

CHAPTER 1

OVERVIEW

Henry D. Sokolski

With most of the world's advanced economies now stuck in recession; Western support for defense cuts and nuclear disarmament increasing; and a major emerging Asian power at odds with its neighbors and the United States; it is tempting to think our times are about to rhyme with a decade of similar woes – the disorderly 1930s.¹

Might we again be drifting toward some new form of mortal national combat? Or, will our future more likely ape the near-half-century that defined the Cold War – a period in which tensions between competing states ebbed and flowed but peace mostly prevailed by dint of nuclear mutual fear and loathing?

The short answer is, nobody knows. This much, however, is clear: The strategic military competitions of the next 2 decades will be unlike any the world has yet seen. Assuming U.S., Chinese, Russian, Israeli, Indian, French, British, and Pakistani strategic forces continue to be modernized and America and Russia continue to reduce their strategic nuclear deployments, the next arms race will be run by a much larger number of contestants – with highly destructive strategic capabilities far more closely matched and capable of being quickly enlarged than in any other previous period in history.

LOOKING BACKWARD

To grasp the dimensions of this brave new world, one need only compare how capable states were of destroying strategic targets instantaneously a half-century ago, with what damage they could inflict today. In 1961, Washington and Moscow engaged in the last and most significant Cold War confrontation over the status of Berlin. At the time, the United States had over 24,000 operationally deployed nuclear weapons. Russia had nearly 2,500. The other nuclear powers—Great Britain and France—had an aggregate of no more than 50 (with France lacking any deployed nuclear weapons).² The difference in nuclear weapons deployment numbers between the top and bottom nuclear powers—a figure equal to at least three orders of magnitude—was massive. America, moreover, was clearly dominant.

In contrast, today, the United States has no more than 1,980 deployed nuclear weapons, and Russia has between 4,537 and 6,537.³ India, Pakistan, the United Kingdom (UK), France, and Israel have 1 to 400 each, and China may have anywhere from between 200 to more than 1,000.⁴ Putting aside North Korea's nascent nuclear force (cf. France's force of 1961), the difference in the numbers of nuclear deployments between the top and bottom nuclear powers, then, has fallen at least two full orders of magnitude and is projected to decline even further. (See Figure 1-1.)

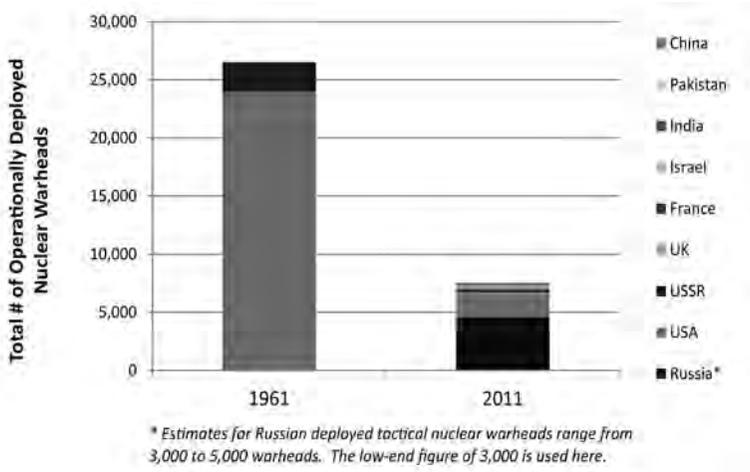
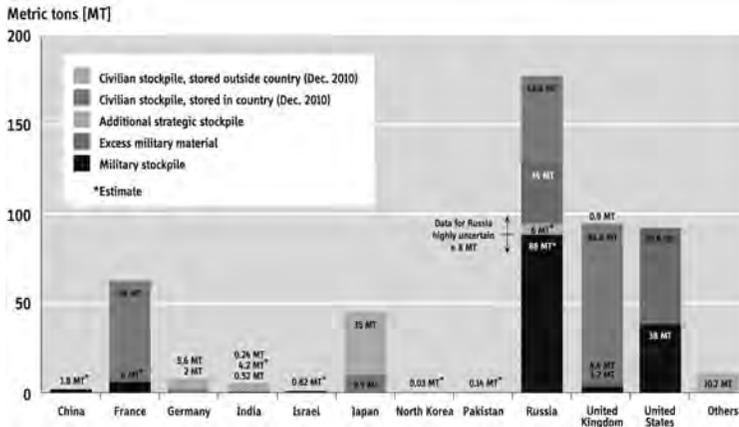


Figure 1-1. From U.S. Strategic Dominance to a Compressed Nuclear Crowd.⁵

As tight as the nuclear deployments between the world’s nuclear-armed states has become, the potential for this nuclear balance to shift quickly and dramatically is far greater still than was the case a half-century ago. In 1961, the United States, Russia, the UK, and France had militarized nearly all of the nuclear weapons materials they had – they held little or nothing back in reserve. Nor could any of them militarize civilian stockpiles of separated plutonium or highly enriched uranium, as none were then available.

