10 µm, SILICON (SI) CCD	< 10 µm, Si CCD
• INFRARED (IR)	10 µm	10 µm
SAR SENSOR		
• ANTENNA (ANT)	10 X 2 m	5 X 2 m
• TRAVELING WAVE TUBE AMPLIFIER (TWTA)	3-5 kw	3-5 kw
• TRANSMIT / RECEIVE (T/R)	4-10 w	4-10 w
SENSOR SUPPORT		
GAP → • RECORDER	50 Mbps	1 GIGABIT PER SECOND (Gbps) (US ONLY)
• DATA COMPRESSION	2X	2X
• TRANSMIT RATE	1 Gbps (LOCAL) 300-600 Mbps (GLOBAL)	1 Gbps (LOCAL) 300-600 Mbps (GLOBAL)
TASKING	3-8 HOURS (SPOT)	< 3-8 HOURS

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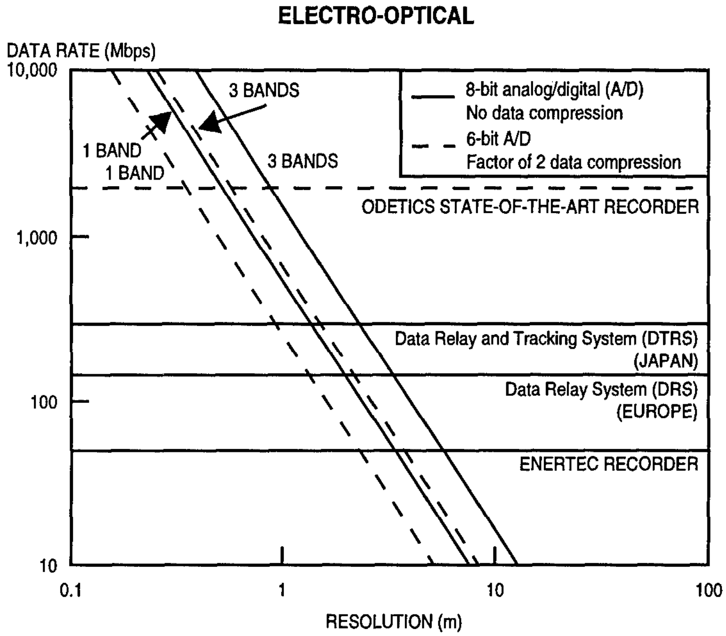
and for some military systems (e.g., Soviet radar ocean reconnaissance satellites [RORSAT]), power is supplied by nuclear generators rather than solar panels.

The only military subsystem for which no comparable civil capability exists is the wideband-sensor data recorder found on some electro-optical and SAR imagers (fig. 5.1). We have found no Japanese supplier of such space-qualified recorders, and only one potential European source—Enertec—which has a wideband tape recorder under development. This difference would be significant were it not for the fact that both the Japanese and the Europeans are developing and will soon deploy relay satellites that will allow imagery gathered over a remote site to be transmitted in real time to a ground station instead of being recorded for later transmission.

The Hubble space telescope is an example of a high-performance, space-based imaging system using late 1970s US technology. If it were pointed at the earth, it could achieve a ground-sample distance (GSD—i.e., resolution) of five-hundredths of a meter (about two inches) from an altitude of 200 kilometers (km) (about 132 miles). Using the best currently available European and Japanese CCDs in the focal plane of a space-based, remote-sensing system, our notional design (table 5.9; table 5.10, right column) could achieve almost the same resolution. Fabricating the optical system for this sensor would be a challenge but within the range of capabilities of both the Japanese and Europeans. Similarly, both have—or are rapidly acquiring—the necessary capability to design, assemble, and operate such large space systems. The European Ariane V and the Japanese H-2 launchers could place the required mass and volume in orbit, and planned relay satellites would allow transmission of the imagery directly to national users. The US could not, through technology export controls alone, prevent the development or launch of such a system.

There is a general tendency to be more concerned about foreign capabilities for imagery satellites than for COMSATs. Thus, export of technologies for COMSATs may not be subject to the same scrutiny as technologies earmarked for imagery systems. However, a number of components exported for COMSATs can also be used to build imagery satellites.



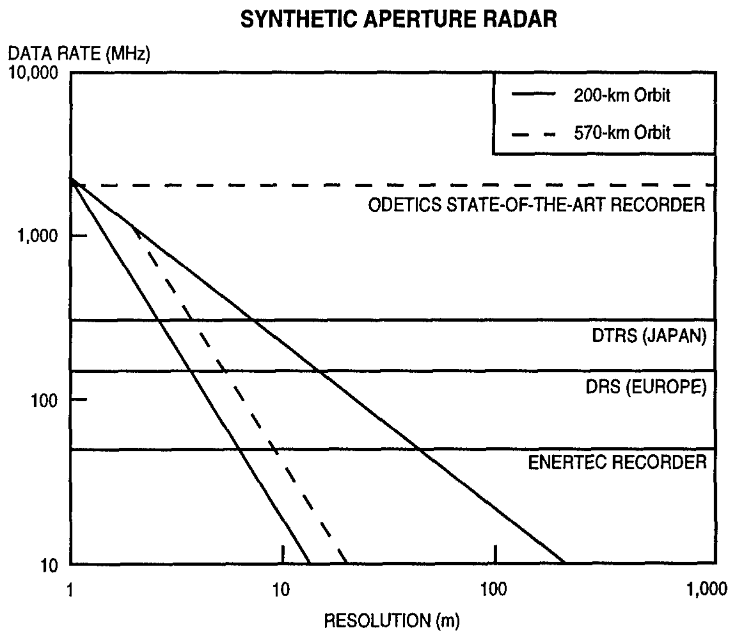


Figure 5.1. System-Level Limits Imposed by Data-Transmission Capabilities

Table 5.9

Sample of Commercial Charge-Coupled Devices

COUNTRY	COMPANY	ARRAY SIZE (NUMBER OF ELEMENTS)	PIXEL SIZE MICROMETERS (µm)	COUNTRY	COMPANY	ARRAY SIZE (NUMBER OF ELEMENTS)	PIXEL SIZE (µm)
US	LORAL	3,456	7 x 7	JAPAN	NEC	4,096	5 x 7
	KODAK	5,000	7 x 7		NEC	2,560	5 x 7
	KODAK	3 x 8,003	9 x 9		HITACHI	5,006	7 x 7
FRANCE	THOMSON	4,096	7 x 7		OKI	4,096	7 x 7
	THOMSON	5,184	7 x 7	BELGIUM	IMEC	1,024	4 x 4
	THOMSON	2,048	10 x 10		IMEC	1,728	6 x 6

Table 5.10

Using Japanese and European Commercial CCDs for a High-Resolution, Space-Based Sensor That Would Fit on an Ariane V or H-2 Launcher (U)

	HUBBLE TELESCOPE (13 MICRON PIXELS)	SYSTEM DESIGNED WITH CURRENT EUROPEAN OR JAPANESE DETECTORS
GSD (FROM 200 km)	0.05 m	0.06 m
PRIMARY MIRROR	2.4 m F/3	2 m F/1.9
SYSTEM FOCAL LENGTH	57 m	16.67 m
SPACECRAFT LENGTH	13.16 m	8 m
DRY WEIGHT	11,000 kg	6,500 kg

Such components include momentum wheels, which are electromechanical devices used on COMSATs to orient and stabilize the spacecraft body and antennas. On an imagery satellite, these devices fulfill the same function, but in doing so, they orient and stabilize the focal plane and optical train. To the extent that they can deliver a strong control force while using little power and keeping weight to a minimum, these devices have utility on military imagery satellites.

Momentum wheels commercially available from European sources have performance characteristics useful for imagery satellites (table 5.11). The German firm Teldix is exporting its DR50 momentum wheel to China for use on the DFH-3 COMSAT. That same momentum wheel is used by the Japanese for the attitude control of their MOS-1 imagery satellite. Even more capable commercial systems are available.

Thus, foreign COMSAT programs (table 5.12) can serve as a vehicle for acquiring technologies that can be diverted to more worrisome reconnaissance applications. If an effective control regime is to be developed, policymakers must be aware of the potential applications of key subsystems and components (such as momentum wheels) as well as the overtly announced uses of complete systems.

Table 5.11

Using European Momentum Wheels for Both COMSATs and High-Resolution Imagery Satellites (U)

TECHNICAL PARAMETER	AEROSPATIALE (FRANCE)		TELDIX (GERMANY)	
MODEL NUMBER	RCPM-50	RCPM-150	DR50[a]	DR68
NOMINAL AVERAGE MOMENTUM (NEWTON-METER-SECONDS [N-m-s])	50	150	50	68
CONTROL TORQUE (NEWTON-METERS [N-m])	0.1	0.1	0.07	0.085
MASS (kg)	10.5	13.5	7.6	7.9
DIAMETER (mm)	350	350	347	347
HEIGHT (mm)	190	190	119	119
NOMINAL POWER (w)	6	10	9-16	9-16
MAXIMUM POWER (w)	110	150	53	90

[a] Used on MOS-1, DFH-3

A unilateral space-technology nonproliferation regime is not a viable policy option, because no one nation now has unique control over all critical space technologies. A number of countries possess capabilities in some of the systems and components utilized in militarily significant satellites (table 5.13). The US has capabilities in all of these fields.

Starting in the early-to-mid 1970s, the nations of Europe and Japan began to develop internally—and purchase externally—the capability to build key subsystems and components for space systems. That process is virtually complete; the Europeans and Japanese are currently marketing state-of-the-art satellite componentry. Thus, any hope that the US might have had of imposing unilateral control over foreign space programs by limiting the export of key components is virtually

Table 5.12

Europe and Japan Demonstrate Spacecraft System-Integration Capabilities

EUROPE		JAPAN	
ERS-1	MULTIMISSION MICROWAVE AND SAR	ENGINEERING TEST SATELLITE (ETS)-VI	LARGE, COMPLEX RELAY SATELLITE
SPOT 1 AND 2	ELECTRO-OPTICAL	JAPAN EARTH REMOTE SENSING (JERS)	SAR, VISIBLE (VIS), SHORTWAVE INFRARED (SWIR)
INTERNATIONAL MARITIME SATELLITE (INMARSAT)	LARGE COMSAT	MARINE OBSERVATION SYSTEM (MOS) 1 AND 2	MIDSIZE ELECTRO-OPTICAL
EUROPEAN TELECOMMUNICATIONS SATELLITE (EUTELSAT)	LARGE COMSAT	ADVANCED EARTH OBSERVATON SYSTEM (ADEOS)	LARGE ELECTRO-OPTICAL
NATO IV	MILITARY COMSAT		
ITALIAN SATELLITE (ITALSAT)	LARGE COMSAT		
INTERNATIONAL SPACE OBSERVATORY (ISO)	IR TELESCOPE		
ENVIRONMENTAL SATELLITE (ENVISAT)	LARGE, MULTISENSOR EARTH OBSERVATION		
HELIOS	MILITARY/INTELLIGENCE ELECTRO-OPTICAL		

Table 5.13

Unilateral Control of Key Subsystems and Components Not a Viable Policy Option

	FRANCE	GERMANY	UNITED KINGDOM	OTHER EUROPEAN COUNTRIES	JAPAN
ELECTRO-OPTICAL (EO) SENSORS	Matra	MBB	EEV	Phillips	NEC Fujitsu
OPTICS	Reosc Angeniex Bertin et Cie Matra Sodern	Zeiss Schott Hareus	Cranfield		Ohara Glass Tokyo Opto-Electronics
VISIBLE DETECTORS	Thomson	Valvo	EEV	IMEC Catholic University Phillips	Melco NEC Hitachi Toshiba Fujitsu Oki
IR DETECTORS	SAT Thomson Sofradir CEA	Valvo AEG Telefunken	Royal Signals Mullard	Phillips IMEC	Fujitsu NEC Melco Toshiba
SAR SENSORS	Alcatel Dassault	Dornier DLR	Marconi	Technical University of Denmark (Air) Selenia Spazio	Melco
ANTENNA	Alcatel	Dornier	Marconi		Melco
TRAVELING WAVE TUBE AMPLIFIER (TWTA)	Thomson	AEG Telefunken Siemens	Marconi Ferranti Thorn		Toshiba NEC
TRANSMIT/ RECEIVE (T/R) MODULES	Alcatel Thomson		Plessey/ Marconi	AME Space (chirp modules)	Fujitsu Toshiba NEC Melco
ATTITUDE SENSORS	Sodern Sagem	MBB (star)	Ferranti (gyro) SIRA (star) Marconi		Toshiba NEC Melco

Table 5.13—continued

	FRANCE	GERMANY	UNITED KINGDOM	OTHER EUROPEAN COUNTRIES	JAPAN
ACTUATORS	Aerospatiale	Teldix	Marconi BAe		Melco IHI
ATTITUDE CONTROL SYSTEM (ACS)	Matra Sodern	Dornier MBB	BAe		Melco Toshiba
ELECTRICAL POWER SYSTEM (EPS)	SAFT Aerospatiale	Telefunken MBB	BAe		Toshiba Sharp
PROCESSORS		DLR	Ferranti (ASARS) Marconi	MDD Spar Norsk	Fujitsu NEC

gone. If such controls are to work in the future, they must include the active participation of Europe and Japan in the control regime.

Military Utility and Implications

There is a natural tendency to define the national security sensitivity of a civil remote-sensing system in terms of its resolution. Those characteristics of a system that allow for high resolution are technically demanding. They include large optical trains, precise attitude control and stabilization of the spacecraft, and high data-rate transmission from the spacecraft to the ground. These technical characteristics easily distinguish highly capable spacecraft and sensors from ones that are less capable.

Certain resolution values are necessary to perform the required military tasks of detection, general identification, precise identification, and description (table 5.14, fig. 5.2). The current civil remote-sensing systems—LANDSAT and SPOT—directly supported military planning and operations during the Gulf War. The trend toward improving the resolution of

Table 5.14

Civil Remote-Sensing Systems: Improved Resolution Increases Intelligence Capability (U)

OBJECT	DETECTION	GENERAL IDENTITY	PRECISE IDENTITY	DESCRIPTION
BRIDGE	6.1	4.6	1.5	0.9
COMMUNICATIONS RADAR	3	0.9	0.3	0.15
COMMUNICATIONS RADIO	3	1.5	0.3	0.15
SUPPLY DUMP	1.5	0.6	0.3	0.03
TROOP UNITS	21.3	2.1	1.2	0.3
AIRFIELD FACILITIES	6.1	4.6	3	0.3
ROCKETS AND ARTILLERY	0.6	0.3	0.15	0.05
AIRCRAFT	4.6	1.5	0.9	0.15
COMMAND AND CONTROL HEADQUARTERS	3	1.5	0.9	0.15
MISSILE SITES (SURFACE-TO-SURFACE MISSILE [SSM], SURFACE-TO-AIR MISSILE [SAM])	3	1.5	0.6	0.3
SURFACE SHIPS	7.6	4.6	0.6	0.3
NUCLEAR WEAPONS COMPONENTS	2.4	1.5	0.3	0.03
VEHICLES	1.5	0.6	0.3	0.05
LAND MINEFIELDS	9.1	6.1	0.9	0.03
PORTS AND HARBORS	30.5	15.2	6.1	3
COASTS AND LANDING BEACHES	30.5	4.6	3	1.5
RAILROAD YARDS AND SHOPS	30.5	15.2	6.1	1.5
ROADS	9.1	6.1	1.8	0.6
URBAN AREA	61	30.5	3	3
TERRAIN	—	91.4	4.6	1.5

Source: Senate Committee on Commerce, Science, and Transportation, *1978 NASA Authorization* (Washington, D.C.: Government Printing Office, 1977), pt. 3, 1597.

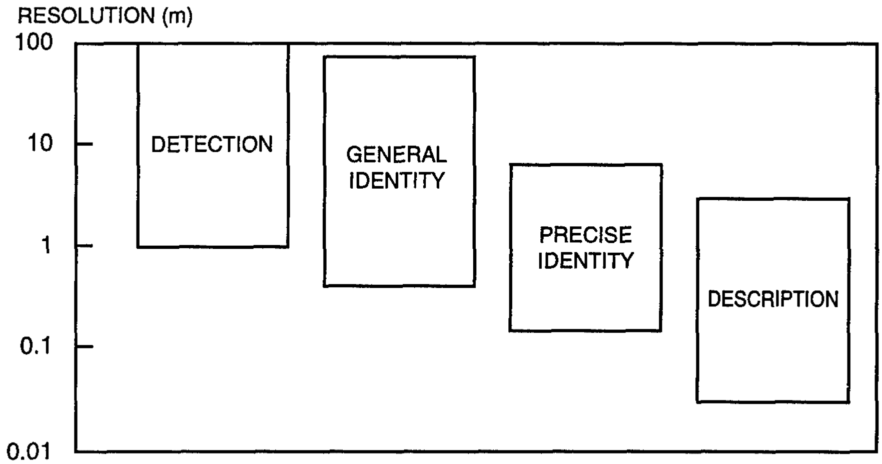


Figure 5.2. Target Resolution for Interpretation Tasks

foreign remote-sensing satellites will increase the military utility of these systems.

But resolution is only one measure of the utility of civil remote-sensing satellites. Also important are the spectral coverage of the imagery and the timeliness of the delivery of data to the user.

The US LANDSAT system provides multispectral imagery. LANDSAT spectral bands were selected with specific civil and scientific tasks in mind, such as estimating crop yields and environmental change. These bands were not selected to support military tasks.

Nevertheless, LANDSAT's multispectral capability serves multiple military planning and operations requirements. Virtually all of the spectral regions included in civil systems (combined with specific resolutions) can support military tasks (table 5.15). For example, multispectral capabilities for vegetation analysis can also be used to support military terrain-delineation analysis and camouflage-detection tasks. LANDSAT imagery is currently being used to support Air Combat Command mission-critical requirements.

Senior US Air Force officials have stated that in the Gulf War, LANDSAT multispectral imagery was used for scene-change detection, terrain traffic analysis, invasion planning

Table 5.15

Civil and Military Uses of Multispectral Imagery (U)

APPLICATION	SPECTRAL BANDS					MILITARY UTILITY
	VISIBLE	NEAR INFRARED	THERMAL INFRARED	SAR	MICROWAVE	
SOIL FEATURES	X (30 m)			X (30 m)		– TERRAIN DELINEATION – ATTACK PLANNING – TRAFFICABILITY
SURFACE TEMPERATURE			X (30 m - 1 km)		X (1–4 km) (OCEAN)	– ANTISUBMARINE WARFARE (ASW) SUPPORT – TRAFFICABILITY – AIRFIELD ANALYSIS
VEGETATION ANALYSIS	X (30 m)	X (30 m)	X (30 m - 1 km)	X (30 m)		– TERRAIN DELINEATION – CAMOUFLAGE DETECTION
CLOUDS	x (1–50 km)		X 1–50 km)			– WEATHER – ATTACK PLANNING
SNOW ANALYSIS	X (30 m - 1 km)				X (1 km)	– AREA DELINEATION – ATTACK PLANNING
SURFACE ELEVATION	X (5–10 m) (STEREO)					– MAPPING – TERRAIN CONTOUR MATCHING – FLIGHT SIMULATION
OCEAN-WAVE ANALYSIS				X		– ASW
ICE ANALYSIS			X (15–100 m)	X	X (1–5 km)	– NAVIGATION – ASW SUPPORT
WATER ANALYSIS	X (30 m - 1 km)	X (30 m–1 km)	X (30 m - 1 km)			– AMPHIBIOUS ASSAULT PLANNING
CULTURAL FEATURES	X (5–30 m)					– TARGETING – BOMB DAMAGE ASSESSMENT (BDA)

("Can we drive tanks and trucks or drop airborne troops in a given region?"), and mapmaking.

An extended time lapse between image acquisition and delivery for analysis is allowable for the performance of science and technology, verification, and terrain analysis (fig. 5.3) because they are longer-term oriented; the objects, activities, or changes they seek to detect are not usually time sensitive. Timeliness is not an issue for such tasks as measurement of antenna diameters or track widths, observation of smoke or vapor plumes, and estimation of temperature changes in a cooling pond. Indeed, for some purposes, it is the change over time in such observable characteristics that determines the utility of an image; the fact that an image is recently acquired may be immaterial. For purposes in which detailed analysis is required—particularly some verification tasks—postprocessing of an image to enhance its resolution, spectral content, or contrasts may actually prolong data-delivery times yet not diminish the utility of the imagery. For other purposes, such as evaluation of detailed characteristics of terrain for maps and movement planning, the relatively slow pace of change of geologic features, vegetation type, and elevation contours

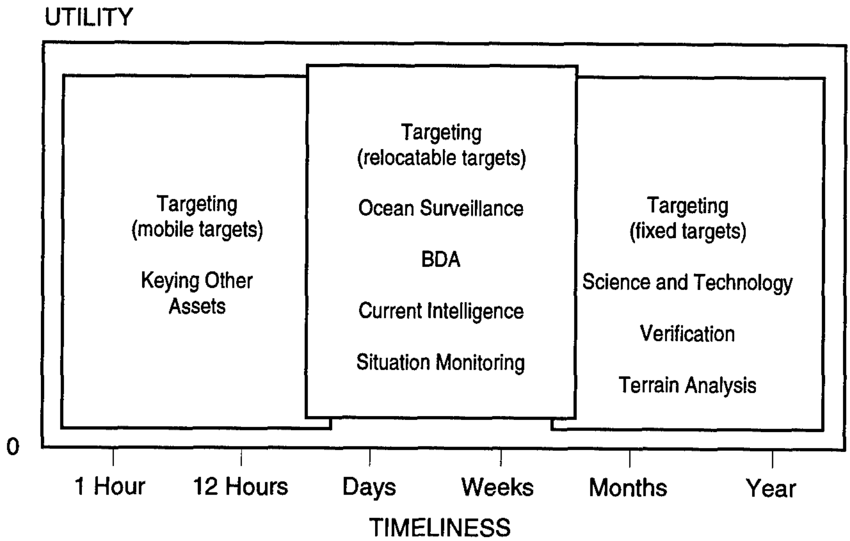


Figure 5.3. Required Timeliness for Military Utility

requires virtually nothing by way of timely data delivery; years may suffice.

Establishing exact boundaries in terms of timeliness requirements for such tasks as ocean and wide-area surveillance and bomb damage assessment (BDA) (fig. 5.3) depends as much on the scenario being considered as on the nature of the analytical task. Wide-area surveillance in search of military construction sites (such scarring is particularly visible where large amounts of earth are being moved—e.g., the construction of new intercontinental ballistic missile [ICBM] bases or sites) may be of interest for weeks or even months after first being observed. In actual battle, however, the construction of earth berms, tank traps, and minefields may require data delivery on the order of several hours at most. Similarly, BDA is most useful when performed soon after the bombs are delivered and before the next mission is launched. Yet, this information is still valuable many hours or even days after the imagery is acquired, particularly if other factors—such as bad weather or heavy air defenses—preclude the information being gathered by more traditional means (i.e., reconnaissance aircraft). Ocean surveillance is equally sensitive to actual mission needs. For example, the determination of sea-temperature profiles for broad-area antisubmarine warfare (ASW) analysis requires data no more timely than the rate at which such synoptic features are likely to change: tens of hours or even days. But the required time lines for delivery of information on ship tracks and mine-placement activities may not exceed a few hours at best.

Except when fixed targets such as ICBM silos are involved, the required time lines for targeting are likely to be determined by the time of flight of the weapon to be delivered and the rate of motion of the target. A smart weapon, such as a homing torpedo or a cruise missile with a target-sensitive seeker, requires no more than that it be delivered to the general vicinity of its intended target to be effective. As weapon “smartness” increases, the utility of satellite imagery in directing these weapons is increasing, as is the allowable delay between image acquisition and arrival of the weapon within the range of its seeker to the target. For more sophisticated uses of satellite imagery, such as determining points of interest against which to direct more specialized sensors for detailed analysis or close-in tracking,

timeliness requirements are determined by the specifics of the mission, target mobility, retargetability of the other sensors, and other specialized factors.

The timeliness of the delivery of remote-sensing data from the spacecraft to the user directly affects its utility. For current civil systems, this delay extends from days to a week or more. It is a consequence of relatively long revisit time, relatively limited capabilities to look off to the side of the satellite's ground track, and relatively low throughput for civil image-processing systems on the ground (table 5.16). Overcoming these limitations is expensive, both in equipment cost and personnel hours.

Civil space-based, remote-sensing systems operate with a combination of relatively high ground resolution and relatively rapid data-delivery times (fig. 5.4). This is due in part to an increase in satellite and sensor capabilities and in part to expanding infrastructures, including relay satellites enabling satellites to transmit data in real time to virtually any point on the earth's surface, as well as more capable image-processing and data-transmission systems. It is the synergistic combination of these improvements that will allow the next generation of civil remote-sensing satellites to perform increasingly sensitive military functions.

Operation Desert Storm clearly illustrated the military utility of civil space systems. Coarse-resolution imagery from European weather satellites and the US National Oceanic and Atmospheric Administration (NOAA) geostationary operational environmental satellites (GOES) proved useful in assessing the likelihood of chemical attacks by the Iraqis and predicting potential dispersion paths of chemical and biological weapons (table 5.17).

LANDSAT and SPOT data, with resolution of 10 to 30 meters, proved useful for such applications as generating updated maps and BDA, plotting major movements of armored vehicles, and simulating approaches for pilots (table 5.17). The US Defense Mapping Agency purchased, from SPOT Image alone, $5.7 million worth of imagery to update digital maps used by troops in forward areas in aircraft and weapons-navigation systems. Incorporating SPOT off-nadir imagery into mission-planning systems enabled pilots to rehearse strike

Table 5.16
System Timeliness
(Priority Mission)

	ORDER TO IMAGE	IMAGING THROUGH PROCESSING	DELIVERY	TOTAL
LANDSAT (16–DAY REVISIT)	2–17	3	1	6–21
SPOT (26–DAY REVISIT) (2–5 WITH TASKING)	3–6	< 1	7 (FROM TOULOUSE, FRANCE)	11–14
ALMAZ (1–4 WITH TASKING)	2–5	1–2	6–7 (AIR DELIVERY)	9–14
RADARSAT (16 DAY-EQUATOR) (3 DAY-HIGH LATITUDE) (1 DAY-ARCTIC)	1/2–16	1/6[a]	–	1–17
ERS (European Space Agency) (35-DAY REVISIT)	1–35	1/8[b]	–	1–35

[a] CLAIM FOUR HOURS FROM OVERPASS TO DATA DELIVERY

[b] CLAIM THREE HOURS FOR "FAST DELIVERY" PRODUCTS

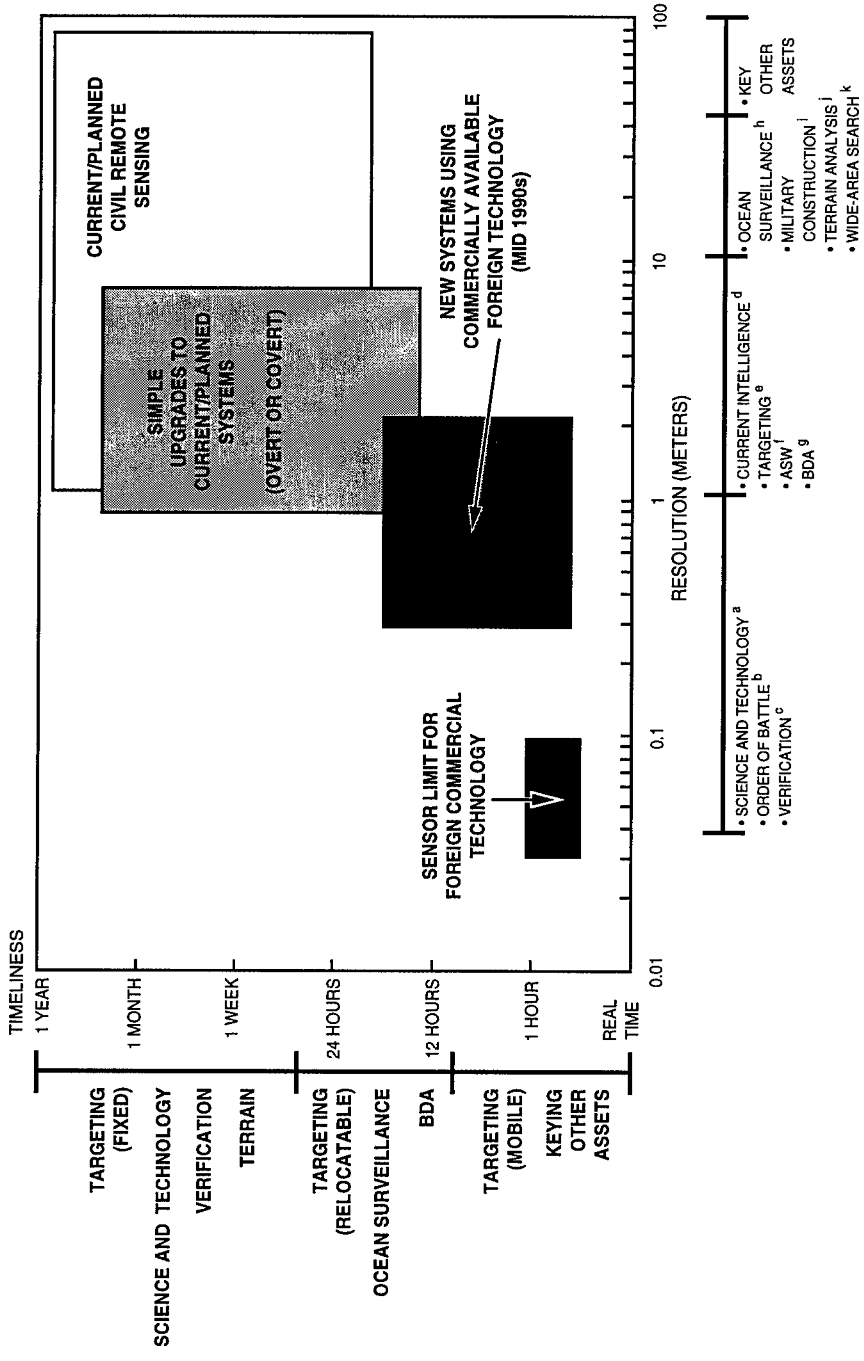


Figure 5.4. Performance of Civil Space Systems

Figure 5.4—Continued

[a]With sufficiently high resolution, a trained image interpreter can perform analysis of military equipment otherwise limited to close-up inspection. Such so-called science-and-technology analyses include measuring the dimensions of antennas, determining vehicle weight from wheel and track impressions, and estimating equipment performance from maintenance and service patterns.

[b]A primary task of the military intelligence analyst is to determine the location and size of opposing forces. With sufficient detail available, an analyst can also determine the type and even the identity of those forces. The combination of all these factors—the order of battle—reveals virtually all that a commander must know before planning an engagement.

[c]Arms agreements place severe requirements on analysis. The use of national technical means to monitor such changes as the dimensions of an ICBM silo entail achieving ground resolution on the order of inches.

[d]Distinguishing between general types of aircraft on the ground, identifying tanks in a column of vehicles, and determining whether silo doors are open or closed are all examples of current intelligence functions that can be performed at resolutions of no greater than one meter (about three feet).

[e]The availability of smart weapons means that a commander need not know the precise location of a target—only that it is out from cover and within the range of the assigned weapon's seeker. Civil space systems can provide this information.

[f]A classic example of the use of remote-sensing data by the Navy is to search for wakes and wave trains, surface disturbances left by periscopes or antennas, and thermal boundaries of ocean currents. This information can be derived from civil sources.

[g]Although BDA gained widespread usage in Operation Desert Storm, the mission has driven the development of many military surveillance and reconnaissance systems. It refers to the need to determine whether a target has been damaged and, if so, to what degree. Desert Storm saw the first use of civil space systems in this role. Most BDA can be performed at no finer than one-meter resolution.

[h]Locating ships at sea or large battle groups in the open ocean is a task well within the capability of current remote-sensing systems.

[i]Roads, revetments, runways, and other large-scale, earth-moving projects leave large areas of scarred or displaced earth. Such features are among the clearest indications of military construction activities and are easily observed with civil remote-sensing systems.

[j]Combining spectral data with panchromatic imagery enables an analyst to locate swamps and bogs, distinguish heavily forested areas from lightly forested areas, and locate barriers such as canyons and steep hillsides. Such information is vital for planning engagements and positioning forces.

[k]Civil systems are deliberately designed to provide "synoptic coverage" or large-scene sizes. The military analogue of this feature is "wide-area search."

Table 5.17

Some Uses of Civil Space Systems during Operation Desert Storm (U)

- European Meteosat and US NOAA weather satellites used to assess wind patterns for predicting likelihood and dispersion paths of chemical attacks.
- LANDSAT and SPOT imagery used to support the following:
  - Preparation of specialized maps (33 LANDSAT image maps, 46 SPOT image maps)
  - Plotting major tank/tracked-vehicle movements
  - Bomb damage assessment
  - Aircraft strike mission simulation and planning

missions on three-dimensional computer reconstitutions of the target areas. A specific example is the detailed preflight mission planning and simulation in preparation for coalition aircraft's delivery of precision guided weapons on the Mina al Ahmadi oil complex, which Iraqi forces had turned on to pump oil into the Persian Gulf.

During Desert Storm, coalition forces made use of standard civil SPOT imagery to assist in BDA missions. Images of Baghdad were taken by the French SPOT system with 10-meter resolution. An image taken on 19 February 1991, before coalition attacks, shows three intact bridges, while an image taken on 10 March 1991, after a coalition air raid, shows that two of the three bridges have been cut. Similar imagery is available from LANDSAT (US), India Remote Sensing (IRS), Earth Remote Sensing (ERS—European Space Agency), Japan Earth Remote Sensing (JERS), and RADARSAT (Canada), and will soon be available from ADEOS (Japan), China/Brazil Earth Remote Sensing (CBERS), and several commercial US systems.

Saddam Hussein might have benefited considerably if the Iraqi military had had access to a LANDSAT-type system during Desert Storm. Specifically, because resolution of a

LANDSAT-type system is sufficient to detect corps-sized deployments and because LANDSAT actually passed over the area in question at least three times from 17 January to 28 February 1991, Iraq could have detected the presence of US Army VII and XVIII Corps in their "jump-off" deployment areas in the Iraqi far-right flank (fig. 5.5). As the commander of US Space Command noted, "During Desert Storm, the allied coalition was able to covertly reposition forces immediately before the ground combat phase began only because the Iraqis did not have an aerial surveillance capability. This move allowed General Schwarzkopf to completely surprise Iraqi ground forces and minimize allied casualties. We could not have managed this against an adversary equipped with reconnaissance satellites."

A senior Air Force official noted that SPOT and LANDSAT provided "the only source of wide-area synoptic coverage" during the Gulf War. Such synoptic coverage is essential for BDA. A SPOT-type civil system could have assisted in the coalition BDA mission against critical targets in a concentrated area such as Baghdad. Because of its off-nadir capability, SPOT is capable of imaging Baghdad during any track within the two dotted lines of figure 5.6. During the Desert Storm air campaign, SPOT made actual passes over the tracks located within these dotted lines on the dates cited; if specifically tasked to do so, it could have imaged Baghdad 18 times.

An analysis of the relative efficiency of civil satellites and search aircraft for detecting aircraft carriers in proximity of the Falkland Islands (fig. 5.7) assumed that no clouds were present and that carriers maneuvered randomly in the deployment area, not avoiding satellites (hence, each look is independent, and binomial statistics apply). The analysis showed (1) that at this latitude, the increased coverage per pass of LANDSAT is almost identically compensated for by the greater number of accessible passes of SPOT (due to taskability) and (2) that neither system approaches the performance of a standard aircraft search. However, this analysis was limited to two satellite systems. One result of the proliferation of imagery systems is that, in the near future, as many as a dozen satellites may be involved in such a search, significantly improving the ability to detect relocatable targets.

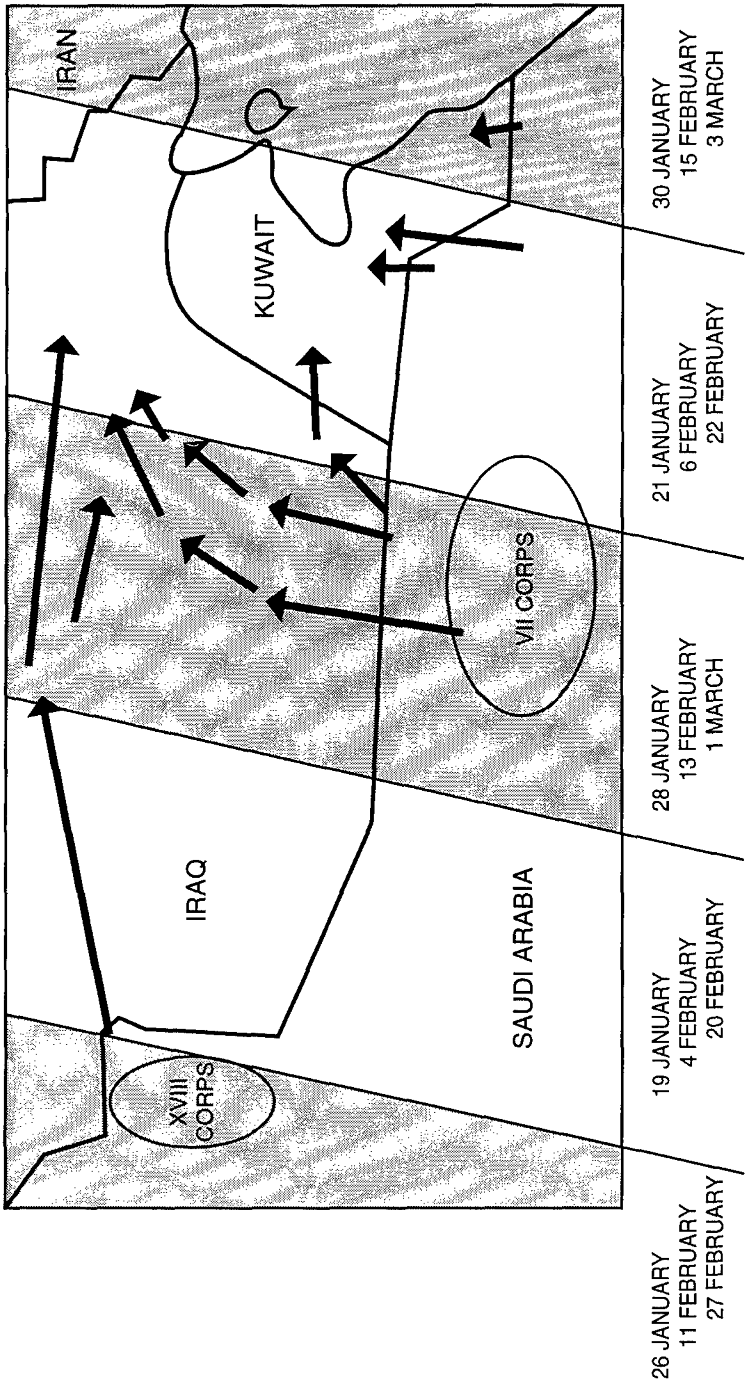
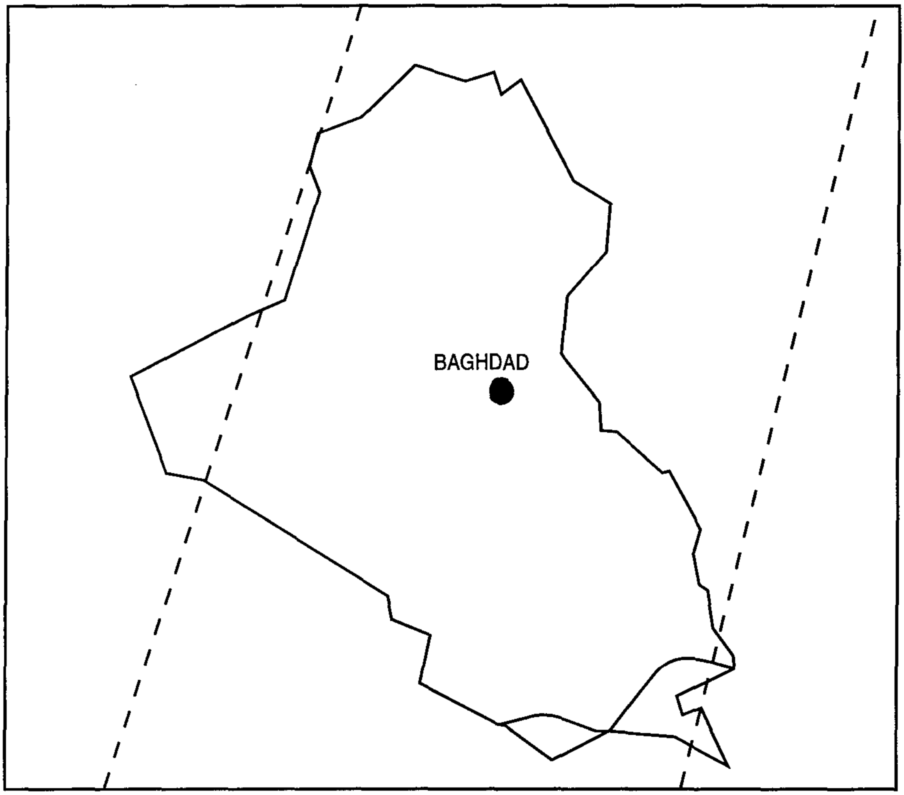


Figure 5.5. Implications of Iraqi Access to LANDSAT-Type System (U)



ALL PASSES WITHIN TRACES PROVIDED VIEWING OPPORTUNITIES OF BAGHDAD:

17 JANUARY	23 JANUARY	2 FEBRUARY	8 FEBRUARY	17 FEBRUARY	24 FEBRUARY
18 JANUARY	28 JANUARY	3 FEBRUARY	12 FEBRUARY	19 FEBRUARY	28 FEBRUARY
22 JANUARY	29 JANUARY	7 FEBRUARY	13 FEBRUARY	23 FEBRUARY	1 MARCH

Figure 5.6. Synoptic Coverage of Civil Remote-Sensing Satellites (U)

Figure 5.5 evaluated the potential impact of Iraqi access to a LANDSAT-type, civil remote-sensing system during the Gulf War. That scenario raises critical questions about a future implication resulting from the accelerating proliferation of foreign remote-sensing systems and ground stations. Major troop movements will become very difficult to conceal from a potential adversary.

One binomial analysis of civil remote-sensing systems assumed that a potential adversary would have access to more than one of the systems. It also assumed a Desert Storm–type

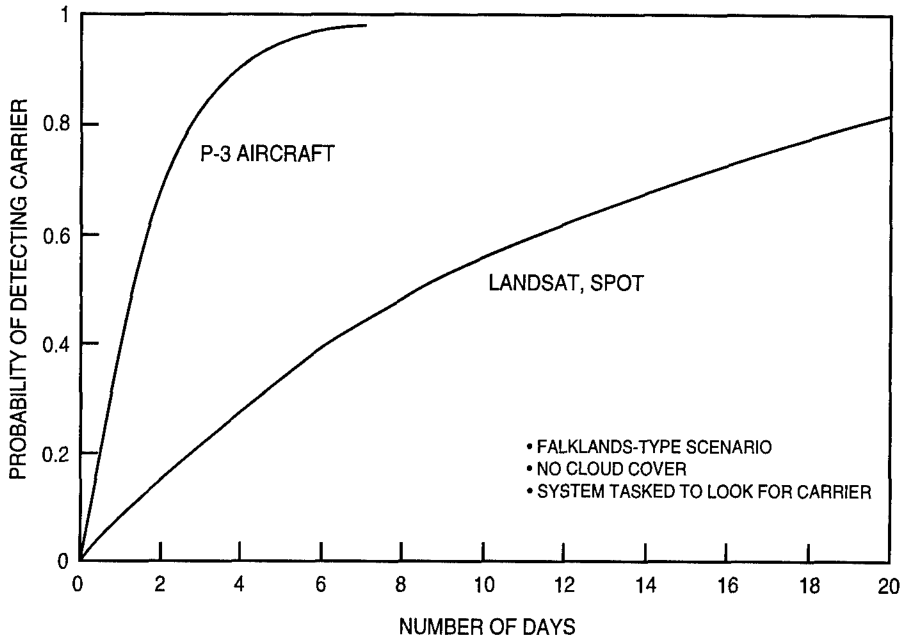


Figure 5.7. Falklands Scenario: Civil Satellites and Search Aircraft

scenario (events detectable by systems with resolutions of 10–20 meters) at midlatitude in 1995.

The analysis reached a twofold conclusion. First, if an adversary had access to all civilian remote-sensing systems (fig. 5.8, dotted line), he would have a 50 percent probability of detecting an event that lasted at least half a day and a 100 percent probability of detecting an event that lasted for two-and-one-half days (60 hours). Second, even if all US and allied systems were removed from enemy access, the probability does not demonstratively improve (fig. 5.8, solid line). That is, he would have a 50 percent probability of detecting an event that lasted one day and a 100 percent probability of detecting an event that lasted two-and-one-half days.

The systems that are most problematic are the ALMAZ and RADARSAT (Canadian) systems with their day/night and all-weather capabilities. The one system that will be the most problematic is the ALMAZ system, which is in Russian hands.