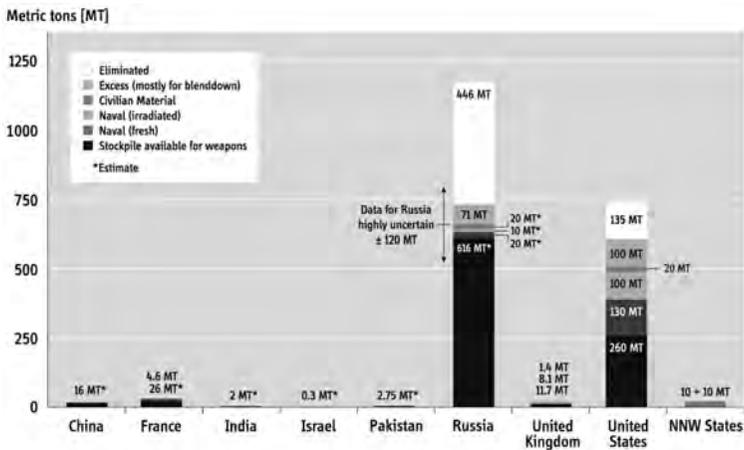
Today, matters are quite different (see Figures 1-2 and 1-3). First, the United States and Russia alone could reconfigure reserve fissile materials and start re-deploying over tens of thousands of additional nuclear weapons that they have in reserve. Second, officials in Japan have publicly allowed that they have the technical capacity to militarize nearly 2,500 bombs’ worth of “civilian” plutonium they have stored domestically.⁶

India, meanwhile, has roughly 1,300 bombs' worth of separated reactor-grade plutonium on tap, is planning on expanding its capacity to produce more of this material significantly over the next 3 to 10 years, and has claimed to have tested a nuclear device using this material.⁷ Third, China has tons of nuclear material that it either could or already has militarized and is still planning on building a "civilian" plutonium reprocessing plant adjacent to one of its major military nuclear production plants that could produce as many as 1,000 bombs' worth of plutonium annually.⁸ Also, not only these states, but Pakistan, Germany, the Netherlands, Brazil, Iran, Argentina, and North Korea, either make or plan to produce such nuclear fuels soon, while several other states have indicated a desire to do likewise.



Source: International Panel on Fissile Materials, *Global Fissile Material Report 2011*, p. 17, available from fissilematerials.org/publications/2012/01/global_fissile_material_report.html.

Figure 1-2. National Stockpiles of Separated Plutonium, 2011.



Source: International Panel on Fissile Materials, *Global Fissile Material Report 2011*, p. 9, available from fissilematerials.org/publications/2012/01/global_fissile_material_report.html.

Figure 1-3. National Stockpiles of Highly Enriched Uranium, 2011.

Then, there is the matter of missile delivery. In 1961, only the United States and the Soviet Union had missiles capable of delivering a Hiroshima-sized bomb. Today, 27 states do.⁹ To be sure, many of these states only have theater-range missiles. But most of these states are in hotspots like the Middle East, where such missiles are sufficient to target several neighbors. Meanwhile, the rest of the world’s nuclear-capable missile states are able to target this same region with intercontinental or medium-range systems.

Finally, the total number of nuclear-armed states has increased. A half-century ago, only the United States, Russia, the UK, and France had nuclear weapons, and an overwhelming numbers of these weapons were in the hand of the United States (see Figure 1-4).