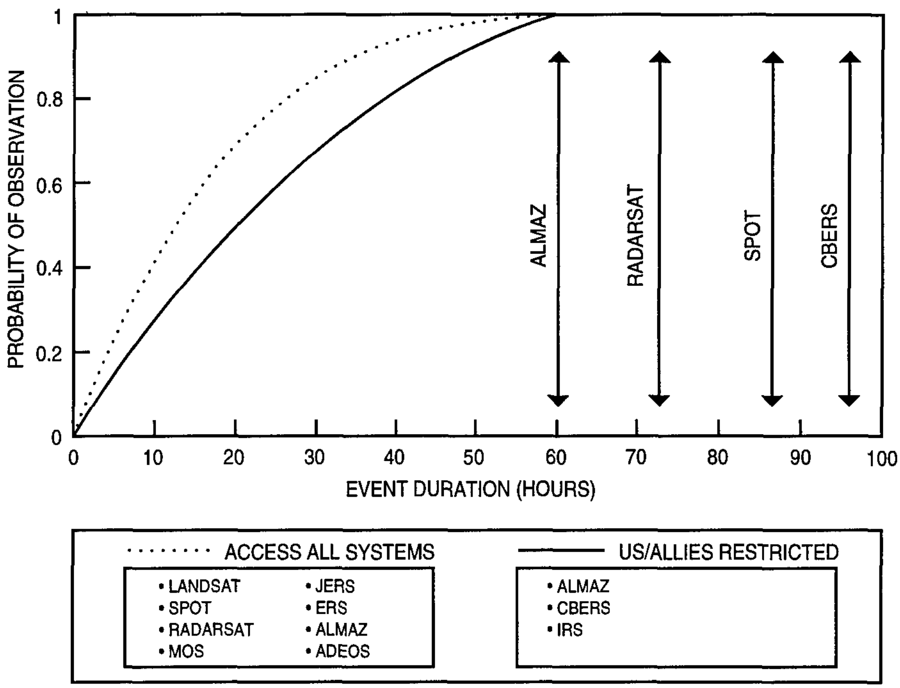


Figure 5.8. Probability of Observation of Midlatitude Event in 1995

Clearly, a wide international proliferation of satellite imagery systems is taking place. These systems are increasingly capable in the areas of resolution, spectral coverage, revisit time, and data-delivery time. Data from the systems has significant military utility for BDA, current intelligence, change detection, targeting, and surveillance. Rapid revisit, rapid data delivery, and day/night, all-weather capabilities may do more to boost the military threat of these systems than improved resolution. Finally, high-performance systems can be built without access to US technology, unilateral controls are likely to be ineffective, and key component technologies are almost all dual use.

Chapter 6

Proliferation of Land-Attack Cruise Missiles: Prospects and Policy Implications*

Dennis M. Gormley and K. Scott McMahon

Although deploying national missile defenses may not enjoy a political consensus in the US Congress, robust theater missile defenses find strong bipartisan support. Propelled by Saddam Hussein's use of modified Scuds during the Gulf War of 1991, America has earmarked most of its investment in theater missile defenses for defeating currently deployed and future ballistic missiles. But ballistic missiles are not the only means by which rogue states could threaten the prompt and secure projection of US forces in regional contingencies. Cruise missiles, particularly those capable of land-attack roles, show signs of quickly becoming at least as threatening as ballistic missiles.

According the Central Intelligence Agency, at least a dozen countries now have land-attack cruise missiles under development.[1] Several appear willing to export complete systems, including ones with low-observable features, as well as component technologies and development expertise. Moreover, the widespread availability of cheap guidance, navigation, and digital-mapping technologies throughout the developing world augurs the conversion of widely proliferated antiship cruise missiles (ASCM) and unmanned aerial vehicles (UAV, including remotely piloted vehicles [RPV]) to land-attack roles. Today more than 70 countries possess ASCMs, while UAVs for various and sundry missions are witnessing explosive growth.[2]

The quickness with which the cruise missile threat will emerge has serious implications for Western security planning. According to the *1994 Defense Science Board Summer Study on Cruise Missile Defense*, the United States "is not in good

*This chapter is adapted from the authors' monograph *Controlling the Spread of Land-Attack Cruise Missiles* (Marina del Rey, Calif.: American Institute for Strategic Cooperation, January 1995). It has been modified and updated in light of recent developments.

shape" to defend against low-flying cruise missiles with small radar cross sections (RCS)—despite huge investments in conventional air defenses.[3] Even so-called poor man's cruise missiles, with large RCSs,[4] could greatly complicate existing air defenses. Consider, for example, how Iraq's use of crudely manufactured cruise missiles might have increased friendly-fire casualties during the Gulf War. As evidenced by the inadvertent shootdown in 1994 of two US Army Black Hawk helicopters over northern Iraq by friendly aircraft, the military services have yet to solve the problem of friendly-fire casualties. Facing both cruise and ballistic missiles in a far more complicated wartime setting, coalition defenses would have been acutely tested by the need to distinguish friendly aircraft from Iraqi cruise missiles.[5] Should such land-attack cruise missiles emerge as quickly as the aforementioned study by the Defense Science Board suggests (within five to 10 years), America's capacity to deter and defend against threats to its regional interests could be severely challenged.

This chapter examines prospects for the proliferation of cruise missiles and considers their implications for the formulation of export policy. It first addresses those factors that condition the pace and scope of this new proliferation challenge—namely, adversary motivations to acquire cruise missiles and routes to (and challenges associated with) acquiring complete systems or the necessary enabling technologies. We then turn to analyzing the Missile Technology Control Regime (MTCR), the international community's principal export-control mechanism for slowing the spread of both ballistic and cruise missiles. The chapter concludes with a set of recommendations bearing on both general policy matters as well as specific measures to slow the spread of land-attack cruise missiles.

Distinguishing Cruise from Ballistic Missiles

To appreciate fully just how existing export controls affect the prospects for cruise missile proliferation, one first must distinguish the differences between ballistic and cruise missile systems—particularly the close relationship between unmanned cruise missiles and manned aircraft. Unlike

ballistic missiles, cruise missiles fly through the air in powered flight for the duration of their trip. They fall into the category of aerodynamic missiles. Ballistic missiles, by contrast, shed their rocket motors once the missiles are propelled outside the atmosphere, after which they pursue an unpowered ballistic course to the target.[6] *Jane's Aerospace Dictionary* defines cruise missiles as aerodynamic vehicles that are "wing supported." A more restricted definition of cruise missiles would relegate them to the category of aerodynamic missiles employing air-breathing propulsion to achieve extended ranges (e.g., the US Tomahawk and the Russian AS-15 cruise missiles).

The first aerodynamic missiles were adapted from drones or manned aircraft reduced in size or range to achieve the desired range-payload objective. Designed with two wings and three surface tails (not until the 1960s did four-wing, four-tail cruciform designs come along), they used standard, liquid-fueled aircraft engines and autopilots for guidance and control. Increasingly more sophisticated guidance schemes replaced these original designs, including command updates, terminal guidance having passive or active radar, and passive infrared (IR) seekers. Television and IR imaging systems came along about the same time that inertial navigation systems (INS) replaced autopilots. Liquid fuels eventually were replaced by solid propellants, and air-breathing engines (turbojets and turbofans) finally came along to extend missile range. When higher specific energies were desired for increased speed or range, ramjets were employed.

Trends in the Proliferation of Cruise Missiles to Date

Aside from the German V-1 cruise missile, most aerodynamic missiles were produced to attack ships and airplanes or to defend coastal areas. Later, some were adapted to attack land targets. Aerodynamic missiles can be launched from the ground, aircraft, ships, or submarines. Most, to date, have been relatively short-range systems such as the greatly proliferated ASCMs, which are now in at least 40 third world military arsenals.

Understanding what motivated the third world to acquire and develop ASCMs is important because it may shed light on what may occur in the 1990s and beyond as regards land-attack cruise missiles. Perceived military utility appears to have been a compelling factor in explaining the rapid proliferation of ASCMs throughout the third world. Moreover, despite their great expense (a typical ASCM costs about $800,000), ASCMs promise high payoff for third world nations that lack the prestige and operational flexibility of large military establishments. ASCMs offer these countries the ability to defeat a major naval combatant in a superpower's navy. Despite the vast differences in gross national product and military capability between third world nations and the industrialized powers, one accurately placed ASCM launched from a third world patrol boat or offshore launcher is capable of achieving strategic results. Argentina's use of Exocet ASCMs in the Falklands War against the British Royal Navy furnishes perhaps the best example of both how effective ASCMs can be and how close a third world power came to achieving strategic results with just one weapon system.[7]

The US has become the most prolific exporter of cruise missile systems in the form of the Harpoon ASCM. This cruise missile is a second-generation system having four clipped-tip triangular wings at midbody and four smaller wings as moving control fins at the rear—a more sophisticated design compared with the first-generation airplane design. It can be launched from ships, submarines, and aircraft; uses a turbojet engine for propulsion; and has an active radar seeker for terminal guidance.[8] The Harpoon-1C has a range of 100 to 120 kilometers. Overall, the US has transferred Harpoons to 23 nations, including North Atlantic Treaty Organization allies, the Middle East (Iran included), the Far East, and South America. Taiwan has reverse-engineered the Harpoon into the Hsiung Feng-2 (HF-2), which is reportedly for sale.

Harpoons in particular—and ASCMs generally—are relevant to the proliferation of land-attack cruise missiles for at least two reasons: (1) they are so widely proliferated within the third world and (2) they are potentially adaptable to land-attack missions. In the case of the Harpoon, its land-attack version is the US Navy's standoff land attack missile (SLAM), which

gained prominence in the Gulf War of 1991. Thus, it is safe to assume that countries that have acquired the Harpoon at least have an important building block for expansion into the land-attack area, however short-range that might be. The key to extending the range of cruise missiles lies in engine, guidance, and navigation technology.

Prospects for the Proliferation of Land-Attack Cruise Missiles

Because cruise missiles for land attack—especially longer-range missions—require sophisticated guidance and complicated support infrastructures to map terrain, they have been relegated largely to superpower arsenals. However, both technology push and doctrinal drive are creating compelling incentives for third world nations to acquire land-attack cruise missiles capable of precise delivery of both conventional payloads and nuclear, biological, and chemical (NBC) weapons.

Technology push stems from numerous factors, the most important of which is the widespread availability of the navigation-and-guidance technology of commercial satellites, together with a variety of increasingly sophisticated mission-planning tools and commercially available satellite imagery. Combined, these technologies and products stand as the major missing elements in helping explain why more third world nations have not already developed or procured land-attack cruise missiles in militarily significant numbers. Worldwide technology diffusion also is prompted by increased motivation on the part of the developed world to sell sophisticated technology and systems to the third world as the developed world's needs shrink in the aftermath of the cold war.[9]

With the demise of the bipolar world, technology push interacts strongly with doctrinal need. Regional powers now have even greater incentive to seek regional self-sufficiency and security from potential adversaries. Perhaps the clearest example of international system change interacting with technology proliferation is reflected in Russia's arms sales. As heir to the former Soviet Union's foreign policy, Russia has chosen not to continue furnishing the far-flung security guar-

antees that her predecessor state so generously distributed around the globe during the height of the cold war. Nevertheless, while formal security guarantees may have evaporated, the collapse of the Soviet empire has led to a virtual fire sale of high technology, weapon systems, and scientific talent to many of her former allies—and virtually anyone else with sufficient capital.

One major consequence of the above trends is that the most sophisticated versions of the industrial world's land-attack cruise missiles may be transferred to third world recipients. For a glimpse of possible future transfers, one need only consider Russia's offering, at the Abu Dhabi Defense Exhibition of February 1993, of a shorter-range version of the 3,000-kilometer-range AS-15 cruise missile or the French Apache stealth cruise missile, which was on display for export at air shows in Paris (June 1993 and 1995) and Singapore (February 1994).[10] Direct transfers of advanced-technology systems such as these could accelerate indigenously based development efforts as well as directly threaten regional and Western interests—particularly if they fall into the hands of rogue states or states with reckless transfer practices. Thus, the extent to which existing export controls preclude or constrain such transfers is a topic of significant importance.

To what extent the third world will react to the availability of new guidance-and-control technology and acquire land-attack cruise missiles depends on several factors, not the least important of which is the effectiveness of voluntary controls on the part of the industrial world. Third world nations also must make difficult choices about the level of investment in development of domestic infrastructure relative to national defense programs. Within national defense programs, priorities inevitably compete for finite resources.

Because prestige is frequently an important factor in the third world's acquisition of a weapon system, operational issues are just as often less critical in motivating a country to acquire a particular weapon system. This is especially true with respect to the way many countries view ballistic missiles. However, Tomahawk's performance in the Gulf War has improved—if not equalized—the prestige value of cruise missiles relative to ballistic missiles.[11]

If, on the other hand, the degree of survivability against a Western power's air force is the principal criterion for judging the relative importance of major weapon systems, cruise missiles might not become an alternative to ballistic missiles but to manned aircraft. Third world aircraft are especially vulnerable to preemptive attacks, particularly with the advent of stealth aircraft and low-observable cruise missiles. Tied as they are to vulnerable airfields, huge investments in aircraft may not make as much sense as a more balanced approach that includes far more survivable and ground-mobile cruise and/or ballistic missiles.

Another useful way to look at investment in land-attack weaponry is to compare the relative cost and operational advantages and disadvantages of cruise and ballistic missiles. On the issue of relative cost, cruise missiles clearly are less costly to design, develop, procure, maintain, and operate. Although the relative costs are much closer than they once were, it is insightful to compare the relative costs of the German V-1 cruise missile and V-2 ballistic missile programs. Put simply, the costs of the two programs reflected the difference in complexity between the simple V-1 design and the far more elaborate V-2 design. V-1s were procured under a contract with German industry for the equivalent of $500 per unit in 1943 dollars. By contrast, each V-2 cost roughly 500 times more than a V-1 cruise missile.[12]

In today's combat environment, cruise missiles possess certain notable advantages over ballistic missiles. Perhaps the most important one lies in the area of accuracy. The aerodynamic stability of the cruise missile permits the use of less sophisticated and therefore less costly guidance-and-control methods than is the case for ballistic missiles, which must undergo the stresses of reentry and high speed. New commercially available guidance-and-navigation technology offers delivery accuracies at costs substantially lower than far more complex ballistic-missile guidance systems. Such accuracy is possible because cruise missiles can receive satellite-navigation corrections all the way to the target from the US global positioning system (GPS) or Russia's global navigation satellite system (GLONASS).

Most of the ballistic missiles currently deployed in third world arsenals possess circular error of probability (CEP) in the range of 1,000 to 2,000 meters.[13] Third world ballistic missiles can potentially receive satellite navigation corrections only until main-engine cutoff, which occurs early in their flight sequence. Assuming satellite navigation corrections before main-engine cutoff, third world ballistic missiles will be relegated to CEPs of no better than 200 to 300 meters for the foreseeable future. For example, China is developing the M-9 missile with a reported CEP of 300 meters. Despite the drawbacks of command guidance, the Indian Prithvi missile employs such guidance in combination with an INS to achieve a CEP in the neighborhood of 250 meters. Better accuracies are theoretically possible for third world ballistic missiles with the addition of map-matching guidance schemes integrated into maneuvering reentry or postboost vehicles for the terminal-delivery phase.[14] The latter improvements, however, are both costly and subject to some export controls. In sum, the relative inaccuracy of ballistic missiles when compared with cruise missiles proscribes the effectiveness and utility of the former when they are equipped with conventional payloads. Cruise missiles, by contrast, offer the third world the capacity to attack military targets effectively without resort to NBC weapons.

Cruise missiles also possess other appealing operational features when compared with ballistic missiles. The fact that they can be placed in canisters makes them particularly easy to maintain and operate in harsh environments. Their relatively compact size offers more flexible launch options, more mobility for ground-launched versions, and a smaller logistics burden, which could reduce their battlefield vulnerability to detection—and thus improve their prelaunch survivability. Moreover, cruise missiles dictate no special launchpad stability requirements and can be launched from commercial ships and airplanes, as well as ground launchers. Finally, the cruise missile's aerodynamic stability, which makes it an inherently easier and cheaper platform from which to achieve precise delivery of conventional payloads, also makes it a better platform for effective dispersal of chemical and biological agents.

Exhaust plumes from cruise missiles are not generally detected by launch-warning systems and, unlike the flight paths of ballistic missiles, those of cruise missiles are not predictable. Most importantly, however, cruise missiles can fly low and thereby pose severe detection challenges—even for airborne radars—due to ground clutter. As higher-quality terrain-elevation data become available through the commercial marketplace, future third world cruise missiles will place stress on the most capable of existing air defenses through very low flight profiles. Reductions in RCSs, which are generally easier to accomplish in more streamlined cruise missile designs than for manned aircraft, will further exacerbate the challenge to air defenses.

Perhaps the most demanding problem for defense against cruise missiles stems from their low cost. The US Army estimates that for a given investment of $50 million, a third world nation could acquire at least 100 cruise missiles. An equal investment for ballistic missiles would purchase only 15 tactical ballistic missiles and three transporter-erector-launchers.[15] Thus, while the individual penetration survivability of a cruise missile with a large RCS may not compare favorably with that of a tactical ballistic missile, saturation attacks with low-cost cruise missiles could more than compensate for this deficiency—especially in light of the cruise missile's better accuracy and resulting higher lethality.

Key Cruise Missile Enabling Technologies

The design requirements for the original cruise missile entailed some form of simple midcourse guidance (preprogrammed autopilot or remote/command guidance), a conventional airframe (metal skin structure with conventional aerodynamic flight controls), conventional propulsion (jet propulsion or use of liquid rocket motors), and terminal guidance (either passive radio-frequency homing, radar, or passive IR for terminal homing). Such designs possessed severe limitations. Midcourse guidance had limited autonomy and accuracy, while propulsion systems produced limited ranges due to poor fuel efficiency (typically 300 kilometers or less). Terminal guidance systems required a "cooperative

target," in that the ability to acquire targets at operating ranges beyond 150 kilometers was severely limited by uncertainties in midcourse guidance.

The two critical enabling technologies that promise to create major incentives for the third world to acquire cruise missiles include precise navigation and guidance technology (GPS and GLONASS) and higher efficiency, lower-volume engine technology.

Navigation-and-Guidance Technology and Systems

Satellite navigation and guidance offer a straightforward solution to the challenges of midcourse and terminal guidance enumerated above. By using very accurate satellite-navigation updates together with even a rudimentary INS, a modern cruise missile can achieve autonomous midcourse guidance and deliver a payload to within a few meters of its intended target.

The US GPS system known as navigation satellite timing and ranging (NAVSTAR) consists of 21 satellites with three spares. Cruising in polar orbit, each satellite has a clock and transmits a signal, enabling a ground receiver with a similar clock to determine its exact position on the earth. A ground station maintains accuracy by introducing minute corrections into the system. One needs signals from three satellites to achieve a precise two-dimensional position and from four satellites for a three-dimensional fix. Receipt of signals from more than four satellites only increases the accuracy of the fix.[16]

Each satellite transmits two signals with slightly different frequencies.[17] Coarse/acquisition (C/A)-code signals are available to all users and furnish an accuracy of roughly 30 meters. The precision (P)-code signals, which are encrypted, are intended only for military users; they deliver an accuracy of roughly 15 meters. Because the Department of Defense (DOD) fears that C/A-code accuracy is sufficient to threaten US security interests, it has introduced a feature—called selective availability (SA)—that intentionally degrades the C/A code signal to produce an accuracy of 100 meters in latitude and longitude and 140 meters in altitude.[18]

However, one can correct SA by employing differential techniques (DGPS), consisting of a receiver and broadcast station on a geodetically referenced site, which applies a correction to the GPS signal and rebroadcasts that correction to portable units within a radius of around a few hundred kilometers.[19] The application of DGPS to cruise missile guidance and navigation is illustrated in figure 6.1. The introduction of wide-area DGPS is overcoming the inherent range limits for local-area DGPS service by collecting local-area differential corrections and transmitting them to a central facility, which then sends them to a satellite for broadcast. Reports indicate that using DGPS techniques can improve accuracy by a factor of 10 for the C/A-code signal; for the military P-code, one estimate suggests the attainment of accuracies of between 75 centimeters and five meters.[20] The emergence of DGPS, combined with the explosive growth of commercial GPS users, may force DOD to abandon SA altogether.[21]

Importantly, one can incorporate differential GPS data not only into weapon systems but also into the making of very accurate map products for both mission planning and terrain-contour matching. Commercial DGPS systems are readily available on the open market throughout the world, with prices dropping in accord with price reductions in the general electronics marketplace.

Russia's GLONASS is slated for completion during 1995–96. Because GPS is fully deployed, GLONASS may be marketed less as an independent source of satellite-navigation information than as a complement to GPS by virtue of the fact that joint use ensures the reliability of GPS and actually improves its accuracy.

As with the US GPS system, GLONASS will deploy 21 satellites (with three spares). Technically, it is similar in principle to GPS, although its coordinate system and the orbital planes of the satellites are somewhat different. Like GPS, GLONASS has C/A-code and P-code equivalents with roughly the same accuracy as GPS's respective codes. GPS- and GLONASS-integrated receivers already have been developed and tested by Honeywell and Northwest Airlines for airline applications, with accuracies reportedly below 20

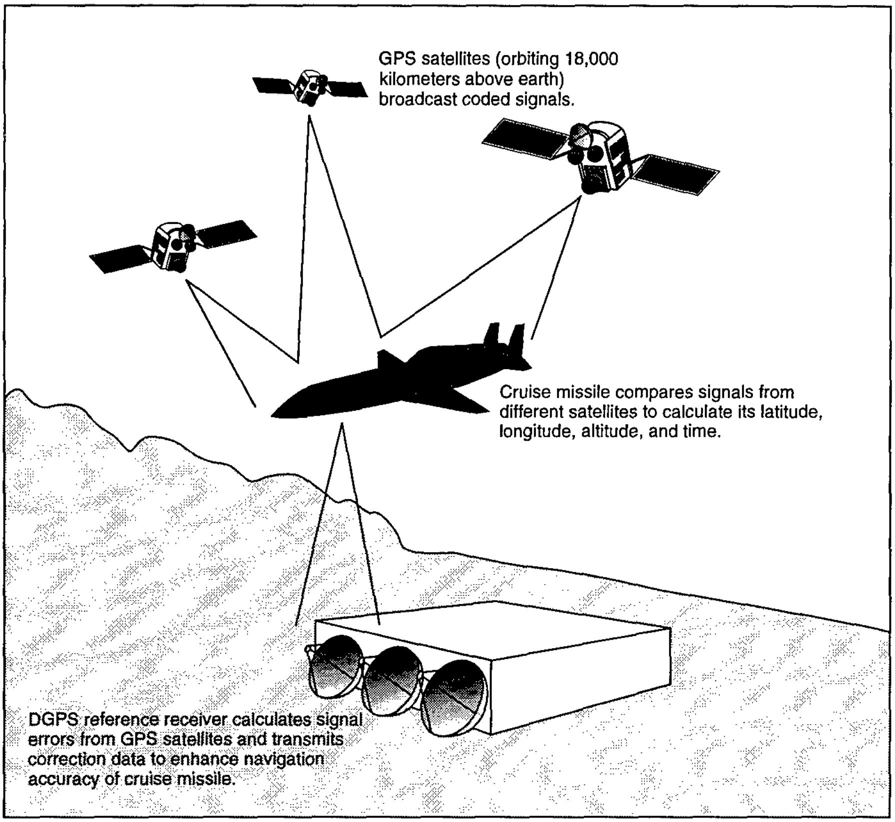


Figure 6.1. Differential GPS Concept for Cruise Missile Navigation

meters.[22] GLONASS- and GPS-integrated receivers furnish an attractive option for third world users who fear any degradation of GPS signal quality and accuracy.

Integrating GPS and INS

A major constraint in third world missile performance relates to the relative quality of the INS. By using accelerometers and gyroscopes that detect motion and calculate needed changes in relative position, INSs furnish guidance and control for both aerodynamic and ballistic missile systems. Unfortunately, INSs accumulate inaccuracies as a function of time. Given the slow speed of long-range cruise missiles, INSs alone do not provide sufficient accuracy for conventional missions.

The advent of GPS has changed the INS picture in revolutionary terms—and in just a decade. Consider that in the early 1980s, third world countries had marginal navigation systems, such as the attitude-heading reference system for the MiG-21, MiG-23, and MiG-25 aircraft, and poor INS for their ballistic missile systems—mostly Soviet-furnished Scuds. A decade later, the developing world is just beginning to gain access to radically improved navigation and guidance by coupling GPS receivers with cheap and relatively inaccurate INS systems, which are widely available for commercial aircraft. Hybrid technology (INS plus embedded GPS) is now widely available.[23] Overall, a quantum jump in capability (roughly a 15-year jump) has occurred; this capability will become increasingly available for military applications in the decade ahead at prices that continue to drop.[24]

Evidence exists that several countries are actively engaged in exploiting GPS, possibly for missile-guidance purposes. Pakistan, China, Burma, Israel, Iran, Russia, France, and Germany have all shown interest in the integration of GPS into missiles and unmanned air vehicles. Several countries (Pakistan, China, India, Indonesia, and Thailand) appear headed toward seeking DGPS to improve the quality of their photogrammetric techniques.[25] For its part, China plans by about 1998 to deploy its own satellite-navigation system—dubbed Twin Star—with 20-meter accuracy.[26]

Mission Planning for Cruise Missile Applications

The advent of GPS technology also brings within the third world's reach all the necessary tools for sophisticated mission planning and possibly even terminal-guidance schemes employing terrain-matching techniques. Although GPS as a guidance technique for cruise missiles obviates the need for detailed digital map making, some countries may nevertheless desire developing accurate digital maps to improve the penetration and survivability of their cruise missiles. Flying cruise missiles at very low altitudes dictates the need for accurate terrain-elevation data, which can be preprogrammed into the cruise missile, thereby avoiding the need for an expensive terrain-avoidance radar system.

The products for such mission planning are readily available today. Conventional wisdom has it that civilian space programs have little military utility. In fact, commercial products of SPOT and LANDSAT satellites were used extensively in Operations Desert Shield and Desert Storm for broad-area search and mission planning. Moreover, the recent US government decision to permit the sale of sophisticated spy-satellite technology and products (namely, imagery that depicts objects one meter in diameter) to commercial customers has generated concern that militarily relevant imagery will become available to potentially hostile powers, despite safeguards for controlling its spread.[27]

Geographic Information Systems (GIS), comprising personal-computer hardware and very sophisticated software (e.g., Auto-Cad), now permit users to make very accurate digital maps with GPS data inputs. One can use such hardware and software capabilities for more than just preprogramming the route of a cruise missile. Better maps and commercially available satellite imagery allow third world states to develop better targeting by improved photogrammetric techniques. For example, the Center for Mapping at Ohio State University blended imagery with DGPS data to archive data on highways and land features. The center used an eight-channel GPS receiver, stereoptic cameras, and standard GIS technology costing roughly $850,000 in order to map several states. Their output permitted vans traveling at 50 to 60 miles per hour to achieve accuracies of approximately two and one-half meters.[28] In other words, the technology is commercially available today to permit proliferating states to digitize satellite imagery generated by SPOT and LANDSAT, add position information taken from differential GPS, and employ it together with a radar altimeter to create a terrain-contour-matching (TERCOM)-like guidance system for intermediate and terminal homing. The challenge is one of integrating these components into a weapon system—a difficult challenge indeed for any third world country. Yet, in a decade or so, it is safe to say that such targeting systems will probably be available in third world cruise missiles.[29]

Third world countries are already exploiting the benefits of this technology. India's first cruise missile, the Sagarika, will reportedly employ a terrain-matching system for guidance and

low-level flight.[30] The US government approved the sale of GIS technology to Iraq in March 1987 for the stated purpose of remote sensing and photo interpretation, according to Iraq's Remote Sensing Center in Baghdad. After using the center's new capabilities to support its war against Iran, Iraq started taking a strong interest in imagery of Kuwait and Saudi Arabia. According to the chairman of SPOT Image Corporation, between 1988 and 1990, his firm delivered to Iraq 20 images of the area—including overlapping ones. SPOT denied another Iraqi request after its invasion of Kuwait in August 1990.[31]

The simple fact is that the US and its allies no longer have a monopoly on space technology. Spending by foreign governments on space is increasing, and cooperative and cost-sharing agreements have reduced each country's burden.[32] Moreover, widespread availability of low-cost, dual-use space technologies (such as charge-coupled devices [CCD]) means that the prospects for enhanced imagery support to third world users will inevitably increase.

Propulsion Systems

Third world countries are not likely to develop the indigenous capacity to produce efficient turbofan engines for small, long-range cruise missiles by the end of this decade. But that does not mean that one cannot acquire turbofan engines through the international marketplace. Turbofan engine technology—like that reflected in the Williams F-107 used for the air launched cruise missile (ALCM) and Tomahawk long-range cruise missile—is available in Russian systems such as the AS-15 and SS-N-21 long-range cruise missiles. As already noted, derivatives of the AS-15 cruise missile outfitted with turbofan engines have been advertised for sale at international air shows. Moreover, US commercial sales to China of turbofan engines for jet trainer aircraft illustrate the challenge associated with controlling cruise missile proliferation at a time when there are far fewer limits on manned aircraft—commercial and military alike.[33]

Turbojet engines are available from a variety of industrial and third world manufacturers.[34] Several countries, including Russia, China, France, and the United Kingdom, produce

turbojet engines suitable for cruise missile applications. Given past practices, Chinese and Russian sales to the third world are quite likely in the future; French and British sales have already occurred. Moreover, US turbojet engines are widely proliferated with the Harpoon ASCM. Also involved in the manufacture and sale of small turbojet engines for supersonic aircraft are India, Israel, South Africa, and Taiwan. Depending on payload weight, such turbojet technology in a small-engine configuration ought to be able to support cruise missiles capable of ranges out to 1,000 kilometers.

Final Thoughts on Future Proliferation of Cruise Missiles

In evaluating the developments discussed thus far, we conclude that to date the problem of cruise missile proliferation has centered on antiship—not land-attack—systems. Still uncertain—though evidence of strong third world interest is growing—is just how aggressively regional adversaries of the US will exploit the revolution in guidance and navigation that now makes land-attack cruise missiles appear so attractive as an alternative or complement to ballistic missiles and attack aircraft.

It is also fair to say that the cruise missile threat has been both understated and exaggerated—though understatement greatly dominates exaggeration. We judge third world incentives to acquire land-attack cruise missiles to be sufficiently compelling to suggest a threat of some considerable magnitude emerging by the end of this decade and growing significantly more prominent thereafter. To the extent that virtually no one has considered this prospect, the cruise missile threat has been understated. In stark contrast, "a virtual blizzard of books, scholarly articles and now official analyses" on ballistic missile proliferation has offered just about everything that can be said about that subject—or so notes Janne Nolan in the journal *Survival*.[35] With a few notable exceptions, that is not the case for cruise missile proliferation.[36]

In part, the relative levels of attention are a function of the recent emergence of the enabling technologies for land-attack cruise missiles. Ballistic missile proliferation, by contrast,

came into prominence as an important security issue in the mid-1980s. In addition, political controversy in the US and Western Europe surrounding active ballistic missile defenses has fixated the analytical and policy communities on the issue of ballistic missile proliferation—at the expense of a broader consideration of other, perhaps equally serious, proliferation trends.[37]

Exaggeration of the cruise missile threat is reflected in the general tendency to focus on the individual components of land-attack cruise missile capability—particularly the implications and impact of the availability of GPS for cruise missile guidance—without giving sufficient attention to the challenges facing the third world in systems integration. What separates the industrial from the developing world is the former's capacity to integrate technology components into complex systems that produce repeatable results according to desired specifications. When we approach cruise missile proliferation purely from the standpoint of individual technology components, it is easy to conclude that the spread of cruise missiles represents a more significant threat than ballistic missile proliferation.

Whatever the reasons for the imbalance, the prospects for cruise missile proliferation undoubtedly are great. Whether militarily significant threats emerge within five or 10 years naturally depends on a number of difficult variables, not the least important of which is the effectiveness of existing export controls.

The Effectiveness of Existing Export Controls

In light of the alternative paths available to the third world for acquiring land-attack cruise missiles (namely, upgrading ASCMs or UAVs for land-attack missions; developing an indigenous manufacturing capability; or purchasing directly from the industrial world), clearly the relative effectiveness of existing export controls will significantly shape the pace and scope of the future proliferation of cruise missiles. The principal international-policy mechanism for controlling exports of missiles capable of delivering weapons of mass destruction is the Missile Technology Control Regime.

The MTCR was announced in 1987 as a voluntary accord (i.e., not a legally binding international treaty) aimed at limiting "the risks of nuclear proliferation" by controlling transfers that could contribute to the development of "nuclear weapons delivery systems *other than manned aircraft*" (emphasis added).[38] The regime had seven original members: the United States, Canada, West Germany, France, Italy, Japan, and the United Kingdom.

In 1993 MTCR member governments agreed to extend the regime's purview to cover missile-delivery systems for chemical weapons (CW) and biological weapons (BW). As of 1995, 25 countries had joined the MTCR as full partners.[39] Russia was invited to join in June 1995. China has apparently agreed to abide by the MTCR guidelines but has not joined as a full partner.[40]

How the MTCR Works

The MTCR seeks to accomplish its purpose through member adherence to an agreed set of export-policy guidelines, which are applied to an extensive list of items contained in the MTCR's equipment and technology annex (appendix F). The annex itself is divided into two sections: category 1 contains complete missile systems and highly sensitive missile-related equipment; category 2 lists dual-use items. The MTCR offers general export guidance applicable to the entire technical annex, as well as specific guidance tailored to each annex category.

The MTCR's general guidance directs members to make a "strong presumption to deny" transfers of any annex item or any missile (regardless of its inclusion in the technical annex) that the member believes is "intended" for the delivery of NBC weapons.[41] In evaluating the recipient government's end-use intentions, MTCR member states are directed to undertake, inter alia, an assessment of the capabilities and objectives of the recipient's missile and space programs, as well as an evaluation of the significance of the transfers in terms of their potential to "contribute" to the development of delivery systems (other than manned aircraft) for NBC weapons.[42]

Category 1 items are, for all intents and purposes, *automatically* considered able to "contribute" to the development of NBC missiles. Within category 1, item 1 includes complete rocket systems (including ballistic missile systems, space-launch vehicles, and sounding rockets) and UAV systems (including cruise missile systems, target drones, and reconnaissance drones) capable of delivering 500-kilogram payloads to ranges of 300 kilometers or more. Item 2 includes certain major subsystems usable in rockets and UAVs meeting the 300-kilometer/500-kilogram threshold, as well as specially designed production facilities and production equipment for 300-kilometer/500-kilogram missiles and their major subsystems.[43] The category 1 guidelines are supplemented by language in the technical annex of 1993, which directs MTCR members to assess whether recipient states could modify missiles or components via range-payload trade-offs to develop missiles meeting the 300-kilometer/500-kilogram threshold.[44]

Because category 1 items are inherently usable as—or in the development of—missiles for NBC delivery, MTCR members should make "a strong presumption to deny" category 1 transfers, regardless of the recipient's "intended" end use. In the unlikely circumstance that a member government does decide to export a category 1 item, it should obtain "binding government-to-government" assurances and take "all steps necessary to ensure" that the item is put only to its stated end use. Members are advised further that the export of category 1 production facilities is flatly prohibited.[45]

MTCR category 2 lists a variety of subsystems, components, machinery, and technologies usable in the development of missiles and other military systems, as well as commercial systems. Major classes of items include, inter alia, propulsion components, propellants, missile structural composites, flight-control systems, missile computers, reduced-observables technology, launch equipment, and test facilities.[46] In a reflection of the MTCR's expanded mandate to cover CW- and BW-capable missiles, item 19 was added in 1993. This category 2 item includes complete rocket or UAV systems capable of "a maximum range equal or superior to 300 kilometers," regardless of payload.[47] Moreover, since item 19 is covered by the annex language on range-payload trade-offs,

even shorter-range systems such as ASCMs might be covered if they could be modified through payload reductions to achieve a 300-kilometer range.

An MTCR member government may export category 2 items and associated production facilities at its own discretion, but only after it has determined that the items are not usable in a missile for NBC delivery, or in one captured by the 300-kilometer/500-kilogram threshold of MTCR category 1. If the internal finding is positive for either application, then the MTCR member is obligated to obtain assurances from the recipient state that the items will not be put to these end uses.[48] However, end-use assurances are not required for a variety of UAV-relevant items if they are "exported as part of a manned aircraft or in quantities appropriate for replacement parts for manned aircraft."[49]

The MTCR export guidelines are implemented according to national legislation. Licensing and enforcement activities, therefore, vary among member states. The accord makes no provision for penalizing countries that violate its guidelines, but individual members can—and do—impose sanctions on violators unilaterally. MTCR members meet at least once a year to discuss enhancements to the regime as well as intelligence information on missile projects of concern. A primary strength of the regime is member agreement that an export denial by one member state will be upheld by all.

Analyzing the MTCR's Effectiveness

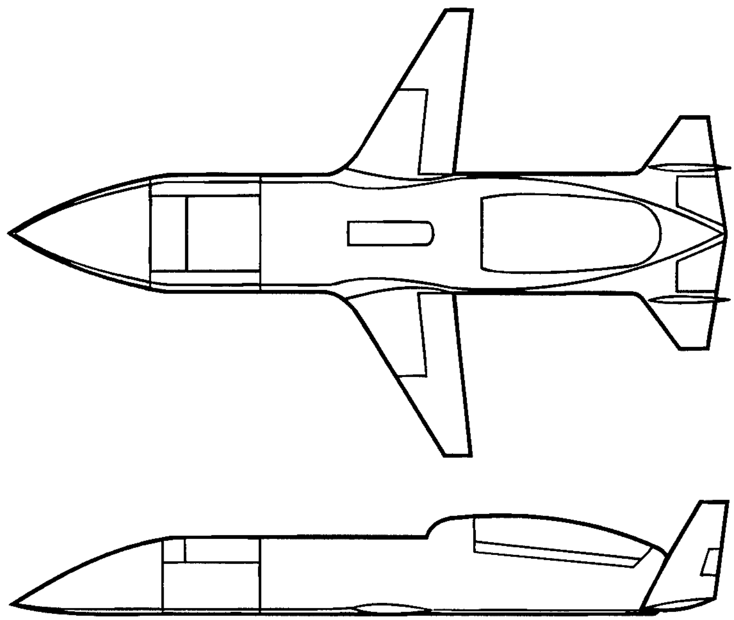
As the only active regime aimed specifically at stemming the diffusion of missile systems to the third world, the MTCR represents a constraining mechanism of considerable importance. In addition to helping derail some surface-to-surface ballistic missile programs, enforcement of the regime's provisions has slowed the emergence of new states wielding ballistic missiles. The list of suppliers also has shrunk. Notably, the former Soviet Union no longer dispenses Scuds to client states. Argentina, Brazil, South Africa, South Korea, and Iraq apparently have terminated indigenous ballistic missile programs, leaving North Korea as the main supplier of MTCR-restricted ballistic missiles.[50]

That said, the regime does suffer from weaknesses regarding cruise missile proliferation, stemming largely from the fact that the MTCR and its key supporters have yet to establish a firm consensus against the spread of cruise missiles. This fundamental shortfall ensures an additional weakness. Specifically, the MTCR's controls on critical enabling technologies for UAVs and complete cruise missile systems are not stringent enough to impede significantly the spread of advanced cruise missiles.

As to recognition of the emerging cruise missile threat, one must recognize first and foremost that, relative to NBC weapons, the consensus against missile proliferation in general has yet to become firmly established. Indeed, a stronger consensus appears to exist—even among MTCR members—for restricting ballistic rather than cruise missile or UAV systems. This conclusion is supported by the fact that key MTCR members have demonstrated a greater willingness to export cruise missiles and other UAVs than ballistic missiles.

The US has transferred short-range ballistic missiles to just three third world countries.[51] In contrast, it has sold ASCMs to more than a dozen and has sold reconnaissance drones worldwide, including the 2,250-kilometer-range Scarab (fig. 6.2) to Egypt. France is reported to have sold ballistic missiles to just one third world customer;[52] Britain and Italy have not transferred any. Yet, France has sold ASCMs to a combined total of nearly 30 developing countries. Britain has sold its turbojet-powered, 110-kilometer-range Sea Eagle ASCM to at least three third world nations. Italy has widely exported its Mirach family of UAVs, including a 900-kilometer-range model to Iraq, Libya, and Argentina.[53]

The US and allied exports cited above demonstrate the MTCR members' unwillingness to restrict key enabling technologies for cruise missiles. The exported ASCMs and UAVs failed to meet the MTCR's category 1 threshold—missiles carrying 500-kilogram payloads to ranges of 300 kilometers—and thus escaped its most restrictive export guidelines. But the category 1 threshold is better suited to impeding ballistic rather than cruise missile proliferation. As noted above, shorter-range ASCMs and RPVs can be adapted for land-attack missions.[54] From an engineering standpoint, it is relatively



Length	6.14 meters
Wingspan	3.35 meters
Height	61 centimeters
Maximum Gross Weight	1,068 kilograms
Speed (Maximum)	Mach 0.8+
Cruise Range	2,250 kilometers
Service Ceiling	13,000 meters
Engine	Teledyne CAE Model 373-8C Turbojet

Figure 6.2. Teledyne Ryan Model 324 "Scarab" RPV (from Teledyne Ryan Aeronautical, San Diego, California)

easier to "scale-up" the range of an existing cruise missile system than a ballistic missile.[55] Indeed, the technology required to produce a 1,000-kilometer-range cruise missile is not fundamentally different from that needed for very short-range systems.[56] Hence, UAVs and UAV technologies falling clearly below the MTCR's range-payload threshold can be exported and applied to the development of long-range cruise missiles.

The fact that the MTCR does not restrict manned-aircraft exports also eases the determined proliferator's task. This exemption represents a direct way to work around MTCR restrictions on UAVs because the relationship between manned aircraft and UAVs is strong. The structures, propulsion, autopilots, and navigation systems used in manned aircraft are essentially interchangeable with those of cruise missiles and other UAV variants; the same is true for production facilities and equipment for UAVs and manned aircraft.

Hence, to impede the spread of cruise missile production capabilities, the MTCR would have to restrict the sale of aircraft-related technologies. But such restrictions appear no more realistic today than they did when the MTCR was developed in the mid-1980s. In fact, global competition to export aircraft and UAVs, their related technologies, and production facilities is increasing.

The major powers are expected to begin selling off their cold war arsenals of military aircraft.[57] They are becoming increasingly dependent on manned-aircraft exports to preserve their defense-industrial bases as domestic military budgets decline in the post-cold-war era.[58] Industry analysts predict that, not counting US purchases, the global market for jet trainers during 1995–2000 could total $4 billion. The market for military UAVs could be higher still, possibly reaching $5 billion, and that figure likely will be outstripped by orders for commercial UAVs. In addition, air forces worldwide are expected to begin a rash of fighter upgrades, which will lead to a major trade in aircraft engines, advanced electronics, radar, and other aerospace subsystems.[59]

Developing countries increasingly are taking advantage of the "buyers market" in aerospace to demand offsets providing indigenous aircraft maintenance—and even production—capabilities. The willingness of former Eastern bloc aircraft producers to undercut the prices of their Western competitors is likely to further accelerate the diffusion of production capabilities related to cruise missiles. Thus, the link between cruise missiles and manned aircraft represents a major challenge to MTCR effectiveness in controlling the spread of enabling technologies and production capabilities for land-attack cruise missiles.

Of course, the quickest way for the developing world to obtain land-attack cruise missiles is to purchase them directly from an industrial-world supplier. Possible confusion over the extent to which MTCR provisions apply to ALCMs may account for France's apparent willingness to consider exporting its Apache cruise missile (fig. 6.3).

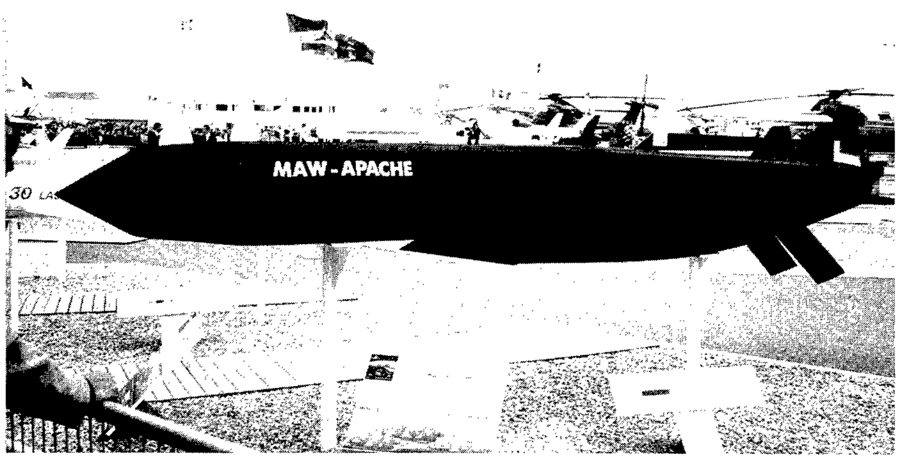


Figure 6.3. Apache Cruise Missile

Under development since 1989, the Apache is modular in design and is intended (at present) to come in three different versions:[60]

• Apache AP[61]—the original 140-kilometer-range version carrying a submunitions payload of 520 kilograms. This version will be deployed by the French and German air forces and is being offered for export, although no firm contracts have been reported. Initial missile deliveries are expected in 1997.

• Apache AI[62]—an extended-range (250 to 400 kilometers) version with a 400-kilogram unitary warhead recently approved for series production in 1999 for the French air force and navy. A derivative of the Apache AI also will be offered as a

competitive bid in the British conventionally armed standoff missile (CASOM) procurement.

• Apache Scalp[63]—the longest-range (400 to 600 kilometers) version slated exclusively for French use as a "strategic" weapon under the control of the General Staff. It is expected to enter series production in 2001.

The Apache family of cruise missiles was designed from the outset with high terminal effectiveness in mind: a stealthy aerodynamic shape with low RCS and IR signatures and very low-level, terrain-following flight characteristics. Although the Apache's prime contractor, Matra Missiles and Space, boasts of the missile's stealthiness in its marketing, it has become increasingly apparent that the French government wants to reserve the most effective low-observable features for the Apache Scalp.[64]

All versions of the Apache are powered by the same turbojet engine. Variations in fuel loading account for differences in range among the three versions.

The MTCR provides the only established basis to object to Apache exports. French industry officials have argued that the Apache AP is designed to fall under the MTCR's range-payload threshold (300 kilometers/500 kilograms), given its 140-kilometer range and 520-kilogram submunition package.[65] But the MTCR cautions members to "take account of the ability to trade off range and payload."[66] At the very least, Apache AP appears readily adaptable to fly to at least 300 kilometers through payload reductions, which would subject it to the MTCR's less stringent category 2 (item 19) restrictions. But it is also quite plausible to believe that the Apache AP could fly to at least 300 kilometers with its 520-kilogram payload package if launched from a sufficiently high (yet not operationally implausible) altitude. That capability would place the Apache AP squarely under the MTCR's category 1 restrictions, requiring the French government to exercise a "strong presumption to deny" any exports. Responding to a reporter's question about MTCR and the Apache in January 1995, a senior French Defense Ministry official stated that the shorter-range version of Apache does not fall under MTCR guidelines and therefore is not subject to multilateral controls.[67]

Russian activities are also worrisome. The sharp decline in Russian defense spending has reportedly forced Russian cruise missile builders to search for foreign customers. According to one source, Moscow has sold its SSC-1 Sepal cruise missile (1,000-kilogram payload to 450 kilometers) to Syria.[68] Also of concern is the flow of systems and technologies to China.[69] Russian technology transfers could facilitate China's development of advanced cruise missile weapons, and one has reason to question whether China can be persuaded to forgo exporting them, the MTCR notwithstanding.[70]

Beyond reported transfers, Russia has marketed a variety of cruise missile systems at arms shows around the globe. In addition to the AS-15, among the more troubling systems is an export version of the AS-16, which can carry a 150-kilogram payload to a range of 150 kilometers.[71] The effectiveness of the country's export-control system is open to question, as is its professed commitment to the MTCR.[72]

Several other MTCR members and adhering states are developing or considering the export of cruise missiles. Israel (an MTCR adherent) is reportedly transforming its Delilah UAV into a 400-kilometer-range ALCM with the aid of Chinese funding.[73] The Spanish company CASA announced recently that it wants to build a land-attack cruise missile. The company will keep the missile's per-unit costs low by using commercial, off-the-shelf technologies. The CASA missile looks similar in design to the French Apache, and its competitive price suggests that Spain may go after the Apache export market.[74] For its part, the United Kingdom has withheld an export license for GEC Marconi in connection with that company's intended transfer of the El Hakim land-attack cruise missile to the United Arab Emirates, which directly funded research on this program.[75] In the end, the way Apache transfers are handled is likely to greatly affect the behavior of these other aspiring cruise missile exporters.

Recommendations for Improving Export Controls

Although the problem of cruise missile proliferation is just beginning to manifest itself, the findings presented herein

suggest that constraining the spread of cruise missiles may be much more difficult than constraining the spread of ballistic missiles. Hence, a need exists for immediate action while there is still time to constrain rapid advances in the cruise missile threat. In this regard, a critical first step is acknowledgment that the challenge of cruise missile proliferation exists, followed by placing cruise and ballistic missile nonproliferation efforts on an equal footing.

We examined the Clinton administration's treatment of cruise missile proliferation in congressional testimony, major foreign-policy speeches, and policy proclamations on export controls and counterproliferation initiatives.[76] Not one of these key addresses or documents specifically mentioned cruise missiles as an important element in the overall problem of missile proliferation. Each focused instead on the proliferation of ballistic missiles and space-launch vehicles. In view of the prospects for cruise missile proliferation, it will become increasingly important to draw specific attention to the cruise missile dimension of the missile proliferation threat—particularly in light of the export-control challenges detailed above.

Any new MTCR initiatives must be firmly grounded in reality, which dictates that member states recognize that they no longer monopolize aerospace expertise or industrial capabilities. Some developing countries are already producing relatively unsophisticated cruise missiles, and they might exploit satellite navigation systems to build longer-range cruise missiles over time. Moreover, a latent cruise missile production capability exists in many regions because of the globalization of the manned aircraft and UAV industries. Hence, although MTCR members should not abandon technology-denial efforts aimed at unsophisticated cruise missiles, neither should they expect them to have a major impact.

We recommend that the MTCR focus its attention on slowing the spread of relatively advanced systems, such as stealthy cruise missiles capable of high speed and/or long range. The critical enabling technologies needed to acquire advanced cruise missiles—including stealth and advanced propulsion systems—are produced almost exclusively by MTCR members or by states that might be persuaded to support tighter

controls. Because stealth and advanced propulsion systems are covered under the dual-use section of the MTCR, member governments can export them at their discretion. Given the particular sensitivity of stealth-technology transfers, however, MTCR members should consider enhancements to the regime.

Low-observable or stealth technologies are covered by item 17 in category 2 of the MTCR's equipment and technology annex. MTCR members should therefore export stealth technologies in accordance with the regime's category 2 guidelines, but the restriction applies *only* if the technologies are usable in the systems described in category 1, items 1 and 2. These items include, respectively, complete missiles capable of carrying 500-kilogram payloads to ranges of 300 kilometers or more and certain major subsystems and equipment for 300-kilometer/500-kilogram missiles. Hence, to better restrict the spread of low-observable cruise missiles, the least controversial modification would be to extend item 17 applications to cover not just category 1 missiles, but also those missiles described in category 2, item 19 (i.e., missiles capable of a maximum range of 300 kilometers or more, regardless of payload). The fact that this change did not occur at the time item 19 was fashioned appears to have been an oversight, but, in any case, subjecting stealth technologies to category 2 export guidelines would still leave transfers at the discretion of individual supplier states.

The second and potentially more effective option would be to make stealth technologies subject to category 1 controls (i.e., "a strong presumption to deny" exports). In its simplest form, one could effect this change by transferring the stealth technologies described in item 17 to category 1, item 2. Some people will argue that considering low observables as a major subsystem has nothing to do with the MTCR's original intent (i.e., controlling delivery systems for weapons of mass destruction). Yet, the addition of stealth to a cruise missile essentially furnishes it with the same characteristics of ballistic missiles that gave impetus to the MTCR's creation: difficulty of defense, short warning time, and shock effect. Moreover, the fact that cruise missiles represent an even more effective means of BW and CW delivery than do ballistic missiles gives further weight to the merits of such a change.

Our discussion of whether or not Apache is subject to MTCR guidelines points to another potential improvement in the regime's technical annex: clarifying the way trade-offs between range and payload for cruise missiles are calculated. It appears that the MTCR's reference to range and payload was written with surface-to-surface ballistic missiles in mind. Calculating such trade-offs for ALCMs is far more difficult, given the various flight profiles such missiles might employ. A discussion of how one determines "payload" in view of the modularity of modern cruise missiles also would seem sensible.

Beyond advocating modifications to the MTCR's technical annex, the US should take the lead in a more general effort aimed at raising MTCR members' awareness of the emerging cruise missile threat. Members should be sensitized to the fact that, with the predicted worldwide expansion of the aircraft upgrade and UAV markets, export-control authorities can expect export-license applications for advanced subsystems usable in cruise missiles. MTCR governments should take such applications as a warning signal. Thereafter, member states should thoroughly investigate the end-use intentions of recipient states, especially when the recipient does not have current, acceptable aerospace systems employing such technologies. Members should prohibit exports of stealth and advanced propulsion systems or proceed only with utmost caution if available evidence suggests that the recipient government is interested in acquiring cruise missiles. If the export is permitted, end-use monitoring would be advisable, even in cases in which end uses involving manned aircraft seem certain. Monitoring might deter—although it cannot prevent—diversions of end items and production equipment from acceptable aerospace projects to cruise missile applications.

Even the most perfectly crafted export-control strategy would be limited in what it could achieve, which is to slow the pace of—not stop—cruise missile proliferation. Yet, slowing the pace can raise the costs and risks that proliferators must incur to acquire advanced cruise missiles. It also furnishes the United States and other affected states with time to develop effective defenses against emerging threats. Demonstrating

that effective cruise missile defenses are being developed apace with the emerging cruise missile threat could have a strong deterrent effect on third world acquisition plans for such missiles.

Notes

1. "The Weapons Proliferation Threat" (Washington, D.C.: Central Intelligence Agency, Nonproliferation Center, March 1995), 3.

2. See, for example, Kenneth Munson, "The Unmanned Air Vehicle Comes of Age," *Jane's Defence Weekly* 24, no. 3 (22 July 1995): 21.

3. As cited in Bryan Bender, "Defense Science Board Report Brands Cruise Missiles Increasing Threat," *Inside the Army* 7 (30 January 1995): 1.

4. RCS is a standard measure defining how visible a target is to a radar and therefore indicating at what range a given radar can detect and track the target. For a tutorial on the importance of RCS in aircraft and cruise missile design, see Bill Sweetman, *Stealth Aircraft: Secrets of Future Airpower* (Osceola, Wis.: Motorbooks International, 1986), especially chap. 3.

5. Without any great fear of Iraqi aircraft threats, US Patriot air defense batteries could focus their radars on high-angle ballistic missile threats, thereby avoiding the fratricide problem. See also Dennis Gormley, "Cruise Missile Threat Quietly Rises," *Defense News* 10 (27 March–2 April 1995): 27–28.

6. Of course, one can configure a reentry bus to undertake terminal maneuvers to avoid active defenses. For more on the differences between ballistic and cruise missiles, see System Planning Corporation, *Ballistic Missile Proliferation: An Emerging Threat, 1992* (Arlington, Va.: System Planning Corporation, 1992), passim.

7. For the best appraisal of the Falklands conflict and the impact of Exocet cruise missile attacks on British naval operations, see Max Hastings and Simon Jenkins, *The Battle for the Falklands* (New York: W. W. Norton, 1983), 153–54, 316–20.

8. The sea-skimming version of the Harpoon employs a radar altimeter to get the missile to the target area; another version employs a climb-and-dive approach, necessitating an inertial navigation scheme in the high-altitude mode.

9. The US Air Force and US Navy—like the French air force over the last two decades or more—may not be able to go into large-scale production for a future fighter until sufficient foreign sales are made to bring down per-unit costs. In an effort to preserve national industrial bases, nations may err on the side of transferring technology by reducing the number of production lines (and accompanying overhead and production costs) to perhaps just the frontline model. As a consequence, prospective buyers have a rare opportunity to purchase the best the West is producing. With offsets included, the third world recipient is receiving not just aircraft but technological infrastructure as well.

10. Information on these displays is derived from interviews with attendees of the Abu Dhabi Air Show and from attendance and discussions with company representatives at the Paris and Singapore exhibitions.

11. For example, see Patrick J. Garrity, *Why the Gulf War (Still) Matters: Foreign Perspectives on the War and the Future of International Security* (Los Alamos, N.Mex.: Center for National Security Studies, 1993), passim.

12. David Israel, "History Repeats?" February 1992 (unpublished paper).

13. The most widely proliferated longer-range ballistic missile in the third world is the Soviet-designed Scud B. Declassified US Department of Defense estimates assert that Soviet forces could achieve Scud B CEPs of approximately 600 to 900 meters. Third world forces have demonstrated significantly less proficiency in their conduct of ballistic missile operations. It seems unlikely that third world Scud operators could even match the upper bound in accuracy achieved by their Soviet counterparts. Iraq, for instance, achieved CEPs of roughly two kilometers with its Scud-derived, 650-kilometer Al Hussein missiles during the Gulf War of 1991. For details and source materials on Scud B accuracies, see Dennis M. Gormley, *Double Zero and Soviet Military Strategy: Implications for Western Security* (London: Jane's Publishing Co., 1988), 75–77; for details on Al Hussein accuracies, see Gregory S. Jones, *The Iraqi Ballistic Missile Program: The Gulf War and the Future of the Missile Threat* (Marina del Rey, Calif.: American Institute for Strategic Cooperation, Summer 1992), 31–32.

14. For a useful treatment of missile accuracy, see Jones, especially 42–43.

15. Briefing charts, Department of the Army, Office of the Deputy Chief of Staff for Operations and Plans—Force Development, Concepts, Doctrine, and Policy Division, subject: Army Theater Missile Defense.

16. The ideal situation is for a receiver to have access to five signals from five satellites at any one time.

17. For technical details, see Department of Commerce, *Federal Radio Navigation Plan, 1990*, PB-91-190868 (Washington, D.C.: US Department of Commerce, 1990); and J. J. Spilker, "GPS Signal Structure and Performance Characteristics," in *Global Positioning System*, vol. 1 (Washington, D.C.: Institute of Navigation, 1980). The most useful layman's guide is Jeff Hurn, *GPS: A Guide to the Next Utility* (Sunnyvale, Calif.: Trimble Navigation, 1989).

18. Accuracy for GPS is defined differently than missile CEP accuracy. Thus, a 100-meter GPS accuracy has a confidence of two dRMS, which means that at least 95 percent of the time, the position information reported is within 100 meters of its true position. By contrast, CEP has a 50 percent confidence level, making CEP four-tenths as large as two dRMS. In other words, a 100-meter GPS accuracy equates to a 40-meter CEP for a missile.

19. For technical details, see V. Ashkenazi et al., "Wide-Area Differential GPS: A Performance Study," *Navigation Journal of the Institute of Navigation* 40, no. 3 (Fall 1993): 297–319.

20. W. Seth Carus, *Cruise Missile Proliferation in the 1990s* (Westport, Conn.: Praeger Publishers, 1992), 61.

21. Cheri Privor, "Panel Says GPS Security Efforts Are Outmoded," *Defense News* 10 (5–11 June 1995): 6.

22. Steve Wooley, "Proliferation of Precision Navigation Technologies and Security Implications for the U.S." (Alexandria, Va.: Institute for Defense Analyses, 1991), 8.

23. For an example of applications in integrated INS/GPS systems, see Mark Hewish, "Integrated INS/GPS Takes Off in the US," *International Defense Review* 26 (February 1993): 172–74; and idem, "GPS Users Proliferate following Gulf War," *Defense Electronics & Computing*, no. 4 (1992), editorial supplement to *International Defense Review* 25 (September 1992): 115–20.

24. According to Steve Wooley, stand-alone and relatively accurate INSs for Western commercial aircraft cost something in the neighborhood of $150,000. Cheaper, less-accurate systems—widely available from France, Germany, China, the United States, and the United Kingdom—cost roughly $50,000 but can be updated with GPS and GLONASS. The integration complexity varies, depending on the platform. See Wooley, 11. As far as GPS technology is concerned, Rockwell offers the NAVCORE V, a five-channel receiver in embedded-chip form, four by two-and-one-half inches in size, for $450 apiece or $250 in bulk.

25. Wooley, 14.

26. "Chinese 'GPS' Project Set," *Aviation Week & Space Technology* 141, no. 16 (17 October 1994): 25.

27. Safeguards on misuse of such high-resolution imagery reportedly include the requirement that companies maintain a record of every job requested. Moreover, the government reserves the right to shut down services during "periods when national security and/or foreign policies may be compromised." As tight as these safeguards may appear, they cannot eliminate the prospect that a hostile power might use an apparently legitimate company to purchase imagery useful for supporting the targeting of fixed military installations. That such services might be eliminated in a crisis only deals with constraining a hostile nation's access to time-critical imagery; it would not preclude the acquisition in peacetime of militarily relevant imagery for targeting fixed installations. See Edmund L. Andrews, "U.S. to Allow Sale of the Technology for Spy Satellites," *New York Times*, 11 March 1994, 1[A].

28. Wooley, 19.

29. To build such highly accurate maps using DGPS, the developer must have access to en route navigation points, which should not be difficult to achieve. What's more, TERCOM guidance is viewed in the US as a great challenge because of the extensive and costly mapping that is required to support TERCOM-guided cruise missiles—not the technology components of the guidance system itself. It should be noted, however, that the US must plan against a variety of worldwide military contingencies, which raises the

cost of mission planning considerably. By comparison, a third world nation's scope of mapping activity will be on a much smaller scale.

30. Rahul Roy-Chaudhury, "India Developing Sea-Based Missile System," Inter Press Service, 29 September 1994 (LEXIS-NEXIS [electronic news service of Reed Elsevier, Inc., Dayton, Ohio]).

31. Michael Krepon, "Bush Ignored Warnings on Saddam," *Defense News* 7 (1–7 June 1992): 19.

32. A study by Rockwell International states that a third world country could exploit commercially available technologies and launch services to procure and launch a two-and-one-half-meter-resolution reconnaissance satellite for less than $60 million. See briefing charts, James R. Howe, Rockwell International, Space Systems Division, Seal Beach, Calif., subject: Nth Country Satellite Threat Estimates, 10 November 1992.

33. According to an account in the *Washington Post*, AlliedSignal concluded a turbofan deal with the Chinese in 1987. Beijing claimed that the engines would be used in jet trainer aircraft. AlliedSignal officials reminded US authorities that similar turbofans were available from other manufacturers and used in business aircraft around the world. The Commerce Department thus approved the sale. But DOD opposed it, citing an intelligence-community finding that China could use the turbofans to upgrade its Silkworm ASCMs and create cruise missiles capable of carrying 450-kilogram payloads to ranges of about 600 kilometers. China's proven willingness to sell missiles to the third world raised the possibility that rogue states would acquire the upgraded Silkworms and use them against US forces in the future. Even so, economic considerations ultimately won the day. The Clinton administration approved the half-billion-dollar sale in 1994. See Jack Anderson and Michael Binstein, "Worrisome Engine Sales to China," *Washington Post*, 9 May 1994, 14[C]. For further ramifications of this sale, see Bill Gertz, "Russia Sells Rocket Motors to China: Moscow Ignores U.S. Objections," *Washington Times*, 13 February 1995, 4[A].

34. See Carus, 76–79, for a useful overview.

35. Janne E. Nolan, review of *Going Ballistic: The Build-Up of Missiles in the Middle East* by Martin Navias, in *Survival* 36, no. 1 (Spring 1994): 177–79.

36. The exceptions are Carus and Henry D. Sokolski, "Nonapocalyptic Proliferation: A New Strategic Threat?" *Washington Quarterly* 17, no. 2 (Spring 1994): 115–27.

37. For an analysis of how politics affected analytical consideration of the threat of Soviet theater ballistic missiles in the 1980s, see Gormley, *Double Zero*, xi–xx and 174–90 .

38. The White House, "Missile Technology Control Regime: Fact Sheet to Accompany Public Announcement" (Washington, D.C.: Office of the Assistant to the President for Press Relations, 16 April 1987). (See appendix E.)

39. The members are Argentina, Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Portugal,

Spain, Sweden, Switzerland, the United Kingdom of Great Britain and Northern Ireland, and the United States of America.

40. In 1990 the USSR first pledged its support for the MTCR's "objectives." Russia reaffirmed this commitment with written assurances in 1993 and was invited to join the regime two years later. Chinese officials initially pledged Beijing's adherence to the regime in 1991, followed by the issuance of a US-Chinese summit statement in 1994 in which Beijing agreed not to export "ground-to-ground" missiles covered by the MTCR's original guidelines of 1987. Diplomatic disputes later stalled US attempts to gain Chinese adherence to the MTCR's enhanced guidelines of 1993. Theresa Hitchens, "U.S. Backs Russia in MTCR," *Defense News* 10 (17–23 July 1995): 12; "U.S. and Russia Agree to Joint Space Station," *Arms Control Today* 23, no. 8 (October 1993): 22; "Secretary's Talks in China: A Summary of Results," *U.S. Department of State Dispatch* 2, no. 47 (Washington, D.C.: US Department of State, Bureau of Public Affairs, 25 November 1991), 859; Department of State, "Fact Sheet: Joint United States–People's Republic of China Statement on Missile Proliferation" (Washington, D.C.: US Department of State, Office of the Spokesman, 4 October 1994); and Steven Mufson, "China Halts Missile Talks with U.S.: Beijing Delays Visits in Taiwan Visa Feud," *Washington Post*, 29 May 1995, 17[A].

41. Arms Control and Disarmament Agency, Office of Public Affairs, "Fact Sheet: The Missile Technology Control Regime (MTCR)" (Washington, D.C.: US Arms Control and Disarmament Agency, Office of Public Affairs, 17 May 1993), 3.

42. Ibid., 4.

43. Ibid., 1.

44. [Department of State,] "Missile Technology Control Regime (MTCR): Equipment and Technology Annex" ([Washington, D.C.: US Department of State, Office of Politico-Military Affairs,] 1 July 1993), introduction.

45. Arms Control and Disarmament Agency, "Fact Sheet: The Missile Technology Control Regime (MTCR)," 3–4.

46. [Department of State, Office of Politico-Military Affairs,] "Summary of the Equipment and Technology Annex" ([Washington, D.C.: US Department of State, Office of Politico-Military Affairs]).

47. [Department of State,] "Missile Technology Control Regime (MTCR): Equipment and Technology Annex," category 2, item 19.

48. Dr Richard Speier, Department of Defense, Office of the Undersecretary of Defense for Policy, Washington, D.C., interview with authors, 19 November 1993.

49. [Department of State,] "Missile Technology Control Regime (MTCR): Equipment and Technology Annex." The quoted language—or similar language—is found in category 2, items 3, 9, 10, 11, and 13.

50. China also apparently continues to supply MTCR-restricted ballistic missiles, as well as missile technology and equipment, to a limited number of customers. Recent clients include Pakistan and Iran, the former purchasing complete M-11 ballistic missiles (500-kilogram payload to 300 kilome-

ters) and the latter purchasing missile technology and equipment. For more on these transfers, see R. Jeffrey Smith and David B. Ottaway, "Spy Photos Suggest China Missile Trade," *Washington Post,* 3 July 1995, 17[A]; and Barbara Opall, "U.S. Queries China on Iran: Fears Transfer of Missile Technology," *Defense News* 10 (19–25 June 1995): 1. For a history of Chinese MTCR commitments and Beijing's compliance, see Robert Shuey and Shirley A. Kan, "Chinese Missile and Nuclear Proliferation: Issues for Congress," *Congressional Research Service Issue Brief* IB92056 (Washington, D.C.: US Library of Congress, 6 July 1995); and Tim McCarthy, "China's Missile Sales—Few Changes for the Future," *Jane's Intelligence Review* 4 (December 1992): 559–63.

51. The US transferred the 37-kilometer-range Honest John to Taiwan and South Korea and the 130-kilometer Lance ballistic missile to Israel. No US transfers have occurred since the mid-1970s. W. Seth Carus, *Ballistic Missiles in the Third World: Threat and Response* (New York: Praeger Publishers, 1990), 16–17.

52. France reportedly transferred MD-660 ballistic missiles to Israel in 1968. The MD-660s are said to be the basis for Israel's 500-kilometer-range Jericho I ballistic missiles. Ibid., 17.

53. System Planning Corporation, *Ballistic Missile Proliferation,* 83, 86–88; and Jeffrey M. Lenorovitz, "Italian RPV Wins $16-Million Bid for NATO Missile Range Service," *Aviation Week & Space Technology* 126, no. 8 (23 February 1987): 52.

54. Some analysts have warned that third world countries will attempt to follow the US and Soviet examples and convert ASCMs to land-attack variants. South Africa was reported to be working on a conversion project in the late 1980s. RPVs can also be converted. India's first cruise missile will apparently be derived from the country's Lakshya target drone (200-kilogram payload to nearly 500 kilometers). Similarly, in the late 1980s, Argentina reportedly converted a Mirach 100 RPV into a 900-kilometer-range, multirole platform that is believed to be capable of performing land-attack missions. "India Is Ready to Put Its Unmanned Target Aircraft into Production," *BMD Monitor* 9 (22 April 1994): 146; and Carus, *Cruise Missile Proliferation,* 72–73.

55. Israel's 80-kilometer-range Popeye air-to-surface missile provides a good example. The missile's contractor, Rafael, decided to enter the Popeye as its bid in the United Kingdom's conventionally armed standoff missile procurement. To meet the British range requirement (250–600 kilometers), Rafael made several modifications, including exchanging the Popeye's solid rocket motor for a turbofan engine. "Missiles Join Line-Up for UK Requirement," *Jane's Defence Weekly* 23, no. 25 (24 June 1995): 12.

56. Carus, *Cruise Missile Proliferation,* 93.

57. Theresa Hitchens and Barbara Opall, "Fighter Exports Will Leapfrog Domestic Buys," *Defense News* 9 (21–27 November 1994): 6; and Barbara Opall, "Upgrade Work Could Top New Sales," *Defense News* 8 (9–15 August 1993): 16.

58. Barbara Opall, "Politics Influence International Fighter Decisions," *Defense News* 8 (9–15 August 1993): 8; Giovanni de Briganti, "Government Holds Key to Export Push," *Defense News* 8 (27 September–3 October 1993): 16; Konstantin Sorokin, "Russia's 'New Look' Arms Sales Strategy," *Arms Control Today* 23, no. 8 (October 1993): 9; and US Congress, Office of Technology Assessment, *Global Arms Trade: Commerce in Advanced Military Technology and Weapons* OTA-ISC-460 (Washington, D.C.: Government Printing Office, June 1991), 21, 48.

59. Robert Holzer, "JPATS Rivals Target World Market for Trainers," *Defense News* 8 (9–15 August 1993): 9; Frank Oliveri, "Officials Say U.S. Sparks Interest in UAVs," *Defense News* 10 (24–30 July 1995): 10; and Opall, "Upgrade Work," 16.

60. The following information on Apache is taken from Jean-Paul Philippe, "Matra to Develop APTGD Missile: A New 'Stealth' Cruise Missile for France," *Military Technology* 19, no. 2 (February 1995): 60–62.

61. Antipiste or antirunway dispenser, which consists of 10 Kriss runway-cratering submunitions, each weighing 51 kilograms.

62. Anti-infrastructure or a penetrating unitary warhead known as Arcole.

63. This version was formerly known variously as the Super Apache, the Apache-C, and the Apache APTGD (i.e., *arme de précision tirée à grande distance* [long-range, high-accuracy weapon]).

64. More recent accounts of the Apache in technical journals make reference to the enhanced stealth characteristics of the Apache Scalp. See, for example, Philippe, 61.

65. Authors' interviews (see note 10).

66. The full text of the MTCR's equipment and technology annex can be found in K. Scott McMahon and Dennis M. Gormley, *Controlling the Spread of Land-Attack Cruise Missiles* (Marina del Rey, Calif.: American Institute for Strategic Cooperation, January 1995): 92–107. The reference to trading off range and payload is in the annex's introduction. (See also appendix F.)

67. Giovanni de Briganti and Barbara Opall, "France Spurns Cruise Missile Proliferation Claim by U.S.," *Defense News* 10 (16–22 January 1995): 1.

68. Duncan Lennox, ed., *Jane's Strategic Weapon Systems* (Alexandria, Va.: Jane's Information Group, September 1994).

69. Jim Mann, "Russia Is Boosting China's Arsenal," *Los Angeles Times*, 30 November 1992 (LEXIS-NEXIS); and Sorokin, 10.

70. See footnote 50 for details on recent Chinese missile-and-technology transfers and sources on China's MTCR compliance record.

71. Ingo Raupach, "Russian Air-to-Surface Guided Weapons," *Military Technology* 19, no. 5 (May 1995): 11.

72. K. Scott McMahon and Dennis M. Gormley, *Russian Cruise Missiles: The Prospects for Control*, PSR Report 2526 (Arlington, Va.: Pacific-Sierra Research Corp., May 1995), 26–37; and R. Jeffrey Smith, "U.S. Waives Objection to Russian Missile Technology Sale to Brazil," *Washington Post*, 8 June 1995, 23[A].

73. See "China Provides Cash for Israeli Cruise Missile," *Flight International*, 17–23 May 1995; and Munson, 21.

74. Craig Covault, "Spanish Ground Attack Missile Design Advances," *Aviation Week & Space Technology* 141, no. 21 (21 November 1994): 103.

75. Christy Campbell, "Arab Missile Ban May Sink Tornado Sale," *Sunday Telegraph*, 26 February 1995, 7.

76. President William J. Clinton, "Address by the President to the 48th Session of the United Nations General Assembly" (New York: Office of the White House Press Secretary, 27 September 1993); "White House Fact Sheet on Non-Proliferation and Export Control Policy" (Washington, D.C.: The White House, Office of the Press Secretary, 27 September 1993); R. James Woolsey, director of central intelligence, statement prepared for the House Foreign Affairs Committee, Subcommittee on International Security, International Organizations, and Human Rights, 28 July 1993, US Central Intelligence Agency, Washington, D.C.; Lynn E. Davis, undersecretary of state for international security affairs, statement prepared for the House Foreign Affairs Committee, 10 November 1993, US Department of State, Bureau of Public Affairs, Washington, D.C.; and Anthony Lake, assistant to the president for national security affairs, "From Containment to Enlargement," speech before the Johns Hopkins University School of Advanced International Studies, Washington, D.C., 21 September 1993.

Chapter 7

US Commercial Satellite Export Control Policy: A Debate

Brian Dailey and Edward McGaffigan

Brian Dailey: It is a little disconcerting to hear so many people argue that the policy decision-making process has moved too quickly. Those of us who have been deeply involved in this process know that the presidential decision of 10 March 1994 is the result of many years of review and debate. A US government commercial remote-sensing policy was codified as far back as 1984 with the enactment by Congress of the Land Remote-Sensing Commercialization Act. This legislation opened up commercial remote sensing and was followed by several policy initiatives of the Reagan administration and, more recently, by revisions to the 1984 act in the Land Remote-Sensing Policy Act of 1992. So, to assert that the issues have not been extensively debated is simply incorrect. In short, the recent policy decision of the Clinton administration was not undertaken capriciously, as some have suggested.

I would also like to comment on an assertion to the effect that no commercial market exists for remote sensing. Several fairly sophisticated companies have extensively analyzed the market potential and have concluded that a significant market does indeed exist within a defined spectrum of image resolution.

What does today's marketplace look like? There has long been a significant market among city planners, mapmakers, scientists, and oil and mining companies, among others, for high-resolution, highly detailed images of farms, roads, rivers, houses, and industrial areas. Until now, this demand has been met mostly by film-based images derived from airplane-mounted cameras, pieced together to form a corrected wide-area photo—a time-consuming, costly, and technically primitive process. Today the aerial photography market generates some $1.7 billion annually. When these images are fused with other data—street grids, property lines, utility

distribution grids, or traffic patterns, for example—the result is a sophisticated and powerful information tool called a geographic information system (GIS), one of the new tools of the information revolution. This highly profitable market currently generates an additional $3–4 billion annually, but it is seriously constrained by its reliance on aerial imagery. When better quality, cheaper, digital, satellite-derived imagery that is more quickly adapted to GIS applications becomes available, this market will explode. Remote sensing will then begin to evolve into a dynamic element in the ongoing global information revolution.

In 1993 the Clinton administration took on the challenge of reassessing this dynamic issue in the post-cold-war environment and, in many ways, made the most significant contribution to commercialization of any administration to date. As noted earlier, much groundwork had already been laid, going back at least to 1984. In 1992, in the aftermath of the sweeping geopolitical changes that had taken place in the early nineties, the House Science Committee drafted the Land Remote-Sensing Policy Act of 1992. Congress had begun to focus on what it could do to promote commercial remote sensing and what kind of national security guidelines could be put in place to ensure that US national security interests would not be undermined.

Having served in the White House as the focal point for coordinating the administration's policy on this bill and having worked extensively with Congress on this issue, I know that it was well supported by the defense community, the intelligence community, the State Department, the Commerce Department, and many other US government agencies. The issue was not so much about the degree of image resolution but about whether and how to control the data during times of national crisis or war. In the end, with the administration's support, Congress passed the Land Remote-Sensing Policy Act of 1992—PL 102-555—which included a framework for assessing and addressing national security concerns.

Meanwhile, as defense contractors began to feel the effects of rapidly declining defense budgets, they started to search for opportunities to responsibly commercialize defense technologies and diversify their customer base. They began to focus on

remote sensing—one of the areas in which Department of Defense (DOD) downsizing was beginning to have serious implications for the industrial base. Of increasing concern to the US government was the fact that many of the critical skills that had been amassed to design and build these systems over the years were beginning to atrophy. Unless industry was allowed to commercialize in this area, the skill base might simply disappear. Industry began to see business opportunities in the high-image-resolution area—as high as one meter—and asked the government to review its policy in this arena.

In 1993, Congress, working with industry and the administration, also undertook yet another examination of US policy in this area. It held hearings, beginning with one by the Senate Select Committee on Intelligence on 20 June 1993. The committee vetted the national security issues very carefully. Among other things, it took into account Russia's announcement that it was commercially marketing two-to-three-meter-resolution imagery products and had the capability of offering .75-meter products, which it intended to market sometime in the future. The committee was also aware that the French were planning to deploy a five-meter system—SPOT 5—very soon and that other countries—Israel, South Africa, China, and India among them—were also working on high-resolution satellite systems. At that point, it was incumbent upon the US government to consider that if it tied the hands of US industry and thereby allowed these countries to dominate this new commercial space market, serious harm could be done to both US national security and economic interests.

The question before the committee was not whether high-resolution imagery would become available on the open market—that was a foregone conclusion. The real question was whether US industry would be allowed to dominate that market and, in the process, preserve this very important national security industrial base. The overwhelming determination, made on a bipartisan basis, was to take steps to encourage US industry to enter this market and to encourage the administration to help pave the way.

Subsequently, the Clinton administration moved very rapidly on this issue and initiated a very comprehensive interagency policy review. Participating were the Commerce Department,

DOD, and the intelligence community, among others, who spent considerable time consulting with Congress and with the civil space community, looking at all issues associated with the worldwide availability of high-resolution satellite imagery products. The Joint Chiefs of Staff (JCS) and the intelligence community were satisfied that national security concerns could be adequately protected with the policy that was ultimately drafted. President Clinton approved that policy, which was issued as a Presidential Decision Directive (PDD-23) that prescribed guidelines for licensing US companies interested in operating commercial remote-sensing systems and marketing high-resolution imagery worldwide.

I think this background is critical to people in government or the private sector who are concerned with US industry's ability to compete in the future with diversified products of a formerly classified nature. The government has encouraged US defense industry to commercialize and has designed funding initiatives to help this industry make the transition. Industry has accepted that challenge in the remote-sensing arena with the encouragement of both Congress and the Clinton administration and, subsequent to the approval of PDD-23, has begun investing its own cash—its own bottom-line profits—in commercial remote-sensing ventures. These companies will have the opportunity to leverage the application of new technologies to integrate vertically into the geographic information-system market and, in so doing, to dominate this high-technology arena. Congress understood this, and the Clinton administration gave its approval and continues to stand by industry on this issue.

If, on the other hand, the administration had imposed restrictions that did not convince potential international customers they would be guaranteed access to the imagery except in cases of extreme danger to national security, I am certain that few international customers would remain interested. They would choose, instead, to go to a non-US supplier, knowing they would encounter no restrictions or limitations—even in times of crisis or war. Because the administration understood this well, it carefully crafted a policy that protects US national security without having a chilling effect on international participation.

So, contrary to what some people have suggested, a very careful decision-making process did in fact exist. The executive branch, Congress, and industry reached what I think is a very satisfactory modus vivendi. Consequently, I am a little concerned about an attempt to rewrite history. One assertion I'm hearing is that there are no interested investors in any non-US systems and that this is evidence for the absence of a commercial remote market. Part of the reason investors are unwilling to put money in foreign systems is that they are aware of the immense technical challenge of building a one-meter system. But the argument I'm hearing that is of most concern is that going forward with high-resolution commercial systems will undermine US arms control interests. The fact of the matter is that by the turn of the century, all nations will have access to high-resolution data. The real issue is whether the US gets to the market first and gains control of it. If that happens, we can count on far less threat to the US than if other nations control the market.

Finally, on the issues of a multilateral mechanism for overseeing remote-sensing activity—similar to a Missile Technology Control Regime (MTCR) in this area—I would simply ask, Why? Do we have an MTCR type of concern in the telecommunications arena? Can't terrorists—don't terrorists—use the telecommunications network to plan and conduct their operations, not only for voice but for data and facsimile transmissions? What's going to happen as the remote-sensing market moves from 30 meters to 10 meters to three meters to one meter? The history of the evolution of remote sensing suggests that countries will come to see this imagery, like telecommunications, as something of a public utility. The demand for data will increase dramatically when people see what an effective, money-saving tool it is in laying utility and cable lines, managing traffic, planning cities, and recovering oil and gas. Combined with infrared and multispectral technology, this market is unlimited in its application at this resolution value. For example, we do not know what the size of the three-to-four-meter infrared market will be since it has not yet been tested or exploited. But many industries—oil and mineral mining in particular—are keenly interested in its potential for cutting the cost of exploration.

If the "arms control process" is invoked in this arena, it will—if anything—end up harming US interests more than helping them. In the first place, proliferation of high-resolution data will probably result in more—not less—regional stability. Its general availability will result in greater transparency and will promote better decision making, thereby attenuating possible hostilities that might arise out of ignorance. But more importantly, people who want to slow down US industry to gain their own advantage will manipulate the process, and they will disregard those same issues once they have achieved their objectives.

The opportunity exists now for the US to dominate the commercial remote-sensing market. We should not jeopardize efforts now under way by US industry and hundreds of millions of dollars invested by several different companies. Industry is acting prudently and moving forward responsibly with the support of the US government. The defense industry has always respected the national security interests of this country and will not risk compromising those interests. Defense industry should be allowed to continue to move forward and diversify at a time when diversification is badly needed.

Edward McGaffigan: I don't think that the commercial remote-sensing policy in place at the moment will survive case-by-case decision making as the policy evolves and real cases come up. Before proceeding, I believe that an observation about policy stability is appropriate. In February 1995, the House voted to terminate the Technology Reinvestment Project (TRP), which had bipartisan origins in 1992 in the task forces of Sen Warren Rudman (R-N.H.) and Sen David Pryor (D-Ark.), as well as support by a broad bipartisan consensus. The vote in the Senate in favor of the program had been something like 95–2. The situation in the House had been similar. Unfortunately, that consensus has now evaporated for reasons I don't have space to list. But those of us who care about that program are trying to save it in the Senate as the budget process proceeds.

Another area of consensus in 1992 was that Kirtland Air Force Base in Albuquerque, New Mexico, was an essential facility of

the Air Force—that it was a "sunrise" as opposed to a "sunset" base, where new tenants would be consolidated. Unfortunately, that no longer held true in February 1995, when Secretary of Defense William Perry placed Kirtland on the DOD base closure list. Those of us in the New Mexico congressional delegation had to expend great energy to convince the secretary and the Base Realignment and Closure Commission that doing so was a mistake before finally succeeding in June 1995. For people in the private sector who get discouraged by the fact that the government does have a tendency to revisit various policies, I can only point out that high-resolution imaging policy is by no means the only area so affected.

The Eyeglass-Israel case was Sen Jeff Bingaman's (D-N.Mex.) introduction to this policy area.[1] Sixty-four senators obviously did not regard this whole area as settled policy. In the letter that they sent to Secretary of Commerce Ronald H. Brown in 1994, the senators pointed out that US government trade policy should not contribute to an intelligence race by providing sophisticated imagery that had not been previously available and that might not be necessary to civil applications. They thought it obvious that this was an international problem requiring international, cooperative, governmental solutions.

This letter surprised many people, who assumed that the policy had consensus support back in 1992. In fact, only a very small group constituted that consensus. Brian Dailey mentioned that he was involved with the executive branch at the time and that the policy was coordinated with everybody there. But I am certain that the Armed Services Committees and the Foreign Relations Committees of the two houses were not included. In fact, as this bill was hot-lined in October 1992,[2] I remember asking someone, "What is this all about?" He said, "Oh, it's just the LANDSAT bill. Don't worry about it. It's just another attempt to figure out how to run the LANDSAT program in an effective way." None of the Armed Services Committees' staff or members realized that the bill was making fundamental changes in the way we license high-resolution imaging satellites—spy satellites. So this policy was not a considered judgment of Congress—in contrast to TRP. There was no floor debate. There was no recorded vote. This was a hot-lined bill passed in the waning

hours of Congress, when people like my boss, Senator Bingaman, and I were diverted on other issues.

The 1992 bill is a classic case of a legislative process in which a limited number of people in Congress pushed their agenda in partnership with allies in the executive branch and industry. The best way to push an agenda and get it all the way through the legislative process is to avoid a big debate that brings in other equities. Those equities—national security and foreign policy—may have been represented in the executive branch, but to some degree the 1984 law that Brian referred to may have prejudiced the executive branch process in the Bush administration. Although the 1984 bill effectively precluded commercial remote sensing (precisely the reason industry wanted the new law), it put the National Oceanic and Atmospheric Administration (NOAA) in charge of licensing in this area.

I don't know much about the theory of government—I'm a physicist, after all—but one of the things we generally try to avoid is having technology regulated by agencies that are boosters of that technology. We don't do that with health technologies; we don't do it any more with nuclear power technologies; and we don't do it with communications technologies. It's just a matter of good public policy not to have the booster regulate the industry it is trying to promote. Without a doubt, NOAA is a big promoter of the "commercial" market for this technology. For at least the last decade, NOAA has been predicting that a $10 billion annual market for satellite imagery will be achieved within a decade. Reality has been somewhat short of NOAA's predictions.

NOAA's approach is that proliferation of high-resolution remote sensing is inevitable—that the only solution is for us to get way out in front of everyone else and take advantage of our multibillion-dollar investment in spy satellites to dominate the market. I understand this attitude: it's technically sweet, and the US firms are ahead. But a fundamental question remains: Is the proliferation of this technology of enough concern to our military and allies that we should potentially treat it as we do uranium-enrichment technology or plutonium-reprocessing technology or missile technology? That is, should we seek ways to at least impede its transfer and seek international

regimes that would set rules of the road for how it will proliferate?

Thinking about this as a proliferation or security problem that might lend itself to a suppliers' arrangement such as we have in the nuclear, chemical, and missile arenas is very different from how Brian thinks about it. Dr Vipin Gupta of Lawrence Livermore National Laboratory has written a balanced, lucid analysis of this issue as a proliferation problem. Like Senator Bingaman, Dr Gupta is not inalterably opposed to high-resolution imaging. In fact, the final sentence in his paper says that in the areas of verification, peacekeeping, and other military applications, such imaging has great potential to be a useful technology—but only if an international regime regulates it properly.[3]

Both Senator Bingaman and Dr Gupta have called for negotiation of a stable international regime for this technology. The fact of the matter is that no one in the executive branch appears to have made any effort to think about what this international regime might look like. Everybody publicly takes the point of view that negotiating an international regime from a nonproliferation or national security perspective would only slow us down and allow the French to catch up. Unfortunately, people in the executive branch who work on other proliferation problems appear not to have been consulted as this policy was developed. Still, it has become clear to me that Dr Gupta and Senator Bingaman have allies in the national security apparatus who are concerned that the current policy is not balanced.

Further, if the main customer for this technology is not the commercial sector but foreign military and intelligence services, it is wrong to assume that Adam Smith economics will prevail and that our comparative advantage will drive everyone else out of the market. I believe that only a very limited number of potential suppliers of high-resolution imagery will be around for some time to come. It is utterly defeatist to wave around long lists of countries that might get into this market. In fact, the true list is not long at all—just France, Israel, and Russia at the moment and perhaps Japan and India in the longer run. All of these governments have security limitations on their high-resolution imagery satellites. Helios and Ofeq are military satellites, for example. We can deal with any other suppliers as

they come along. I would point out that in the case of the Nuclear Suppliers' Group or the MTCR, we did not give up in the face of far longer supplier lists. We worked out the first things first in a small group, and then we figured out how to bring others in. We should do the same here.

I think it's pretty clear that the primary market for one-meter imagery is not urban planners or pipeline builders or telephone companies trying to figure out where to put their lines. If that were the market, it would be hard to understand the heart palpitations in industry and at the Commerce Department about greater control over the shutters of our commercial satellites for national security reasons. The people who are going to have problems with a greater degree of shutter control than we apparently have at the moment are the foreign military and intelligence services to whom our industry will be marketing.

The new generation of imagery satellites is fundamentally different from the current LANDSAT and SPOT generation in their utility for intelligence and national security applications. This fact has to be of concern to our military as it prepares for future Desert Storms in which—thanks to the lack of any international regime—it may no longer enjoy the information dominance it had in the Gulf War.

In chapter 5 of this book, Steve Berner points out that the conduct of the Persian Gulf War would have been very different had the Iraqis had access to this technology. There will be no big left hook next time if this technology has proliferated without controls and we don't have means of dealing with it.

The issue fairly begs for a suppliers' group solution. The proliferation of commercial, high-resolution imaging satellites is as much a national security issue as the proliferation of advanced weaponry, as Dr Gupta points out.[4] We have regimes in place to deal with other advanced weaponry and reprocessing and enrichment technology, as well as ballistic and cruise missiles. Such suppliers' groups work best when the number of suppliers is small and the entry costs are large—criteria that would seem to describe the current situation involving high-resolution imagery. At the moment, the rules of the road would involve only us, the Russians, the

French, and the Israelis, with the prospect for new suppliers being very limited.

But just in case my solution of seeking a suppliers' regime to ensure that our deployed forces are not put at risk by foreign imagery suppliers is not taken up or doesn't work, I'd like to raise another insurance policy that I think is necessary—an antisatellite (ASAT) capability of some sort for this country. If a future General Schwarzkopf needs to achieve surprise to save American lives, he'll need the capability to deal with foreign high-resolution imagery satellites that might be available to a future Saddam Hussein. In a sense, it's a tragedy, given all the money spent on the Strategic Defense Initiative (SDI), that we don't have a variety of capabilities available to our military commanders today. We should be able to force foreign satellites that might be cooperating with our foes to close their shutters when they are over our deployed forces. In extremis, we should be able to destroy those satellites.

A suppliers' regime that tries to protect American deployed forces and ensures dominant battlefield awareness for our commanders—as we had in Operation Desert Storm—is well within the art of the possible for our negotiators. The harder case—the one first brought forth by the Eyeglass-Israel issue—is determining how a suppliers' regime would deal with regional security concerns. Dr Gupta makes suggestions for this at great length in his paper.[5]

I don't see an easy solution, but—like Dr Gupta—I'm convinced the problem will surely not be solved by an ad hoc US national policy that allows commercial remote-sensing firms in this country to forge ahead in the absence of any agreed international suppliers' guidelines that address the security aspects of the competition. The Israeli case will be the first of many. Nations involved in regional hot spots will not want their defenses laid bare to adversaries. Do we want North Korea to be able to obtain imagery of South Korea and our forces there? How about Iraq obtaining imagery of our forces in Kuwait and Turkey? Is there to be no limit on Iraq's, Iran's, or Libya's ability to utilize imagery in peacetime to prepare for future conflict?

I can easily imagine many other cases that will keep the secretary of state literally a prisoner in his office as he receives

demarche after demarche from foreign ambassadors angry at the military potential bestowed on an adversary by one of our commercial firms. I am not even sure that our current policy will prevent clearly terrorist states—such as North Korea, Iran, Iraq, or Libya—from gaining access to our own high-resolution imagery to use against us and our allies. I guess it will be worked out case by case. The licenses issued so far by NOAA don't deal with real-world cases. They simply protect everybody's ability to argue about shutter control once real problems arise. This is procedure substituting for policy.