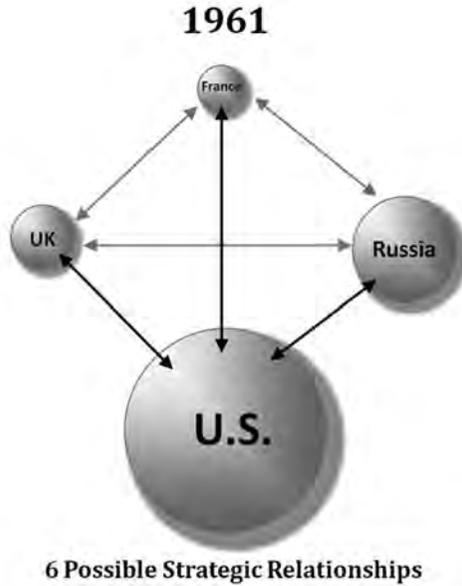


Figure 1-4. Four Nuclear Weapons States in 1961.

Now, there are nine nuclear-armed states. Two of these states – the UK and France – are within the North Atlantic Treaty Organization (NATO) and coordinate their nuclear plans closely. North Korea, meanwhile, is a state that the major powers hope will only be nuclear armed for a temporary period, i.e., that it will give up its few nuclear arms in ongoing negotiations. In this world, the United States likes to think that most of the currently nuclear-armed states are allies or strategic partners of the United States (see Figure 1-5). This world, however, may not last long. Certainly, Tehran is waiting in the wings, and Turkey, Saudi Arabia, Algeria, South Korea, Syria, and Japan are all poised as possible mid-term nuclear-weapons-options states. Unlike France, China, Russia, and the UK, though, these Post-Cold War nuclear-weapons aspirants may

not afford the world the courtesy of testing before deploying their first bomb. Instead, initially, they are likely to develop “peaceful” nuclear energy programs, as Iran, India, Iraq, and North Korea did, and then move toward nuclear weapons only when they conclude it is useful to do so. Whether or not “safety” and nuclear stability in this new world will be “the sturdy child of [mutual] terror” (Churchill’s description of Cold War stability), remains to be seen. Certainly, the stool of nuclear deterrence will have many more legs that could give way in many more surprising ways than were possible a half century ago. (See Figure 1-6.)

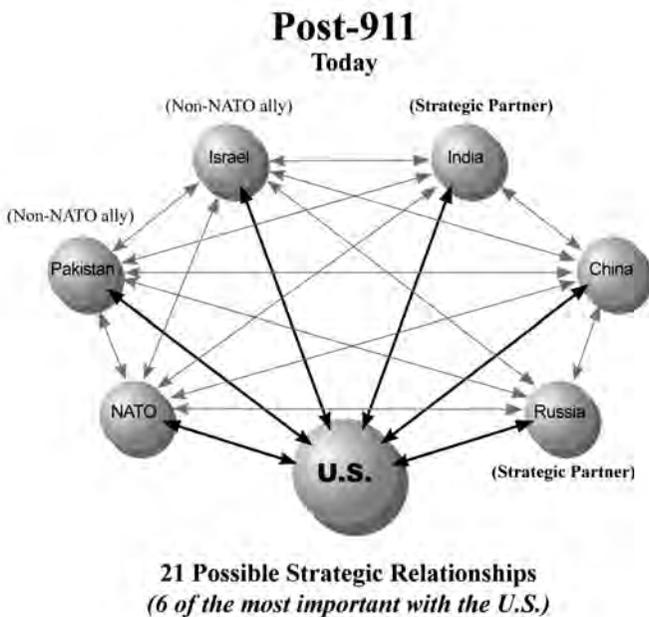
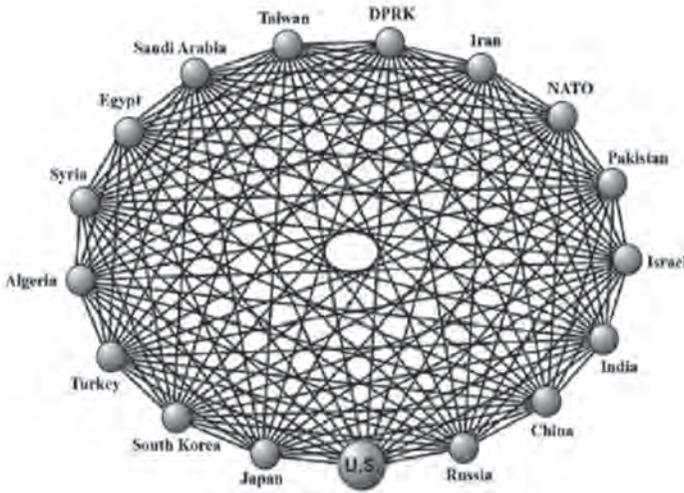


Figure 1-5. Nuclear Weapons States Today.