These are the sorts of issues that Dr Gupta discusses. He comes to the conclusion that a different sort of international suppliers' regime, not one left purely to market forces, could produce national and international security benefits by facilitating regional arms control, strengthening international cooperation, unobtrusively assessing threats, and supporting peacekeeping.[6] No one is trying to broker such a regime today, and that is very unfortunate. But I would predict with high confidence that that day will come, that the ultimate regime will not allow unfettered competition in the marketplace, and that there will be a much higher degree of shutter control on commercial high-resolution imagery satellites than Brian might like.

Notes

1. The American firm Eyeglass (now called Orbimage) proposed in late 1994 to enter into an arrangement with a Saudi Arabian firm to place a ground station in Riyadh. The station would be capable of receiving images of the entire Middle East—including Israel—from the Eyeglass satellites. Israel strongly objected to this arrangement on security grounds. In May 1995 Eyeglass "voluntarily" promised to ensure that Israel would not be imaged by its satellites. On that basis, the arrangement was approved by the Commerce Department.

2. "Hot-lining" is a procedure by which all Senate offices are contacted to clear noncontroversial bills, which are then passed by voice vote.

3. Dr Vipin Gupta, *New Satellite Images for Sale: The Opportunities and Risks Ahead,* UCRL-ID-118140, CSTS-47-94 (Livermore, Calif.: Lawrence Livermore National Laboratory, 28 September 1994), 34.

4. Ibid.

5. Ibid., 26–34.

6. Ibid., 34.

PART 3

Our Strategy against North Korea

Chapter 8

Resolution of the North Korean Nuclear Issue*

Walter B. Slocombe

This essay deals with the Agreed Framework between the United States and North Korea (appendix B), which addresses an urgent nuclear issue. However, the US government recognizes that a broader approach leading to a change in the basic character of North Korea's relations with the Republic of Korea will be needed before there can be real stability and peace in the region.

The challenges facing all of us have been prioritized within the US Department of Defense (DOD) by Secretary William Perry as (1) preserving the fruits of the end of the cold war and protecting against the reemergence of the threats it posed; (2) building a framework for security in Asia, the Middle East, Southwest Asia, and Europe; and (3) combating the dangers of the new threats—particularly weapons of mass destruction. It is in the context of all three of these challenges that we view the implementation of the agreement reached between the United States and North Korea in October 1994 as highly important to peace in the Pacific.

I want to lay out the terms of the Agreed Framework, its background, and the alternatives. I believe that this agreement is in our interest because if it is carried out, it will both eliminate the North Korean nuclear weapons program and open the door to a change in the whole situation in Northeast Asia. Of course, the key is implementation. If North Korea does not fully implement the agreement, the US will have no choice other than turn to different measures to deal with the North Korean nuclear program.

Dealing effectively with the problem of the North Korean nuclear weapons program is crucial because if unchecked, the program threatens two key US interests: checking the spread

*This essay is adapted from a speech given by Mr Slocombe in March 1995.

of nuclear weapons and maintaining stability in Asia. The importance of both of those concerns to our overall interest hardly needs elaborate proof. Stopping the spread of weapons of mass destruction—particularly nuclear weapons—is one of our highest national security tasks, and the stability of Asia is critical to the security and prosperity of the United States.

The foundation of both the economic growth and the political stability of Asia is ultimately military security. The linchpins of that security are our defense commitments to the Republic of Korea and to Japan. Those commitments will continue and will be buttressed, not only by the continued presence of approximately 100,000 American troops in the region but also by the closest possible cooperation on security and strategic issues.

One of the principal challenges to security and peace in Asia, of course, has been the division of the Korean Peninsula and the hostilities engendered by the unreconstructed character of the Pyongyang regime—particularly its very large, very powerful, and forward-deployed armed forces. But North Korea's challenge to stability in Northeast Asia acquired a more ominous dimension during the last decade or so with the emergence of a major North Korean nuclear weapons program.

In the early 1980s, North Korea constructed and began to operate a large nuclear facility complex, chiefly at Yongbyon. In the judgment of the US intelligence community, the purpose of this complex has been the production of plutonium for use in nuclear weapons. The program began with a small, five-megawatt, graphite-moderated reactor, which began operating in 1985. The associated facilities at Yongbyon include those for fuel fabrication, as well as lines for reprocessing, which separate the plutonium from the nuclear waste in spent fuel rods that have been through the reactor. Two substantially larger reactors are under construction.

The expanding North Korean nuclear program presents an unmistakable and unacceptable threat to US and allied interests for a number of mutually reinforcing reasons:

- First, an unchecked nuclear capability in the North, coupled with the North's oversized conventional force and its past aggressive—even terrorist—actions, could be used for

purposes of extortion or blackmail against the Republic of Korea; it also would increase the huge costs of a war in Korea.

- Second, a nuclear arsenal in North Korea could ignite a nuclear arms race in Asia generally. Further—and of global significance—failure to curb North Korean efforts would undermine the international Nuclear Nonproliferation Treaty (NPT) and the International Atomic Energy Agency's (IAEA) safeguard system associated with it, as well as undercut global nonproliferation efforts in a broader sense. North Korea could export nuclear technologies and components to pariah states or terrorists worldwide, as it has already done with conventional weapons.
- Finally, although the immediate concern is the Korean Peninsula, the upgraded missile-delivery systems that the North is developing could project a nuclear threat across most of Northeast Asia.

As mentioned earlier, in 1985 the small reactor began operating. In 1989 it was defueled for the first time, and the North Koreans then reprocessed the spent fuel to remove the plutonium. In 1992 North Korea refused to cooperate with the IAEA to clarify the amount and disposition of the plutonium. We estimate that this defueling and subsequent reprocessing yielded enough plutonium for one nuclear weapon—conceivably two.

Controversy over North Korean noncompliance with the NPT and IAEA safeguards obligations continued from 1992 through mid-1994. During this time, the US consistently made clear that it wanted a negotiated solution, but talks aimed at resolution of the problem faltered.

In June 1994, events reached a crisis. During late spring of that year, North Korea defueled its reactor for the second time and refused to allow the IAEA to take steps that could have helped shed light on the amount of plutonium removed during the earlier refueling. Moreover, North Korea declared that it would end its IAEA membership and safeguards agreement, refuel the reactor, and reprocess the spent fuel taken out of the reactor.

In light of these threats, these acts, and the lack of progress in bilateral talks, the US—in cooperation with the Republic of Korea, Japan, and other allies and friends—took steps to

obtain a sanctions resolution from the United Nations (UN) Security Council against North Korea.

DOD recognized that the course of seeking sanctions, while absolutely necessary, carried real risks. North Korea had declared that sanctions were, in its view, an act of war. The North has a massive conventional capability, including over 10,000 artillery tubes and multiple rocket launchers lined up along the demilitarized zone (DMZ). This capability, coupled with its threats (e.g., to turn Seoul into a sea of fire) meant that we had no choice other than take seriously the North's postures and augment our defense capability, along with that of the Republic of Korea.

The measures undertaken involved temporary deployment of people and units, as well as accelerated implementation of planned modernization initiatives for the standing forces that the US has in Korea. The US, in consultation with the Republic of Korea, considered and began to implement a wide range of options. Under the most serious consideration were deployment options that would have cost hundreds of millions of dollars annually and would have involved the deployment of more than 10,000 additional troops, as well as planes, ships, and equipment. These deployments were not, of course, all that would have been required in the event we thought that war was imminent. Rather, they were meant to present an enhanced deterrent to North Korean aggression and provide a significant boost to our defensive posture in the region if deterrence failed. These steps were taken—and more were being considered—on the recommendation of the US and UN military commanders in the theater. These steps indicate the firmness and seriousness with which we viewed the problem and illustrate the costs and risks of alternative actions to an agreed resolution.

Throughout, we continued to believe that a diplomatic solution that met our requirements was preferable to the uncertainties and risks of sanctions and their consequences. Accordingly, June 1994 was also a time of intense diplomatic engagement through informal and formal channels with the North Koreans. Former president Jimmy Carter, acting on behalf of the US, reached an agreement with President Kim Il Sung of North Korea that the North would freeze its program

temporarily in the context of an immediate return to negotiations in Geneva. Although it is impossible to be confident about North Korean motivations, I believe it was due not only to President Carter's eloquence but in considerable part to the military readiness of the US and the Republic of Korea that North Korea took these steps to freeze its efforts—which previously it had adamantly refused to do—and reopen the talks.

After months of negotiations, on 21 October 1994 the US and North Korea signed an Agreed Framework that forms the basis for resolving the nuclear issue on the Korean Peninsula. Of course, like most agreements, it must be implemented to realize its promise. Frankly, this agreement is not based on trust and confidence because little in North Korea's record would justify that attitude; rather, it is based on a step-by-step approach. Action on the part of the North will be required in tandem with action on the part of the US, its allies, and friends. If for any reason North Korea fails to do what it is required to do under the framework, we retain the option of engaging in sanctions through the UN Security Council and returning—as I believe we would have to do—to the military enhancements we began in 1994 to increase the readiness and combat power of US and South Korean forces. To maintain that option even as the agreement is implemented, we and the Republic of Korea will, of course, have to maintain and modernize our forces on the Peninsula and our ability to reinforce them as needed. We will do so.

The basic principles of the agreement are quite simple: the North must stop—and eventually dismantle—its nuclear-weapons-related program, as well as come into full compliance with the NPT. Unsurprisingly, North Korea was not willing to undertake these broad new obligations without receiving something substantial in return. Specifically, in exchange for halting and later dismantling its program and resolving past discrepancies, North Korea will receive alternative energy sources—initially in the form of bunker oil for electric generators and heat and later in the form of more proliferation-resistant light water reactor (LWR) technology. LWRs are more resistant to proliferation because, among other things, they require fuel that North Korea cannot produce itself. Moreover, separating

the plutonium—while not impossible—is substantially more complex and expensive than with the graphite-moderated reactor, and the spent fuel is more easily stored for expatriation.

The agreement has the following key elements:

- First, it calls for immediately shutting down and eventually dismantling North Korea's graphite-moderated reactor program, including three nuclear reactors. These include one that is complete and operating and two that are in reasonably late stages of construction. It also calls for shutting down facilities for separating weapons-grade plutonium and closing all nuclear-fuel-related facilities.
- Second, it requires North Korea to come into full compliance with its obligations under the NPT and its IAEA safeguards agreement before any nuclear components for the reactors are delivered.
- Third, it controls the spent nuclear fuel that was removed from the reactor in the spring of 1994—and that remains in North Korea—by preventing it from being reprocessed, stabilizing it for storage, and taking it out of the country.
- Fourth, it provides arrangements for the delivery of alternative energy in the form of annual shipments of heavy fuel oil in amounts equivalent to the 255-megawatt electrical potential and thermal potential of the three reactors that will be shut down, not constructed, or not finished, pursuant to the agreement.
- Fifth, it calls for the formation of an international consortium to provide two LWRs to replace the graphite-moderated facilities. That consortium, Korean Peninsula Energy Development Organization (KEDO), was formally chartered on 9 March 1995 by the US, Republic of Korea, and Japan. Negotiations on difficult, complex issues of financing and arrangements for these reactors and for the general implementation of the program are under way.

The bulk of the funding for the LWRs will come from the Republic of Korea and from Japan, although we expect that other countries—including the US and a wide variety of nations that have an interest in the problem—will make contributions. Because so much of the money is coming from the Republic of Korea, and for other reasons as well, the

reactor will have to be the new South Korean standard-design reactor. Although this device is based on improvements to a US design, it is being built in the Republic of Korea. (Incidentally, an agreement exists to build several of these LWRs in China.) But North Korea has resisted the plan to use a South Korean reactor. Unless North Korea agrees, the LWR project simply cannot—and should not—go forward. The US is fully in agreement with the Republic of Korea and other allies on this point. Were North Korea to respond to any lack of agreement on the South Korean reactors by breaking its obligations under the Agreed Framework, grave consequences would follow.

In addition to the relatively technical aspects of dismantling the nuclear program in return for the establishment of alternative energy sources, the agreement has political and economic sides as well. It carries forward the process of normalizing diplomatic and trade relations between North Korea and the rest of the world by taking small steps, as the Agreed Framework is implemented, to exchange diplomatic offices and to address issues concerning trade and sanctions. Of critical importance, the agreement requires restoration of the dialogue between North and South Korea, together with the United States, with the objective of denuclearizing the Korean Peninsula and eventually reaching a peaceful resolution of problems there. These include both conventional and political confrontations.

It is important to emphasize that the obligations in the nuclear field that North Korea has undertaken in this agreement go far beyond the requirements of the NPT. They require North Korea to dismantle its current nuclear program completely—not simply place it under IAEA safeguards. Nothing in the NPT prevents a party to that treaty from having graphite-moderated reactors, from having a reprocessing plant, and from actual reprocessing—provided the activities are conducted under IAEA safeguards. Further, the agreement provides for strict international monitoring of North Korean compliance at all stages.

One of the criticisms often advanced against the treaty is that the North does not have to do anything until several years have passed, when it has already received important benefits.

The fact is that North Korea, under the agreement, must take—in fact, has taken—critically important steps before getting any benefit from the US or any other country. That step-by-step process will continue.

Step one of this process includes several actions (fig. 8.1). Specifically, the North Koreans have kept in storage the 8,000 fuel rods that were taken out of the reactor in the spring of 1994 instead of reprocessing them to extract plutonium sufficient for making some five or six bombs. In the time since the agreement was signed, these fuel rods could have been run through the reprocessing facility and the plutonium separated. Second, they have already sealed the reprocessing facility and fuel-fabrication and storage facilities. Third, they have refrained from refueling and restarting the five-megawatt reactor from which the spent fuel was unloaded in the spring of 1994. Running at its 1994 rate, this reactor could have produced enough plutonium for one bomb each year it operated—and it could have been run faster. However, it is now being sealed by the IAEA. Fourth, the North Koreans have stopped construction of two big new reactors with capacities of 50 and 200 megawatts. These reactors together could have produced plutonium for more than a dozen bombs annually.

Also worth pointing out is the access and verification that North Korea has permitted, because these actions are so striking an improvement over its past conduct. That is, North Korea has permitted IAEA inspectors to remain permanently at Yongbyon with access to the reactor construction site nearby at Taechon to implement the freeze and to verify and monitor on a daily basis that the freeze remains in effect. The director general of the IAEA has reported good cooperation on compliance with the halt of the nuclear program by North Korea. IAEA inspectors will remain in North Korea for the duration of the framework implementation. North Korea also has permitted a US technical team to visit the Yongbyon complex to do surveys of measures necessary to stabilize the spent fuel so that it can be stored until removed from North Korea, as required by the agreement. Removal will actually start when the first nuclear components for the LWRs are delivered (see fig. 8.1).

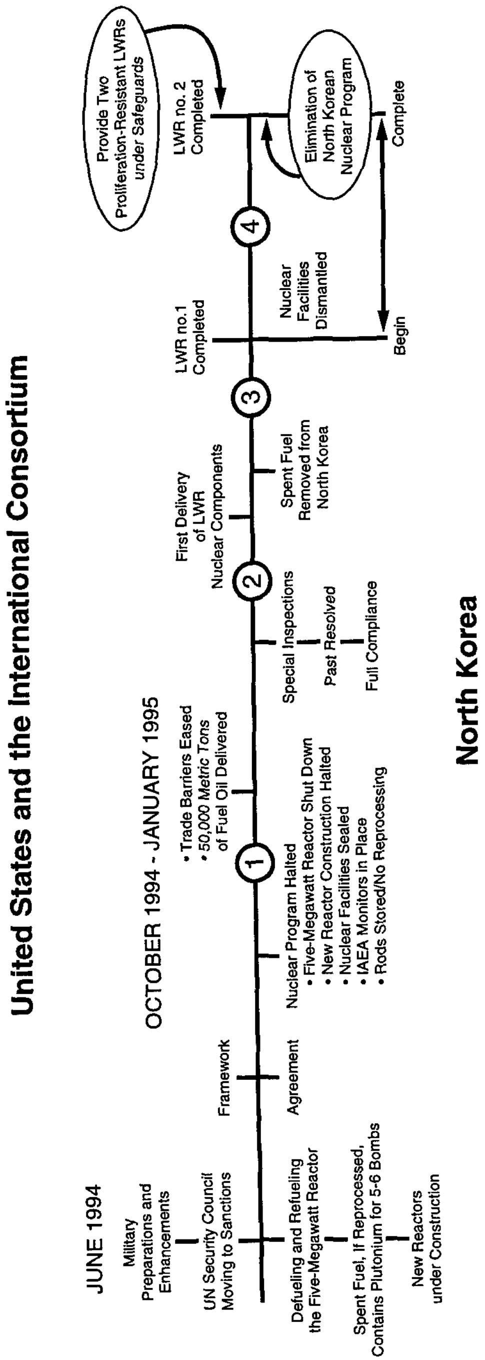


Figure 8.1. Verified Steps in the Elimination of North Korea's Nuclear Program

Obviously, continued vigilance will be essential, and we expect a fair number of more or less serious bumps in the road toward implementation. But the North Koreans have accomplished the critical first step of compliance: a verified freeze and a halt to their nuclear program.

The US also has responsibilities under step one of this process and under subsequent steps (see fig. 8.1). Specifically, in mid-January of 1995, we delivered to North Korea 50,000 metric tons of heavy fuel oil—the first of annual supplies that will eventually reach 500,000 metric tons for use in the thermal power plant at Sonbong. We took other steps required of us in the first 90 days, including limited relaxation of trade controls.

The next milestone was the formulation of KEDO, mentioned earlier. Many countries expressed interest in KEDO during its first conference in March 1995. This agency will continue work on the LWR project to reach a detailed agreement with North Korea on the supply of LWRs.

Step two of the process (see fig. 8.1) will take place upon completion of the plant structure (i.e., the basic structure and the turbines) for the first LWR but before any of the nuclear components arrive. At that time—probably in the year 2000 and before any nuclear components for the reactor are delivered—the North will have to allow the IAEA to conduct special inspections to resolve questions about its past plutonium production (i.e., the one or two bombs' worth removed in the 1989 refueling and reprocessed at that time). It also will have to come into full compliance with the NPT and with full-scope safeguards.

When these actions are completed—and only then—the international consortium will deliver and begin to install the nuclear components for the first LWR. At that point, the North Koreans must also commence shipping the spent fuel rods from the five-megawatt reactor out of the country for reprocessing and storage of the plutonium under IAEA safeguards.

Only when all the spent fuel has been expatriated (i.e., when North Korea has completed its responsibilities under step three [see fig. 8.1]) will the consortium complete and deliver LWR number one. Simultaneously with that completion and delivery, North Korea will begin to disassemble and destroy the

graphite-moderated reactors and associated facilities. While those facilities are being disassembled, the consortium will be working to complete LWR number two. But that reactor will not be completed until the last of the North Korean nuclear-weapons-related facilities is completely dismantled. Step four will conclude when LWR number two is completed (see fig. 8.1). As the LWRs operate, North Korea will be required to export the spent fuel, as directed by the consortium or its key members—including the United States.

Proceeding simultaneously will be a resumption of North-South dialogue, an easing of trade and economic restrictions, and a gradual process of opening diplomatic relations. Clearly, this is a complex, they-take-a-step, we-take-a-step process. Nothing in this agreement depends on trust. Our performance will be based on the North Koreans' performance. If they do not perform, we can—in my view, must—go back to the path we were on in the spring of 1994: sanctions, military enhancements, and international pressure. Conversely, of course, as continued North Korean compliance is confirmed, the US, the Republic of Korea, and Japan—as well as other countries—will carry out their own obligations.

Taking a step back from the admittedly intricate details of this agreement, we face only two choices regarding the North Korean nuclear weapons program (fig. 8.2). Realistically, the alternative of doing nothing—letting the program run unchecked in the hopes that North Korea will somehow implode or be a responsible possessor of this capability—is simply not acceptable.

Our alternatives are, therefore, (1) an agreed deal along these lines or (2) a return to the course of sanctions. Our preferred course is the agreed deal. Under the Agreed Framework, we obtain our key objectives: North Korea's nuclear program is halted; the nuclear past is resolved; North Korea comes into full NPT compliance; spent fuel with plutonium for five or six weapons is removed from the country; and graphite-moderated, nuclear-weapons-related facilities are dismantled and replaced by far less proliferation-prone reactors.

Without an agreement, the North unquestionably would resume constructing, reprocessing, and refueling the reactors—and we would have to respond with sanctions. Further, we would have to take steps to ensure that the North could not

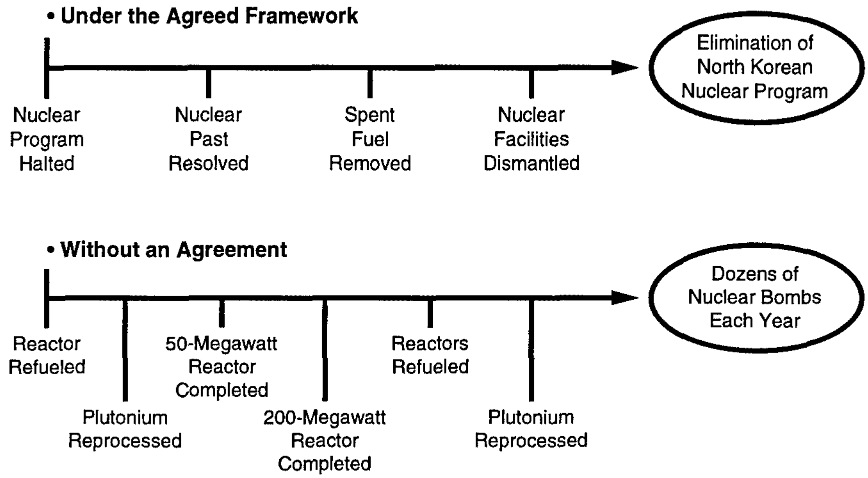


Figure 8.2. North Korean Alternatives

convert into practice its rhetoric that such sanctions are the equivalent of war. Certainly, this would require substantial measures of military preparation by both the US and the Republic of Korea. Sanctions could be made to work, but such a proposition would be long term, risky, and costly.

In our view, therefore, the choice is clear. We should continue to pursue a course of implementation of the Agreed Framework so long, of course, as that is what is actually happening. We entered this agreement with no illusions, but we are working exceptionally hard—both domestically and internationally—to implement the framework. The record of North Korea in the past is clear—and not encouraging. If the North is prepared to honor this agreement, then not only will the nuclear problem be solved, but the way will be open for resolution of a broad range of political, military, and strategic problems on the Peninsula—ranging from confrontation of conventional forces to the export of missiles and missile technology.

So the agreement thus provides a framework for the peaceful settlement of the nuclear issue on the Korean Peninsula and lays the cornerstone for building a framework for security in Asia. Those benefits require implementation. Despite statements of the North Korean press to the contrary,

we hope to find agreement on every aspect of this accord. We will have ample information on whether it is being implemented, and we will insist on strict implementation.

Those are the alternatives. In my view, we must press forward and take the steps necessary to implement the agreement, including putting together the financial and technical aspects of the consortium. But we and our KEDO partners also must continue to impress upon North Korea that punctilious compliance with all provisions of the agreement is essential.

Chapter 9

The Nuclear Deal: What the South Koreans Should Be Concerned About

Victor Gilinsky

I have tried in the past to make two basic points about the problems the proposed light water reactor (LWR) transfer to North Korea poses for the United States: (1) It sets a bad example by rewarding violation of international norms. We have all heard that this case is not supposed to set a precedent. Still, it is hard to explain why it is good for the US to give LWRs to North Korea because it already has a bomb program and bad for Russia to sell LWRs to Iran because it doesn't yet have a bomb program. (2) Although the US–North Korean arrangement is often described as involving the dismantlement of North Korea's nuclear weapons program, realistically, the arrangement only requires North Korea to put its plutonium production facilities on hold. The assumption that the North Koreans badly want the LWRs and therefore will be under pressure to perform their side of the deal is, to my mind, highly questionable. If they really wanted electricity, they never would have picked the complex and lengthy nuclear option. In practice, the US will be under pressure to perform to avoid restart of plutonium production.

I would like to shift the focus and consider the practical aspects of the project from the point of view of a potential participant—say, South Korea—assuming the project does go forward. I don't pretend to any special expertise on Korean affairs, but I do have some experience with nuclear affairs.

I would like to raise a number of questions about the LWR project and related inspection and security matters—questions to which I would want answers if I were a participant. If the questions have been addressed in recent meetings of the Korean Peninsula Energy Development Organization (KEDO)—which was set up to run the North Korean project—we haven't yet heard the answers.

First, consider the LWR project. One would do well to keep in mind the difficulty of building a technologically complex project of this sort anywhere, under any auspices. It is especially difficult in a country that lacks the basic technological context. In a project of this sort, success depends on a high level of cooperation among all participants—including the recipient.

Can we realistically expect that sort of cooperation from the North Koreans, even if their objections to a South Korean LWR are overcome? Will North Korea play the part assigned to it by a multinational foreign project group? In fact, who will be in charge of the project? Normally, it is the owner. Is this North Korea? Is it KEDO? How does KEDO enforce its decisions unless North Korea agrees with them?

Who will be in charge of the construction site? Normally, the owner has the right to control quality and shut down the project if the owner is not satisfied with the work. Will North Korea have this right?

Again, normally, the builders use a large component of local labor and local contractors. Will that be the case here? Will North Korean law apply at the work site? Who will be in charge of project security? Whose armed guards will patrol the site?

Who will train the North Korean workers and technical staff? As a practical matter, it will have to be the South Koreans. Will North Korea agree to take instruction from South Korea?

Who will operate the reactors if they are actually built? Who will train the operators? Who will approve the qualifications of the operators? Will South Korea, which has the most reason to be concerned in the event of an accident, have a voice in these decisions?

Who will license the plant for operation? Whose safety standards will be used? Are we satisfied with a North Korean licensing approval?

How will we deal with the nuclear safety requirement that the LWRs must be connected to reliable sources of outside power for shutdown cooling and emergencies? Who will be responsible for necessary major upgrading of the North Korean electrical transmission grid?

Let me turn to international inspection issues as they affect the project. Under the agreement, the North Koreans are

supposed to let the International Atomic Energy Agency (IAEA) inspect the disputed waste site before key nuclear components are supplied. Very likely, some of these components would be from the United States. Let us be optimistic and assume that the IAEA will actually get a look at the site some years from now.

Suppose further that the IAEA concludes that no significant amount of plutonium was separated in the past. That conclusion is likely to involve a degree of judgment—the situation is bound to involve technical uncertainties. Will the IAEA make public its data or at least let South Korea see it? Normally, the IAEA works in secrecy. One is supposed to trust its judgment. Is that acceptable here? Interestingly, the US has described the inspection condition as requiring North Korea to satisfy the IAEA. That is not necessarily the same as getting to the bottom of how much plutonium was separated. Realistically, the manner in which the IAEA resolves uncertainties will be affected by the interests of the major parties. Does South Korea want the IAEA to give North Korea the benefit of the doubt or to err on the side of caution?

Now suppose, in the alternative—although I find this hard to imagine—that the IAEA concludes that North Korea separated some number of kilograms of plutonium. What happens then?

The answer is pretty clear as it applies to US exports of nuclear equipment. The approval of such exports would depend on first having in place a US–North Korean agreement for cooperation. I don't see how such an agreement could be approved or any nuclear-export licenses issued until the IAEA inspects the disputed sites. An IAEA conclusion that significant past plutonium separation occurred would mean, of course, that the North Koreans will have been branded as nuclear cheaters and liars. That will be so even if the incident is somehow passed off as a material-accounting "mistake." In these circumstances, it is difficult to imagine US export approvals from the US Nuclear Regulatory Commission and the Congress.

If US components are essential, what then happens to the project? And what happens to the thousands of South Korean workers in North Korea who are building the reactors?

Since almost everyone thinks the North Koreans did separate plutonium, we might want to think now about the

consequences. Or are we counting on the IAEA not finding out? Or do we hope that a change in North Korea will rescue the situation?

What about North Korea's existing nuclear program? This must involve several thousand persons. If we believe that North Korea was interested in building a bomb, some of these scientists and engineers must have been working on bomb design and manufacture. What are these people doing now?

If North Korea has really separated one or two bombs' worth of plutonium, is it reasonable to believe that it will resist completing the job? Do we want to know the answer?

These are some of the questions that come to mind immediately. We could easily come up with a much longer list. Do satisfactory answers exist?

Chapter 10

The North Korean Nuclear Deal and East Asian Security*

Paul Wolfowitz

With the North Korean nuclear agreement, a great deal is at stake. This agreement not only affects the danger that North Korea—a state with a record of brutal use of force and reckless export of dangerous weapons technologies—may acquire nuclear weapons. It also creates precedents for our ability to prevent the proliferation of nuclear weapons to other dangerous states—most notably Iran and Iraq. No less important, our handling of this agreement could affect profoundly our relations with the principal nations of Northeast Asia. Those relationships—particularly the ones with our democratic allies, Japan and South Korea—will determine our ability to maintain peace in that vital part of the world in the next century.

So it is not too much to say that this agreement and our handling of it will affect future prospects of war and peace. It is appropriate for the United States Congress to study this agreement very carefully and to deliberate thoroughly over any actions that it may take.

This agreement is not the foreign policy triumph that the Clinton administration claims it to be, and it does not solve the North Korean nuclear problem. It simply postpones that problem and may, in the process, make its solution ultimately more difficult. Perhaps even more important, it does nothing to change the North Korean policies that are the fundamental cause of tension on the Korean Peninsula.

Unfortunately, however, Congress cannot simply reject this agreement and go back to where we were before. The very fact of this agreement has altered the situation irretrievably. It has shifted the burden from North Korea to live up to its earlier

*Testimony before the Senate Foreign Relations Committee, hearings on the North Korean nuclear accord, 25 January 1995.

agreements—including the Nuclear Nonproliferation Treaty (NPT) and the North-South nuclear agreement of December 1991—and has created a potential pretext for North Korea to proceed with its nuclear program if it can claim that others are not living up to this agreement. By blocking implementation of the agreement, Congress would create just such a pretext.

Moreover, nonimplementation would create a damaging split with our Japanese and Korean allies, who have endorsed the agreement—however reluctantly. Preserving the strength of those relationships is one of the most important stakes the US has in the entire issue—one that has suffered in the course of these negotiations. It would be a mistake for Congress to further weaken our allies' confidence in American consistency and reliability by yet another unilateral change of course. We have little alternative, therefore, to proceeding with the agreement.

To be fair, a perfect agreement would not have been possible, given whom we are dealing with and given the risks and limitations of military options. However, one of the mistakes the administration made in negotiations was to foster the notion that the only alternative to an agreement like the present one was war. The real alternative was to be prepared, if necessary, to continue and even intensify the economic pressure on North Korea—to present it with the fundamental choice of ending the basic confrontation on the Korean Peninsula or facing a potentially catastrophic economic decline.

Instead, we have paid a rather high price for relatively small gains and have encouraged North Korea to continue to think that it can have the important economic benefits of good relations with the US and Japan without any change in its persistent refusal to recognize and deal with South Korea or to end the military confrontation on the Peninsula. Fortunately, however, the strong economic, military, and diplomatic position of both the US and our South Korean ally still gives us a great deal of leverage on the situation if we use it properly.

What Congress can do is endeavor to ensure that the North Koreans live up to their commitments, to protect the leverage necessary to enforce the agreement, to guard against attempts by the North Koreans to continue the kind of pressure tactics that have proved effective for them since 1993, and—most

important of all—to advance the other important interests of the US and its allies that were so badly neglected by the exclusive focus of these negotiations on nuclear issues. North Korea must accept the legitimacy and equality of South Korea as the essential step toward a true peace on the Korean Peninsula and the indispensable precondition for the reduction of military threat. To achieve these objectives, we must understand what the agreement accomplishes and what it does not.

Problems of the Agreement Itself

If fully implemented, the agreement would achieve some important limits on the North Korean nuclear program, including the dismantling of large nuclear production reactors now under construction and related reprocessing facilities.* But these gains come at a price: the $4 billion price tag associated with the two large light water reactors (LWR) the North Koreans will receive; the price of legitimizing the pretense that the purpose of the North Korean nuclear program is to provide energy; and, even more consequential, the price of legitimizing the sale of similar reactors to other countries of proliferation concern. Indeed, this agreement is already creating difficulties for the administration's commendable efforts to discourage the Germans and Russians from selling reactors of a similar type to Iran. That price might be worth paying, given the dangers posed by the North Korean nuclear program, except for three important drawbacks.

First, many of the most important gains come far in the future. Second, as long as the International Atomic Energy Agency (IAEA) is unable to conduct special inspections (the agreement delays such inspections until the first LWR is ready to receive "key" nuclear components), we will have no handle at all on covert nuclear activities in North Korea. This is more than a matter of determining the past history of the North Korean program—as important as that question is. It is also

* For a detailed treatment of the nuclear aspects of the agreement, see Victor Gilinsky's "The Nuclear Deal: What the South Koreans Should Be Concerned About" (chap. 9).

the only way of detecting and deterring North Korean nuclear development that may proceed in secret while the known facilities remain frozen. Given the North Korean track record and the extraordinary secrecy surrounding everything in that country, there is every reason to suspect that the North Koreans will continue with some kind of nuclear development in secret, as other countries like Iraq and Pakistan have done while pretending to observe nuclear commitments.

Third, the agreement is silent or ambiguous on a number of crucial questions. For example, although the agreement is ambiguous when it speaks of disposing the spent fuel from North Korea's existing reactor "in a manner that does not involve reprocessing in the DPRK [Democratic People's Republic of Korea]," it is silent about the disposal of the much larger quantities of spent fuel that will eventually be produced by the LWRs. (Although the plutonium in this fuel is described as not "weapons grade" and presents difficulties for handling and weapons design, it can nonetheless be used to make weapons.) Moreover, the agreement says nothing about North Korea's continued development of nuclear delivery systems—which may be the most important question, given our ignorance about how far the North Korean program has already proceeded.

Thus, the most important gains from the agreement do not come for some time and, in some cases, not until considerable ambiguities have been resolved. True, the agreement does achieve an immediate freeze on the known North Korean facilities, but this is a two-edged sword. As long as the North Koreans retain the ability to restart those facilities, we much expect continued attempts to threaten withdrawal as a means of wringing further concessions. Given the North Korean record of ignoring its past obligations, we have no reason to be optimistic about actual implementation of the agreement.

Importance of the Larger Context

That is why the larger context in which the agreement will be implemented is as important as the details of the agreement. That is, what the agreement implies about the realization of economic pressures on North Korea and what it

fails to do in addressing the questions of North-South relations and the conventional military threat on the Peninsula, not to mention the manner in which it was negotiated, are as important for the future as the details of the nuclear arrangements.

Defenders of the agreement commonly argue that North Korea's desire to obtain LWRs will assure compliance. We should be skeptical about the notion that a regime facing the kind of immediate crisis that North Korea faces will be heavily influenced by the prospect of additional electricity supplies five to 10 years (or more) in the future—all the more so because it is quite obvious that the purpose of the North Koreans' nuclear program, from the start, has not been to generate electric power. Moreover, if that were their real need, it could be met much more quickly by the construction of fossil fuel plants. In fact, North Korea may find it useful to *delay* completion of the LWRs if for some reason it wishes to delay the implementation of the agreement. We should not be surprised to find that Western companies involved in the project are more eager to complete it than are the North Koreans.

The most important gains for North Korea could come very quickly in the form of rapidly developing economic relations with the US and, even more lucratively, with Japan. Indeed, North Korea seemed on the verge of such a breakthrough with Japan in 1991, in the wake of the visit to Pyongyang by the then-powerful Japanese politician Shin Kanemaru. But concerns about the nuclear issue—in both Japan and the US—put that process on hold. Although the commitments the US makes in the nuclear agreement to improving political and economic relations with North Korea are vague, pressures to interpret them liberally are likely to grow rapidly. Unless we can achieve extraordinary coordination with Japan, even more rapid expansion of that country's relations with North Korea is likely, to include not only trade and investment but foreign aid as well.

Once these relations develop, reimposing restrictions for anything short of the most egregious North Korean behavior will be difficult if not impossible. This stands to be North Korea's greatest gain from the agreement. We may be creating

a life-support system for a regime that would otherwise be facing the possibility of economic collapse.

In this context, the failure to obtain any reduction in the North Korean conventional military threat or any significant progress in North-South relations is a major flaw in the agreement. To argue that this negotiation was only about nuclear issues and not about political and military confrontation on the Peninsula misses two major points.

First, we are using political and economic leverage that is critical to any successful resolution of the larger issues. Unless we can maintain control over the development of North Korea's economic relations with the outside world, our leverage over these issues will disappear.

Second, as long as North Korea refuses to recognize the South or deal with it on equal terms and continues to maintain a huge, offensively structured armed force for the purpose of unifying the Peninsula by force, it is difficult to see how there could be much confidence in any solution to the nuclear problem. Conversely, if real progress occurs in reducing the risk of war in Korea, ambiguities about North Korea's nuclear status will be much less threatening.

The manner in which the agreement was negotiated creates serious problems for the future. Most important, the failure to give serious emphasis to South Korean concerns in the negotiations has strengthened the North Koreans' belief that they can develop their relations with the US and Japan while continuing their dangerous refusal to deal with the South.

In addition, these inconsistencies will haunt us if we need to rally international support for a stronger policy in the future. In particular, by allowing former president Jimmy Carter to cut the ground out from under even the very mild sanctions effort that our key allies had signed up to, the Clinton administration made it virtually impossible to mobilize that kind of effort a second time. In fact, once President Clinton allowed President Carter to reverse US policy in the way that he did, the outcome of the negotiations was virtually foreordained by our loss of leverage.

Finally, the appearance that the US has yielded in the face of North Korean pressure will lead to more such pressure in the future. Unless we are prepared to face a breakdown of the

agreement, North Korea will continue to threaten it. We cannot put ourselves in a position in which the only alternative to agreement is war; nor can we permit the North Koreans to think that they can continue to make gains by threatening war.

What Congress Might Consider

Since Congress at this point cannot produce a better agreement by overturning the present one, it is better to think about how the overall context might be shaped so that (1) the agreement is implemented strictly and (2) the deficiencies in the agreement—particularly the important issues that it fails to address—can be corrected over time. In doing so, we must define our overall objectives.

What we want—as well as what our South Korean allies want—is *not* to squeeze the North Korean regime until it collapses. It may collapse in any case of its own failures, but the South Koreans are understandably fearful of the problems and dangers that would present. What they would most like to see—and what we should support—is the gradual transformation of North Korea and an end to North-South confrontation.

To achieve this, however, we should confront North Korea with a clear choice: If it will abandon its preparations for unification of the Peninsula by force, recognize South Korea and deal with it directly, and reduce the military threat it poses to the South, it can expect to have support from other countries, including the US and Japan as well as South Korea, to achieve a "soft landing." However, if it continues its confrontational policies toward the South, it faces real dangers of economic collapse. What it cannot do is have it both ways. At a time when North Korea is facing major decisions about its future leadership, we must present it with a clear choice.

If North Korea wishes to have the kind of economic relations with the West that give it a chance of surviving, we should insist that (1) most important, it recognize South Korea, accept its permanence and legitimacy, and deal with it directly as an equal; (2) it take steps to reduce the conventional military threat on the Peninsula and to develop confidence-building measures to reduce the risk of war; (3) it cease the development of delivery systems for weapons of mass destruction; (4) it take

early steps to implement the regime of mutual inspections envisioned in the North-South agreement on denuclearization; and (5) it stop exporting missiles and other destabilizing weapons. If we are to support these objectives, Congress should consider insisting on a number of things as part of the implementation of the nuclear agreement.

First, to ensure that North Korea cannot continue to reject dealings with the South, we should make clear that the provision of the LWRs must come from South Korea. Moreover, specific agreements for supply of the reactors must provide for continued control over the spent fuel. We should insist on these conditions in any circumstances, but particularly if the US is to take even a modest share in funding the reactors.

Second, further development of US and Japanese relations with North Korea—particularly those steps that would provide significant economic support—cannot take place without meaningful progress in North-South relations. North Korea must understand that progress with the South will set the pace for its relations with the outside world.

Third, we need to make clear that continued development of delivery systems for nuclear weapons—particularly long-range missiles—will put the entire nuclear agreement in question. Further, the issue of special inspections—whether under IAEA auspices or under the terms of the North-South agreement of 1991—cannot wait for "significant completion" of the first LWR if North Korea wants to have meaningful development of relations with the US and Japan.

Fourth, although the precise timetable may be difficult to specify, the provision of heavy fuel to North Korea—which in effect frees up other fuel supplies for use by the North Korean military—cannot continue indefinitely without some significant progress in reducing the military threat.

Fifth, Congress should insist on regular reports on North Korean compliance with the agreement, to include evidence of progress in North-South relations and progress in reducing the military threat on the Peninsula, as well as reports on measures taken *and* measures under consideration for improving US and Japanese relations with North Korea.

Finally, we need to make preparations to deal with the prospect of a North Korean effort to threaten withdrawal from

the agreement. This should include the development of agreed measures with our allies and other concerned outside countries as well as preparations to strengthen South Korean and US defenses on the Peninsula in order to reduce North Korean attempts to threaten war as a means to blackmail.

PART 4

US Policy toward Iran: The Hazards Ahead

Chapter 11

Assessing the Iranian Threat*

Geoffrey Kemp

Iran poses a number of threats to American interests in the Middle East, each requiring careful examination.[1] Without help from the Gulf Cooperation Council (GCC), the US cannot protect the Persian Gulf from major threats. Yet, pushing such cooperation too far and too fast runs the risk of overloading the delicate political systems of the GCC states and plays into the hands of parties who bitterly oppose the GCC governments, including opposition groups within the kingdoms. Iranian threats include indirect and direct military challenges to the security of oil supplies and the GCC states; possible nuclear, biological, and chemical (NBC) weapons programs; subversion of friendly regimes such as Saudi Arabia and Egypt; acts of terrorism against the regime's opponents and secularists in other Muslim countries; and opposition to the Middle East peace process. It is useful to distinguish between a range of military threats, on the one hand, and political threats that relate more to subversion and terrorism, on the other. It is also important to distinguish short-term threats from those that could arise over a longer period of time.

The Military Issues

Iran's professional military leaders now believe that superior military power is decisive in shaping the strategic environment in the Middle East. They learned this lesson the hard way—through their defeat in the Iran-Iraq War and the vivid images of Operation Desert Storm. As a consequence, they believe that military preparedness must be granted a high priority. Iran cannot rely on a "people's war" fought with inferior equipment

for its defense—a belief its leaders trumpeted in the early, idealistic days of the Iran-Iraq War. Instead, Iran needs large stockpiles of modern weapons and a professional force in being. The problem is that Iran has neither the trained manpower nor the money to match the conventional capabilities of the US and its allies. It may therefore be tempted to focus its strategy on subversion and terrorism while exploring shortcut routes to obtain weapons of mass destruction, including a small number of nuclear weapons.

In particular, concern exists that a desperate regime, dominated by radicals, could use its limited military assets not to invade a neighbor—such as Kuwait—but to change the nature of confrontation in the Gulf. Iran simply lacks the assets for such an invasion. Some people have postulated that Iranian submarines could lay mines in shipping lanes or that Iranian shore-based missiles could attack tankers to try to block the Strait of Hormuz. The purpose of these actions would not be to achieve any maritime victory over the US but to sow panic through the oil markets and put the Arab Gulf on notice that Iran will not sit back and allow its revolution to be squashed.

In such circumstances, US military assets are adequate to defeat any Iranian military action. (Determining whether a limited engagement would be in American interests is another matter.) On the other hand, escalation to a full-scale war with Iran would pose an enormous set of problems for the US—both militarily and politically.

Conventional Rearmament

Iran is trying to rebuild, restructure, and modernize its armed forces. Although it currently has some money to buy advanced arms on the international market and most weapons are not difficult to find, the problem of supplier reliability and total costs remains. Russia, for example, may have an ample supply of arms, but it has yet to demonstrate an ability to provide long-term support to its customers. Service is believed to be unreliable and erratic, and spare parts are often unavailable. The issue of Russian weaponry was further complicated for Iran by President Boris Yeltsin's pledge to President Bill Clinton in late September 1994 that Russia would not sign

any new defense contracts with Iran. However, Russia agreed to fulfill existing contracts.

The lessons of international sanctions imposed on Iran during the Iran-Iraq War suggest that self-reliance must be one of Iran's long-term goals, if only to avoid future humiliations. This objective would entail increased domestic production of arms and support items and decreased dependency on foreign supplies. However, the undeveloped state of Iran's domestic armaments industry ensures that weapons produced locally will be inferior to those purchased on the international arms market.

To mitigate the impact of continuing US and West European sanctions on arms sales, Iran has developed supply relationships with Russia and some of the remaining communist states to buy new aircraft, submarines, tanks, and missiles. Although their service leaves much to be desired, Russia, North Korea, and China manage to provide some advanced conventional weaponry. Iran's modernization program should benefit from the arms glut; the problem remains, however, that while arms supplies from multiple sources may tend to reduce the hardships of future sanctions, the inefficiencies of operating different weapons from different suppliers tend to increase.

Iran's exact expenditures for arms purchases have been difficult to pinpoint. In 1992 the Central Intelligence Agency (CIA) estimated that Iran was spending $2 billion on arms purchases. The Iranian minister of defense, Akbar Torkan, claimed that Iran's entire defense budget in 1993 was only $850 million.[2] A significant decrease in Iranian purchases occurred in 1992–93. The Stockholm International Peace Research Institute (SIPRI) reported that Iran spent $867 million on the import of major conventional weapons in 1993. Several defense analysts put the 1993 figure around $800 million.

A better indicator than the actual numbers, however, is the general trend of an across-the-board buildup. Iran is rebuilding its military forces, modernizing its equipment, and seeking the most advanced arms possible. These developments do not necessarily imply aggressive intent. This program is still reasonable, given Iranian needs and comparisons with past Iranian force levels and those of neighboring states; Iran still has a long way to go to be militarily effective.[3]

If these trends continue and anticipated purchases materialize, Iran could eventually develop a much enhanced sea-denial capability. Its acquisition plans include Russian *Kilo*-class diesel submarines, Russian Su-24 Fencer attack aircraft, Chinese Silkworm antiship missiles, and—possibly—the Russian Tu-22M Backfire bomber armed with the Kitchen standoff air-to-surface missile. With a coastline far longer than Iraq's and with more widely dispersed naval assets, Iran could slow the access of major ships through the Persian Gulf and cause trouble for US forces.

However, all evaluations of Iran's capabilities are dogged by the paucity of concrete facts about the Iranian buying spree. This lack of information creates uneasiness as to the accuracy of available estimates. A modernization program is under way, but its parameters are unknown. Observers have difficulty assessing the buildup, especially without an end point in sight. Moreover, Iran has yet to decide on an appropriate force structure and doctrine, assure continuity of arms suppliers, standardize its hybrid equipment, replenish stocks, and upgrade existing equipment. These tasks are not easy.

We have, of course, more benign explanations of what is happening. A comparison of the current inventory against Iran's forces at the peak of the shah's buildup in 1978–79 reveals that Iran has only one-third to one-half the major weaponry it formerly had. It has less than half as many tanks as at the time of the shah's fall, and most of these are outdated and improperly equipped for night warfare. Iran has a good number of artillery tubes but is unable to use them properly due to a lack of fire-control and target-acquisition systems. Iran's approximately 100 attack helicopters date back to the 1970s. Compared with its well-armed neighbors—Iraq and Saudi Arabia—Iran's potential military threat diminishes. Unlike Iraq and Saudi Arabia, Iran has not been a profligate spender on arms. In fact, if one accepts the 1979 baseline year, trends in military capability and balance have shifted against Iran.

Iran's Weapons of Mass Destruction

There is widespread belief in Western intelligence circles that Iran has embarked on a covert nuclear weapons program.

Such a program would represent a new, dangerous threat to the Middle East and would eclipse all other points of contention. Concern exists over the security of nuclear weapons and their associated technologies in the former Soviet Union. The specter of an oil-rich Middle East country that harbors nuclear ambitions and that finds it much easier to circumvent control regimes in pursuit of covert nuclear options is very well substantiated. The seizures of smuggled radioactive goods in Germany in August 1994 suggest that such a scenario is quite plausible.

Some individuals within the Islamic Republic's hierarchy see a utility in Iran's pursuing a nuclear weapons program. Strong evidence indicates that the Iranians are engaged in a modest nuclear research program with possible military implications.

However, confusion abounds regarding evidence that the Iranians are physically assembling the infrastructure and teams necessary for a full-fledged nuclear weapons program. In 1992 Iran permitted the International Atomic Energy Agency (IAEA) to inspect its listed nuclear facilities and other installations alleged to contain nuclear activity. On this occasion, the IAEA found no incriminating evidence of illegal actions, although some doubt exists within the intelligence community as to whether the IAEA team looked in the right places. Based on the open literature, no known secret facility in Iran is physically engaged in building components for nuclear weapons at this time. CIA director James Woolsey said on 23 September 1994 that "Iran is 8–10 years away from building such weapons, and that help from the outside will be critical in reaching that timetable."[4] He also noted Iranian efforts to purchase nuclear technology and weapons, especially in Russia. The announcement in early January 1995 that Russia had finally agreed to begin work on the unfinished nuclear reactors at Bushehr further confirmed suspicion about Iran's nuclear intentions. Few Western economists accept Iran's argument that it needs nuclear power stations to help redress long-term energy needs.

Although Iran has very demanding domestic needs, its hard-currency revenues are sufficiently large in aggregate terms that if a small percentage were siphoned off to support

nuclear activity, it would amount to a sizable sum. It might be enough to tempt countries or individuals hard-pressed for money to sell Iran the necessary knowledge or technology. Furthermore, Iran has a significant number of well-educated scientists and engineers. The experiences of the Soviet Union, China, and North Korea—poor countries in macroeconomic terms—further illustrate how advanced national security projects can be developed if major resources are allocated to such ends on a priority basis.

The uncertainty about the nuclear program poses a policy dilemma for the United States. Elevating concerns about an Iranian bomb to the top of the list of priorities may weaken US credibility on a whole array of technology-transfer issues and undermine nonproliferation strategies elsewhere. On the one hand, strident American rhetoric that includes discussion of preemptive or covert operations against Iran to stop its nuclear weapons program could have precisely the reverse effect.

On the other hand, taking a relaxed approach and dismissing nuclear rumblings as mujahideen and Zionist propaganda is even less responsible. Focusing intelligence efforts on Iran is essential. If Iran is progressing, the West must heighten controls on exports, enact sanctions against those countries or individuals who are parties to proliferation, and compel the IAEA to conduct more spot inspections of suspicious Iranian facilities. However, even under safeguards, Iran may develop the infrastructure and specialist training in nuclear engineering that, at some point in the future, could be turned to weapons use. Such a scenario could occur if Iran were prepared to withdraw from the Nuclear Nonproliferation Treaty (NPT) or embark on a covert program—as both Iraq and North Korea have done.

In September 1994 at the third session of the NPT-extension preparatory committee, Iran attacked the Western position on a number of issues. A key Iranian criticism dealt with Article 4, which includes the right of nonnuclear states to peaceful nuclear technology. Iran contends that, despite this article, the US and others have repeatedly blocked Iranian attempts to acquire technology for nuclear energy. Indeed, Mark Hibbs reported that Iran was considering withdrawing from the NPT

over this issue,[5] which is especially sensitive for Iran, given the US concessions made to North Korea in this very area.

Iran's nuclear ambitions are bound to be influenced by the international community's attempt to persuade Iran that Iraqi nuclear weapons are under permanent international control. Iran must be convinced that an Iraqi program will not reemerge once new leadership comes to power in Baghdad. This task will not be easy. In the long run, it is important to include Iran in any arms control regime in the Middle East. Israel will never agree to Middle East arms control regimes involving nuclear weapons unless Iran—and probably Pakistan—are subject to strict verification standards.

In addition to a possible nuclear weapons program, some analysts express concern about Iran's nascent biological weapons programs. Once developed, biological agents could, in theory, be used for both terrorist and regular military operations. Iran also has the capability to produce chemical weapons, even though it signed the Chemical Weapons Convention.

Assessing the Military Threats

Iran currently poses no significant land threat to any of its Gulf neighbors, including Iraq. Iran's army and air forces would face more severe logistical problems in projecting power into the Arab Gulf states than Iraq encountered. A land invasion of the Arabian peninsula would require initial confrontation with Iraq, which still has the largest ground forces in the region. Any attack across the Gulf waters would require major amphibious and airlift efforts, which are presently beyond Iran's capabilities.

Nevertheless, Iran is a maritime power with a long coastline. Beyond simple acts of intimidation against its weaker neighbors, Iran could pose dangers for US and GCC maritime operations if its sea-denial capabilities continue to improve. US aircraft carriers would probably not risk entering the Gulf in the event of likely hostilities with Iran—at least in the early days of confrontation. Hence, they would be limited to air operations from positions in the Arabian Sea and the Gulf of Oman. This restriction, in turn, would limit the range and intensity of naval air operations over Iranian targets, especially

those north of Isfahan. The most serious naval challenge to the American fleet would be posed by a combination of submarines, mines, surface-to-surface missiles, and long-range strike aircraft with standoff missiles. US carriers based outside the Gulf could conduct isolated bombing raids deep into Iran but would not be able to sustain them without land-based air-refueling facilities. According to Western naval intelligence sources, Iranian submarines have struggled to rectify the poor performance of the batteries in their two new Russian-built *Kilo*-class submarines. Iran has made approaches to *Kilo*-class sub veterans in "an Indian naval establishment" for help in overcoming the battery challenge, since the Indian navy has eight *Kilo*-class submarines.[6]

It is unlikely that Iran can pose much of a conventional threat to the Gulf as long as the US maintains a strong forward military presence, expands defense cooperation with the GCC countries, continues to be effective in limiting technology and Western arms supplies to Iran, maintains cooperative relations with Russia, and commands wide-ranging political support throughout the Middle East. If some of these conditions change, however, Iran's military challenges will be more difficult to counter. The US cannot assume that the next major crisis in the Gulf will be a repeat of Operations Desert Shield and Desert Storm.

Terrorism and Subversion

Although Iran's military potential poses a long-term threat to the Gulf, there are other causes for more immediate concern. Specifically, they are (1) Iran's subversion of friendly regimes by means of its support of terrorism and (2) its rejection of the Arab-Israeli peace process. If Iran and its rejectionist allies succeed in promoting radical regimes in the Middle East, American military power—no matter how powerful—may not be sufficient to prevent the erosion of stability and the increasing threat to the Gulf itself.

Iran's Activities in Sudan and North Africa

On 18 August 1993, the US government announced that Sudan would be added to the State Department's list of countries supporting terrorism, based on evidence that Sudan harbors such terrorist groups as Hizballah and the Palestinian Islamic Jihad. This decision underlined Sudan's ever-growing link to Iran, which is allegedly a main supporter of these organizations. Teheran supplies Sudan with arms and ammunition and uses it as a training ground for Islamic and Palestinian terrorists. The full extent of Iranian influence over Sudan remains unclear.

In addition to US government concerns, officials in Tunisia, Saudi Arabia, Egypt, and Algeria contend that Sudan is a launching pad for Iranian-style militancy and the supplier of significant logistical support for terrorist organizations across the region. Egyptian officials and media spokesmen have initiated a large-scale campaign to assign blame to Iran and Sudan for the surge of violence within Egypt.

Arab officials also allege that Iran is supporting Tunisia's banned al-Nahda fundamentalist movement and the Islamic Salvation Front in Algeria. Sources at the Iranian Foreign Ministry stated in November 1992 that Teheran is committed to support "the legitimate Algerian revolution against tyranny and arrogance."[7] On 27 March 1993, Algeria announced that after "analyzing the international situation and particularly the interference of certain countries in Algeria's internal affairs, as well as their declared support for terrorism, the High Committee of State has decided to break diplomatic relations with Iran and recall our ambassador to Sudan."[8]

To many Iranian officials, the willingness of Western and Arab countries to publicize Iran's complicity appears hypocritical and self-serving. They contend that these countries falsely blame Iran for indigenous opposition movements that harbor legitimate grievances.

Iran also has been implicated in attacks on Jewish and Israeli targets. Approximately 100 people were killed on 18 July 1994 in a bombing of Jewish organizations in Buenos Aires. Coupled with a bomb explosion on 20 July on a Panamanian plane and two bombings in London on 26–27 July, the

disaster in Argentina led a resurgence in international terrorism. Israel has charged that Hamas and the Lebanese-based Hizballah are responsible for the blasts; Israeli and US officials also have singled out Iran.

Despite the fact that Iranian operatives have been linked to the bombing of the Israeli Embassy in Buenos Aires on 17 March 1992, in which nearly 30 people were killed, the Iranian government has repeatedly denied any connection. On 8 May 1992, the US Department of State alleged Iranian involvement in the attack.[9]

Iranian involvement in terrorist attacks in Turkey also has been alleged. Following the death of prominent Turkish journalist Ugur Mumcu on 24 January 1993, segments of the Turkish press accused Iran of orchestrating the fatal car bombing. In early February, Turkish interior minister Ismet Sezgin announced the arrest of 19 members of a group called Islamic Action that he claimed had been trained in Iran. They were charged with the murder of two prosecular journalists—Mumcu and Ali Akbar Ghorbani, an Iranian dissident. Ghorbani had been a member of the People's Mujahideen.[10]

Iran supports several organizations that have well-established records of committing acts of terrorism. According to the US State Department and other sources, Iran offers financial, political, and/or logistical support to Hizballah, Hamas, the Popular Liberation Front, and possibly the Islamic Jihad.

Iran's Rejection of Israel and the Peace Process

The Iranian government severed relations with Israel in February 1979, soon after the overthrow of the shah. The Islamic Republic has always rejected Israel's right to exist and has supported the more rejectionist elements of the Palestinian movement. Support for Hizballah and other terror groups is another manifestation of Iranian opposition to the peace process. Hizballah, Hamas, or other militant groups aligned with Iran can be used to disrupt the process and rattle participants.

In the wake of the Israeli-Palestinian agreement of September 1993, Iranian rejectionism carries greater risks for Iran's foreign and economic relations, especially the potential for

friction with Europe and Japan, both of whom have been far more willing to deal with Iran than has the United States. With their strong support for the peace agreements, Europe and Japan may be more likely to heed US calls for diminished ties with Iran and to support rejection of Iranian requests for debt relief from international financial institutions. Iran strongly denounced the Israeli-Jordanian treaty signed on 26 October 1994. Ayatollah Ali Khamenei called the Arab-Israeli agreements "an unjust compromise." In addition to criticism of King Hassan and King Hussein, he referred to Israel as "the Zionist knife-wielders who are alien to human sentiments."[11]

The Gulf Arabs and Iran

Iran's relations with the Gulf Arab countries operate on two tracks. On the one hand, Iran has a decided need to cultivate friends, escape regional isolation, and continue important trade relations. On the other hand, it nurtures a desire to assert an independent and forceful foreign policy. In view of recent Iranian behavior towards the GCC countries, one can question whether Iran's leaders have the skill and acumen to balance these two often contradictory goals. Indeed, relations between Iran and its Arab neighbors have been strained for decades—especially since the revolution. Fearful of Islamic revivalism, most Arab states supported Iraq during the Iran-Iraq War and paid huge sums of money to sustain Saddam Hussein's war effort. The shock and trauma of Iraq's invasion of Kuwait in 1990 put all the GCC countries on notice that they could quite literally be obliterated by aggressive neighbors. Given the vast asymmetries in population and wealth between the GCC and countries such as Iran, Iraq, and Yemen, it is not surprising that security is of paramount concern.

Even though the US umbrella provides a strong deterrent against major aggression of the kind that occurred in 1990, the American presence may be less effective against political threats and subversion. Given the complicated sociology of most GCC countries—large foreign populations and the diverse ethnic and religious backgrounds of all residents—internal security issues are an increasingly important factor in regional stability. In this context, the Iranian threat looms large.

The Gulf states have grown increasingly apprehensive that Iran is determined to become the regional hegemon. Moreover, whatever conciliatory moves Iran may have been willing to make have been obscured by its bullying tactics over control and sovereignty of Abu Musa Island and Tunb Islands. Iran's claim to the islands has generated widespread apprehension. What began as a dispute between Sharja and Iran escalated to a dispute with the United Arab Emirates (UAE), then the GCC, and then to the Arab League. The issue is one of principle, but strong strategic overtones also exist. If Iran were to gain sovereignty over the islands, it could extend its territorial waters into large areas that contain much oil. The UAE has proposed submitting the dispute to the International Court of Justice for resolution. To date, however, Iran has refused to accept this avenue of reconciliation. So long as the dispute remains unresolved and Iran continues to occupy and reinforce Abu Musa, tensions between Iran and the GCC will continue.

Since the Iraqi invasion of Kuwait in August 1990, Kuwait, Bahrain, Qatar, and Oman have all signed defense-cooperation agreements with the United States; the UAE also signed an agreement on 25 July 1994. A less formalized arrangement with Saudi Arabia is also in place.[12]

A similar array of actions was involved in the various military agreements. The agreement with Bahrain "expanded a previous agreement to include a joint exercise program, access to ports and airfields, and prepositioning of equipment." The US and Kuwait "signed a 10-year agreement allowing US access to ports and facilities, prepositioning of military equipment and joint training."[13] American officials renewed an existing facilities-access agreement with Oman. As a result of Saddam's moves in October 1994, Kuwait agreed to base a squadron of US planes and to expand the number of US tanks stored in the kingdom. Qatar agreed to store a brigade's worth of armor. Since the end of the Gulf War, allied aircraft have been based in Saudi Arabia to enforce the no-fly zone.[14]

Conclusions

Over the next 10 years, Iran could pose serious challenges to its neighbors, and its actions will continue to need

deterring. Thus, an American military commitment will remain necessary to the security of the Gulf. Yet, Iran also feels threatened, and its own insecurities may contribute to the dynamics of threat escalation. The leadership in Teheran presently feels beleaguered, paranoid, and intimidated by changes occurring both in the neighborhood and in the international environment.

Iran's mullahs are fighting a rear-guard action to save a revolution, and the removal of one or two leaders will make little difference to the governance of the country. Without a doubt, the unpopularity of the Iranian regime is second only to the impotence of the opposition, both inside and outside the country. Most Iranians would probably rejoice if the mullahs were removed from power.

Iran's rejection of the Arab-Israeli peace process and its support for regimes and groups intent on using force to overthrow legitimate governments ensure continued conflict with moderate states in the Middle East and outside powers, especially the United States. Indeed, Iran's leaders have rejected American calls for an official dialogue to discuss major points of contention. Although significant voices in Teheran have favored such a dialogue in the past, the radical factions headed by Khamenei have effectively torpedoed any prospects for talks in the near future. Many American observers of Iranian politics believe that the radicals fear American military power less than the prospect of America's establishing itself as the leader of Western secularism and the generator of a global culture that threatens the very essence of the revolution. Iran's ability to influence political events in the Middle East is clearly linked to other factors over which it has only marginal—if any—control. A revolution in Algeria leading to the establishment of an Islamic regime could have profound implications for the stability of the Mediterranean, including Egypt. A collapse of the Arab-Israeli peace process, aided and abetted by Iranian interference, also could have a profound and negative domino effect on the region. The resurgence of Saddam Hussein or an equally ruthless successor in Iraq could likewise spell danger.

From an American perspective, the search for an optimum policy towards Iran and the Gulf remains illusive and fraught

with dangers. At one level, military cooperation with the GCC has gone from strength to strength, and the deployments of American forces to Kuwait during October 1994 demonstrated that it will be a long time before either Iran or Iraq can directly challenge the US and GCC with military force. However, the political and sociological dimensions of Gulf security pose more complicated problems. Without GCC cooperation, the US will not be able to protect the Gulf from major threats. The stability of the Gulf will depend on how well the US can maintain a delicate balance between security needs and political action.

Notes

1. This material draws upon a recent book by the author, *Forever Enemies? American Policy and the Islamic Republic of Iran* (Washington, D.C.: Carnegie Endowment for International Peace, 1994).
2. Islamic Republic of Iran Permanent Mission to the United Nations, "Defence Minister: Iran Will Not Be Dragged into Mid East Arms Race," release no. 075, 15 April 1993.
3. For more information on Iran's military programs, see Shahram Chubin, *Iran's National Security Policy: Intentions, Capabilities, and Impact* (Washington, D.C.: Carnegie Endowment for International Peace, 1994).
4. R. James Woolsey, "Challenges to Peace in the Middle East," *Peacewatch*, no. 33 (26 September 1994).
5. Mark Hibbs, "Iran May Withdraw from NPT over Western Trade Barriers," *Nucleonics Week* 35, no. 38 (22 September 1994): 1.
6. "Iran May Turn Down Third 'Kilo' Delivery," *Jane's Defence Weekly* 22, no. 14 (8 October 1994): 4.
7. Youssef Ibrahim, "Arabs Raise a Nervous Cry over Iranian Militancy," *New York Times*, 21 December 1992, A1, A10; and *Al-Sharq Al-Awsat*, 19 November 1992, 1, in FBIS [Foreign Broadcast Information Service]-NES, 23 November 1992, 52.
8. "Algeria Breaks Diplomatic Ties with Iran," Reuters, 27 March 1993. An abbreviated version of the Reuters report appeared in "Algeria Breaks Ties with Iran," *New York Times*, 28 March 1993, 14.
9. "U.S. Sees Iranian Role in Buenos Aires Blast," *New York Times*, 9 May 1992, 3. The US statement explained that "information has been gathered that indicates Iranian involvement in the attack, but there is not conclusive evidence at this time."
10. According to People's Mujahideen press releases, Ghorbani was kidnapped in June 1992 and then tortured and murdered with direction from Teheran. See also "Turkey Asserts Islamic Ring That Killed Three Has Iran Links," *New York Times*, 5 February 1993, A6; and "Widow of Iranian Dissident Blames Teheran in His Death," *New York Times*, 10 February 1993, A14.

11. *Voice of the Islamic Republic of Iran*, 27 October 1994, in FBIS-NES, 27 October 1994, 42–44.
12. "Comfort Blanket for the Gulf," *The Economist*, 5 December 1992, 39–40.
13. "Buying Security from the West," *Jane's Defence Weekly*, 28 March 1992, 534.
14. Michael Gordon, "Kuwait Is Allowing U.S. to Station a Squadron of Warplanes," *New York Times*, 28 October 1994, A3.

Chapter 12

Opportunities for Change in Iran*

Kenneth R. Timmerman

The litany of Iran's misdeeds has been spelled out in detail by Secretary of State Warren Christopher and other US officials in public speeches, articles, and discussions with foreign leaders. Iran's support for international terrorism, its self-avowed goal of obstructing the Arab-Israeli peace process, its nuclear weapons program, its subversion of neighboring regimes, and its grotesque violation of human rights are not a subject of dispute. Clearly, we have a regime in Tehran that is inimical to the United States and its interests around the world. What *is* in dispute is what we can do about it.

Simply put, we have two basic policy options, each with its own multitude of variants. Either we take an activist's approach and seek a change of regime in Tehran or we take the accommodationist's approach and try to work out some modus vivendi with the ruling clerics. There is no middle ground between these two positions—a situation I believe to be one of the fundamental errors of dual containment, which otherwise represents a positive advance in US policy.

Much can be said for going forward with caution. The United States has been burned before in its dealings with Tehran, and, increasingly, we have clear signs that the regime is in trouble. One could argue that by waiting and standing off, the US could reap the fruits of the activist's approach without ever exposing itself to the dangers. The regime could very well fall on its own.

Although this proposition is very tempting, it is simply too good to be true. After 16 years of revolution, Tehran's leaders are still obsessed with the United States. If things get worse and they feel their regime begin to totter, they will lash out against the US as the cause of their demise, regardless of

whether the US is involved or not. In the eyes of the ruling clerics, the US is already seeking to undermine their regime and has been for the past 16 years. We can protest our innocence all we like, but to President Hashemi Rafsanjani, Ayatollah Ali Khamenei, and their colleagues, we are the enemy—and we are directly responsible for all their ills.

In April 1995, during a state visit to India, the "moderate" Hashemi Rafsanjani drummed this point home once again in a speech to 10,000 Indian Shiite Muslims. "Just as you have fought against British imperialism," he said, "we have also been battling against American imperialism."[1]

So obsessed are the Iranians with the United States that not only do they continue to celebrate, every year on 4 November, the seizure of the US Embassy in Tehran but they also celebrate, on 9 April, the breaking off of diplomatic ties between the two countries.

On 9 April 1995, Parliament deputy speaker Hassan Ruhani, who is also Ayatollah Khamenei's personal representative on the Supreme Council for National Security, ridiculed the US because it was "desperate" to open negotiations with Tehran. "The Americans tell the world that Iran is a dangerous country," he said, "but they themselves want to talk to us."[2]

While I suspect the initiative here is really on the Iranian side—because the Iranians are worried that the US sanctions will severely disrupt their economy—it is clear that, seen from Tehran, any expression of US willingness to talk, negotiate, or hold official government-to-government contacts is a sign of US weakness.[3]

Similarly, whenever the State Department announces that the US is not opposed to the Islamic Republic but only to its policies, Iranian leaders take heart. They believe the US is so anxious to renew ties with Tehran that it is preparing to send secret envoys to discuss new business. Instead of appeasement, a more assertive approach would invoke the inalienable right of the Iranian people to choose their leaders and their form of government through popular consent.

Our allies in Europe and, to a lesser extent, Japan find too radical even the current US approach—which seeks to end preferential trade, conventional arms sales, and dual-use technology transfers to Iran. Instead, the Europeans are

pursuing a "critical dialogue" with Tehran, which allows them to pretend they are preserving their fundamental values and respect for human rights, all the while feeding the Islamic Republic with the best technology they have.

Here is how the European approach works. When German foreign minister Klaus Kinkel goes to Tehran, he meets with Ali Akbar Velayati and presents him with a formal "nonpaper" on Iran's human-rights abuses. Then he pulls out of his briefcase a sheaf of contracts that German companies are seeking with Tehran, and the ink begins to flow.

I recently participated in a dialogue with a senior German diplomat at a forum chaired by Peter Rodman when he was still at the Center for Strategic and International Studies (CSIS) and asked the diplomat if he could point to a single Iranian concession over all the years of "critical dialogue." Our German colleague hesitated a bit, turned slightly red, and then acknowledged that he could not.

Since 1982, Germans have sold on the average $2.5 billion worth of high-technology goods to Iran. What they have gotten in return is a well-funded Iranian intelligence network implanted on German soil, infiltrating the Muslim immigrant population, assassinating Iranian opposition figures in public restaurants, and using private German airports and German front companies to purchase technology so sensitive for the Iranian nuclear weapons program that even the German government would not authorize its sale to Iran.

German machine tools can be found in every Iranian weapons plant, from companies such as Georg Fischer, Frederick Deckel, Fritz Werner, and Leybold. German chemical companies, including the giants Bayer and BASF, have built a pesticides plant in Qazvin that was so perfectly conceived for the production of nerve gas that the German government had to intervene in 1992 to block any further deliveries (but since the plant had already been operating since 1988, the damage was done). Under intense US pressure, Germany withdrew its offer to rebuild the damaged Bushehr nuclear power station in 1992, paving the way for the current Russian contract.

Germany, of course, is not alone. Iran became Italy's third-largest client for machine tools in 1994, with sales of some $160 million—much of it to Iranian dual-use facilities. Britain,

Switzerland, Belgium, Austria, and even Canada do a thriving business in high technology with Iran. Japan's Kawasaki Heavy Industries is engaged in reengining a fleet of rapid patrol boats purchased from the former East German navy and fitting them out with new weapons systems. Alone among our allies, France has taken a more responsible stand toward its own dual-use technology sales to Iran. But as the recent alleged transfer of Exocet missiles to Iran by the government of Prime Minister Edouard Balladur shows, France will not hesitate to ship arms to Iran if it sees a benefit to such a move.[4]

The Clinton administration has not been sitting idly by, and I commend their efforts to get our allies to cooperate in stemming the flow of dangerous technologies to Iran. But as shown by the few examples I have cited, polite diplomacy is not enough. Europe will continue to pursue its policy of critical dialogue as a fig leaf to disguise its naked mercantilism until it is forced to do otherwise. This is just appeasement by another word.

Critical dialogue with the regime in Tehran offers the US no leverage to achieve its policy goal, which is an end to disruptive Iranian behavior, including Iran's increasingly assertive threats to world oil supplies. If Iran's track record with Europe provides any measure, then accommodation only emboldens Iran's leaders to increase their support for international terrorist groups, to further disrupt the peace process, to more flagrantly subvert neighbors such as Bahrain, to pursue their military buildup in the Strait of Hormuz, and to continue their quest for a nuclear weapons capability that is yet one more tool in the mullahs' hands toward regional domination.

So what leverage do we have if we abandon any hopes of reforming the mullahs in Tehran? The notion of containing Iran without engaging the regime is a tempting one. Why not work with our allies to stop the things that are truly dangerous and that are feasible to stop, while allowing them to continue less sensitive trade if they so desire?

The simple answer is that containment is no longer enough. Iran has been too successful in procuring nuclear weapons technologies, in spite of our entreaties to our allies. When we have been successful and have blocked a problematic sale,

Iran has simply gone shopping in Russia, China, and India. We need more powerful tools.

Further, many of our allies simply don't share our perception of the Iranian threat. I have sat and listened to senior officials in Paris, Bonn, and elsewhere complain that the US is exaggerating Iran's nuclear weapons program and that until some "hard proof" emerges of Iran's intentions, civilian nuclear trade should be allowed to continue. We hear the same argument from the Russians today—and to a lesser degree from the US Commerce Department, which claims that its control lists are so effective in preventing the licensing of sensitive technology for sale to Iran that trade with that country does not pose a strategic threat to the United States.

As with Iraq in the late 1980s, we could show our friends reams of evidence—as I believe we have—and still they would find fault with it. The lure of huge export sales is simply too great, while the holes in Western export controls are large enough to drive a bomb through.

The most stinging rebuff to dual containment was delivered in person by German chancellor Helmut Kohl, who stood on the White House lawn with President Clinton on 9 February 1995 and complained of US hypocrisy in asking Germany and other allies to curtail their dual-use sales to Iran. If the US were truly concerned about support for the Iranian regime, it should look at who is buying Iranian oil. The culprits are not German oil companies, he said, but American oil companies. The US should put its own house in order before telling its allies what to do.

The Clinton administration has apparently concluded that the German chancellor is right about oil. US oil companies purchase nearly one-quarter of all Iranian oil exports.

Now, I have no illusions about what Germany and our other allies will try to do once we ban US companies from purchasing Iranian oil. So far, the only ally that has indicated it might adopt a similar measure is Japan. If the Japanese come through, however, this ban could make a major dent on Iran's ability to market its oil—and, hence, Iran's ability to support expensive purchases of dual-use technology and terrorist programs abroad. US and Japanese companies

combined bought 1.2 million barrels of Iranian oil per day in 1994—some 42 percent of all Iranian oil exports.[5]

A ban on oil purchases will send a clear signal to our allies that not only do we *say* we mean business—because dual containment is very clear on that—but that we really *do* mean business when it comes to putting pressure on the Tehran regime. The real key is whether it will prompt them to reevaluate their position.

An oil ban alone makes a strong moral statement. But applied in isolation, it is unfair to US companies, who have been pursuing business that our policy has allowed—up until now. Moreover, it is unlikely to have any more effect on the Europeans than our polite diplomacy has had in the past. Europe is in the midst of a chronic economic slump that it cannot seem to shake, with unemployment running at an average 12 percent—significantly higher in some countries. The European economies depend far more on exports than the US ever has. In Germany, for instance, nearly 50 percent of economic output is exported, as compared to just over 10 percent in this country.

Even the oil ban could be strengthened. A number of foreign oil firms do business in the United States—including British Petroleum, Shell, Agip, Sumitomo, Tomen, Elf-Aquitaine, and Total. Why should US oil firms alone take the hit for a policy toward Iran that Washington believes is aimed at protecting the collective security of all of our allies? After all, Japan and Europe depend far more on Gulf oil than we do. If the US is supposed to maintain security in the Gulf, then our allies can help when we believe that collective security is at stake.

Moreover, I believe that the president and our diplomats need a more powerful tool of suasion that they can use with discretion to get reluctant allies to come on board and do what they otherwise might eschew because of a short-sighted vision of their own self-interest. Banning foreign companies from selling their goods in the United States if they continue to trade with Iran would not just send a clear message to our allies: it would drive them in panic from Tehran.

We are talking about big-name companies here: Siemens, Daimler Benz, Toyota, Aérospatiale. Given the choice of doing

business with Tehran or doing business in the US, most would choose the US at the drop of a hat.

What I am suggesting, of course, is an activist's approach. I do so because I am convinced that no one can reform a regime that takes its cue from God.

A friend of mine in Paris, a colonel in the Iranian army, once joked to me at the height of the Iran-Contra affair about the US delusion in seeking moderates in Tehran. "The most moderate of them all is Ayatollah Khomeini," he said.

The prince of the so-called moderates, Hashemi Rafsanjani, sits in on every single meeting of the Supreme Council on National Security that deals with Iran's nuclear weapons program. He personally takes part in every decision to dispatch a hit team to assassinate Iranian leaders in exile. As one senior US official put it recently, "Iranian 'pragmatism' as personified by President Rafsanjani can best be described as the willingness to use the weapon of terrorism when it is in Iran's interest, while resorting to the tools of diplomacy when it is not."[6]

But a more profound reason exists for favoring a more assertive approach at this juncture in history: it could actually work. The regime in Tehran is in turmoil. In the 16 years since the revolution against the shah and the coup d'etat by followers of Ayatollah Khomeini, never before have Tehran's rulers had to confront such massive social, political, and economic difficulties as today.

Over the past three years, riots have erupted in virtually every major Iranian city, including the bloody clashes that took place on 4 April and 16 April 1995 in the Tehran suburbs, in which as many as 150 people were reportedly killed.

Even Iran's clergy, once the very backbone of the regime, has turned against it in recent years, creating a crisis of legitimacy for a government that calls itself "Islamic." Of the remaining grand ayatollahs still living in Iran—Ali Hussein Montazeri, Hassan Tabatabai-Qomi, Mohammad Rouhani, and Sadeq Rouhani—all oppose the regime and have called for the abolition of its most basic institution: the *velayet faghih*.[7] All are also under house arrest.

Many, many signs indicate that all is not well in Tehran today and that the regime is desperately looking for a way out. We report on this regularly in *The Iran Brief.* As the protests become bloodier, the regime is seeking "front men" such as Ibrahim Yazdi—foreign minister in the first cabinet of Mehdi Bazargan in 1979—who could lead a transition government that would allow them to escape the wrath of the people and to expatriate the billions of dollars they have extorted in their official capacities over the past 16 years.

I have been asked by senior US officials what we can hope for in Iran. Where is the opposition, they wonder? Why do we never hear of organized groups inside Iran? Why do the exiles continue to bicker?

Judging the Iranian opposition is easy for people who sit in Washington with no one pointing a gun at their heads. Many of the people in exile still have families in Iran, while those who are in the country and have dared raise their voices walk a fine line between prison and summary execution.

Has there been no opposition in a country where more than 10,000 people have been executed over the past 16 years for political crimes—a country which in 1994 detained 19,000 people as political prisoners, according to Galinda Pohl, the United Nations rapporteur for human rights?[8]

Is there no opposition when in major cities such as Meshed, Qazvin, Tabriz, Isfahan, and Tehran riots break out and escalate so quickly that the regime must call out special political shock troops to put them down—often at the cost of dozens of casualties?

Is there no opposition when a renowned Iranian writer, Ali Sirjani, is tortured to death in 1994 for having criticized the regime in print? Or when a major Tehran newspaper is closed for having published a satirical cartoon depicting Iran's supreme leader, Ayatollah Ali Khamenei, early this spring?

Is there no opposition when the former head of the military police, Gen Azizollah Amir Rahimi, is imprisoned in October 1994 for having published an open letter calling on the mullahs to turn over power to a democratically elected government?

Is there no opposition when the leader of a banned political party, Daryoush Forouhar, issues a "Letter to the Iranian

Nation" on 21 March 1995—the ancient Persian holiday of Now Ruz—calling on Iranians to overthrow the Islamic regime?

And is there no opposition when 15 acting Iranian generals, including five brigadiers from the Revolutionary Guards Corps, send a letter to Ayatollah Khamenei calling for "an end to clerical meddling in the nation's politics" and expressing their support for the imprisoned General Rahimi?[9]

I believe that a window of opportunity has opened in Iran—an opportunity for change which, if managed right, could lead to a pro-Western, democratic regime.

Can the US hope to influence the course of events? I believe that the answer is yes: cautiously, from a distance, and primarily through public diplomacy. My prescription is as follows:

- Temporarily cut off US trade with Iran, clearly linking this action to Iran's unacceptable behavior. To be effective, the trade ban must be enforced by sanctions of foreign companies that seek to violate it. This would also entail the activation of existing legislative sanctions against China and Russia for their nuclear deals with Iran.
- Increase public funding for broadcasting in the Farsi language into Iran. Unfortunately, in response to Republican legislation, the administration has cut back the funding for the Voice of America—including its Farsi language service—as part of an across-the-board cost-cutting measure. The Central Intelligence Agency has also terminated some funding for opposition radio broadcasts into Iran, which should be reinstated and expanded.
- Initiate public funding for human-rights reporting inside Iran, to give better and more graphic coverage of demonstrations, protests, and acts of repression by the regime.

These three steps would constitute a "containment-plus" policy, which I believe is firmly grounded in the traditions of US foreign policy toward inimical regimes. Either we can compose with Iran—in which case, let's get down to business tomorrow—or Iran has become an enemy of the United States.

If Iran *has* become an enemy and if it is indeed pursuing the policies so vigorously opposed by the Clinton administration,

then we need a more vigorous response than dual containment to counter Iran's behavior.

Imagine for an instant what the Middle East would be like if the Islamic Republic ceased to exist and Iran were governed by a parliamentary democracy that respected free speech and the rights of women and that abstained from foreign adventurism. I believe that policy goal is one which any administration—Republican or Democrat—would be proud to pursue.

Notes

1. "Iran, U.S. Exchange Barbs on Indian Soil," Reuters, 18 April 1995.
2. Kiannoche Dourranieh, "Iran Claims US Is Desperate to Open Negotiations," French Press Agency (AFP), 9 April 1995.
3. The US acknowledges direct contacts with Iranian government officials at the International Claims Tribunal at The Hague and through the Swiss Embassy in Tehran, which represents US interests in Iran. It does not acknowledge any other contacts with Iran, either directly or indirectly.
4. Jean-Marc Govin and Jean Lesieur, "Iran: La Pasqua Connection," *L'Express*, 23 March 1995.
5. "Buyers of Iranian Oil," *The Iran Brief*, 5 December 1994.
6. Statement by Charles Dunn, deputy director of the State Department's Office of Counterterrorism, quoted in "State Criticizes Iran's Terrorist Record," *The Iran Brief*, 3 April 1995.
7. This is the notion that a cleric, initially Ayatollah Khomeini, should be the "supreme guide" of the state government. The guide also serves as commander of the armed forces and has powers exceeding those of the president or any other elected official.
8. Reuters, 21 February 1994. Amnesty International reports the figure of 10,000 publicly announced executions since the 1979 revolution, while Iranian exile groups say the true figure is many times higher.
9. *Keyhan* (London), 30 March 1995.

Chapter 13

The Stalemate in US-Iran Relations

Gary Sick

Talking about what the United States should do about its Iran policy without asking what Iran should do about its US policy is an exercise in futility. In this case, it really does take two to tango. Unfortunately, neither Iran nor the US is even close to the dance floor, let alone an embrace, however tentative it might be.

The simple fact is that the US is unlikely to consider doing anything toward Iran beyond plotting to make life more difficult for that country. Iran will respond to this in its time-tested way—shouting revolutionary slogans, commemorating the dates of its most famous victories over the US, and chanting "Death to America" on all public occasions.

The US and Iran are in a mutual propaganda trap. Each of us demonizes the other. In fact, this process has become something of a cottage industry in both countries.

In the US, we have resorted to what might be called policy by thesaurus. US officials and those people who wish to jump on the bandwagon have standard names for Iran: *outlaw state, rogue state, backlash state* (whatever that is). There should be a prize for this name-calling process. Why not *demon* or *villain* or *fiend* or *renegade* or *maverick* or *heretic* or *misfit?*

We repeat these formulas in the same rote fashion as Iranians intone the "Great Satan" formula. A recent visitor to Iran noted that the dutiful chants of "Death to America" at a public meeting had an eye-glazing quality. "When we chant 'Death to America,'" one 21-year-old student said later, "it's supposed to mean American policies and not the American people. But I'd like to see America for myself, away from all this bombardment of propaganda."

In reality, most Iranians are woefully uninformed about the United States, relying on a mixture of official propaganda and soap operas. They will soon lose the soap operas when their

satellite dishes are taken away from them. I don't know if that is a net gain or loss for their ability to understand what is going on in this country and its society.

Similarly, in the US, we mostly hear the official mantra—rogue, outlaw, backlash. The media repeats all of this and amplifies the noise. However, when the media takes the effort to send a correspondent to Iran—which several major news organizations have done recently—the stories that come out reflect a much more complex reality than the one-dimensional reporting of the administration and its acolytes.

These stories do not make Iran out to be a pretty place. It is not a pretty place. But the complex picture of Iran 17 years after the revolution is blurred and obscured by the mindless repetition of the thesaurus.

We are trapped in a 1979 time warp. Both the US and Iran conduct their official discourse as if nothing had happened in the last 17 years. The effect is bad information, bad policy, and an escalating cycle of hostility. One of the results of shouting past each other is that any genuine offer of dialogue, which typically is offered in a lower tone of voice, will be drowned out by the megaphones chanting the latest mantra.

I wish to examine here what the US might do to improve its policy toward Iran. This question is really hypothetical. I detect no willingness even to consider changes except to seek new rhetoric to condemn Iran or the adoption of policies intended to punish it—but which are more likely to have the effect of shooting ourselves in the foot. Iran is marginally more interested in a dialogue than is Washington but remains unwilling to take the kind of dramatic steps that would be required to break the present cycle. So I see little or no chance that we are going to see any breakthroughs in US-Iran policy in the near term, barring some remarkable and unanticipated change in attitude on one side or the other.

Under these circumstances, perhaps the most interesting question is, Would we have anything to talk about if we decided to talk? The answer is definitely yes. Iran is the largest country in the Gulf, with the most people and longest coastline. It is not going away. The US is the predominant military and political power in the region, and it will probably remain so for many years to come. Iran and the US have major

interests in the region; some of those conflict, but others are shared. We are not lacking for things to talk about. But let's be more specific.

The first benefit, which probably would have to precede even an agreement to talk, would be a lowering of the propaganda noise on both sides. That is a necessary precondition for achieving anything more substantive, and it is the most obvious obstacle to any progress at the present time.

Second, if the two sides chose to have a dialogue, after what might be an initial face-to-face shouting match, each side would have to begin to establish priorities—to define exactly what it would like to achieve with the other. That in itself would be a useful exercise.

Today Iran routinely denounces the US as the "world-devouring arrogance"—a catchy phrase that it often combines with a call for US withdrawal from the Persian Gulf. That isn't much of a negotiating agenda. If real talks materialized, Iran would have to consider what it might realistically expect to achieve.

Negotiating a reduction in US military presence in the Gulf, for example, might be possible—perhaps in return for an agreement on Iran's part not to acquire certain long-range military systems that are seen as particularly threatening to US and Arab regional interests. Such a bargain could serve the interests of both parties: (1) US military downsizing may soon generate nearly irresistible pressures for the US to reduce its active military presence in the Gulf, even without such a bargain; (2) on the other hand, Iran is barely able to find the hard currency to pay for the long-range systems it is trying to buy from Russia and others.

Present US policy calls for Iran to change its behavior in six different areas (active opposition to the peace process, fishing in troubled water in other countries, terrorism, purchases of conventional arms, acquisition of weapons of mass destruction, and human rights). If the Iranians were miraculously to comply, our policy statements mention no benefits that they could anticipate as a result of their newfound enlightenment.

Assuming a dialogue were to begin, the US would have to (1) define more clearly which of these behaviors are more important, (2) offer a more precise definition of what we would

expect from Iran, and (3) give some indication of what we might be prepared to offer in return. Let us examine a few concrete examples.

Iran is attempting to acquire an infrastructure of equipment and expertise that could be used for the development of nuclear weapons. Although great differences exist in the estimates about just how close Iran may be to achieving that objective, most of us Americans can agree that preventing this from happening is very much in our interest.

Ideally, we would like to see Iran denounce nuclear activities of all kinds. In reality, we might have to settle for something less. A realistic negotiating objective might incorporate the following elements: (1) Iran contracts to return all irradiated fuel to the original suppliers for treatment or disposal; (2) Iran renounces acquisition of reprocessing and uranium-enhancement technology beyond the laboratory level; (3) in return, the US agrees to withdraw its opposition to the sale of light water reactors; (4) both sides reaffirm their adherence to the provisions of the Nuclear Nonproliferation Treaty (NPT), including intrusive inspections by the International Atomic Energy Agency (IAEA); and (5) the US and other suppliers maintain their embargo on the sale to Iran of equipment and materiel associated with the development of a nuclear weapons program but permit international loans and credits for the development of other sources of power (e.g., hydroelectric).

This negotiating scenario could be expanded to cover many of the issues that bedevil US-Iran relations. For example, concrete proposals could be explored on Iran's policies toward the peace process, on terrorism, and on other key matters.

Frankly, elaborating such a negotiating strategy hardly seems worth the time and effort when there is no apparent will in either Iran or the US to pursue it. At this stage, such efforts amount to little more than wishful thinking.

However, the present policies of both Iran and the US also amount to little more than wishful thinking. Iran is guilty of wishful thinking if it believes that the US can be driven from the Gulf by rhetorical denunciations and periodic attempts to drive wedges between the US and its Arab allies in the Gulf region. Much less can Iran expect to position itself militarily—

even if it vigorously pursues the nuclear option—to frighten the US away from its doorstep.

Similarly, the US is deluding itself by believing it can single-handedly isolate Iran or even—in the romantic notions of some observers—bring down the present regime. Ferment is indeed present in Iran today, but that ferment is due to its own internal dynamic—not to anything we have done or not done.

The revolution is over, and the fiery slogans have a hollow ring. Khomeini said the revolution was not about the price of melons, but it turns out that it is! The demonstrations in Iran are not about clerical rule or a return to the monarchy or even about democracy and human rights. They are about quality of life, drinking water, inflation, housing, and jobs. The demonstrations are serious—not because they threaten to overturn the government but because they force the government to confront its failure to keep promises and to deal with fundamental economic issues.

Some very serious antiregime demonstrations going on in the Gulf today do have the possibility of undermining an existing government. However, those riots are not in Iran—they are in Bahrain, where a low-level rebellion has been under way since December 1994.

In Iran, two processes of change are under way, both of which are extremely important to US interests. The first is domestic. An intellectual ferment is afoot in Iran that some of the participants refer to as a reform movement. A new generation of Iranian scholars and intellectuals is asking questions about the present political system. Writers are openly challenging the concept of clerical rule, and some are even calling openly for the mullahs to return to the mosque. Unlike most other countries in the Middle East, these individuals are permitted to travel abroad, to meet with their counterparts from other countries—including the United States—and to express their views in scholarly meetings. The political system in Iran tolerates this activity, but it is worth noting that boycott bills pending in the US House and Senate would not. Instead, they would make it a crime for Americans to have any dealings with Iranians for any reason whatsoever.

The second process under way is the emergence of a new nationalism in Iranian foreign policy. In the early 1980s, Iran thought it could transform the entire world in its own image. Those days are over. The ideological fever has subsided, and Iran has begun to recognize that it must coexist with the rest of the world.

Curiously, this recognition has taken the form of returning to the plans and strategies of the shah's era. The best example is the purchase of submarines. President Hashemi Rafsanjani addressed Iran's motivations in a press conference in January 1993:

> The purchase of submarines goes back to before the revolution. It has nothing to do with this period. Before the revolution, the previous regime purchased a number of submarines from Germany and America, and they had started to build bases for them. With the revolution, Germany and America stopped the contracts and our claim is still outstanding. After the revolution, we proceeded along the same line, except through Russia.