Possible Proliferated Future



(136 chances for strategic miscalculations)

Today, plus

Iran	DPRK	Taiwan	Saudi Arabia	Egypt
Syria	Algeria	Turkey	South Korea	Japan

Figure 1-6. Possible Nuclear States in the Future.

WHY WORRY

An increasingly fashionable rejoinder to such broodings is to maintain an optimistic brand of nuclear realism. Any intelligent state, it can be argued, knows that using nuclear weapons is militarily self-defeating and that these weapons' only legitimate mission is to deter military threats. Fretting about nuclear use and nuclear proliferation (vertical or horizontal), as such, is mistaken or overwrought.¹⁰

But is it? Can states deter military threats with nuclear weapons if their actual use is self-defeating? Which states, if any, actually believe they are militari-

ly useless? The Russians and Pakistanis clearly do not. Just the opposite: They have gone out of their way to develop battlefield nuclear weapons and plan to use them first to defeat opposing advanced conventional forces. As for the United States, France, and the UK, all have studiously and repeatedly refused to renounce first use. Israel, meanwhile, insists that while it will not be first to introduce nuclear weapons in the Middle East, it also will not be second. This leaves North Korea – a wild card – and India and China, whose declared no first-use policies are anything but clear-cut policy propositions.

But are not the days of strategic mortal combat – of all-out industrial wars, nuclear or non-nuclear – behind us? Certainly, with the events surrounding September 11, 2001 (9/11), this view has gained the backing of an increasing number of U.S. and allied military analysts and pundits.¹¹ Reflecting this outlook, the United States and its European allies have turned several Cold War nuclear “survival” bunkers into private real estate opportunities or historical tourist sites.¹²

The problem is that at least two states have not. U.S. intelligence agencies have determined that Russia invested over \$6 billion to expand a 400 square mile underground nuclear complex at Yamantau a full decade *after* the Berlin Wall fell. American intelligence officials have also determined that this complex is burrowed deep enough to withstand a nuclear attack, and is large enough and provisioned sufficiently to house 60,000 people for months (see Figure 1-7). They believe it is one of a system of as many as 200 Russian nuclear bunkers.¹³ It is unclear why Russia has upgraded these Cold War underground centers.



Figure 1-7. Russian Underground Nuclear Complex at Yamantau.

China's nuclear passive-defense activities are no less perplexing. In 2009, China's strategic missile command, the 2nd Artillery Brigade, revealed that it had completed 3,000 miles of dispersed, deep, underground tunnels for the deployment of its nuclear-capable cruise and ballistic missile forces (see Figure 1-8). China spent enormous sums to build this system and is still expanding the complex. This system appears to be designed and provisioned to house thousands of military staff during a protracted nuclear exchange.¹⁴

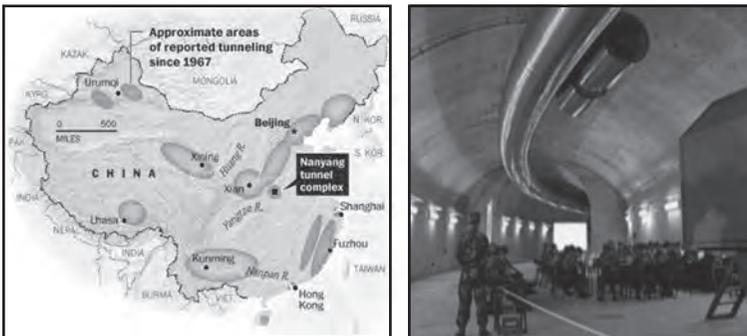


Figure 1-8. Chinese Underground Tunnels.

North Korea also has gone to extensive lengths to protect its strategic assets. Almost all of its nuclear and long-range military systems have underground tunneled bases or host areas. U.S. intelligence agencies estimate that North Korea has in excess of 10,000 major tunnels to protect its key military and civilian assets.

GOING BALLISTIC

All of this suggests that several nuclear-armed states still believe they may have to endure or engage in major wars involving nuclear arms. Fortifying this suspicion is the increasing capacity states have to deliver both nuclear and non-nuclear payloads quickly against one another. Back in 1961, only the United States and Russia had nuclear-capable missile systems – i.e., cruise or ballistic missile systems capable of delivering a first-generation nuclear bomb at least 500 kilograms, 300 kilometers, or further. Now, 27 countries have perfected or acquired such systems, and no fewer than nine can launch a satellite into orbit – i.e., have what is prerequisite to develop intercontinental ballistic missiles (ICBMs) (see Figure 1-9).¹⁵ In addition, the United States, China, Iran, South Korea, Israel, and key NATO states are all working on precision missiles capable of achieving major results using only conventional munitions – i.e., of knocking out large military bases and major naval surface combatants.¹⁶ More nuclear-capable missile states are likely to emerge.