The same thing is true of Iran's policies on nuclear proliferation at the United Nations, where its spokesman proudly proclaims that "Iran was the first country to propose a nuclear-free zone in the Middle East," which of course refers to the shah's proposal in 1974. The fact that an Iranian says this without blushing is something quite new. Making such a statement would have been impossible a few years ago. This new sense of nationalism and pursuit of Iran's national interests without regard to ideology or even to religion is also visible in its reaction to Russia's suppression of the Muslims in Chechnya and to Iran's mediation attempts in Azerbaijan, Tajikistan, Afghanistan, and elsewhere in Central Asia.

This change does not make Iran any less dangerous or more reassuring to its neighbors. On the contrary, most of the Gulf states had problems and concerns with Iran when it was under the shah.

The point, however, is that Iran today is becoming increasingly aware of its long-term national interests and the need to subordinate ideological objectives to those interests. As a consequence, dealing with Iran as a more conventional state is becoming possible.

Iran today is less of a threat to its neighbors and to the international system than the Iran of 1979. Ideologically, much of the early boisterousness of the revolution was eroded by war, the relentless pressure of economic realities, and the unforgiving demands of governing a large country with severe problems. Today, Iran is much less likely to undertake adventurous and costly interventions in the affairs of its neighbors than it was in the 1980s.

Even if Iran wanted to interfere regionally, its capabilities are substantially reduced. Iran is still a power to be reckoned with in the Gulf, but its economic and military strength relative to its neighbors is an order of magnitude lower than it was in prerevolutionary days. It has not lost the capacity to do mischief, but it is likely to do so with much greater caution and with a greater awareness of the potential costs than was the case immediately after the revolution.

These basic trends are largely overlooked in the US, partly because we are preoccupied with reciting our current mantra but also because Iran perpetuates the myth of a rampaging, ideologically crazy state. In a telling moment of candor, Rafsanjani described the dilemma. In one of his weekly public addresses, he complained that Iran always seems to be blamed for any radical activity anywhere in the world: "Everywhere there is a movement, the name of Islam and Iran is mentioned. The enemies even mention Iran's name where Iran is not present. . . . In many events we really are not involved; yet, they point to Iran."

Then he paused for a moment and added, "Of course we accept it and take pride in the fact that the root of all this lies in the Islamic revolution. Iran is the mother of Islamic nations."

So I have no good news to offer. One cautionary remark is in order. Two cardinal tests should be applied to any foreign policy initiative: (1) Does it do more harm than good? (2) Does the policy have a realistic prospect of accomplishing its intended objective?

As they are presently being conducted, both US and Iranian policies fail both of those tests. Surely we can do better.

PART 5

Fighting Proliferation: Devising a Strategic Response

Chapter 14

DOD's Counterproliferation Initiative: A Critical Assessment

Chris Williams

On 7 December 1993, Les Aspin—then the secretary of defense—announced a new Defense Counterproliferation Initiative (DCI). According to the secretary, the spread of weapons of mass destruction represented one of the most direct and urgent threats facing US national security. Aspin contrasted the old nuclear danger of a massive Soviet first strike with that of "perhaps a handful of nuclear devices in the hands of rogue states or even terrorist groups. The engine of this new danger is proliferation." He also stated that "with this initiative, we [at the Department of Defense (DOD)] are making the essential change demanded by this increased [proliferation] threat. We are adding the task of protection to the task of prevention. . . . At the heart of the Defense Counterproliferation Initiative, therefore, is a drive to develop *new military capabilities* to deal with this new threat" (emphasis added).[1]

This announcement of DCI was met with concern in some quarters and confusion and derision in others. If the objective was to provoke a reaction, then Secretary Aspin clearly succeeded.

This essay highlights the reactions of several different domestic groups and bureaucracies to the DCI and then offers some personal views (and they are just that because I don't speak for the House Armed Services Committee or its members). I will try to show that, although the DCI got off to a rocky start—in large measure because of DOD's own foibles—the initiative does hold the promise of better focusing US military planning and capabilities on the threat posed by the proliferation of strategic technologies. However, I also believe that, if the initiative is to meet with success, it will have to evolve from its current—almost exclusive—emphasis on *acquiring new hardware* and instead concentrate more on developing and implementing *a broad, multifaceted "competitive strategy"* to

deny any adversary the ability to benefit politically or militarily from the acquisition or use of strategic technology.

The arms-control community regarded Aspin's speech as a declaration of war on traditional nonproliferation tools such as diplomacy and arms control. Aspin seemed to be suggesting that failure in US and international nonproliferation efforts was preordained. One should note, however, the secretary's statement that "prevention remains our preeminent goal. . . . The DCI in no way means we will lessen our nonproliferation efforts."[2]

Still, critics in the arms-control community would not be mollified. From their perspective, the Aspin speech appeared to be yet another half-baked idea from the same group—the Office of the Secretary of Defense (OSD)—whose credentials were already tarnished by the positions it had taken on the important issue of export controls. Specifically, these critics objected to the new administration's export "decontrol" policies and practices, including its actions to massively decontrol certain dual-use technologies such as computers and telecommunications and to disestablish the Coordinating Committee on Multilateral Export Controls without having another international body to function in its place.

The arms-control community also reacted negatively to the evident endorsement—in a public forum—by Dr Ashton Carter, in writings prepared just prior to his appointment, of using preemptive military strikes as a means of "solving" the proliferation threat.[3] Most arms-control proponents are not in favor of preemption, preferring to endorse reliance on diplomacy and other measures aimed at slowing or reversing proliferation. It is worth noting, however, that in hearings in 1994, some legislators who favored arms control opposed the development and deployment of US missile defenses on the grounds that emerging missile threats could be defeated through preemptive military attacks. Evidently, a split may exist in the arms-control community on this question.

How did various executive departments and agencies react to Aspin's announcement? The State Department viewed it as a challenge to its preeminent role in dealing with all things related to proliferation. Officials there moved right away to limit the scope of the DCI to protect their role as vicars of nonproliferation policy. To achieve this objective, they turned to Daniel

Poneman, an ally on the National Security Council (NSC) staff, who obliged them by promulgating a set of formal definitions for the terms *nonproliferation* and *counterproliferation*. The definition restricted counterproliferation only to "weapons of mass destruction" and placed it under—or subservient to—the administration's broader nonproliferation efforts.

The Department of Energy (DOE)—particularly its Defense Programs element—saw the DCI as a means of reversing the downward spiral of its budget. The national laboratories, in particular, saw it as a potential godsend; after all, their primary mission—the development and testing of nuclear weapons—clearly does not have the support of the Clinton administration. Thus DOE scientists are seeking to sustain certain critical skills through challenging projects other than nuclear testing—and the DCI holds great promise in that regard.

The military services reacted skeptically, seeing the DCI as (1) a potential drain on service budgets already strained to the breaking point and (2) as another OSD-driven "initiative," such as the Strategic Defense Initiative: imposed from above without a great deal of forethought and with little or no involvement of the military. Their concern was heightened when Dr Harold Smith, assistant to the secretary of defense for atomic energy, speaking at a conference in New Mexico, suggested that DOD would budget $300–400 million per year on the DCI, mostly for new hardware programs. How would OSD seek to pay for this new, unfunded mandate? Each of the services fully expected to be hit with a "tax" that would further undermine readiness and slow the few remaining modernization projects.

The services also reacted negatively to the blunt challenge issued by OSD's Dr Carter. In a July 1994 interview with *Jane's Defence Weekly*, Carter warned that DOD civilians would dictate to the services how much would be spent on the DCI. According to him, if the services "do not hear the music, then we will have to do it ourselves."[4] This sort of statement clearly did not convey a strong willingness on the part of senior OSD officials involved in the DCI to take into account service concerns.

Likewise, the Joint Staff appears to have been surprised by the announcement. It forced the staff to begin to consider issues such as whether counterproliferation represented a "new mission area"—or, if not, what it did represent—and

whether a single commander in chief (CINC) such as the CINC of US Strategic Command should be granted lead responsibility for planning and executing counterproliferation operations. Furthermore, the Joint Staff agreed with the services in questioning the wisdom of spending vast sums per year on counterproliferation-related technologies and hardware.

In response to a report of May 1994 to Congress by Deputy Secretary of Defense John Deutch detailing how the $400 million per year for DCI would be spent, Adm William Owens, vice-chairman of the Joint Chiefs of Staff (JCS), moved to make counterproliferation a key area of focus in his joint war-fighting, capability-assessment program. The objective was to provide a war fighter's perspective on which technologies and systems truly merit additional funding in an era of constrained resources. Owens's gambit proved successful; in fiscal years 1996 through 2000, DOD will program (i.e., budget) approximately $60–80 million for counterproliferation instead of the $400 million contemplated earlier by OSD civilians.

How valid are the criticisms and concerns expressed by various interest groups and bureaucracies? First, I understand the concerns that many people in the arms-control community and elsewhere share regarding preemption. But no one would debate that in a war, we would want to be able to limit the damage an opponent might inflict upon us or our allies with strategic weapons. This necessarily means that we must have the capability to knock out certain targets. But theoretical arguments about preemption ultimately make it harder for us to acquire the capabilities that everyone agrees we need.

Furthermore, I do not believe, as the State Department apparently believed, that its preeminent role in the formulation of nonproliferation policy was ever under direct challenge. The definitions issued by Mr Poneman as a result of the department's entreaty are decidedly unhelpful. As Henry Sokolski has correctly pointed out, the problem is much broader than simply weapons of mass destruction; it includes a variety of other "strategic technologies" such as unmanned aerial vehicles, submarines, cruise missiles, imagery derived from space-based sensors, and more.[5]

The concerns expressed by the services and the Joint Staff about the initiative were both substantive and legitimate. They

were correct in arguing that $400 million per year is probably more than is needed and would in fact place additional strain on service budgets. Similarly, their concerns about the lack of OSD coordination were valid. Admiral Owens was entirely justified in instituting a process to ensure that US military commanders have an opportunity to assess relevant technologies and system concepts before DOD commits to fielding them. Also important are reviewing whether counterproliferation is indeed a "new mission area" and canvassing the CINCs to determine their knowledge of the proliferation threat and their capabilities for responding to it.

I believe that DOD erred by focusing its attention on the wrong end of the problem. When Secretary Aspin stressed development of new technologies and systems—a so-called hardware solution—he diverted attention from what I consider to be more important issues. These include (1) developing appropriate "competitive strategies" for preventing the emergence of regional actors that can threaten our interests and (2) instituting changes to military doctrine, training, and operations to deal with emerging or extant proliferation threats.

As a useful first step, Secretary Aspin should have asked the Joint Staff—representing the war-fighting CINCs—and all of the services to perform a detailed assessment of how their ability to control the aerospace, sea, and land could be degraded, disrupted, or denied by the possession or use of strategic technologies by an adversary. Such an endeavor would have taken a significant amount of time and energy and would have forced the system to grapple with such fundamental issues as what constitutes a strategic technology and why.

I contend that the US military has yet to form a credible opinion on this topic. By way of example, you may have heard the same stories I have about the high-level war game that sought to address possible response options to the use of nuclear weapons in a given theater of operations. According to the story, once a nuke went off, the generals got up and pushed in their chairs; the game was over. The problem was simply too difficult to handle—too hard to think about.

Such a response is no longer acceptable—if it ever was. The military must take steps *now* to better understand what

constitutes a strategic threat and how such threats will affect its ability to perform its most basic functions.

I am pleased to report that the military is beginning to take the proliferation issue seriously, and we in Congress ought to encourage such efforts. For example, the war-fighting commands are carefully reviewing the threat of strategic technology in their particular area of responsibility. And the services' institutions of higher learning are beginning to address these issues. That's a positive development because the war colleges and universities are where much of the most insightful "freethinking" occurs.

I'm not necessarily talking about big-think policy analyses. Instead, I'm considering such questions as how does use of a biological weapon against a port or airfield affect aircraft sortie rates, and how can these effects be mitigated? How much of what types of antidotes should be prepositioned in-theater? How many times a year should US soldiers, sailors, airmen, and marines don full chemical protective gear in order to provide a realistic training experience? What types of weapons are needed to destroy a deeply buried chemical laboratory or command and control center? And so forth and so forth. These issues may sound mundane, especially when compared to such lofty topics as determining whether the Nuclear Nonproliferation Treaty will be extended indefinitely or for only 20 years. But in some ways, they are far more important.

After such a detailed assessment of the threat and its implications is completed, DOD should then undertake a review of the extent to which changes in doctrine, training, and logistics would meet existing or emerging requirements—that is, it should explore nonhardware solutions to the problem. Field manuals, JCS publications, and the like may not be standard reading for most Americans, but they are the lifeblood of the services. They form the basis on which our military writes plans and actually prosecutes wars in the interests of the American people. These documents need to be reviewed to ensure that they reflect emerging strategic threats and opportunities for countering them. Again, some progress is being made, but more needs to be done.

Next, if we determine that changes in doctrine, training, and so forth, would not do the trick, then DOD should review *existing* military capabilities (weapons, sensors, airlift, prepositioned

equipment, chemical gear, etc.) to determine whether they would suffice in meeting the requirement. If these assets proved insufficient, then—and only then—DOD should consider new hardware-development programs. Moreover, in light of other pressing needs and fiscal constraints, DOD should pursue only those system concepts with the highest potential payoff.

Unfortunately, this approach is precisely the opposite of Secretary Aspin's (i.e., hardware first—doctrine/training/threat analysis later). In my judgment, he got it backwards.

Does this mean that the DCI is not worth pursuing? Absolutely not. As noted above, there are signs that DOD is beginning to ask the right questions and take the proliferation of strategic technology seriously. For its part, Congress has taken some limited—but useful—steps to encourage progress in this area. For example, Congress has set aside some modest funding for JCS-coordinated simulations and exercises to better assess the threat and its implications; it has provided some seed money for the war colleges and National Defense University to begin germinating novel concepts and bring the right people together to discuss the issues; and it has also provided a modest amount of funding for development of the highest priority technology and hardware systems, such as those referred to in John Deutch's report, mentioned above.

Finally, I would encourage the administration to think long and hard about the need to develop truly competitive strategies that have as their objective preventing the emergence of major regional competitors to the US in the first place. In this regard, I urge senior officials in DOD, the Department of State, NSC, and other departments and agencies to give them the most serious consideration.

Notes

1. Secretary of Defense Les Aspin, speech to the National Academy of Sciences, Washington, D.C., 7 December 1993.

2. Ibid.

3. See Robert D. Blackwill and Ashton B. Carter, "The Role of Intelligence," in *New Nuclear Nations: Consequences for U.S. Policy*, ed. Robert D. Blackwill and Albert Carnesale (New York: Council on Foreign Relations Press, 1993), 234.

4. "Jane's Interview: Ashton Carter," *Jane's Defence Weekly*, 30 July 1994, 40.

5. Henry Sokolski, "Nonapocalyptic Proliferation: A New Strategic Threat?" *Washington Quarterly* 17 (Spring 1994): 2.

Chapter 15

Competitive Strategies: An Approach against Proliferation

David J. Andre

International peace and stability and other US interests are potentially threatened by the proliferation of strategic weapons—both advanced conventional systems and weapons of mass destruction (WMD), including nuclear, biological, and chemical (NBC) weapons, and missile-delivery systems. Policymakers have been responding to this difficult and complex challenge with a broad range of initiatives aimed at curbing both the incentive to obtain these capabilities (i.e., the "demand side") and the availability of enabling components and associated technology (i.e., the "supply side").[1]

Based on such matters as the experience gained in the Gulf War with Iraq, the related assumption that nonproliferation approaches may not succeed entirely, and the concern over limitations in US force capabilities, the Department of Defense (DOD) has been pursuing counterproliferation, mainly by developing systems capabilities and exploring military response options as part of the Defense Counterproliferation Initiative (DCI).[2] A growing body of technical assessments, studies, and analyses indicates that implementing these measures will be operationally challenging, technically complex, costly, and—in some instances—not entirely feasible. Insights from war games are revealing here. For example, after nonmilitary actions fail to defuse a hypothetical but realistic crisis, experienced military planners and other participants typically see few to no good alternatives to high-risk military operations that offer the prospect of, at best, modest—and thus commonly politically unacceptable—chances of success. This has prompted postgame comments such as, "Our political leaders must begin to act now so we never have to deal with this problem militarily."

The authors of other chapters in this volume as well as other commentators have lamented the lack of adequate progress in

dealing with the proliferation of strategic weapons through current nonproliferation and counterproliferation policies and programs.[3] Although necessary and even useful in most cases—and acknowledging occasional, if grudging, progress—these initiatives collectively have proven insufficient in achieving meaningful results.[4] They likely will not significantly impede, much less prevent, proliferation, and military counterforce response options undoubtedly will continue to require acceptance of often disconcerting levels of risk and uncertainty. Moreover, the problem augurs to worsen, if only because countries determined to acquire these capabilities have growing access to scientific, technological, and economic means to develop or simply buy them. We have won the (cold) war yet are at risk of losing what might pass for peace in the new world (dis)order.

Perhaps it is time to try other approaches, not necessarily in lieu of but at least along with current pursuits:

- We could try to get ahead of the proliferation problem through more forward-looking, proactive strategic planning, instead of just reacting to it by (1) making heavy demands on the defense acquisition system (e.g., near-leakproof, active theater and strategic defenses against ballistic and cruise missiles); (2) relying on process- instead of results-oriented negotiations (e.g., the evolving nuclear deal between North Korea, the US, South Korea, and Japan, and indefinite extension of the Nuclear Nonproliferation Treaty [NPT]); and (3) adopting individual initiatives piecemeal (e.g., item-level, technology-control measures).
- Instead of worrying about how to keep nonproliferation efforts from failing in the face of concerted exertions by proliferators determined to succeed and generally seeking to diagnose and ameliorate our assorted shortcomings here, we could develop strategies aimed at exploiting our strengths in leveraging proliferators' weaknesses and vulnerabilities.
- Instead of pursuing broadly formulated, even indeterminate, ends—which may amount to little more than just muddling through, buying time, and hoping for the best—we could seek to achieve more clearly defined and actionable goals.

- Instead of thinking and acting almost solely in relation to current actors and events in the context of the short- to (at best) medium-term future, we could adopt a longer-range view of the proliferation problem, including planning in relation to a set of not-implausible alternative futures a decade or more hence.

One candidate framework that meets these demanding criteria at least conceptually is "competitive strategies" (CS). These strategies call for thinking and acting strategically in a manner consistent with the view that the US is engaged in a long-term competition with a broad assortment of proliferators—both acquiring parties and suppliers. Treating proliferation as a problem of long-term competition requiring a CS approach by the US is not unlike what DOD did during the cold war, vis-à-vis the Soviet Union.[5]

By design, however, these past DOD efforts were largely military: military-operational, military-technical, and military-economic. Looking ahead, we see a major role for the military in deterring attacks against US territory, military forces, and overseas interests, and in hedging against and otherwise planning to prosecute active operations against dangerous proliferation-related threats.[6] But we need to conceptualize much broader, more multifaceted strategic approaches that will obviate—or at least reduce—the need for direct military action or that will view the military as but one of a range of possible available tools of statecraft. Perhaps CS has something to offer here, as well.

Background to Competitive Strategies

In his *Annual Report to the Congress, Fiscal Year 1987*, Secretary of Defense Caspar Weinberger announced, "I have decided to make competitive strategies a major theme of the Department of Defense during the remainder of this Administration."[7] Later that spring, he wrote, "Implementation of our overarching strategy of secure deterrence requires an array of strategies that capitalize on our advantages and exploit our adversaries' weaknesses."[8] So it was that Competitive Strategies for the Long-Term Competition with the Soviet

Union—more simply, DOD Competitive Strategies Initiative—first came to public attention in 1986. But it has much deeper roots.

At the broadest level of national policy, discussions of US strategy for competing with the Soviet Union began in the late 1940s, when our relations with the Soviets began to change fundamentally for the worse and there was little or no prospect of a favorable turn of events in the foreseeable future. Studied interest in systematic planning for competing with the Soviets over the long term waned until 1968, when Andrew W. Marshall replaced James Schlesinger as director of strategic studies at RAND.[9] Marshall's quest for a framework for structuring and giving direction to RAND's program of strategic studies led to his report *Long Term Competition with the Soviets: A Framework for Strategic Analysis*, published in 1972.[10] This document was a seminal contribution to US strategic thinking in the post–World War II era. It reflects the strong influence of Marshall's interest, beginning in the early 1960s, in the subject of organizational behavior and in the efforts at the Harvard Business School to develop the field of business policy and strategy.[11]

Marshall concluded that what one saw immediately in thinking about US relations with the Soviets was a continuing, essentially endless, military-economic-political competition. Consciously or not, we and the Soviets had implicit strategies for guiding our actions in this competition, within which each side tended to emphasize different things based on its respective appreciations of relative strengths and weaknesses. Moreover, this competition would proceed in the face of resource constraints on both sides. So our strategy for conducting the competition had to involve more than just trying to outspend the Soviets. We needed to be efficient in attaining our goals at less cost than the Soviets would incur in pursuing theirs. In addition, before deciding to acquire a particular weapon system in a given mission area, we had to raise a more important question: What is an appropriate and advantageous strategy overall, as well as for this particular area of the continuing competition? This inquiry led logically to a consideration of overarching, long-term US interests and goals as to how the

competition should evolve—its pace, scope, degree of stability, and ultimate outcome.

In context of the history of American strategic culture, this kind of thinking by Marshall and his colleagues raised a whole series of first-order questions that, although highly relevant, were seldom addressed by DOD and by the defense analytic community at large, which tended to emphasize relatively narrow, technical, systems-analysis kinds of studies. This, then, was the rich, pioneering intellectual tradition that Secretary Weinberger attempted to exploit, advance, and institutionalize when he launched DOD's Competitive Strategies Initiative in 1986.

Competitive Strategies: Concept and Methodology

Worth considering in greater detail are the basic CS concept and the methodology devised to give it analytic utility.[12] As implemented in DOD, CS is both a process and a product. As a process, it is a method of systematic strategic thinking that allows for developing and evaluating US defense strategy in terms of a long-term competition. As a product, it is a plan of action (or a set of such plans) or simply a guide for helping the nation gain and maintain a long-term advantage in a particular competition.

The goal of CS was, through systematic, long-range, strategic-competition planning, to make the US approach to the competition with the Soviets more efficient and effective to enhance deterrence and the security of the US and its friends and allies. At bottom, DOD sought to contain the threat until, one hoped, things improved politically.

Methodologically, CS called for identifying and aligning enduring US strengths against enduring Soviet weaknesses (the particulars here depended upon which part of the competition was of immediate interest and on the goals established for the competition). This necessitated employing a three-step, chess-match-like methodology (three was considered the minimum) in a move/response/counterresponse sequence in order to create a new or improved military capability in high-leverage areas, thereby gaining and maintaining the

initiative, shaping the competition, and achieving particular competition goals. All of this was to be done in the context of a planning horizon that extended 15–20 or more years into the future. The notion of "enduring" strengths and weaknesses involved dealing with things that, by their very nature, were hard to change, at least in the near term to midterm—thus the need to look out 15–20 years or more.

A "new or improved military capability" comprised one or more of the following:

- Policies and plans.
- Strategy (deterrent, force development, and/or force employment).
- Military doctrine, operational concepts, and tactics.
- Forces and organizational concepts.
- Training (individual-, unit-, and force-level).
- Hardware systems (platforms, munitions, and supporting systems).
- Technology (improvements to existing systems and research and development [R&D] programs).

Given this robust list of options, including combinations, CS should not focus exclusively—or even mainly—on weapon systems or technologies. Indeed, a particular competitive strategy might not require any new resources to be effective in competing with the Soviets. It might only involve conceiving smarter ways of using capabilities and assets already in hand or programmed.

Developing "leverage" in the long-term competition involved finding ways to

- encourage the Soviets to divert resources to less threatening forces or doctrine (e.g., defensive rather than offensive capabilities);
- get them to preserve forces we could defeat relatively easily (e.g., fixed-site air defenses);
- obsolesce existing Soviet capabilities (i.e., impose costs; for example, by regularly modernizing our air forces);
- establish areas of enduring military competence (e.g., use our doctrine, operational concepts, technology, etc., to shape the competition);

• present unanticipated military capabilities with potentially significant impacts on the Soviets (i.e., take the initiative, shift the focus of the competition, and change the rules of the game);[13] and

• make the Soviets uncertain about the effectiveness of major components of their military capability (e.g., doctrine, plans, existing equipment, R&D program, etc.) or otherwise undermine their confidence in the expected outcome of their plans and programs.

Whether with regard to the former Soviet Union or any other competitor, CS planning and analysis must accommodate several important conceptual guidelines:

CS assumes that, like it or not, the competition phenomenon is essentially omnipresent and, in virtually all cases that matter, is ongoing and likely will continue—perhaps indefinitely. The only question is whether to acknowledge that we are already involved in a competitive dynamic of actions and reactions with one or more competitors and seek to shape future behaviors, events, trends, and the overall state of competition consciously, rather than unconsciously.[14] For example, even though the US Army did not necessarily have CS-style Soviet reactions in mind when it adopted AirLand Battle doctrine and when it joined with the US Air Force in the "Assault Breaker" program, the Soviets reacted nonetheless. They reacted, as well, to the North Atlantic Treaty Organization's (NATO) follow-on forces attack (FOFA) concept and to various aspects of the US Navy's maritime strategy.

CS requires identifying a specific competitor or several competitors. In general, this was largely self-defining during the cold war. However, right up to the time of the debunking of Soviet communism and the collapse of the empire it had dominated for much of the twentieth century, Western experts were still debating whether the Soviet hierarchy was essentially monolithic or, as in pluralistic democracies, it comprised competing factions representing divergent points of view that our strategies could exploit.

The best competitor is reasonably predictable. For all of the dangers and other difficulties the Soviets presented as

competitors, American policy elites widely believed and acted as though the Kremlin was largely inhabited by "rational actors" who would act responsibly when it really mattered and in ways that the policy elites could anticipate. This notion was generally confirmed in the course of successfully defusing several major crises. Short of that, however, the history of Western intelligence and national security policy in the cold war is replete with instances of the Soviets doing the unexpected—sometimes with major consequences.[15]

The most effective competitive strategy takes advantage of the competitor's enduring predispositions. This guideline requires understanding a competitor well enough to elicit a desired response that is also compatible with his basic values, interests, and objectives. To do otherwise is to work counter to human nature and thus to limit the predictability of the opponent's reaction. Insights into possible behavior of the Soviets were gleaned from their own extensive writings—including voluminous codifications of immutable "laws of war" and the like—as well as from the ever-expanding multidisciplinary corpus of knowledge and information generated by the massive Western intelligence effort over almost half a century. In addition, American strategists could always count on a seemingly congenital predisposition of the Soviets to paranoia and to a mutually reinforcing national inferiority complex when it came to their perceived need and ability to defend the homeland.[16]

Time is a critical factor that must be made a part of any competitive strategy. All advantages are transitory; their duration depends on the advantage sought and the opponent's willingness and ability to react. In addition, time is a matter of relative scale. Even as we seemingly were prepared to compete with the Soviets indefinitely, shorter time lines had to be carefully managed within the overall competition. The complex dynamics of the various subsidiary military-balance areas (e.g., artillery versus artillery, air versus air defense) testify to this practical reality.

US policymakers could choose from among four broad alternatives in planning and managing the long-term military competition with the Soviet Union:

• The US had the lead and needed to retain it (e.g., advanced technology in general; modern naval and air forces).

• At any given time, one side or the other enjoyed the lead, but the US had to hold its own (e.g., tank technology; the overall armor/antiarmor balance).

• We had to cope with the Soviets' comparative advantage in a particular area by determining how to compete from a position of relative weakness (e.g., fighting outnumbered in the event of a war in Europe).

• Lastly, we could decide not to compete (e.g., large-scale Soviet investments in civil defense that we chose not to match).

These basic but important ideas, as well as others that emerged as we gained experience, provided an essential basis in theory for understanding and conducting CS planning and analysis as it was formally undertaken by DOD in 1986.

Aside from the defining early contributions of Andrew Marshall and others to the theoretical and practical understanding of CS, these strategies were neither revolutionary (as some were suggesting) nor even new. Senior members of DOD and their closest advisors had pursued this kind of thinking over the years in several areas, even though at the time, no one characterized it as CS. For example, Secretary Weinberger's *Defense Guidance* documents for 1981 and 1982—the first two years of the Reagan administration—made reference to "competing with the Soviet Union in peacetime."[17] They stressed the idea of imposing costs on the Soviets, along with other goals that were to be pursued through CS. In his annual reports to Congress for FY 1987 and FY 1988, the secretary cited several historical examples of what were judged successful CS. Both the ability of US bombers to penetrate Soviet airspace and US antisubmarine warfare (ASW) programs figured prominently among the cases mentioned.[18]

As a basic concept in strategic planning, then, and as both Secretary Weinberger and Andrew Marshall always were quick to point out, CS itself was not new. What was new about CS as DOD began to practice it in 1986 was Secretary Weinberger's decision to formally institutionalize the process by involving people at many different levels and by attempting to develop

and implement CS in a deliberate, systematic, and thus more effective way than hitherto had been the case. He hoped that such an approach might lead ultimately to a fundamental change for the better in how the department thought about and developed the military component of US national security strategy, structured its research, development, and acquisiton (RDA) programs, and, more generally, arrived at key decisions as part of DOD's Planning, Programming, and Budgeting System (PPBS).

Adopting and Adapting Competitive Strategies to Current Needs

What, if anything, might all of this theory and both formal and informal historical practice have to offer in contemplating the post-cold-war future? In particular, how much—if any—of the original CS concept and methodology is suitable for use in waging an effective fight against the proliferation of strategic weapons? At first glance, there appears to be some good news. But there is some potentially bad news as well—or at least a few things that merit a closer look and probably some hard work to rationalize in the current context.

Competitive Strategies Past and Future: Commonalities

On the positive side of the ledger, policymakers, planners, and analysts do not need to begin with a blank slate. There are some important, immediately transferrable, or readily adaptable commonalties with past practice, such as

- certain basic definitions and planning concepts, some already mentioned, and analysis tools and techniques;[19]
- the natural complementarity that exists between long-term competition planning and more traditional planning and management systems, such as—in the case of DOD—the PPBS and the Joint Staff's Joint Strategic Planning System (JSPS); and
- the value of planning backward from not-implausible alternative futures that involve one or more proliferators fielding and even employing strategic capabilities against the US or one of its allies or friends (of particular importance here for dealing with the proliferation of strategic weapons; this

includes assessing the full range of military operational implications of such potential threats).

In seeking to draw on lessons from past practice, we must at the outset take good account of what may be implied by the conceptual guidelines introduced earlier:

CS assumes that, like it or not, the competition phenomenon is essentially omnipresent and, in virtually all cases that matter, is ongoing and likely will continue—perhaps indefinitely. As formerly, with respect to the Soviets, the question is whether we will acknowledge that we are already involved in a competitive dynamic of actions and reactions with various competitors—in this case proliferators—and seek to shape future behaviors, events, trends, and the overall state of the competition consciously, rather than unconsciously. The Israeli air strike against the Osirak reactor, the coalition's war against Iraq, and the US-sponsored multilateral deal with North Korea involving its nuclear program are actions that we might reasonably expect to influence the future behavior of proliferators. The problem, to date, is that while some of our actions may be inducing competitor reactions that we might favor, all too often our approach to controlling proliferation is inconsistent. For example, although the stated aims of current policies are generally supportive of our long-term security interests, in practice they often are subordinated to more short-term domestic and foreign political and economic goals whose pursuit works counter to the basic notion of competing consciously and effectively over the long term.

CS requires identifying a specific competitor or several competitors. Although we acknowledge the value of common policy guidelines, a one-size-fits-all strategy to counter proliferation would have to be so general as to be virtually useless in particular instances. Each case is unique—sometimes in nontrivial ways. Consider, for example, the fundamental differences in the challenges posed to US interests and policy on proliferation by North Korea, Pakistan, Taiwan, France, Israel, and radical Islamic fundamentalism.

The best competitor is reasonably predictable. Given the broad range of national and elite psychologies represented by

the full spectrum of current and potential future proliferators, this guideline appears to pose some real challenges. At the least, it would seem to suggest limiting expectations about what we can gain from subtleties in plans aimed at influencing the behavior of assorted "crazies" and others whose reactions may be hard to anticipate. We must remember, however, that Western policymakers only gradually came to believe that the Soviets were rational and, within limits, predictable. As Winston Churchill once said with characteristic insight and eloquence, Russian policy "is a riddle wrapped in a mystery inside an enigma." He then proffered what turned out to be akin to the Rosetta stone in deciphering the Soviets' logic well enough to deal with them effectively during the cold war: "But perhaps there is a key. That key is Russian national interest."[20] One suspects that this conclusion as well as all that derives from it retains its applicability—again, within limits—when dealing with proliferators.[21] Very importantly, we need not assume rationality on the part of a competitor. We need only be able to reasonably anticipate his reactions because he has displayed fairly consistent preferences for certain modes of action.[22]

The most effective competitive strategy takes advantage of the competitor's enduring predispositions. This guideline argues for focusing on competitors about whom we already are reasonably knowledgeable, while gathering more intelligence and developing a better working understanding of the others. It also suggests exploiting opportunities where we now have leverage or can generate it quickly, such as those cases in which proliferators depend upon us for something that is important to them.

Time is a critical factor that must be made a part of any competitive strategy. Because competitors are unique, each may have a different perspective on the concept of time that we need to factor into our own strategic calculus. For example, the Soviets often were credited with taking the long view—seeing the "inevitable" victory of Marxism-Leninism as requiring perhaps decades or more to achieve. But what of those competitors whose operational time horizon includes the afterlife and glory achieved there through martyrdom in this life? Less teleologically—and to take competition goals as an

example—in the short term it may be necessary as a practical matter to seek (with some urgency) to prevent certain dangerous proliferators from gaining access to nuclear weapons. Over the longer term, however, it may be sufficient just to contain them—as we did with the Soviet Union.

Competitive Strategies Past and Future: Dissimilarities

On the other side of the ledger, some key differences exist between military CS against the former Soviet Union and a broadened formulation of competition planning involving assorted proliferators—differences that may require major changes to past practice or entirely new perspectives and methods. These dissimilarities stem from the greatly increased uncertainty, complexity, and sensitivity that result from the following:

Expanding, perhaps substantially, the number of competitors. This includes both suppliers and recipients of strategic capabilities—both state and nonstate actors, starting now and extending into the future.

Increasing the number of instruments of policy at least theoretically available for prosecuting a competition. Even when it was largely confined to the military domain, CS planning and analysis proved quite challenging. Taking account of political, diplomatic, economic, psychological, and other factors, as well, portends to greatly increase the complexity of the task.

Competing in areas of interest for national security—not just with enemies but also with friends and perhaps even traditional formal military allies. It is a long way conceptually and analytically—as well as politically—from Iraq to, say, Taiwan and Germany.

Having to coordinate with a greater number of contributing and interested offices and agencies within the US government and, as necessary, with selected non-US players. Among other things, this calls for participatory arrangements that are inclusive and that facilitate close cooperation, coordination, and sharing of intelligence, yet allow for safeguarding sensitive national security information.

Having to choose from a much larger universe of possible competition goals, as well as having to manage the inevitable resulting increased frequency of inconsistencies and even conflicts among them. Developing and implementing effective strategies for fighting proliferation requires that everyone involved achieve a congruence of goals—seldom an easy task. For example, throughout the cold war, there existed an abiding, underlying—if seldom fully articulated—tension within the US government as to whether the overriding aim of policy should be to compete effectively with the Soviets or to seek stability in our relations with them.

Having to adapt and improve existing analysis tools and methods and create entirely new ones. Path-type, political-military simulation exercises and operational war games have proven helpful—within limits—in exploring alternative security environments for the future, including the possible nature of future war, and associated implications for policy. On the technical side, however, the suite of computer-based models that has evolved over the last several decades remains inadequate in helping military planners (as opposed to a few technical experts) understand the nature and implications of integrated (i.e., conventional and NBC) warfare.[23]

In sum, if seeking to employ the CS approach in planning against the proliferation of strategic capabilities, one can build on some important continuities with past practice. But one must also take into account many important differences.

Planning Competition Strategies

The object of strategy in general is to bring about some preferred end or state of being, including conditions that are most favorable to one's own side. But the crafting of strategy involves more art than science, so there is no generally accepted best way to do it.

Elements of Strategy

At the same time, one can approach the task usefully by applying time-tested principles and techniques. For example, any true strategy—including a competitive strategy—involves

the pursuit of particular ends (i.e., aims, goals, or objectives) in relation to one or more identified competitors, threats, or a more general set of strategic conditions. This necessitates employing various means (e.g., instruments of policy, including associated human, materiel, and financial resources) through a time-phased plan of some kind that rationalizes and integrates these various strategic elements in the manner in which it answers the question "How?"

In other words, a competitive strategy—like any true strategy—should provide a realistic, actionable explanation of how, over a given period of time, a particular set of steps will accomplish clearly stated, measurable goals for a given competition.

Experience in DOD with planning for long-term military competition with the Soviet Union reveals that having to focus on goals and on the How? question—the essence of strategy—causes one to think differently. It also raises very different issues and questions than might otherwise be the case, particularly when one contemplates long-term competitive futures. Among other things, it encourages taking charge of the future. That is, it helps offset the tendency to focus almost solely on current problems by identifying opportunities, exploiting them from a position of established strength, moving in chosen directions, and proactively shaping the competitive environment.

Key Questions in Competition Planning

People who participate in long-range strategic competition planning and analysis—whether with respect to competitors who are threats, friends, or allies—might profitably organize their thinking around certain key questions.[24]

1. What is the abiding context of US strategy that any current strategy must comport with, and what major assumptions underlie and thus condition our strategic thinking about the future?
2. What is the evolving nature of the global strategic environment? What alternative futures are possible over the next 15–20 years?
3. Which alternative futures do we prefer? Which do we wish to avoid?

4. Who are our current and likely future competitors? Who are the key third parties?
5. What are our competitors' and key third parties' goals and their strategies for achieving them?
6. What is the current state of the competition(s)? What future states are possible, and which do we prefer?
7. What major problems, enduring weaknesses, and other constraints face our competitor(s)? What are their strengths?
8. In any and all cases, what are our time-phased goals for the competition—both overall and supporting?
9. What are our areas of advantage or leverage, including our enduring strengths, relative to the particular challenge(s) the competition poses? What are our limitations or weaknesses?
10. What basic capacities or core competencies do we need to develop, sustain, adapt, protect, and plan to leverage?
11. What strategies can we employ that will permit us to influence—or even dominate—key competitions and future trends and events?
12. What is the likely range of competitor and third party countermoves? How might we respond?
13. What are the implications for resource allocation, including priorities, trade-offs, and divestment?
14. How can we best balance the costs, risks, and opportunities that accrue to various alternative security futures and competitive strategies?

The perspective afforded and the mental discipline imposed simply by asking such questions not only enrich the planning process but also enhance the chances of developing an effective strategy.

Where from Here?

All of the aforementioned history, theory, and assorted basics of strategy and strategic planning may be well and good, as far as it goes, if only by analogy. But how might we proceed from here?

For all of the potential dangers and uncertainties that lie ahead (and we must not underestimate them) the present situation offers an opportunity to make a real difference in

how we fight against proliferation—both preventing or at least modulating it, as well as countering it. We still have time to do it right—or at least to greater practical long-term effect. But we need to get on with it—and in a serious way. Competitive strategies may have value to add here—not just militarily, as was the case in DOD during the cold war, but more broadly. To determine with greater specificity what that value might be, we should do several things:

- Go back to the beginning and think through the issue of strategic weapons proliferation from first principles, including basic definitions (e.g., nonproliferation and counter-proliferation).[25]
- Ask what constitutes a strategic capability (including related technology), both now and as time unfolds—and why.
- Examine the existing body of literature on long-range strategic planning, including CS, and consider how the concepts, methods, and techniques discussed might have to be adapted to render them more relevant to the proliferation issue. Be willing to conceive entirely new approaches as well.
- Build on existing trend analyses and threat assessments and add to the current catalog, looking at the near-term, midterm, and long-term future.
- Select one or a few current and possible future proliferators (Iran and North Korea [or even a united Korea] might be good candidates), and begin to plan against them, employing the list of key questions provided earlier and adjusting the methodology as needed.
- Adopt the dynamic approach to planning. For example, give the proliferator credit for being at least as perceptive, resourceful, and adaptive as we are, and think in terms of action and reaction sequences—over the long term.

DOD experience in planning for long-term peacetime military competition with the former Soviet Union confirms that all of this is far easier said than done—much less done well. We must anticipate and plan for various forms of institutional resistance. Because we will find critical data lacking, we will need more and better intelligence. And we will require all manner of tough philosophical, technical, analytic, management, and policy judgments—including even the defining

fundamentals (such as the basic assumptions and the specific competition goals to pursue).

Lack of an overarching strategic approach that is unambiguously goal oriented, forward looking, proactive, and anchored on a foundation of national strength makes the ongoing fight against the proliferation of strategic weapons more difficult than it otherwise might be. Viewing proliferation as a problem of long-term competition and adapting the traditional CS concept and methodology to strategic planning and analysis may offer a useful beginning in meeting this need. It is at least worth trying—and there is no time like the present.

Notes

1. For a summary of the proliferation issue, including current US policy responses, see Robert G. Joseph, "WMD: A Proliferation Overview," in William H. Lewis and Stuart E. Johnson, eds., *Weapons of Mass Destruction: New Perspectives on Counterproliferation* (Washington, D.C.: National Defense University Press, 1995), 3–15.

2. See Mitchel B. Wallerstein, "Concepts to Capabilities: The First Year of Counterproliferation," in Lewis and Johnson, 17–25. The current official definition of the term *counterproliferation* is limited to WMD.

3. See especially "DOD's Counterproliferation Initiative: A Critical Assessment" (chap. 15 of this volume) by Chris Williams; and Richard D. Fisher, Jr., "Building a More Secure Asia through Missile Defense," *Backgrounder*, no. 138 (Washington, D.C.: Heritage Foundation, Asian Studies Center, 24 October 1995).

4. Problems with traditional approaches to nonproliferation and alternatives to them are examined by Lewis A. Dunn, "Proliferation Prevention: Beyond Traditionalism," in Lewis and Johnson, 27–38.

5. A thoughtful treatment of the US-Soviet military competition, including suggested means and methods for competing effectively, is presented in J. J. Martin et al., *The U.S.-Soviet Long-Term Military Competition*, Final Technical Report prepared for the director, Defense Nuclear Agency, and director, Net Assessment, Office of the Secretary of Defense, vols. 1–3 (San Diego, Calif.: Science Applications International Corporation, 5 June 1990). Volume 1, *Concepts*, describes the nature of the peacetime military competition, including concepts useful for understanding what was important in this competition and for developing strategies to compete effectively. Volume 2, *Planning and Analysis*, proposes a structured process for devising and implementing strategies for the long-term military competition, evaluates current analysis tools in terms of their adequacy to support competitive strategy development, and recommends improvements. Volume 3, *Appendices*,

contains case studies and other background papers that supplement volumes 1 and 2.

6. See, for example, Dunn, 36–37.

7. Caspar W. Weinberger, *Annual Report to the Congress, Fiscal Year 1987* (Washington, D.C.: Government Printing Office, 5 February 1986), 87.

8. Caspar W. Weinberger, "U.S. Defense Strategy," *Foreign Affairs*, Spring 1986, 694.

9. Since the mid-1970s, Marshall has been the first and only director of the Office of Net Assessment in the Office of the Secretary of Defense.

10. A. W. Marshall, *Long-Term Competition with the Soviets: A Framework for Strategic Analysis* (U), RAND Report R-862-PR (Santa Monica, Calif.: RAND, April 1972). (Confidential; subsequently reedited and declassified)

11. See, for example, the many works on business competitive strategies by Harvard's Michael E. Porter, including *Competitive Strategy: Techniques for Analyzing Industries and Competitors* (New York: Free Press, 1980); and *The Competitive Advantage of Nations* (New York: Free Press, 1990).

12. The discussion in this section is adapted from David J. Andre, *New Competitive Strategies: Tools and Methodologies*, vol. 1, *Review of the Department of Defense Competitive Strategies Initiative, 1986–1990*, Final Technical Report (McLean, Va.: Science Applications International Corporation, 30 November 1990).

13. Whatever one may believe regarding the technical feasibility and the economic affordability of the Reagan administration's Strategic Defense Initiative (SDI), announced in 1982, former Soviet officials have said in recent meetings with US analysts that they viewed SDI as a compelling competitive strategy. They were at least as concerned, if not more so, with unknowable but—in their view—inevitable, pathbreaking technical spin-offs from the massive SDI research program as they were with the US achieving its stated goals.

14. Even as Secretary Weinberger was attempting to institutionalize competition planning in DOD in the mid-1980s, some officials and staff members in other departments and agencies of the federal government questioned the basic wisdom of characterizing the Soviets as competitors, much less planning accordingly.

15. Examples include the Soviet decisions to MIRV [multiple independently targeted reentry vehicle] their strategic nuclear missiles, invade Czechoslovakia and Afghanistan, remove the Berlin Wall, and dissolve the Soviet Union itself.

16. As *Pravda* often exhorted, "Defense of the Fatherland is the supreme law of life."

17. Department of Defense, *Defense Guidance, Fiscal Year 1981* (U); and *Defense Guidance, Fiscal Year 1982* (U). (Secret) Information extracted is unclassified.

18. Caspar W. Weinberger, *Annual Report to the Congress, Fiscal Year 1987*, 86; idem, *Annual Report to the Congress, Fiscal Year 1988*, 66–67.

Refer also to Randall A. Greenwalt, David J. Andre et al., *Historical Examples of Competitive Strategies*, Final Technical Report sponsored by the Office of the Under Secretary of Defense (Policy), Office of the Secretary of Defense (OSD), and prepared for director, Competitive Strategies Office, OSD (Denver, Colo.: Science Applications International Corporation, 23 March 1991).

19. Analysis tools to support competition planning, including an evaluation of current tools and techniques, are discussed in Martin et al., vol. 2, *Planning and Analysis*. For an assessment of the application of particular tools in the DOD Competitive Strategies Initiative, see Andre, *New Competitive Strategies*.