Figure 1-9. 27 Nuclear Capable Missile Countries in 2011.

The strategic importance of these missile trends is difficult to exaggerate. First, they cannot help but increase the chances for war. One way to measure a state's diplomatic shadow or potential to influence others is simply to map out the range arcs of its deployed missiles. Today, increasingly, these range arcs overlap. Consider Iran. The reach of its missiles now intersects with that of missiles based in Israel, Egypt, the United Arab Emirates (UAE), Syria, Russia, Pakistan, France, Saudi Arabia, China, the UK, and the United States.

This is a very different world than that of a half-century ago. In 1961, when alliance loyalties within the Communist and Free World Blocs were at their height, only Russia and America's missiles were aimed at each other. Now, there is no Communist Bloc, what remains of the Free World alliance system (e.g., NATO, Australia-New Zealand-U.S. Treaty [ANZUS], etc.) is rela-

tively weak, and nuclear-capable missiles in hotspots like the Persian Gulf could be fired from any number of states—both near and far. For nuclear-armed states, this situation places a premium on securing nuclear weapons assets against surprise attack. It also raises first-order questions about nuclear escalation, which brings us to the second reason more missiles in more hands is a major worry: These missiles can act as conventional catalysts for nuclear war.

Increasingly, with precision guidance and submunitions technologies, it is possible to destroy targets that once required nuclear weapons—e.g., large air strips and air fields, command centers, naval ports, and moving surface ships—with a handful of conventionally armed missiles instead. This has raised the prospect of states being able to knock out a significant portion of an opponent's key military forces *without* having to use nuclear weapons.¹⁷

The good news is that this scenario makes the initial use of nuclear weapons far less likely. The bad news is that with enough precision guidance capabilities, a state might be tempted to initiate combat in the expectation of winning without ever having to go nuclear and end up miscalculating fatally.

WAR SCENARIOS

A real-world case, now taken seriously by Pakistani security analysts, is the mid-term prospect of an Indian conventional missile decapitation strike against Pakistani strategic assets. The Indians, in this scenario, would use precise, offensive, long-range missiles against Pakistan's nuclear forces and command centers. Then, New Delhi could fend off any Pakistani retaliatory nuclear strike with India's much

larger nuclear forces and with Indian non-nuclear missile defenses. Finally, India would be able to prevail against Pakistani armor and artillery, with superior Indian military conventional forces.¹⁸

To hedge against this prospect, Pakistan has already ramped up its nuclear weapons production and is now toying with deploying its nuclear weapons in ways designed to further complicate Indian opportunities to knock them out (e.g., delegation of launch authority under certain circumstances, forward deployment, dispersal, mobility, etc.).¹⁹ All of these methods only increase the prospects for nuclear use and have goaded India to develop nuclear ramp-up options of its own.

Beyond this, advanced conventional weapons might ignite a nuclear conflict directly. Again, consider India and Pakistan. After being hit by so many Pakistani-backed terrorist attacks, the Indian government has toyed with a conventional counterstrategy known as “Cold Start.” Under this approach, India would respond to Pakistan-backed terrorist attacks by quickly seizing a limited amount of Pakistani territory, with Indian forces deployed to march on command immediately (i.e., from a “Cold Start”).

The idea here would be to threaten to take enough away from Pakistan that it holds dear (including Islamabad’s desire to defend all of Pakistan), but not enough to prompt Pakistan to threaten India with its nuclear weapons. Unfortunately, India’s Cold Start plan has had nearly the reverse effect. Shortly after New Delhi broached its strategy, Pakistani military officials announced their intent to use tactical nuclear weapons against any invading Indian force and deployed new, short-range nuclear-armed tactical missiles along the Pakistani-Indian border precisely for this purpose.²⁰

Unfortunately, Pakistan's inclination to rely on nuclear weapons to counter conventional threats is not unique. Moscow, faced with advanced Chinese and NATO conventional forces, has chosen to increase its reliance on tactical nuclear weapons. For Russia, employing these weapons to counterbalance China and NATO's conventional forces is far less stressful economically and is militarily pragmatic, given Russia's shrinking cohort of eligible military servicemen. China, in response, may, according to some experts, be toying with deploying nuclear artillery systems of its own.²¹

CHINA AND THE ARMS RACE AHEAD

All of these trends are challenging in their own right. They also suggest what the next strategic arms race might look like. First, as the United States and Russia try to reduce or contain their nuclear weapons deployments, at least one nuclear-weapons state may be tempted to close the gap. Of course, in the short- and even mid-term, Pakistan, Israel, and India could not attempt to play catch up. For these states, getting ahead of the superpowers would take great effort and at least 1 to 3 decades of continuous, flat-out military nuclear production. It is quite clear, moreover, that none of these states have yet set out to meet or beat the United States or Russia as a national goal.

China, however, is a different matter. It clearly sees the United States as a key military competitor in the Western Pacific and in Northeast Asia. China also has had border disputes with India and historically has been at odds militarily with both it and Russia. It is not surprising, then, that China has actively been modernizing its nuclear-capable missiles to target

key U.S. and Indian military air and sea bases with advanced conventional munitions, and is developing similar missiles to threaten U.S. carrier task forces on the open seas. In support of such operations, China is also modernizing its military space assets, which include military communications, command, surveillance, and imagery satellites and an emerging anti-satellite capability.²²

Then there is China's nuclear arsenal. For nearly 30 years, most respected security analysts have estimated the number of deployed Chinese nuclear warheads to be between 150 and 400. Yet, by any account, China has produced enough weapons-usable plutonium and uranium to make four or more times this number of weapons. Why, then, have Chinese nuclear deployments been judged to be so low?

First, there is China's declared nuclear weapons strategy. In its official military white papers since 2006 and in other forums, Chinese officials insist that Beijing would never be the first state to use nuclear weapons and would never threaten to use them against any non-nuclear-weapons state. China also supports a doctrine that calls for a nuclear retaliatory response that is no more than what is "minimally" required and to use nuclear weapons only for its defense.²³ Most Western Chinese security experts have interpreted these statements to mean Beijing is interested in holding only a handful of opponents' cities at risk; this, in turn, has encouraged interpreting uncertainties regarding Chinese nuclear warhead deployments toward the low end.

What China's actual nuclear use policies might be, though, is open to debate. As one analyst recently quipped, with America's first use of nuclear weapons against Japan in 1945, it is literally impossible for any

country other than the United States to be first in using these weapons. More important, Chinese officials have emphasized that Taiwan is not an independent state and that under certain circumstances, it may be necessary to use nuclear weapons against this island "province." Finally, there are the not-so-veiled nuclear threats that senior Chinese generals have made against the United States if it should use conventional weapons against China in response to a Chinese attack against Taiwan (including the observation that the United States would not be willing to risk Los Angeles to save Taipei).²⁴

The second cause for conservatism in assessing China's arsenal is the extent to which estimates of the number of Chinese warheads have been tied to the *observed* number of Chinese nuclear weapons missile launchers and, so far, the number of these systems that actually have been seen has been low. Moreover, few, if any, missile reloads are assumed for each of these missile launchers, and it is presumed that none of China's missiles have multiple warheads. The numbers of battlefield nuclear weapons, such as nuclear artillery, are also presumed to be low or nonexistent.

All of this may be right, but there are reasons to wonder. The Chinese, after all, claim that they have built 3,000 miles of tunnels to hide China's missile forces and related warheads and that China continues to build such tunnels.²⁵ Employing missile reloads for mobile missile systems has been standard practice for Russia and the United States. It would be odd if it was not also a Chinese practice, particularly for the country's growing number of solid fueled rocket and cruise missile systems. There is also evidence that China may soon have multiple warhead dispensers for some of its rockets. Finally, several experts believe China may be

fielding battlefield artillery for the delivery of tactical nuclear shells.²⁶

Precisely how large is China's nuclear arsenal, then? The answer is unclear. What is not is the relevance of the answer. Several Chinese sources suggest China may have deployed roughly nine times the 150 to 400 nuclear weapons most analysts currently estimate the country has. If this is so, China would have as many or more deployed warheads as the United States and nearly as many as Russia.²⁷

The first issue this possibility raises is how sound are current U.S. and Russian nuclear modernization and missile defense plans. It hardly would be in Washington or Moscow's interest to let Beijing believe it could operate more freely with Chinese conventional forces against Taiwanese, Japanese, American, Indian, or Russian interests in the belief that China's nuclear capabilities could deter Russia or the United States from responding. (See Figure 1-10.)