20. Radio broadcast of 1 October 1939.

21. Stephen Peter Rosen of Harvard University has argued persuasively in private conversation that we can better understand and deal with even "crazy" actors by broadening our knowledge of their actual strategic—including noncrisis—behavior. Even as regards "noncrazies," Rosen notes that the rational-actor model is limited by our ability to understand how others "calculate"—when they calculate at all. (Anyone may occasionally act on impulse.) In any and all cases, however, in Rosen's view the key question reduces to, What are a given actor's interests, what does he want, and what is the associated cost-benefit or ends-means logic?

22. Stephen Rosen brought this insight to my attention.

23. Tools to support counterproliferation planning and analysis are discussed briefly in Wallerstein, 21.

24. Adapted from Martin et al.

25. Limiting the official definition of counterproliferation to weapons of mass destruction ignores the reality that, even if the spread of WMD were somehow controlled, advanced conventional weapons—some with WMD-like effects—and supporting capabilities will continue to present an even more rapidly growing threat to US interests and military forces worldwide. Moreover, many of the military capabilities whose development now falls under the Defense Counterproliferation Initiative both predate the DCI and were and remain fungible across a range of conventional and nonconvenional—including WMD—threats.

Chapter 16

Fighting Proliferation with Intelligence

Henry Sokolski

Prior to Operation Desert Storm, US policy toward the proliferation of strategic weapons technology was to delay or prevent it through a policy of nonproliferation—export controls, customs interdictions, end-use checks, diplomatic demarches, nonproliferation pledges, regional arms-control talks, and the safeguarding of sensitive nuclear activities. Desert Storm changed all that. Scud missiles were targeted and intercepted. Coalition forces were inoculated against possible Iraqi use of biological weapons. Iraq's missile and nuclear, biological, and chemical (NBC) weapons facilities were bombed. Finally, these and related facilities were ferreted out and dismantled as part of the cease-fire plan of the United Nations (UN). In short, with Desert Storm, the United States and its allies moved beyond preventing proliferation to fighting it.

This change from a nonproliferation policy to fighting proliferation is fundamental. Indeed, the US government has yet to comprehend fully what this more combative world requires.[1] What follows is an examination of how fighting versus merely attempting to prevent proliferation will require policymakers and intelligence officials to work much more closely with one another, not only on the development of new intelligence collection and analysis requirements but on the very definition of proliferation and the strategy used by the United States to combat it.

Instead of pursuing nonproliferation efforts as most governments have—by reacting (often belatedly) to a state's efforts to acquire the capability to produce strategic weapons—fighting proliferation requires devising a strategy that works backwards from a possible future in which one hypothesizes that these weapons are already employed or might be used against the United States or one of its allies. Such assessments will need to spell out the specific military operational implications of these threats so that policymakers can determine the level of attention

each deserves and develop strategies to delay, stop, and—if possible—neutralize them militarily or politically.

All of that assumes that the intelligence community and policymakers can agree on what proliferation is. It also assumes that they have a way to develop relevant threat scenarios that neither requires policymakers to make intelligence determinations nor forces intelligence officers to arbiter everyday policy disputes. Finally, it assumes that the US government understands and can meet the intelligence-collection requirements arising from the new approach.

What Is Proliferation?

Despite (or perhaps because of) the current interest in the issue of proliferation, defining the term has in itself become a topic of debate. Fifteen or 20 years ago, the situation was quite different. Then, the only proliferation that seemed worth worrying about was that related to nuclear weapons. As a result, the definition of *proliferation* was simple: the spread of unsafeguarded nuclear technology to smaller states.

Because the security implications of additional states going nuclear were so unacceptable and because the technical thresholds that smaller states needed to attain in order to get nuclear weapons seemed so high, US policy was first, second, and last, one of prevention. There was little serious thought given to waging war against a state seeking to acquire nuclear weapons—or much need for such thinking. Instead, the focus was on the near-term efforts of nonproliferation: preventing certain states from getting the wherewithal to go nuclear. That was 15 or 20 years ago. Now the premises of that period no longer pertain.

Consider, for example, how government officials now speak about proliferation. The talk is no longer just about preventing countries from going nuclear but about the need to "counter" a wide variety of weapons technologies. This more ambitious proliferation agenda, especially as currently articulated, is bewildering. In the first six months of the Clinton administration alone, public officials (including those in intelligence) argued that the United States should be concerned about the spread of (1) weapons of mass destruction (NBC munitions); (2) weapons of mass destruction and the means for their

delivery; (3) weapons of mass destruction and the missiles needed to deliver them; (4) special weapons; (5) advanced weapons; (6) advanced conventional weapons; (7) destabilizing numbers and types of advanced conventional weapons; (8) conventional weapons; and—to complete the circle—(9) "weapons of proliferation concern."[2]

The Confusion of Current Views

Clearly, the intelligence community's role in fighting proliferation is difficult to pinpoint if what's being fought is itself left this vague. In particular, although suggestive of something more aggressive than "nonproliferation," it is not clear what the government's new desire to "counter" proliferation means. In fact, the dictionary lists six separate entries for the word *counter,* and only one is a verb. The verb means oppose, offset, or nullify. The question is, In what way? With military countermeasures, counterattacks, counteroffensives, or counterintelligence? All of this sounds exciting. Images of the Israeli air strike against Osirak in 1981 come to mind even though the opportunities for repeating such heroics may be far less than one might wish. The word, however, just as easily appeals to people who want to oppose dangerous proliferation activities through the kind of diplomacy, safeguard inspections, disarmament procedures, export controls, and sanctions that are already in place.[3]

Although the term *counterproliferation* may seem useful as new terminology, it is no substitute for clear thinking about what the problem is—especially when one considers whose proliferation the United States is supposed to be countering and what proliferation is.[4] A popular view, particularly among many conservatives, is that the United States should simply focus its opposition to proliferation against enemies who have not yet acquired strategic weaponry. This approach was first seized upon at the outset of the cold war, when the US had a nuclear monopoly and a clear fear of the Soviet Union. Today, however, America has few—if any—clear-cut adversaries. There are countries on the US government's terrorist lists, but the United States and its allies still talk and trade with them. Also, shouldn't the United States care about states that have

strategic weapons systems? What about China's efforts to significantly upgrade its existing strategic forces with technology from the West and Russia? What of the republics of the former Soviet Union keeping and upgrading the systems the Soviets left behind? Certainly, these developments deserve attention. Do we mean to ignore them?

There is also confusion about which weapons technologies are of proliferation concern. Many officials wish to cling to the convenience of limiting proliferation to only apocalyptic weaponry and related technologies. If proliferation can no longer be limited to nuclear weapons, they argue, it would be best to confine proliferation concerns to weapons of mass destruction.

This approach, however, ignores the very real concern that weapons-delivery vehicles present. Yet, to the extent that trucks, planes, and ships could serve as vehicles, the scope of what is meant by "means of delivery" becomes a problem. In response, two types of solutions have been offered. The first is to limit concerns about delivery systems to missiles and related technology as controlled under the Missile Technology Control Regime (MTCR). The second is to argue that not just missiles but planes should be included as well. That, in turn, has encouraged an even broader approach: any weapon that can inflict military harm against the United States or its friends should be included.

Neither approach is sound. Certainly, to widen proliferation's focus to cover anything of military concern is to trivialize it. Not just strategic systems but tanks and planes become proliferation worries. The first kind of weaponry, however, is very different from the second. Nuclear weapons can be covertly acquired and employed in small numbers to produce shocking strategic results against the United States or its friends, even in their most defended state. In contrast, years of acquisition and overt training with thousands of tanks or planes are necessary to pose a significant military threat to US forces or US-led coalitions, and—even then—effective military defenses or countermeasures against such weapons are available to the United States. (Thus, current conventional arms-control proposals rarely speak of banning the sale of planes or tanks but talk instead about increasing warning time by requiring states to make such arms sales more public through UN registries and the like.)

Moreover, a broad definition of proliferation would have to include not only the weapons themselves but also the related technology. Designating most conventional arms as weapons of proliferation concern, then, would stretch existing export control, customs, and intelligence collection and analysis efforts beyond any hope of focus. For these reasons, many people in the US intelligence community prefer to limit their attention just to weapons of mass destruction.

Focusing on what has traditionally been of proliferation concern—NBC weapons—however, runs the risk of ignoring new threats that are likely to emerge. After all, since 1945, what is of proliferation concern has itself changed several times, evolving from a worry about the Soviet Union getting nuclear weapons to the current concern regarding smaller states that might get NBC munitions, as well as long-range missiles.

And there is every reason to believe that new worries are on the way. Certainly, congressional interest in the military implications of satellite services (imagery, navigation, and communications) being sold to third world states suggests as much. So, too, does Congress's recent enactment of a law imposing sanctions against countries selling destabilizing types and numbers of advanced conventional weapons to Iran or Iraq.[5] The US Navy is also concerned about Iran's acquisition of conventional submarines. These vessels will be difficult to find in the confined waters of the Persian Gulf and, if properly armed, could threaten American and allied fleets. In short, our list of concerns is expanding and is likely to include high-leverage technologies and weapons systems that could enable smaller states to threaten war-winning or victory-denying results against the United States or its friends without resorting to weapons of mass destruction.[6]

Toward a Prescriptive Definition

As difficult as defining proliferation may be, the intelligence and policy communities should make the effort. In fact, they have no choice: Congress in 1992 instructed the executive branch to identify what "types and numbers of advanced conventional weapons [are] destabilizing."[7] There are two schools

of thinking on how best to do this. The first is simply to compile new lists of weapons technologies that should be monitored or controlled. Besides being familiar, this approach has the short-term advantage of being responsive to Congress. The difficulty comes in the long term: as already noted, compiling lists of what might be of concern tends to attenuate the government's already limited ability to maintain a constructive focus.

This legitimate concern with overreach was, in part, what prompted consideration of a second—more prescriptive—approach, which was first presented before the Senate Select Committee on Intelligence in 1990 by Henry S. Rowen—then the assistant secretary of defense for international security affairs.[8] Instead of trying to describe what is of proliferation concern by listing specific weapons and related technologies, criteria were established prescribing what was worth worrying about and why. Three criteria were suggested. A weapons or weapons-related technology was of proliferation concern if (1) it enabled another state to inflict high-leverage strategic harm against the United States or its friends; (2) the United States lacked effective defenses or countermeasures against this capability; and (3) its mere acquisition could change other states' perceptions as to who was the leading power in a given region.

High leverage is not to be confused here with high or advanced technology. Relatively low-technology, nonnuclear submarines in the Gulf, for example, could sink one of the US Navy's capital ships, preclude the Navy from identifying the perpetrator, and make the political demands to quit the area nearly irresistible. Advanced jet fighters, on the other hand, might incorporate high technology but are low leverage since hundreds of them would be necessary to secure local air superiority against US or allied forces. Even then, US air defenses would prove effective against organized air attacks.

The meaning of *strategic harm* also requires reflection. During the cold war, this term meant intercontinental, global nuclear conflict with the Warsaw Pact countries. Today, however, wars are more likely to be like Desert Storm than the nuclear wars depicted in popular television movies such as *The Day After* or novels such as Tom Clancy's *Red Storm Rising.* As a result, what constitutes victory-denying harm differs from strategic harm. During the cold war, for example,

keeping Soviet nuclear submarines from gaining passage to open seas was critical to US security. Today, however, US and coalition forces potentially could be defeated by an inability to find, identify, and destroy third world conventional submarines laying mines in the Persian Gulf.

Finally, the adequacy of one's defenses can be determined only in relation to what constitutes war. Certainly, in the 1960s at the height of the cold war, missile defenses against the Soviets did not seem necessary to most US officials because they believed that any Soviet missile strike against the United States or its allies would prompt a massive US nuclear response. That, they reasoned, would deter such attacks. In Desert Storm, however, coalition adhesion was threatened by nonnuclear missile strikes against coalition forces and Israel. Here, even limited missile defenses were understood to be critical.

A key difficulty in getting the type of military threat assessment called for by Rowen is that it requires intelligence and policy officials to cooperate. Working with the policy community on threat assessments (which include the adequacy of US defenses), however, is something the intelligence community has long considered sensitive—if not taboo. The intelligence community fears that working on such assessments will inevitably drag it into policy disputes. It also worries that policymakers will make determinations about intelligence data that they have no business making.

The advantage of this prescriptive approach, however, is that it encourages the kind of communication between intelligence and policy officials which is necessary to anticipate and execute effective diplomatic, commercial, or military operations against proliferation. This interaction is also critical to developing more than merely reactionary or episodic covert-action programs and counterintelligence operations against proliferation. Instead of merely following up tips and heading off particularly dangerous shipments on an ad hoc basis, intelligence operatives could be told what proliferation developments deserve special attention and orchestrate a variety of clandestine efforts in advance. These efforts might include leaking damaging information about projects to the foreign press, introducing faulty software and hardware into programs, and encouraging others to take steps to sabotage them.

If the United States were to pursue this approach, the intelligence community—starting with the intelligence components of the military services—would have to focus on the potential military threats that proliferation developments might pose. The military commands and service staffs, meanwhile, would have to share their views on what they believe high-leverage and strategic weapons systems might be in key scenarios and indicate where their defense preparations might be inadequate. The policy community, finally, would have to work with the military to prioritize the various likely threats and develop strategies in coordination with the military and intelligence communities to contain, reverse, or combat them.[9]

The Need to Rethink Policy and Intelligence Reasoning

In addition to working together more closely, fighting proliferation will require the intelligence and policy communities to think about proliferation problems differently. At a minimum, it will require these communities to reconsider their traditional cold war relationship. At the height of the cold war, this relationship was fairly routinized. The United States knew who the adversary was—the Warsaw Pact states; the fear was war. Intelligence was tasked to collect and analyze what Moscow tried to keep secret: its war plans, capabilities, and true foreign policy objectives.

Such clarity about the adversary's identity and the urgency associated with global war generated a serious effort to learn everything possible about existing Warsaw Pact military capabilities, especially their order of battle. This technical aspect of intelligence, in turn, made it relatively easy to establish a division of labor between the intelligence and policy communities. Intelligence collected secrets that the military needed to help bound the uncertainties associated with war, and policy did all it could to reduce the likelihood of war.

As one recent discussion on intelligence noted, what is most required from the intelligence community is secret information in support of military operations:

> [A] former senior official suggested that the touchstone for the intelligence community should be its concentration on secrets. He contrasted a "secret" with an "uncertainty," which could be studied, and a "mystery," which is unknowable. A secret, he said, is a valued piece of information that gives its possessor an advantage and would give another who acquired the secret an advantage. The government might want to ponder uncertainties and mysteries, but it should reserve the intelligence service for the pursuit of secrets.[10]

This makes sense. For purposes of fighting proliferation, however, certain adjustments are necessary.

First, as noted before, adversaries of the United States are far less apparent than they were during the cold war. The United States must plan for a security environment in which there may well be a shifting set of allies and adversaries. Moreover, even if Washington had perfect clarity about who its future enemies might be, that knowledge would not exhaust the parties the United States would be interested in monitoring for proliferation purposes. For instance, the United States is obviously concerned about what North Korea is doing. But precisely because the United States is worried about having to go to war in Korea and having to cope with NBC weapons and long-range missiles, it is also keenly interested in what South Korea might be doing to acquire or use such weapons itself. One of the last things the United States wants is to be drawn into a war with (or by) a friend and then have its joint defense plans undermined by this ally's unilateral employment of proscribed strategic weaponry.

Also, the United States is interested in stemming the proliferation of strategic weaponry in general. Given the broad uncertainties of the future security interests of the United States and, therewith, the uncertainty of who its friends and competitors will be, a prudent expenditure of effort in curtailing proliferation today can pay big dividends in the future. Thus, the proliferation activities of a country like Indonesia, which at present is neither a formal ally nor an adversary, are of interest to the US government particularly if, with a modicum of effort, the United States and its friends can persuade that country to forgo the acquisition of strategic weapons.

What fighting proliferation requires, then, is something more than what became routine in the cold war. It requires not just the collection of secrets from known adversaries but

military threat assessments that consider current and possible future threats along with analysis that will enable the United States to slow or prevent proliferation in a much more entrepreneurial fashion.

This kind of forward-looking assessment will require intelligence and policy officials to examine a wide set of uncertainties about the future and to use a variety of analytic methods to build likely proliferation scenarios. Instead of merely trying to determine which countries have which weapons capabilities, policy and intelligence officials will need to determine how these capabilities might be employed against the United States or its allies, spell out what the military operational implications of these employments would be in the most probable war settings, and pinpoint what military vulnerabilities these employments are most likely to create.

A New Paradigm

Working together on such assessments will not be easy for the policy and intelligence communities. That is understandable. Collecting and analyzing proliferation secrets—information that other people are trying to conceal from the United States to prevent it or its friends from taking appropriate action—is what intelligence officials who have been working with proliferation issues are most comfortable with. Policymakers, on the other hand, are generally most at ease developing policy justifications concerning proliferation—arguments supporting or opposing positions or actions the government might take.

Clearly, if the intelligence and policy communities are to focus on the uncertainties that fighting proliferation requires, a new paradigm governing their relationship on these issues needs to be established. One model that suggests itself is the operations research and gaming activities the US military has done for years in order to anticipate what it will need to meet military contingencies. The following sections borrow from that experience. They comprise a suggested hierarchy of policy and intelligence reasoning that would encourage the kind of analysis and operations research that a true fight against proliferation would require. This hierarchy consists of four kinds of proliferation

knowledge: proliferation secrets, uncertainties, excursions, and policy judgments.

Proliferation Secrets

Proliferation secrets are information that other people are trying to conceal to prevent a significant US or allied response. This information is collected and analyzed for policymakers by the intelligence community. Proliferation secrets tend to be straightforward. An example of a proliferation secret might be information as to whether or not the People's Republic of China (PRC) has transferred M-11 ballistic missiles or missile technology to Pakistan in contravention of the guidelines of the MTCR. The PRC and Pakistan would want to keep this information from the United States since the transfer of such missiles could trigger trade sanctions and would be diplomatically embarrassing.

Proliferation Uncertainties

Proliferation uncertainties are less clear-cut. They can only be known imperfectly since they concern possible future technical, economic, political, or military developments—that is, educated guesses about the future. An example of a proliferation uncertainty might be projections as to when Pakistan would be able to produce and operate M-11 ballistic missile systems on its own. Getting a handle on such uncertainties in the Pakistani case would be most useful to policymakers since it would tell them how much time they had to head off or prepare for such activities.

Intelligence estimates concerning proliferation should highlight such uncertainties but rarely do. They do not analyze what the government does and does not know, the variety of futures that might happen, their probabilities, and the independent variables or determinants of each likely future. Instead, intelligence estimates have tended to be fixed, oracular "determinations" that simply reflect the consensus of the moment—that is, what most intelligence analysts agree is the best single guess of what the truth may be. Generally left unaddressed are the gaps in the government's knowledge, which, admittedly, can be embarrassing. That is perhaps why these proliferation estimates

are sometimes treated as sensitive secrets rather than the speculative analyses that they often are.

Proliferation Excursions

Proliferation excursions take uncertainties one step further. They involve the use of information and uncertainty analysis (that is, projections) to divine the likely relation or possible operational implications of known or possible proliferation developments. Operations research, scenario building, and gaming would all fit under this heading. An example might use operations-research techniques to determine the military implications of Pakistan's employing M-11 ballistic missiles against Indian forces. This information would be useful to understand just how serious a problem the spread of this technology might be and allow the United States and its allies to prepare militarily for the consequences.

Policy Judgments

Policy judgments are opinions or conclusions about what positions or actions the government should take toward particular proliferation developments. These judgments are based on arguments that, one would hope, reflect the best information and analysis of the situation, its possible implications, and full consideration of the ramifications of whatever action or position is decided upon. An example here would be the US government's current judgment that M-11 missile proliferation to Pakistan jeopardizes continued peace in Southwest Asia and should, therefore, be opposed.

As noted before, the hierarchy of policy reasoning and the hierarchy of intelligence certitude concerning proliferation issues are opposites. Whereas policy officials are most comfortable with developing and arguing over policy justifications concerning proliferation, the intelligence community is most at home collecting and analyzing proliferation secrets. As for proliferation uncertainties and excursions, neither enjoy much favor in either community since they seem either too complex or technical for busy policymakers or too close in their implications to policy-making for intelligence officers.

To the extent that it was less necessary during the cold war to have policy and intelligence cooperate in doing uncertainty analyses and excursions on the Soviet threat, this division between policy and intelligence was relatively clear, and it generally worked. With proliferation issues, however, such a marked division of labor quickly becomes dysfunctional. Whereas policy officials are eager to use intelligence to issue demarches to US allies about specific exports, imports, or other activities, intelligence agencies are naturally worried about jeopardizing sources and methods. Also, knowing the military implications of specific proliferation developments is critical to policymakers to gauge the importance of particular developments and to come up with the appropriate responses. Yet, the military is uncomfortable discussing possible US force vulnerabilities. Finally, policymakers need to know the full range of what technical, political, and military outcomes are possible for a particular proliferation development. Intelligence analysts, on the other hand, are typically leery of making any but the most conservative projections for fear of being accused of being wrong somewhere down the road.

Each of these dysfunctions has caused friction between the intelligence and policy communities and is part of the reason why the director of Central Intelligence (DCI) created the Nonproliferation Center. Designed to coordinate all of the government's intelligence efforts related to proliferation and to serve as a single point of contact within the community that policymakers could turn to, the center has gone a long way to improve relations between policy and intelligence officials working on proliferation. Such liaison work, however, is no substitute for rethinking the policy and intelligence suppositions that are the cause of the friction between these groups.

Certainly, officials who are fighting proliferation need to stop thinking of their goal as simply one of buying time—a static objective; instead, they need to view their efforts as a campaign, which is dynamic. Progress in this struggle would not be measured in terms of how many states have signed up to agreements such as the Nuclear Nonproliferation Treaty but by how well an agreed strategy to prevent, delay, and combat proliferation has been implemented.

Once policy and intelligence officials begin to think of our efforts against proliferation in this light—as a kind of warfare—it will be more natural for them to become interested in delving into the uncertainties and excursions normally associated with military planning. In fact, in wartime, intelligence officials' cooperation with policymakers is expected (as, for example, in the Office of Strategic Services during the Second World War). Operations research, gaming, and predictive analysis would all be needed in fighting proliferation in order to identify technical, political, and economic opportunities to slow or prevent proliferation and to disinform and sabotage the efforts of those states seeking to acquire nuclear weapons. They would also be needed to identify future proliferation-induced military vulnerabilities, both of American forces (along with those of US allies) and of potential adversaries, and ways of mitigating them.

New Intelligence Requirements

The DCI's Nonproliferation Center has rightly focused on developing an intelligence strategy to tackle the issue of proliferation. However, development of a basic strategy document has been under way for nearly two years. In part, that is because the security environment is changing, and an intelligence strategy—like any strategy—must take account of those changes. Yet the center's development of a strategy has been—and will continue to be—hindered by the absence of a coherent, agreed-upon, prescriptive definition of proliferation.

Definition

Of course, the intelligence community cannot be expected to develop a prescriptive definition on its own. Nevertheless, it makes sense for the community to work on such a definition for two very practical reasons. The first is that the intelligence community retains an expertise in proliferation that should not be ignored out of some overly fastidious concern about the line between policy and intelligence. Thus, the intelligence community often generates (and rightly) reports on proliferation matters without specific requests from policymakers. These reports are intended to alert policy officials to issues

and trends that policy has not addressed and presume a prescriptive definition of what proliferation is. One can ignore this behavior or reflect upon it and use the expertise exhibited in the best of these reports to fashion a realistic and coherent definition of proliferation.

A second, more practical, reason for the intelligence community to help define proliferation is that without a sound, prescriptive definition, intelligence officials and agencies will be hard pressed to do their job or measure their performance. How much of a failure would it be, for example, if US intelligence failed to anticipate North Korea's acquisition of several night-vision goggles as compared to failing to anticipate its development of crude, unmanned air vehicles that could penetrate US air defenses? Knowing which is more important is possible only with a prescriptive definition that identifies what is of greater concern and why.

One way to develop this definition without suffering the dilution of 1,001 coordinations would be for the intelligence community to work with people in the military who are most interested in proliferation problems—that is, members of command staffs charged with actually having to worry about fighting a war in their region. That has the immediate advantage of engaging people most likely to be affected by weapons proliferation and whose views are critical to giving descriptive details to any prescriptive definition once it is in place. Once a working definition has been developed, the other policy elements within the Departments of State and Defense can be brought on board. With a prescriptive definition in hand, both policy and intelligence could establish a process for gauging proliferation threats, prioritizing them, and establishing an overall strategy of diplomatic, economic, and military activities and goals for fighting proliferation.

Collection

Proliferation-related intelligence collection to date has tended to be technocentric. Tremendous amounts of attention continue to be paid to imagery and its interpretation, as well as to the collection of signals. There is also a heavy emphasis on technical matters in the way proliferation issues are handled

and discussed. Generally, far more time is spent on the question of whether a particular country has a particular capability and the specific technical facts associated with its acquisition than on what such acquisition might mean economically, politically, or militarily.

To some extent, this emphasis is unavoidable: tracking nuclear weapons and missile acquisitions or developments requires rocket scientists and nuclear engineers to make sense of things. Yet, relying too heavily on these experts and focusing exclusively on their collection requirements comes at the cost of collecting the kinds of political and economic information that is needed to curtail or prevent proliferation in the first place.

In this regard, what might help most would be a greater understanding, in policy and intelligence circles, of "opportunity analysis."[11] As one proponent of this type of analysis has written, we need much more of the "kind of analysis [that] illuminates for the policy maker opportunities for advancing U.S. objectives and interests through diplomacy, military and economic moves, cultural activities, and other political action."[12] This type of analysis requires that intelligence be collected that will point to "opportunities and vulnerabilities the United States can exploit to advance a policy as well as to the dangers that could undermine a policy."[13] It is obviously important, for example, to know the technical details of Argentina's Condor 2 missile program but no more so than knowing which elements within that country's military are secretly opposed to the missile's development. The former is useful to know if the effort to stem the missile's proliferation fails, while the latter is critical to diplomatic and covert maneuvering to end the program altogether. Both kinds of information are secret, yet only one is especially relevant to policymakers looking for opportunities to defeat proliferation.

Further, in support of policymakers, intelligence collectors (and analysts) need to pay even more attention than they have in making sure they have as much unclassified material as possible on the matters about which they are collecting classified materials. That, again, may not seem a task worthy of agencies known primarily for their work with secrets, but frequently the government cannot make a demarche or inform

allies of developments that require their assistance unless the information can be used in an unclassified forum.

Finally, even more needs to be done to collect information relevant to war. How and why other states might use the strategic weapons systems they are developing or acquiring is at least as important as specifics about the weapons themselves. What kinds of exploitable problems might the employment of these capabilities produce within the military and political leadership? What efforts are smaller states making to hide development or employment of strategic capabilities from American intelligence collectors? Are US and allied efforts succeeding in forcing them to change their acquisition or employment plans? How are countries that are seeking to acquire nuclear weapons reacting to efforts to stop or hinder their programs? What sectors of those governments or their populations are opposed to acquiring strategic systems? To what extent are these doubts related to American or allied actions aimed against these programs?

If intelligence officers are collecting the answers to these questions, these answers should be reflected by changes in Washington's strategy against targeted states seeking to acquire nuclear weapons and also by changes in US collection requirements. Indeed, if collection requirements stay the same, it is a sign that the intelligence community is not collecting what it should or that the policy community is failing to implement an effective strategy.

Analytic Requirements

The effort to fight proliferation will require more than just new targets for collection; intelligence analysis will also have to change. In particular, to support policymakers looking for opportunities to disrupt, slow, or stop a proliferation program of another country, an increased need will exist for analysis that lays out the uncertainties and variables connected with a particular program. That is true not only in the technical arena (for example, what engineering bottlenecks remain for country X to complete project Y; and what are the range of possibilities for country X to master them?) but in political and economic affairs as well.

Recently, we have seen how nuclear and missile programs in countries such as Argentina, South Africa, Taiwan, and Brazil have been either terminated or suspended because of political considerations or economic factors. The United States and its friends could have done more to reinforce some of these forces earlier, had more collection and analysis existed on what the various domestic constituencies for and against these programs were.

Taiwan's decision in 1991 not to develop a space-launch vehicle is a case in point. After considerable internal debate, Taiwan decided to focus its development efforts in the area of satellite technology rather than rocketry. Knowing who supported what, for what reasons, and what political and economic costs they were willing to pay to pursue their aims was critical for policymakers who wanted to move Taiwan along a more benign path of satellite development.

Beyond this, it would also be helpful to have analyses of how each of these countries could better meet the peaceful goals they claimed they were pursuing by investing in these projects (for example, civilian nuclear and space-launch vehicles, large mainframe supercomputers, and so forth). This analysis is especially useful if one is to mount effective public diplomacy efforts against proliferation developments. Also, one must do counterintelligence analysis on how incipient nuclear states are likely to hide their activities or how they plan to get around weaknesses in existing safeguard and inspection regimes and how they plan to avoid intelligence-collection efforts. Such analysis goes beyond uncertainty analysis into the realm of excursions. This work need not be done by intelligence analysts alone; it can be contracted out. In any case, it is work that should be jointly managed by intelligence and policy officials who have a clear grasp of the facts and know what kind of analysis is needed.

This requirement for gaming, economic analysis, and operations research is even clearer in the case of developing military threat analyses. Here, the involvement of the intelligence agencies, particularly those of the military services, is imperative. Without their involvement, no threat assessment—no matter how correct—is likely to alter defense requirements in the areas of weapons acquisition and development or service

training or doctrine. Again, such involvement does not come naturally. As one Defense Intelligence Agency analyst explained to me, "We don't do excursions; they are too hypothetical." When analysts in the defense intelligence services attempt to do such work, moreover, it is often heavily edited and reduced to banality out of concern that it might upset the military services, who have a large stake invested in their five-year spending plans. They do not need or want any second-guessing—implicit or otherwise—generated by intelligence officials. Unfortunately, such a perspective can be literally self-defeating.

One way to change that is to sponsor threat assessments by analysts from outside the government and arrange for the military commands or service staffs to participate in their production. The money is likely to be there: for fiscal year 1996 alone, the policy arm of the Department of Defense spent several million dollars on proliferation studies, and the Energy Department and the Central Intelligence Agency together spent orders of magnitude more on this same set of issues.

Given this spending, it is important that a concerted effort be made to focus and manage the government's study efforts. The National Intelligence Council or the Intelligence Community Management Staff might play a useful role in seeing that this money is used to develop the right kind of analyses. They have a solid bureaucratic interest in doing so, since these studies should have a direct impact on intelligence-collection requirements. At a minimum, some effort is needed to keep track of what is being done by the government as a whole. Without such monitoring, matching analysis on proliferation to the government's nonproliferation strategy will be nearly impossible.

Conclusion

Clearly, if the US government wants to do more than just react to the proliferation of strategic weapons capabilities, the role of intelligence in this fight will have to change along with policy. If the United States is to anticipate developments in the proliferation of strategic weapons; slow or reverse them through diplomatic, political, or economic appeals; or develop military options for coping with their employment, the government will

have to commit itself to a long-term strategy of competition not unlike what it did during the cold war.[14] The heart of such a strategy is to match US strengths against an adversary's weaknesses in an effort to force it into less threatening areas of competition.

Instead of engaging in one major competition—as the United States did with the Soviets—the United States will have to engage in and manage a varied number of competitions against several suppliers and acquiring states. As with the earlier competition with the Soviets, the US will have to anticipate each of these entities' reactions to US and allied moves to fight their actions with regard to the proliferation of strategic weapons and be able to maintain relative advantage in defeating or mitigating these moves. Yet, as with the Soviets, the endgame is the same: America's goal should be to contain the threat until each government trying to acquire strategic weapons is defeated by its own internal contradictions and gives way to a new, more peaceful regime.

Iran, for example, despite severe economic difficulties, continues to pursue costly nuclear programs and conventional military systems in an effort to dominate the Persian Gulf and its neighbors. Although the United States must worry about the military implications of Iran's acquiring these weapons and defending against them should they be employed, a competitive strategy might also attempt to check Tehran's proliferation activities by challenging Iran in areas where it is especially vulnerable and where the United States and its allies hold key advantages. Specifically, in conjunction with allies, Washington and its allies could take additional measures to lessen Iran's access to Western economic assistance and assets as long as it pursues programs dangerous to US and allied interests in the region. A second element in a competitive strategy might be to encourage Tehran to spend more on defensive weaponry by regularly demonstrating the decisive nature of US and allied air superiority in the region and the potential cost to Iran of ignoring its air defenses. A concerted effort to bring this point home to the leadership in Tehran by a vigorous enforcement of UN resolutions against Iraq might result in the Iranian government's spending its limited resources in a more benign area (air defense) rather than in a more dangerous one

(long-range missiles). Finally, the US and its allies should be more alert to Iranian political and domestic opposition that might divert Iran from its current, hostile course.[15]

Again, developing and implementing such a competitive strategy will require several changes in the way intelligence and policy officials currently address proliferation problems. As I have argued, first, it will require that they at least agree on a prescriptive definition of what it is they are fighting. Second, it will require that they reconsider the basic relationship between the policy and intelligence realms that currently makes fighting proliferation so difficult—if not impossible. It simply is impractical for policy and intelligence officials to continue to avoid cooperating on the kinds of operations research and uncertainty analyses needed to gauge and give priority to the potential proliferation threats the United States faces. To assure any meaningful level of success in this area, the role of the military—both the service staffs and the commands, relative to the current actors in proliferation-related policy and intelligence—will have to grow.

Developing such a strategy against proliferation will not be easy. It will take more than a month or even several years. But Washington should be in no rush to get it wrong. Certainly, our experience in Iraq has made that much clear.

Notes

1. That is not to say that the shift was not anticipated. For the creation of the US Department of Defense Proliferation Countermeasures Working Group, see, for example, Barbara Starr, "DoD to Track TBM Proliferation," *Jane's Defence Weekly*, 10 February 1990; and idem, "Third World SSM Threat Studied," *Jane's Defence Weekly*, 16 November 1991.

2. See, for example, Senate Committee on Governmental Affairs, testimony of Director of Intelligence James Woolsey, hearing on "Proliferation Threats of the 1990s," 102d Cong., 2d sess., 24 February 1993; and House, *Department of Defense Appropriations Act for FY 1993* (PL 102-396), 102d Cong., 1st sess., 1992, H.R. 5504, sec. 1607.

3. For example, see agenda, "Counter Proliferation" conference, Arms Control and Disarmament Agency, Washington, D.C., 24–25 May 1993, which emphasizes technology transfer, export controls, verification technologies, and information management.

4. See Les Aspin, secretary of defense, remarks before the National Academy of Sciences Committee on International Security and Arms Control, 7 December 1993.

5. See House, *Department of Defense Appropriations Act for FY 1993*, sec. 1607; and House, *The National Defense Authorization Act for FY 1993*, 102d Cong., 2d sess., 1992, H.R. 2100, sec. 1336.

6. For a discussion of the potential strategic significance of submarines in closed seas; accurate conventional missiles; and command, control, communications, and intelligence (C^3I) technologies, see Henry Sokolski, "Nonapocalyptic Proliferation: A New Strategic Threat?" *The Washington Quarterly*, Spring 1994, 115–27.

7. See House, *Department of Defense Appropriations Act for FY 1993*, sec. 1607.

8. An unclassified presentation of this approach can be found in Senate Committee on Governmental Affairs, *Proliferation and Regional Security in the 1990's*, 101st Cong., 2d sess., 9 October 1990, 49–54. The approach has also been considered within the Department of Defense's Defense Intelligence Agency. See Dan Spohn, "Proliferation Production," Staff Working Paper of the Office of the Defense Intelligence Officer for Research and Development, October 1992.

9. This might seem to be what counterproliferation is all about. In fact, it is something different. Indeed, it is impossible to *neutralize* weapons of proliferation concern since by definition, they are systems for which we *lack* adequate military countermeasures. We *can* limit the damage such weapons might inflict through active and passive defenses and offenses. Neutralizing these threats with effective military countermeasures in the way we do with electronic countermeasures against enemy radars, though, is not yet possible. If it were, these weapons, by definition, would no longer be of proliferation concern but merely of military concern: they would not be capable of inflicting strategic harm, assuming they were properly opposed.

10. Abram Shulsky and Jennifer Sims, *What Is Intelligence?* (Washington, D.C.: Consortium for the Study of Intelligence, 29 April 1992), 32.

11. See Jack Davis, "The Challenge of Opportunity Analysis: An Intelligence Monograph" (Langley, Va.: Center for the Study of Intelligence, Central Intelligence Agency, 1992).

12. Kenneth deGraffenreid, "Intelligence and the Oval Office," in *Intelligence Requirements for the 1980's: Intelligence and Policy*, ed. Roy Godson (Lexington, Mass.: Lexington Books, 1986), 28.

13. Davis, 7.

14. See Andrew W. Marshall, *Long-Term Competition with the Soviets: A Framework for Strategic Analysis* (Santa Monica, Calif.: RAND, 1972); and idem, "Competitive Strategies: History and Background" (Washington, D.C.: Office of Net Assessment, Department of Defense, 3 March 1988).

15. See Ken Timmerman's "Opportunities for Change in Iran"—chapter 12 of this volume—and Patrick Clawson, *Iran's Challenge to the West: How, When, Why* (Washington, D.C.: Washington Institute for Near East Policy, 1993).

APPENDIX A

Treaty on the Nonproliferation of Nuclear Weapons

*The States concluding this Treaty,** hereinafter referred to as the "Parties to the Treaty,"

Considering the devastation that would be visited upon all mankind by a nuclear war and the consequent need to make every effort to avert the danger of such a war and to take measures to safeguard the security of peoples,

Believing that the proliferation of nuclear weapons would seriously enhance the danger of nuclear war,

In conformity with resolutions of the United Nations General Assembly calling for the conclusion of an agreement on the prevention of wider dissemination of nuclear weapons,

Undertaking to cooperate in facilitating the application of International Atomic Energy Agency safeguards on peaceful nuclear activities,

Expressing their support for research, development and other efforts to further the application, within the framework of the International Atomic Energy Agency safeguards system, of the principle of safeguarding effectively the flow of source and special fissionable materials by use of instruments and other techniques at certain strategic points,

Affirming the principle that the benefits of peaceful applications of nuclear technology, including any technological by-products which may be derived by nuclear-weapon States from the development of nuclear explosive devices, should be available for peaceful purposes to all Parties to the Treaty, whether nuclear-weapon or non-nuclear-weapon States,

Convinced that, in furtherance of this principle, all Parties to the Treaty are entitled to participate in the fullest possible exchange of scientific information for, and to contribute alone or in cooperation with other States to, the further development of the applications of atomic energy for peaceful purposes,

Declaring their intention to achieve at the earliest possible date the cessation of the nuclear arms race and to undertake effective measures in the direction of nuclear disarmament,

Urging the cooperation of all States in the attainment of this objective,

Recalling the determination expressed by the Parties to the 1963 Treaty banning nuclear weapon tests in the atmosphere,

*Signed at London, Moscow and Washington on 1 July 1968.

in outer space and under water in its Preamble to seek to achieve the discontinuance of all test explosions of nuclear weapons for all time and to continue negotiations to this end,

Desiring to further the easing of international tension and the strengthening of trust between States in order to facilitate the cessation of the manufacture of nuclear weapons, the liquidation of all their existing stockpiles, and the elimination from national arsenals of nuclear weapons and the means of their delivery pursuant to a treaty on general and complete disarmament under strict and effective international control,

Recalling that, in accordance with the Charter of the United Nations, States must refrain in their international relations from the threat or use of force against the territorial integrity or political independence of any State, or in any other manner inconsistent with the Purposes of the United Nations, and that the establishment and maintenance of international peace and security are to be promoted with the least diversion for armaments of the world's human and economic resources,

Have agreed as follows:

Article I

Each nuclear-weapon State Party to the Treaty undertakes not to transfer to any recipient whatsoever nuclear weapons or other nuclear explosive devices or control over such weapons or explosive devices directly, or indirectly; and not in any way to assist, encourage, or induce any non-nuclear-weapon State to manufacture or otherwise acquire nuclear weapons or other nuclear explosive devices, or control over such weapons or explosive devices.

Article II

Each non-nuclear-weapon State Party to the Treaty undertakes not to receive the transfer from any transferor whatsoever of nuclear weapons or other nuclear explosive devices or of control over such weapons or explosive devices directly, or indirectly; not to manufacture or otherwise acquire nuclear weapons or other nuclear explosive devices; and not to seek or

receive any assistance in the manufacture of nuclear weapons or other nuclear explosive devices.

Article III

1. Each non-nuclear-weapon State Party to the Treaty undertakes to accept safeguards, as set forth in an agreement to be negotiated and concluded with the International Atomic Energy Agency in accordance with the Statute of the International Atomic Energy Agency and the Agency's safeguards system, for the exclusive purpose of verification of the fulfillment of its obligations assumed under this Treaty with a view to preventing diversion of nuclear energy from peaceful uses to nuclear weapons or other nuclear explosive devices. Procedures for the safeguards required by this article shall be followed with respect to source or special fissionable material whether it is being produced, processed or used in any principal nuclear facility or is outside any such facility. The safeguards required by this article shall be applied on all source or special fissionable material in all peaceful nuclear activities within the territory of such State, under its jurisdiction, or carried out under its control anywhere.

2. Each State Party to the Treaty undertakes not to provide *(a)* source or special fissionable material, or *(b)* equipment or material especially designed or prepared for the processing, use or production of special fissionable material, to any non-nuclear-weapon State for peaceful purposes, unless the source or special fissionable material shall be subject to the safeguards required by this article.

3. The safeguards required by this article shall be implemented in a manner designed to comply with Article IV of this Treaty, and to avoid hampering the economic or technological development of the Parties or international cooperation in the field of peaceful nuclear activities, including the international exchange of nuclear material and equipment for the processing, use or production of nuclear material for peaceful purposes in accordance with the provisions of this article and the principle of safeguarding set forth in the Preamble of the Treaty.

4. Non-nuclear-weapon States Party to the Treaty shall conclude agreements with the International Atomic Energy Agency to meet the requirements of this article either individually or together with other States in accordance with the Statute of the International Atomic Energy Agency. Negotiation of such agreements shall commence within 180 days from the original entry into force of this Treaty. For States depositing their instruments of ratification or accession after the 180-day period, negotiation of such agreements shall commence not later than the date of such deposit. Such agreements shall enter into force not later than 18 months after the date of initiation of negotiations.

Article IV

1. Nothing in this Treaty shall be interpreted as affecting the inalienable right of all the Parties to the Treaty to develop research, production and use of nuclear energy for peaceful purposes without discrimination and in conformity with Articles I and II of this Treaty.

2. All the Parties to the Treaty undertake to facilitate, and have the right to participate in, the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy. Parties to the Treaty in a position to do so shall also cooperate in contributing alone or together with other States or international organizations to the further development of the applications of nuclear energy for peaceful purposes, especially in the territories of non-nuclear-weapon States Party to the Treaty, with due consideration for the needs of the developing areas of the world.

Article V

Each Party to the Treaty undertakes to take appropriate measures to ensure that, in accordance with this Treaty, under appropriate international observation and through appropriate international procedures, potential benefits from any peaceful applications of nuclear explosions will be made available to non-nuclear-weapon States Party to the Treaty on

a nondiscriminatory basis and that the charge to such Parties for the explosive devices used will be as low as possible and exclude any charge for research and development. Non-nuclear-weapon States Party to the Treaty shall be able to obtain such benefits, pursuant to a special international agreement or agreements, through an appropriate international body with adequate representation of non-nuclear-weapon States. Negotiations on this subject shall commence as soon as possible after the Treaty enters into force. Non-nuclear-weapon States Party to the Treaty so desiring may also obtain such benefits pursuant to bilateral agreements.

Article VI

Each of the Parties to the Treaty undertakes to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control.

Article VII

Nothing in this Treaty affects the right of any group of States to conclude regional treaties in order to assure the total absence of nuclear weapons in their respective territories.

Article VIII

1. Any Party to the Treaty may propose amendments to this Treaty. The text of any proposed amendment shall be submitted to the Depositary Governments which shall circulate it to all Parties to the Treaty. Thereupon, if requested to do so by one third or more of the Parties to the Treaty, the Depositary Governments shall convene a conference, to which they shall invite all the Parties to the Treaty, to consider such an amendment.

2. Any amendment to this Treaty must be approved by a majority of the votes of all the Parties to the Treaty, including the votes of all nuclear-weapon States Party to the Treaty and all other Parties which, on the date the amendment is

circulated, are members of the Board of Governors of the International Atomic Energy Agency. The amendment shall enter into force for each Party that deposits its instrument of ratification of the amendment upon the deposit of such instruments of ratification by a majority of all the Parties, including the instruments of ratification of all nuclear-weapon States Party to the Treaty and all other Parties which, on the date the amendment is circulated, are members of the Board of Governors of the International Atomic Energy Agency. Thereafter, it shall enter into force for any other Party upon the deposit of its instrument of ratification of the amendment.

3. Five years after the entry into force of this Treaty, a conference of Parties to the Treaty shall be held in Geneva, Switzerland, in order to review the operation of this Treaty with a view to assuring that the purposes of the Preamble and the provisions of the Treaty are being realized. At intervals of five years thereafter, a majority of the Parties to the Treaty may obtain, by submitting a proposal to this effect to the Depositary Governments, the convening of further conferences with the same objective of reviewing the operation of the Treaty.

Article IX

1. This Treaty shall be open to all States for signature. Any State which does not sign the Treaty before its entry into force in accordance with paragraph 3 of this article may accede to it at any time.

2. This Treaty shall be subject to ratification by signatory States. Instruments of ratification and instruments of accession shall be deposited with the Governments of the Union of Soviet Socialist Republics, the United Kingdom of Great Britain and Northern Ireland and the United States of America, which are hereby designated the Depositary Governments.

3. This Treaty shall enter into force after its ratification by the States, the Governments of which are designated Depositories of the Treaty, and 40 other States signatory to this Treaty and the deposit of their instruments of ratification. For the purposes of this Treaty, a nuclear-weapon State is one

which has manufactured and exploded a nuclear weapon or other nuclear explosive device prior to 1 January 1967.

4. For States whose instruments of ratification or accession are deposited subsequent to the entry into force of this Treaty, it shall enter into force on the date of the deposit of their instruments of ratification or accession.

5. The Depositary Governments shall promptly inform all signatory and acceding States of the date of each signature, the date of deposit of each instrument of ratification or of accession, the date of the entry into force of this Treaty, and the date of receipt of any requests for convening a conference or other notices.

6. This Treaty shall be registered by the Depositary Governments pursuant to Article 102 of the Charter of the United Nations.

Article X

1. Each Party shall in exercising its national sovereignty have the right to withdraw from the Treaty if it decides that extraordinary events, related to the subject matter of this Treaty, have jeopardized the supreme interests of its country. It shall give notice of such withdrawal to all other Parties to the Treaty and to the United Nations Security Council three months in advance. Such notice shall include a statement of the extraordinary events it regards as having jeopardized its supreme interests.

2. Twenty-five years after the entry into force of the Treaty, a conference shall be convened to decide whether the Treaty shall continue in force indefinitely, or shall be extended for an additional fixed period or periods. This decision shall be taken by a majority of the Parties to the Treaty.

Article XI

This Treaty, the Chinese, English, French, Russian and Spanish texts of which are equally authentic, shall be deposited in the archives of the Depositary Governments. Duly certified copies of this Treaty shall be transmitted by the

Depositary Governments to the Governments of the signatory and acceding States.

IN WITNESS WHEREOF the undersigned, duly authorized, have signed this Treaty.

DONE in triplicate at the cities of Washington, London and Moscow, this first day of July, one thousand nine hundred and sixty-eight.

APPENDIX B

Agreed Framework between the United States of America and the Democratic People's Republic of Korea

Geneva, October 21, 1994

Delegations of the Governments of the United States of America (U.S.) and the Democratic People's Republic of Korea (DPRK) held talks in Geneva from September 23 to October 21, 1994, to negotiate an overall resolution of the nuclear issue on the Korean Peninsula.

Both sides reaffirmed the importance of attaining the objectives contained in the August 12, 1994 Agreed Statement between the U.S. and the DPRK and upholding the principles of the June 11, 1993 Joint Statement of the U.S. and the DPRK to achieve peace and security on a nuclear-free Korean Peninsula. The U.S. and the DPRK decided to take the following actions for the resolution of the nuclear issue:

I. Both sides will cooperate to replace the DPRK's graphite-moderated reactors and related facilities with light water reactor (LWR) power plants.

1) In accordance with the October 20, 1994 letter of assurance from the U.S. President, the U.S. will undertake to make arrangements for the provision to the DPRK of a LWR project with a total generating capacity of approximately 2,000 MW(s) by a target date of 2003.

-- The U.S. will organize under its leadership an international consortium to finance and supply the LWR project to be provided to the DPRK. The U.S., representing the international consortium, will serve as the principal point of contact with the DPRK for the LWR project.

-- The U.S., representing the consortium, will make best efforts to secure the conclusion of a supply contract with the DPRK within six months of the date of this Document for the provision of the LWR project. Contract talks will begin as soon as possible after the date of this Document.

-- As necessary, the U.S. and the DPRK will conclude a bilateral agreement for cooperation in the field of peaceful uses of nuclear energy.

2) In accordance with the October 20, 1994 letter of assurance from the U.S. President, the U.S., representing the consortium, will make arrangements to offset the energy foregone due to the freeze of the DPRK's graphite-moderated reactors and related facilities, pending completion of the first LWR unit.

-- Alternative energy will be provided in the form of heavy oil for heating and electricity production.

-- Deliveries of heavy oil will begin within three months of the date of this Document and will reach a rate of 500,000 tons annually, in accordance with an agreed schedule of deliveries.

3) Upon receipt of U.S. assurances for the provision of LWRs and for arrangements for interim energy alternatives, the DPRK will freeze its graphite-moderated reactors and related facilities and will eventually dismantle these reactors and related facilities.

-- The freeze on the DPRK's graphite-moderated reactors and related facilities will be fully implemented within one month of the date of this Document. During this one-month period, and throughout the freeze, the International Atomic Energy Agency (IAEA) will be allowed to monitor this freeze, and the DPRK will provide full cooperation to the IAEA for this purpose.

-- Dismantlement of the DPRK's graphite-moderated reactors and related facilities will be completed when the LWR project is completed.

-- The U.S. and the DPRK will cooperate in finding a method to store safely the spent fuel from the 3 MW(s) experimental reactor during the construction of the LWR project, and to dispose of the fuel in a safe manner that does not involve reprocessing in the DPRK.

4) As soon as possible after the date of this Document U.S. and DPRK experts will hold two sets of experts talks.

-- At one set of talks, experts will discuss issues related to alternative energy and the replacement of the graphite-moderated reactor program with the LWR project.

-- At the other set of talks, experts will discuss specific arrangements for spent fuel storage and ultimate disposition.

II. The two sides will move toward full normalization of political and economic relations.

1) Within three months of the date of this Document, both sides will reduce barriers to trade and investment, including restrictions on telecommunications services and financial transactions.

2) Each side will open a liaison office in the other's capital following resolution of consular and other technical issues through expert level discussions.

3) As progress is made on issues of concern to each side, the U.S. and the DPRK will upgrade bilateral relations to the Ambassadorial level.

III. Both sides will work together for peace and security on a nuclear-free Korean Peninsula.

1) The U.S. will provide formal assurances to the DPRK, against the threat or use of nuclear weapons by the U.S.

2) The DPRK will consistently take steps to implement the North-South Joint Declaration on the Denuclearization of the Korean Peninsula.

3) The DPRK will engage in North-South dialogue, as this Agreed Framework will help create an atmosphere that promotes such dialogue.

IV. Both sides will work together to strengthen the international nuclear nonproliferation regime.

1) The DPRK will remain a party to the Treaty on the NonProliferation of Nuclear Weapons (NPT) and will allow implementation of its safeguards agreement under the Treaty.

2) Upon conclusion of the supply contract for the provision of the LWR project, ad hoc and routine inspections will resume under the DPRK's safeguards agreement with the IAEA with respect to the facilities not subject to the freeze. Pending conclusion of the supply contract, inspections required by the IAEA for the continuity of safeguards will continue at the facilities not subject to the freeze.

3) When a significant portion of the LWR project is completed, but before delivery of key nuclear components, the DPRK will come into full compliance with its safeguards agreement with the IAEA (INFCIRC/403), including taking all steps that may be deemed necessary by the IAEA, following consultations with the Agency with regard to verifying the accuracy and completeness of the DPRK's initial report on all nuclear material in the DPRK.

Robert L. Gallucci
Head of the Delegation of
the United States of
America, Ambassador at
Large of the United States
of America

강석주

Kang Sok Ju
Head of the Delegation of
the Democratic People's
Republic of Korea, First
Vice-Minister of Foreign
Affairs of the Democratic
People's Republic of Korea

APPENDIX C

Joint US-DPRK Press Statement

KUALA LUMPUR, JUNE 16, 1995

The delegations of the United States of America (U.S.) and the Democratic People's Republic of Korea (DPRK) held talks in Kuala Lumpur from May 19 to June 12, 1995, with respect to implementation of the DPRK-US Agreed Framework of October 21, 1994.

Both sides reaffirmed their political commitments to implement the US-DPRK Agreed Framework, and with particular regard to facilitating the light water reactor (LWR) project as called for in the Agreed Framework, decided as follows:

I

The U.S. reaffirms that the letter of assurance from the U.S. President dated October 20, 1994 concerning the provision of the LWR project and interim energy alternatives continues in effect.

The Korean Peninsula Energy Development Organization (KEDO), under U.S. leadership, will finance and supply the LWR project in the DPRK as called for in the Agreed Framework. As specified in the Agreed Framework, the U.S. will serve as the principal point of contact with the DPRK for the LWR project. In this regard, U.S. citizens will lead delegations and teams of KEDO as required to fulfill this role.

II

The LWR project will consist of two pressurized light water reactors with two coolant loops and a generating capacity of approximately 1,000 MW(E) each. The reactor model, selected by KEDO, will be the advanced version of U.S.-origin design and technology currently under production.

III

The Commission for External Economic Relations, representing the DPRK Government, and KEDO will conclude a supply agreement at the earliest possible date for the provision of the LWR project on a turnkey basis. On the basis of this statement,

the DPRK will meet with KEDO as soon as possible to negotiate the outstanding issues of the LWR supply agreement.

KEDO will conduct a site survey to identify the requirements for construction and operation of the LWR project. The costs of this site survey and site preparation will be included in the scope of supply for the project.

KEDO will select a prime contractor to carry out the project. A U.S. firm will serve as program coordinator to assist KEDO in supervising overall implementation of the LWR project; KEDO will select the program coordinator. A DPRK firm will enter into implementing arrangements as necessary to facilitate the LWR project.

IV

In addition to the LWR project, the two sides decided to take the following steps towards implementation of the Agreed Framework.

Experts from the two sides will meet in the DPRK as soon as possible in June to agree on a schedule and cooperative measures for phased delivery of heavy fuel oil in accordance with the Agreed Framework. KEDO will begin immediately to make arrangements for an initial delivery of heavy fuel oil, subject to conclusion of the above agreement.

The DPRK-U.S. Record of Meeting of January 20, 1995, on safe storage of spent fuel will be expeditiously implemented. In this regard, a U.S. team of experts will visit the DPRK as soon as possible in June to begin implementation.

APPENDIX D

Statement by the Assistant to the President for Press Relations

THE WHITE HOUSE

Office of the Press Secretary
(Santa Barbara, California)

For Immediate Release April 16, 1987

The President is pleased to announce a new policy to limit the proliferation of missiles capable of delivering nuclear weapons. The U.S. Government is adopting this policy today in common with the governments of Canada, France, the Federal Republic of Germany, Italy, Japan, and the United Kingdom. These nations have long been deeply concerned over the dangers of nuclear proliferation. Acting on this concern, these seven governments have formulated Guidelines to control the transfer of equipment and technology that could contribute to nuclear-capable missiles. This initiative was completed only recently, following several years of diplomatic discussions among these governments. The fact that all seven governments have agreed to common guidelines and to a common annex of items to be controlled serves to prevent commercial advantage or disadvantage of any of the countries. Both the Guidelines and its Annex will be made available to the public.

The President wishes to stress that it is the continuing aim of the United States Government to encourage international cooperation in the peaceful use of modern technology, including in the field of space. The Guidelines are not intended to impede this objective. However, such encouragement must be given in ways that are fully consistent with the nonproliferation policies of the U.S. Government.

The United States, and its partners in this important initiative, would welcome the adherence of all states to these guidelines in the interest of international peace and security.

# # #

Notice to the Press

The State Department will address this topic at their daily briefing today at 12:30 P.M., and they will also hold a briefing by specialists at 2:00 P.M. at the State Department.

# # #

APPENDIX E

Missile Technology Control Regime: Fact Sheet to Accompany Public Announcement

EMBARGOED UNTIL
6:AM EDT 4/16/87

The United States Government has, after careful consideration and subject to its international treaty obligations, decided that, when considering the transfer of equipment and technology related to missiles whose performance in terms of payload and range exceeds stated parameters, it will act in accordance with the attached Guidelines beginning on April 16, 1987.

GUIDELINES FOR SENSITIVE MISSILE-RELEVANT TRANSFERS

1. The purpose of these Guidelines is to limit the risks of nuclear proliferation by controlling transfers that could make a contribution to nuclear weapons delivery systems other than manned aircraft. The Guidelines are not designed to impede national space programs or international cooperation in such programs as long as such programs could not contribute to nuclear weapons delivery systems. These Guidelines, including the attached Annex, form the basis for controlling transfers to any destination beyond the Government's jurisdiction or control of equipment and technology relevant to missiles whose performance in terms of payload and range exceeds stated parameters. Restraint will be exercised in the consideration of all transfers of items contained within the Annex and all such transfers will be considered on a case-by-case basis. The Government will implement the Guidelines in accordance with national legislation.

2. The Annex consists of two categories of items, which term includes equipment and technology. Category I items, all of which are in Annex Items 1 and 2, are those items of greatest sensitivity. If a Category I item is included in a system, that system will also be considered as Category I, except when the incorporated item cannot be separated, removed or duplicated. Particular restraint will be exercised in the consideration of Category I transfers, and there will be a strong presumption to deny such transfers. Until further notice, the transfer of

Category I production facilities will not be authorized. The transfer of other Category I items will be authorized only on rare occasions and where the Government [A] obtains binding government-to-government undertakings embodying the assurances from the recipient government called for in paragraph 5 of these Guidelines and [B] assumes responsibility for taking all steps necessary to ensure that the item is put only to its stated end use. It is understood that the decision to transfer remains the sole and sovereign judgment of the United States Government.

3. In the evaluation of transfer applications for Annex items, the following factors will be taken into account:

A. Nuclear proliferation concerns;

B. The capabilities and objectives of the missile and space programs of the recipient state;

C. The significance of the transfer in terms of the potential development of nuclear weapons delivery systems other than manned aircraft;

D. The assessment of the end use of the transfers, including the relevant assurances of the recipient states referred to in subparagraphs 5.A and 5.B below;

E. The applicability of relevant multilateral agreements.

4. The transfer of design and production technology directly associated with any items in the Annex will be subject to as great a degree of scrutiny and control as will the equipment itself, to the extent permitted by national legislation.

5. Where the transfer could contribute to a nuclear weapons delivery system, the Government will authorize transfers of items in the Annex only on receipt of appropriate assurances from the government of the recipient state that:

A. The items will be used only for the purpose stated and that such use will not be modified nor the items modified or replicated without the prior consent of the United States Government;

B. Neither the items nor replicas nor derivatives thereof will be retransferred without the consent of the United States Government.

6. In furtherance of the effective operation of the Guidelines, the United States Government will, as necessary and appropriate, exchange relevant information with other governments applying the same Guidelines.

7. The adherence of all States to these Guidelines in the interest of international peace and security would be welcome.

SUMMARY OF THE EQUIPMENT AND TECHNOLOGY ANNEX

[Only the full text of the Annex is authoritative, and it should be consulted for precise details.]

Category I

-- Complete rocket systems [including ballistic missile systems, space launch vehicles, and sounding rockets] and unmanned air vehicle systems [including cruise missile systems, target drones, and reconnaissance drones] capable of delivering at least a 500 kg payload to a range of at least 300 km as well as the specially designed production facilities for these systems.

-- Complete subsystems usable in the systems in Item 1, as follows, as well as the specially designed production facilities and production equipment therefor:

-- Individual rocket stages;
  - -- Reentry vehicles;
  - -- Solid or liquid fuel rocket engines;
  - -- Guidance sets;
  - -- Thrust vector controls;
  - -- Warhead safing, arming, fuzing, and firing mechanisms.

Category II

-- Propulsion components.

-- Propellants and constituents.

-- Propellant production technology and equipment.

-- Missile structural composites: production technology and equipment.

-- Pyrolytic deposition/densification technology and equipment.
-- Structural materials.
-- Flight instruments, inertial navigation equipment, software, and production equipment.
-- Flight control systems.
-- Avionics equipment.
-- Launch/ground support equipment and facilities.
-- Missile computers.
-- Analog-to-digital converters.
-- Test facilities and equipment.
-- Software and related analog or hybrid computers.
-- Reduced observables technology, materials, and devices.
-- Nuclear effects protection.

APPENDIX F

Equipment and Technology Annex

EMBARGOED UNTIL
6:AM EDT 4/16/87

1. Introduction.

(a) This annex consists of two categories of items, which term includes equipment and technology. Category I items, all of which are in Annex Items 1 and 2, are those items of greatest sensitivity. If a Category I item is included in a system, that system will also be considered as Category I, except when the incorporated item cannot be separated, removed or duplicated. Category II items are those items in the Annex not designated Category I.

(b) The transfer of design and production technology directly associated with any items in the Annex will be subject to as great a degree of scrutiny and control as will the equipment itself, to the extent permitted by national legislation.

2. Definitions. For the purpose of this Annex, the following definitions shall apply:

(a) The term technology means specific information which is required for the development, production or use of a product. The information may take the form of technical data or technical assistance.

(b)(1) Development is related to all stages prior to serial production such as

- design
- design research
- design analyses
- design concepts
- assembly and testing of prototypes
- pilot production schemes
- design data
- process of transforming design data into a product
- configuration design
- integration design
- layouts

(2) Production means all production stages such as

- production engineering
- manufacture

- integration
- assembly (mounting)
- inspection
- testing
- quality assurance

(3) Use means

- operation
- installation (including on-site installation)
- maintenance (checking)
- repair
- overhaul and refurbishing

(c)(1) Technical data may take forms such as blueprints, plans, diagrams, models, formulae, engineering designs and specifications, manuals and instructions written or recorded on other media or devices such as disk, tape, read-only memories.

(2) Technical assistance may take forms such as

- instruction
- skills
- training
- working knowledge
- consulting services

(d) Note: This definition of technology does not include technology in the public domain nor basic scientific research.

(1) In the public domain as it applies to this Annex means technology which has been made available without restrictions upon its further dissemination. (Copyright restrictions do not remove technology from being in the public domain.)

(2) Basic scientific research means experimental or theoretical work undertaken principally to acquire new knowledge of the fundamental principles of phenomena and observable facts, not primarily directed towards a specific practical aim or objective.

(e) The term production facilities means equipment and specially designed software therefor integrated into facilities for prototype development or for one or more stages of serial production.

(f) The term <u>production equipment</u> means tooling, templates, jigs, mandrels, moulds, dies, fixtures, alignment mechanisms, test equipment, other machinery and components thereof, limited to those specially designed or modified for prototype development or for one or more stages of serial production.

<u>ITEM 1 - CATEGORY I</u>

Complete rocket systems (including ballistic missile systems, space launch vehicles, and sounding rockets) and unmanned air vehicle systems (including cruise missile systems, target drones, and reconnaissance drones) capable of delivering at least a 500 kg payload to a range of at least 300 km as well as the specially designed production facilities for these systems.

<u>ITEM 2 - CATEGORY I</u>

Complete subsystems usable in the systems in Item 1, as follows, as well as the specially designed production facilities and production equipment therefor:

(a) Individual rocket stages;

(b) Reentry vehicles, and specially designed equipment therefor, as follows, except as provided in note (1) below for those designed for non-weapons payloads:

(1) Heat shields and components thereof fabricated of ceramic or ablative materials;

(2) Heat sinks and components thereof fabricated of lightweight, high heat capacity materials;

(3) Electronic equipment specially designed or modified for reentry vehicles;

(c) Solid or liquid fuel rocket engines, having a total impulse capacity of 2.5 x 10^5 lb-sec or greater, except as provided in note (1) below for those specially designed or modified for orbital correction of satellites;

(d) Guidance sets capable of achieving system accuracy (CEP) of 10 km or less at a range of 300 km, except as provided in note (1) below for those designed for missiles with range under 300 km or manned aircraft;

(e) Thrust vector controls, except as provided in note (1) below for those designed for rocket systems with range under 300 km;

(f) Warhead safing, arming, fuzing, and firing mechanisms, except as provided in note (1) below for those designed for systems other than those in Item 1.

Notes to Item 2:
(1) The exceptions in (b), (c), (d), (e), and (f) above may be treated as Category II if the subsystem is exported subject to end use statements and quantity limits appropriate for the excepted end use stated above.
(2) CEP (circle of equal probability) is a measure of accuracy; the radius of the circle centered at the target, at a specific range, in which 50 percent of the payloads impact.

ITEM 3 - CATEGORY II

Propulsion components and equipment usable in the systems in Item 1, as follows, as well as the specially designed production facilities therefor:

(a) Lightweight turbojet and turbofan engines (including turbocompound engines) that are small and fuel efficient;

(b) Ramjet/Scramjet engines, including devices to regulate combustion, and specially designed production equipment therefor;

(c) Rocket motor cases and specially designed production equipment therefor;

(d) Staging mechanisms and specially designed production equipment therefor;

(e) Liquid fuel control systems and components therefor, specially designed to operate in vibrating environments of more than 12g rms between 20 H_z and 2,000 H_z including:

(1) Servo valves designed for flow rates of 24 liters per minute or greater at a pressure of 250 bars, and having flow contact surfaces made of 90 percent or more tantalum, titanium or zirconium, either separately or combined, except when such surfaces are made of materials containing more than 97 percent and less than 99.7 percent titanium;

(2) Pumps (except vacuum pumps), having all flow contact surfaces made of 90 percent or more tantalum, titanium or zirconium, either separately or combined, except when such

surfaces are made of materials containing more than 97 percent and less than 99.7 percent titanium.

Notes to Item 3:
(1) Item 3(a) engines may be exported as part of a manned aircraft or in quantities appropriate for replacement parts for manned aircraft.
(2) Item 3(e) systems and components may be exported as part of a satellite.

ITEM 4 - CATEGORY II

Propellants and constituent chemicals for propellants as follows:

(a) Propulsive substances:

(1) Hydrazine with a concentration of more than 70 percent;

(2) Unsymmetric dimethylhydrazine (UDMH);

(3) Spherical ammonium perchlorate with particles of uniform diameter less than 500 microns;

(4) Spherical aluminum powder with particles of uniform diameter of less than 500 microns and an aluminum content of 97 percent or greater;

(5) Metal fuels in particle sizes less than 500 microns, whether spherical, atomized, spheroidal, flaked or ground, consisting of 97 percent or more of any of the following: zirconium, titanium, uranium, tungsten, boron, zinc, and alloys of these; magnesium; Misch metal;

(6) Nitro-amines (cyclotetramethylene-tetranitramine [HMX], cyclotetramethylenetrinitramine (RDX)) when specially formulated as propulsive substances.

(b) Polymeric substances:

(1) Carboxy-terminated polybutadiene (CTPB);

(2) Hydroxy-terminated polybutadiene (HTPB);

(c) Composite propellants including molded glue propellants and propellants with nitrated bonding and aluminum content in excess of 5 percent.

(d) Other high energy density fuels such as Boron Slurry, having an energy density of 40×10^6 joules/kg or greater.

ITEM 5 - CATEGORY II

Production technology or production equipment specially designed or modified for production, handling, mixing, curing, casting, pressing, machining and acceptance testing of the liquid or solid propellants and propellant constituents as described in Item 4.

ITEM 6 - CATEGORY II

Equipment, technical data and procedures for the production of structural composites usable in the systems in Item 1 as follows, and specially designed components and accessories and specially designed software therefor:

(a) Filament winding machines of which the motions for positioning, wrapping and winding fibres are coordinated and programmed in three or more axes, specially designed to fabricate composite structures or laminates from fibrous and filamentary materials; and coordinating and programming controls;

(b) Tape-laying machines of which the motions for positioning and laying tape and sheets are coordinated and programmed in two or more axes, specially designed for the manufacture of composite airframes and missile structures;

(c) Interlacing machines, including adapters and modification kits for weaving, interlacing or braiding fibres to fabricate composite structures, except textile machinery which has not been modified for the above end uses;

(d) Specially designed or adapted equipment for the production of fibrous and filamentary materials as follows:

(1) Equipment for converting polymeric fibres (such as polyacrylonitrile, rayon, or polycarbosilane) including special provision to strain the fibre during heating;

(2) Equipment for the vapor deposition of elements or compounds on heated filamentary substrates; and

(3) Equipment for the wet-spinning of refractory ceramics (such as aluminum oxide);

(e) Specially designed or adapted equipment for special fibre surface treatment or for producing prepregs and performs. Note: Equipment covered by this subitem includes

but is not limited to rollers, tension stretchers, coating equipment, cutting equipment and clicker dies.

(f) Technical data (including processing conditions) and procedures for the regulation of temperature, pressures or atmosphere in autoclaves when used for the production of composites or partially processed composites.

Note to Item 6: Specially designed or adapted components and accessories for the machines covered by this entry include, but are not limited to, moulds, mandrels, dies, fixtures and tooling for the preform pressing, curing, casting, sintering or bonding of composite structures, laminates and manufactures thereof.

ITEM 7 - CATEGORY II

Pyrolytic deposition and densification equipment and technology as follows:

(a) Technology for producing pyrolytically derived materials formed on a mold, mandrel or other substrate from precursor gases which decompose in the 1300°C to 2900°C temperature range at pressures of 1 mm Hg to 150 mm Hg (including technology for the composition of precursor gases, flow rates, and process control schedules and parameters);

(b) Specially designed nozzles for the above processes;

(c) Equipment and process controls, and specially designed software therefor, specially designed for densification and pyrolysis of structural composite rocket nozzles and reentry vehicle nose tips.

ITEM 8 - CATEGORY II

Structural materials usable in the systems in Item 1, as follows:

(a) Composite structures, laminates, and manufactures thereof, including resin impregnated fibre prepregs and metal coated fibre performs therefor, specially designed for use in the systems in Item 1 and the subsystems in Item 2 made either with an organic matrix or metal matrix utilizing fibrous or filamentary reinforcements having a specific tensile strength greater than 7.62×10^4m (3×10^6 inches) and a specific modulus greater than 3.18×10^6m (1.25×10^8 inches);

(b) Resaturated pyrolized (i.e., carbon-carbon) materials specially designed for rocket systems;

(c) Fine grain artificial graphites for rocket nozzles and reentry vehicle nose tips having all of the following characteristics:

(1) Bulk density of 1.79 or greater (measured at 293K);

(2) Tensile strain to failure of 0.7 percent or greater (measured at 293K);

(3) Coefficient of thermal expansion of 2.75×10^{-6} or less per degree K (in the range of 293K to 1,255K);

(d) Ceramic composite materials specially designed for use in missile radomes.

ITEM 9 - CATEGORY II

Compasses, gyroscopes, accelerometers and inertial equipment and specially designed software therefor, as follows; and specially designed components therefor usable in the systems in Item 1:

(a) Integrated flight instrument systems which include gyrostabilizers or automatic pilots and integration software therefor, specially designed or modified for use in the systems in Item 1;

(b) Gyro-astro compasses and other devices which derive position or orientation by means of automatically tracking celestial bodies;

(c) Accelerometers with a threshold of 0.005 g or less, or a linearity error within 0.25 percent of full scale output or both, which are designed for use in inertial navigation systems or in guidance systems of all types;

(d) Gyros with a rated free directional drift rate (rated free precession) of less than 0.5 degree (1 sigma or rms) per hour in a 1 g environment;

(e) Continuous output accelerometers which utilize servo or force balance techniques and gyros, both specified to function at acceleration levels greater than 100 g;

(f) Inertial or other equipment using accelerometers described by subitems (c) and (e) above or gyros described by subitems (d) or (e) above, and systems incorporating such equipment, and specially designed integration software therefor;

(g) Specially designed test, calibration, and alignment equipment for the above;

(h) Specially designed production equipment for the above, including the following:

(1) For ring laser gyro equipment, the following equipment used to characterize mirrors, having the threshold accuracy shown or better:

(i) Rectilinear Scatterometer (10 ppm);

(ii) Polar Scatterometer (10 ppm);

(iii) Reflectometer (50 ppm);

(iv) Profilimeter (5 Angstroms);

(2) For other inertial equipment:

(i) Inertial Measurement Unit (IMU Module) Tester;

(ii) IMU Platform Tester;

(iii) IMU Stable Element Handling Fixture;

(iv) IMU Platform Balance Fixture;

(v) Gyro Tuning Test Station;

(vi) Gyro Dynamic Balance Station;

(vii) Gyro Run-In/Motor Test Station;

(viii) Gyro Evacuation and Fill Station;

(ix) Centrifuge Fixture for Gyro Bearings;

(x) Accelerometer Axis Align Station;

(xi) Accelerometer Test Station.

Note to Item 9: Items (a) through (f) may be exported as part of a manned aircraft or satellite or in quantities appropriate for replacement parts for manned aircraft.

ITEM 10 - CATEGORY II

Flight control systems usable in the systems in Item 1 as follows, as well as the specially designed test, calibration, and alignment equipment therefor:

(a) Hydraulic, mechanical, electro-optical, or electro-mechanical flight control systems (including fly-by-wire systems) specially designed or modified for the systems in Item 1;

(b) Attitude control equipment specially designed or modified for the systems in Item 1;

(c) Design technology for integration of air vehicle fuselage, propulsion system and lifting and control surfaces to optimize

aerodynamic performance throughout the flight regime of an unmanned air vehicle;

(d) Design technology for integration of flight control, guidance, and propulsion data into a flight management system for optimization of rocket system trajectory.

Note to Item 10: Items (a) and (b) may be exported as part of a manned aircraft or satellite or in quantities appropriate for replacement parts for manned aircraft.

ITEM 11 - CATEGORY II

Avionics equipment specially designed or modified for use in unmanned air vehicles or rocket systems and specially designed software and components therefor usable in the systems in Item 1, including but not limited to:

(a) Radar and laser radar systems, including altimeters;

(b) Passive sensors for determining bearing to specific electromagnetic sources (direction finding equipment) or terrain characteristics;

(c) Equipment specially designed for real-time integration, processing, and use of navigation information derived from an external source;

(d) Electronic assemblies and components specially designed for military use incorporating any of the following:

(1) Specially designed, integral structural supports;

(2) Techniques for conductive heat removal;

(3) Radiation hardening;

(4) Design for reliable short-term operation at temperatures in excess of 125°C;

(e) Design technology for protection of avionic and electrical subsystems against electromagnetic pulse (EMP) and electromagnetic interference (EMI) hazards from external sources, as follows:

(1) Technology for design of shielding systems;

(2) Technology for the configuration design of hardened electrical circuits and subsystems;

(3) Determination of hardening criteria for the above.

Notes to Item 11:
(1) Item 11 equipment may be exported as part of a manned aircraft or satellite or in quantities appropriate for replacement parts for manned aircraft.
(2) Examples of equipment included in this item:
- Terrain contour mapping equipment;
- Scene mapping and correlation (both digital and analog) equipment;
- Doppler navigation radar equipment;
- Passive interferometer equipment;
- Imaging sensor equipment (both active and passive).

ITEM 12 - CATEGORY II

Launch and ground support equipment and facilities usable for the systems in Item 1, as follows:

(a) Apparatus and devices specially designed or modified for the handling, control, activation and launching of the systems in Item 1;

(b) Military vehicles specially designed or modified for the handling, control, activation and launching of the systems in Item 1;

(c) Gravity meters (gravimeters), gravity gradiometers, and specially designed components therefor, designed or modified for airborne or marine use, and having a static or operational accuracy of one milligal or better, with a time to steady-state registration of two minutes or less;

(d) Telemetering and telecontrol equipment suitable for use with unmanned air vehicles or rocket systems;

(e) Precision tracking systems:

(1) Tracking systems which use a translator installed on the rocket system or unmanned air vehicle in conjunction with either surface or airborne references or navigation satellite systems to provide real-time measurements of in-flight position and velocity;

(2) Software systems which process recorded data for postmission precision tracking enabling determination of vehicle position.

ITEM 13 - CATEGORY II

Analog computers, digital computers, or digital differential analyzers specially designed or modified for use in air vehicles or rocket systems and usable in the systems in Item 1, having any of the following characteristics:

(a) Rated for continuous operation at temperatures from below –45°C to above 55°C;

(b) Designed as ruggedized or radiation-hardened equipment and capable of meeting military specifications for ruggedized or radiation-hardened equipment; or,

(c) Modified for military use.

Note to Item 13: Item 13 equipment may be exported as part of a manned aircraft or satellite or in quantities appropriate for replacement parts for manned aircraft.

ITEM 14 - CATEGORY II

Analog-to-digital converters, other than digital voltmeters or counters, usable in the systems in Item 1 and having any of the following characteristics: rated for continuous operation at temperatures from below –45°C to above 55°C; designed to meet military specifications for ruggedized equipment, or modified for military use; or designed for radiation resistance, as follows:

(a) Electrical input type analog-to-digital converters having any of the following characteristics:

(1) A conversion rate of more than 200,000 complete conversions per second at rated accuracy;

(2) An accuracy in excess of 1 part in more than 10,000 of full scale over the specified operating temperature range;

(3) A figure of merit of 1 x 10^8 or more (derived from the number of complete conversions per second divided by the accuracy).

(b) Analog-to-digital converter microcircuits having both of the following characteristics:

(1) A maximum conversion time to maximum resolution of less than 20 microseconds;

(2) A rated nonlinearity of better than 0.025 percent of full scale over the specified operating temperature range.

ITEM 15 - CATEGORY II

Test facilities and equipment usable for the systems in Item 1, as follows:

(a) Vibration test equipment using digital control techniques and specially designed ancillary equipment and software therefor capable of imparting forces of 100 kN (22,500 lbs) or greater;

(b) Supersonic (Mach 1.4 to Mach 5), hypersonic (Mach 5 to Mach 15), and hypervelocity (above Mach 15) wind tunnels, except those specially designed for educational purposes and having a test section size (measured internally) of less than 25 cm (10 inches);

(c) Test benches with the capacity to handle solid or liquid fuel rockets of more than 20,000 lbs of thrust, and capable of measuring the three thrust components.

Note to Item 15(a): The term "digital control" refers to equipment, the functions of which are, partly or entirely, automatically controlled by stored and digitally coded electrical signals.

ITEM 16 - CATEGORY II

Specially designed software, or specially designed software and related specially designed analog or hybrid (combined analog/digital) computers, for modeling, simulation, or design integration of rocket systems and unmanned air vehicle systems, usable for the systems in Item 1.

ITEM 17 - CATEGORY II

Technology, materials, and devices for reduced observables such as radar reflectivity, optical/infrared signatures and acoustic signatures (i.e., stealth technology), for military application in rocket systems and unmanned air vehicles, and usable for the systems in Item 1, for example:

(a) Structural materials and coatings specially designed for reduced radar reflectivity;

(b) Optical coatings, including paints, specially designed or formulated for reduced optical reflection or emissivity, except when specially used for thermal control of satellites.

ITEM 18 - CATEGORY II

Technology and devices specially designed for use in protecting rocket systems and unmanned air vehicles against nuclear effects (e.g., Electromagnetic Pulse (EMP), X rays, combined blast and thermal effects), and usable for the systems in Item 1, for example:

(a) Hardened microcircuits and detectors specially designed to withstand radiation as follows:

(1) Neutron dosage of 1×10^{12} neutrons/cm^2 (single event);

(2) Gamma dose rate of 1×10^9 rads/sec;

(3) Total dose 1500 rads (single event).

(b) Radomes specially designed to withstand a combined thermal shock greater than 100 cal/cm^2 accompanied by a peak overpressure of greater than 7 pounds per square inch.

Note to Item 18(a): A microcircuit is defined as a device in which a number of passive and active circuit elements are considered as indivisibly associated on or within a continuous structure to perform the function of a circuit.

Contributors

Dr David J. Andre, a retired US Army colonel, is a consultant and a former operational and strategic analyst in the Office of the Secretary of Defense and chairman of the Department of Military Strategy at the National War College. He writes, lectures, designs war games, and conducts analyses on the changing global security environment, the possible nature of future war, the "revolution in military affairs," and the proliferation of weapons of mass destruction and other strategic capabilities. He was involved with competitive strategies in the Office of the Secretary of Defense as a military assistant to the director of the Office of Net Assessment from 1980 to 1984 and as special assistant for analysis to the deputy undersecretary of defense for planning and resources from 1987 to 1990.

Steven Berner is president of Berner, Lanphier and Associates, a consulting firm in Rockville, Maryland, specializing in aerospace and defense issues. Mr Berner has over 25 years of experience in evaluating the policy, technology, and operational implications of US and foreign space activities. He has assessed the military, civil, and commercial capabilities and competitiveness of worldwide space programs for the Office of the Secretary of Defense, the assistant secretary of the Air Force for space, the intelligence community, the White House's National Space Council and Office of Science and Technology Policy, the National Aeronautics and Space Administration (NASA), the Department of Commerce, and the Office of the US Trade Representative. Mr Berner's other work includes developing concepts for advanced space systems and assessing the commercial markets for new space and telecommunications products and services.

Dr David Blair is professor of defense economics and of deterrent strategy at the Air War College, Maxwell AFB, Alabama. Formerly a Research Fellow at Harvard University and the Naval

War College, Dr Blair has done research on a variety of topics in economics and defense, including lean production in the aerospace industry, US vulnerability to surprise attack, the viability of ballistic missile defenses, the Soviet economy, and the Salvadoran land-reform program. Dr Blair, who earned a BA in mathematics from the University of Tennessee and a PhD in economics from UCLA, is currently writing a book on the development and production of the F-22 aircraft.

Dr Brian D. Dailey is currently vice president for business development for Lockheed Martin's Space and Strategic Missiles Sector. He is responsible for the sector's domestic and international marketing and business development and for managing its strategic planning and customer relations. Previously he was vice president of Washington Operations for Lockheed Missiles and Space Systems Group, and before that he held the positions of vice president of Lockheed Commercial Space Company and director of commercial programs for Lockheed Missiles and Space Company, Sunnyvale, California. Dailey came to Lockheed from the White House, where he was executive secretary of the National Space Council. In that capacity, he was responsible for formulating and coordinating US civil, commercial, and national security space policy. Prior to his appointment to this position by President George Bush, he served as senior professional staff member for the Senate Armed Services Committee. He was responsible for all military space and intelligence programs for the Strategic Forces and Nuclear Deterrence Subcommittee. He has served in various capacities in the Department of Defense and research institutes, including a professorship at the US Naval Postgraduate School, where he taught courses on intelligence programs, space policy, arms control, and nuclear targeting, and edited a book on Soviet strategic deception. Dailey is a graduate of the University of Southern California, where he earned a PhD in international relations.

Dr Victor Gilinsky is a Washington, D.C.–based consultant on energy. He has been active on proliferation issues for many years, going back to his early work at RAND in Santa Monica, California. He joined RAND soon after receiving a PhD in physics

from the California Institute of Technology in 1961. In 1971 he moved to the Atomic Energy Commission in Washington, D.C., where he was assistant director for policy and program review. From 1973 to 1975, he was head of the RAND Physical Sciences Department. From 1975 to 1984, he served on the Nuclear Regulatory Commission (NRC), having been appointed by President Gerald Ford and reappointed by President Jimmy Carter. During his NRC tenure, Dr Gilinsky was heavily involved in nuclear-export issues. In 1982 he received Caltech's Distinguished Alumnus Award.

Dennis M. Gormley is vice president for policy research at the Pacific-Sierra Research Corporation in Arlington, Virginia. Before joining Pacific-Sierra in 1979, he served as head of foreign intelligence at the US Army's Harry Diamond Laboratories in Washington, D.C. During 1984 he was a research associate at the International Institute for Strategic Studies in London. He has frequently served on Department of Defense advisory committees, has furnished expert testimony to Congress on national security issues, and has served as a consultant to Sandia National Laboratories and RAND. Besides authoring or coauthoring over two dozen technical reports for government customers, he is author of the book *Double Zero and Soviet Military Strategy* (1988). Mr Gormley has also contributed chapters to several edited books, and his work has appeared in such periodicals as *Arms Control Today, Military Review, Orbis, RUSI Journal, Survival,* and *Washington Quarterly.*

Geoffrey Kemp is director of the Middle East Arms Control Project at the Carnegie Endowment for International Peace. He received his BA and MA degrees from Oxford University and his PhD in political science from the Massachusetts Institute of Technology. He served in the White House during the first Reagan administration and was special assistant to the president for national security affairs and senior director for Near East and South Asian affairs on the National Security Council staff. In the 1970s, he worked in the Defense Department's Policy Planning Office and Program Analysis and Evaluation Office, making major contributions to studies of US

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Edward McGaffigan, Jr., is currently senior policy advisor to Sen Jeff Bingaman (D-N.Mex.). From April 1989 to May 1991, he served as legislative director for the senator, and from February 1983 until March 1989, he worked as national security, science and technology legislative assistant for the senator. Throughout his 12 years with Senator Bingaman, he has supported the senator's work on technology policy, personnel and acquisition reform, nonproliferation and export-control policy, as well as sustaining New Mexico's defense laboratories and military bases and diversifying their missions. Mr McGaffigan was a member of the Foreign Service for almost seven years prior to joining Senator Bingaman's staff. From February 1981 to February 1983, he served as a senior policy analyst and then assistant director in the White House Office of Science and Technology Policy, where he oversaw international scientific cooperation and export-control matters. During much of this period, he held a dual appointment on the National Security Council staff. Previously, Mr McGaffigan carried out various assignments within the State Department dealing with US-Soviet relations and politico-military issues. In his only overseas assignment, he was stationed as a science attaché in the US Embassy in Moscow from July 1978 to April 1980. Prior to joining the Foreign Service in May 1976, Mr McGaffigan worked at RAND on evaluating Japanese science and technology and at the Arms Control and Disarmament Agency on strategic arms control issues. Mr McGaffigan grew up in Boston. He majored in physics at Harvard, where he received his bachelor's degree in

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K. Scott McMahon is a national security analyst with the Pacific-Sierra Research Corporation in Arlington, Virginia, where he conducts studies in US foreign policy and defense policy. Since 1987 he has focused on evaluating threats arising from the spread of advanced weaponry in the third world and examining US diplomatic and military options for meeting this challenge. He holds a BA degree in political science from Tulane University and an MA degree in international affairs from American University. Before joining Pacific-Sierra in 1991, he served as director of communications for High Frontier, the organization that pioneered the concept behind the Strategic Defense Initiative. Mr McMahon's recent publications include *Controlling the Spread of Land-Attack Cruise Missiles* (coauthor with Dennis M. Gormley, 1995) and *Unconventional Nuclear, Biological, and Chemical Weapon Delivery Methods: Whither the 'Smuggled Bomb'* (1995).

Gary Sick served on the National Security Council staff under Presidents Ford, Carter, and Reagan. He was the principal White House aide for Iran during the Iranian Revolution and hostage crisis and is the author of two books on US policy toward Iran. Mr Sick retired from the Navy with the rank of captain, having served in the Persian Gulf, North Africa, and the Mediterranean. From 1982 to 1987, he was the deputy director for international affairs at the Ford Foundation, where he was responsible for programs relating to US foreign policy. Mr Sick has a PhD in political science from Columbia University, where he is Senior Research Scholar and adjunct professor of international affairs. He is a member of the board

of Human Rights Watch in New York and chairman of the advisory committee of Human Rights Watch/Middle East. He is cochairman of the Columbia University Seminar on the Middle East and is a member of the International Institute of Strategic Studies (London) and the Council on Foreign Relations (New York). Mr Sick is the executive director of Gulf/2000, an international research project on political, economic, and security developments in the Persian Gulf, sponsored by Columbia University, with major funding from the W. Alton Jones Foundation and additional support from the Rockefeller and MacArthur Foundations.

Walter B. Slocombe was nominated by President Clinton on 13 July 1994 to be undersecretary of defense for policy and was confirmed by the Senate on 14 September 1994. Prior to this appointment, he served as principal deputy undersecretary of defense for policy since 1 June 1993. Pending his confirmation, he had been a consultant to the Office of the Undersecretary of Defense for Policy from 21 January 1993. From 1986 to 1993, Mr Slocombe served as a consultant to RAND and the Strategic Air Command Technical Advisory Committee, as a member of the advisory panel for the Office of Technology Assessment studies of strategic command and control, and as chairman of its study of the defense industrial base. He was a member of the advisory councils of the Center for Strategic and International Studies, the Woodrow Wilson School of Public and International Affairs at Princeton University, the National Security Archive, the Center for Naval Analyses Strategy and Forces Division, MIT's Lincoln National Laboratory, and the Center for National Security Studies at the Los Alamos National Laboratory. Mr Slocombe was also on the board of directors of the United States Committee for the International Institute for Strategic Studies. From January 1981 until he joined the Clinton administration, he was a member of the Washington, D.C., law firm of Caplin and Drysdale. He had previously served as deputy undersecretary of defense for policy planning from November 1979 to January 1981 and as principal deputy assistant secretary of defense for international security affairs from January 1977 to November

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Henry D. Sokolski is the executive director of the Nonproliferation Policy Education Center and teaches graduate courses on proliferation at Boston University's Institute of World Politics in Washington, D.C. He is currently completing *Armageddon's Shadow*—a book on proliferation. From 1989 to early 1993, Mr Sokolski was a political appointee of the Bush administration and served as deputy for nonproliferation policy in the Office of the Secretary of Defense. Prior to his appointment, Mr Sokolski worked in the secretary's Office of Net Assessment as a full-time consultant on advanced proliferation issues, served as senior military legislative aide to Sen Dan Quayle (R-Ind.), and was special assistant on nuclear energy matters to Sen Gordon Humphrey (R-N.H.). Mr Sokolski also served briefly as a consultant on proliferation issues to the director of central intelligence's National Intelligence Council. Prior to public service, Mr Sokolski was a Visiting Scholar at the Heritage Foundation in 1982; a Public Affairs Fellow at the Hoover Institution, Stanford, California, in 1981; and a lecturer at the University of Chicago, Rosary College, and Loyola University. He has written on a variety of proliferation and security issues and has been published in a number of periodicals, including the *Wall Street Journal*, the *Christian Science Monitor*, the *Washington Post*, *Orbis*, *Washington Quarterly*, *International Defense Review*, and the *Annals of the Academy of Political and Social Science*.

Dr Richard H. Speier is an independent consultant in the Washington, D.C., area. He has worked in the Office of Management and Budget on nuclear and space issues and in the Arms Control and Disarmament Agency on the consequences of nuclear proliferation and the economics of dangerous

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Dr Leonard Weiss received a BEE degree from the City College of New York in 1956, an MSEE degree from Columbia University in 1959, and a PhD from Johns Hopkins University in 1962, all in electrical engineering. He has been a consultant to industry and government and has held tenured or visiting academic appointments at various universities, including Brown University; University of Maryland; University of California, Berkeley; and UCLA. Dr Weiss is the author of numerous technical papers on various aspects of applied mathematics, especially automatic control. He was a Sloan

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Christopher Williams is a professional staff member of the House Armed Services Committee. Prior to joining the committee's staff in 1991, he served as policy analyst and acting director for strategic defense and space arms control policy with the Office of the Assistant Secretary of Defense (International Security Policy). In this capacity, he also served as executive secretary, US Negotiating Group on Space Arms, US-Soviet Nuclear and Space Talks, Geneva, Switzerland; as executive secretary, Special Independent Review of the Strategic Defense Initiative (SDI) Program, requested by President George Bush; and as executive secretary, Joint Defense Science Board–Defense Policy Board Review Summer Study of Tactical/Theater Missile Defenses. Williams also served as legislative assistant for foreign affairs to Rep Robert Lagomarsino (R-Calif.) and as legislative assistant for national security affairs to Sen Orrin Hatch (R-Utah).

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