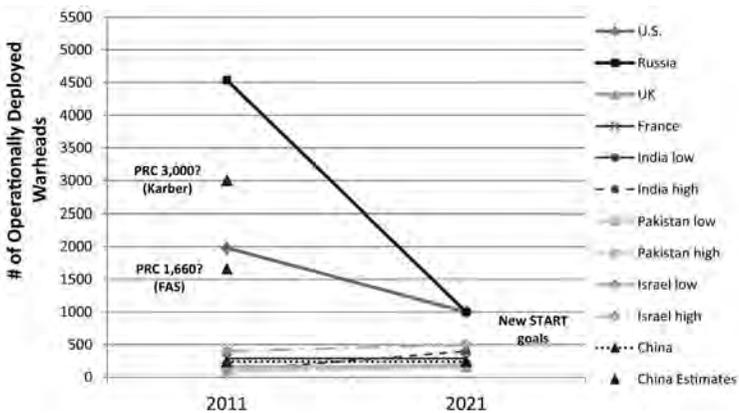


Figure 1-10. The Next Decade, Nuclear Uncertainties, and Competitions.²⁸

Yet another question a much larger Chinese nuclear strategic force would raise is how it might impact Washington and Moscow's current strategic arms negotiations. Would the United States and Russia be eager to make much deeper nuclear weapons cuts if they thought China might, as a result, end up possessing more deployed weapons than either Washington or Moscow? At this point, would they not have to factor China into their arms control calculations? And if so, how?

INTERESTED PARTIES

Japan would be another interested party. It already has nearly 2,500 weapons' worth of separated plutonium on its soil that it was supposed to use to fuel its light-water reactors and its fast reactors. Now, however, Japan has decided not to build more nuclear power reactors domestically. It also is reviewing the merits of continuing its fast reactor efforts, a program that is technically premised on Japan expanding its current domestic fleet of light-water reactors.

A related and immediate operational question is whether or not Japan will bring a \$20-billion civilian nuclear spent fuel reprocessing plant capable of producing 1,000 bombs' worth of plutonium a year at Rokkasho online as planned in late 2012. This plant and Japan's plutonium recycling program have been controversial, since they were decisions made under Prime Minister Nakasone and can be tied to internal Japanese considerations for developing a plutonium nuclear weapons option. Although this plant is not necessary for the management of Japan's spent fuel, the forward costs of operating it could run as high as \$100 billion over its lifetime.²⁹

In light of the questionable technical and economic benefits of operating Rokkasho, it would be difficult for Tokyo to justify proceeding with this plant's operation *unless* it wanted to develop an option to build a nuclear weapons arsenal. What, then, would one have to make of a Japanese decision to open Rokkasho, if this decision came on the heels of news that China actually had many more nuclear weapons than was previously believed?

South Korea, which has attempted to get its own nuclear weapons at least once and is asking the United States to back Seoul's efforts to separate "peaceful" plutonium from U.S.-origin spent fuel in Korea, is sure to be watching what Japan decides. After North Korea's sinking of the *Cheonan* and the bombardment of Yeonpyeong Island, South Korean parliamentarians called for a possible redeployment of U.S. tactical nuclear weapons. Washington, however, rejected this request.³⁰ This raises the worry that Seoul might again consider developing a nuclear-weapons option of its own. South Korea already has its own nuclear-capable rockets and cruise missiles. How North Korea might react to South Korea developing a nuclear weapons option is anyone's guess.

In addition to Japan and South Korea possibly reacting negatively to news of a Chinese nuclear ramp up, there is India. It already has hedged its nuclear bets with plans to build five unsafeguarded plutonium-producing breeder reactors by 2020, and by laying the foundations of an enrichment plant that may double its production of weapons-grade uranium.³¹ India, too, has roughly 1,000 bombs' worth of separated plutonium it claims it can convert into nuclear weapons. It also has pushed the development of a nuclear submarine, submarine ballistic missiles, missile

defenses, and long-range cruise missiles. Late in 2011, India announced it was working with Russia to develop a terminally guided ICBM in order to off-balance Chinese medium-range ballistic missile deployments near India's borders.³² India has never tried to compete with China weapon-for-weapon, but if Chinese nuclear warhead numbers were to rise substantially, India might have no other choice but to try.

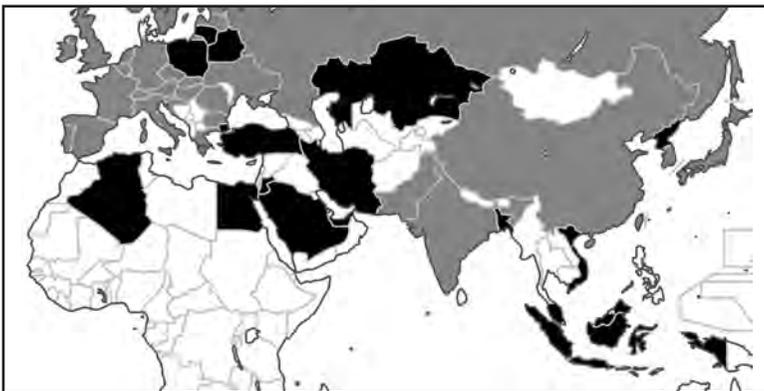
Pakistan, of course, will do its best to keep up with India. Since Islamabad is already producing as much plutonium and highly enriched uranium as it can, it would likely seek further technical assistance from China and financial help from its close ally, Saudi Arabia. Islamabad may do this to hedge against India, whether China or India build their nuclear arms up or not. There is also good reason to believe that Saudi Arabia might want to cooperate on nuclear weapons-related activities with Pakistan to help Saudi Arabia hedge against Iran's growing nuclear weapons capabilities.

NOT-SO-PEACEFUL ENERGY AND ARMS CONTROL

In this regard, Saudi Arabia has made it known that it intends to buildup its "peaceful" nuclear energy capabilities. It recently announced (*after* the Fukushima nuclear accident) that it would spend over \$100 billion to build 16 large-power reactors in the kingdom before 2030. This would constitute one of the most lucrative, best financed near- and mid-term nuclear power markets in the world. The reactors also could serve as the basis for development of a major nuclear weapons option. As Saudi Arabia's former head of intelligence recently told NATO ministers, the

kingdom would have to get nuclear weapons if Iran did. Other news reports claim the kingdom is eager to work with Pakistan to secure such an option.³³

In this regard, Saudi Arabia is not alone. Turkey also announced an ambitious “peaceful” nuclear power program shortly after Iran’s nuclear enrichment efforts were revealed in 2002; Turkey expressed an interest in 2008 in enriching its own uranium.³⁴ Given Turkish qualms about Iran acquiring nuclear weapons, the possibility of Ankara developing a nuclear weapons option (as it previously toyed with in the late 1970s) must be taken seriously.³⁵ In addition, Algeria and Egypt (political rivals) and Syria (a historical ally of Iran) all have either attempted to develop nuclear weapons options or refuse to forswear making nuclear fuel, a process that can bring them within weeks of acquiring a bomb.³⁶ Israel, meanwhile, continues to make nuclear weapons materials at Dimona, and all of these states have nuclear-capable missile systems of some sort. (See Figure 1-11.)



Note: States in light grey already have established nuclear power programs.

Figure 1-11. States Planning to Have Their First Nuclear Power Reactor by or before 2031.

Clearly, these trends, if continued, could spell trouble. How bad they might get, though, depends largely on what the United States, Russia, China, and other key states choose to do. The United States is focused on negotiating nuclear weapons reductions with Russia. The New Strategic Arms Reduction Treaty (New START) is supposed to be followed by an agreement that will cover both strategic and theater nuclear arms in Europe. Washington arms control planners are reported to be toying with reducing nuclear weapons deployments to levels as low as 300 warheads.³⁷ Given Russian concerns about U.S. and NATO missile defense efforts and advanced NATO conventional forces, though, it is unclear how soon a follow-on agreement to START might be reached.

Meanwhile, the Obama administration is doing all it can to secure an international agreement to end the military production of fissile material for nuclear weapons. The prospects for finalizing such an agreement, though, are poor. Iran, Pakistan, North Korea, and Egypt all must consent to ratify it. But they are unlikely to do so until Israel, India, the United States, and South Korea take dramatic disarming steps.

Worse, the treaty's promotion risks complicating the establishment of effective fissile controls in nuclear fuel-producing states that lack nuclear weapons. Under the proposed treaty, no controls would be placed over production of nuclear weapons-usable fuels if they were committed to civilian purposes; the treaty would ban only military fissile production. Also, under the treaty, nuclear weapons states would be permitted to keep the weapons they already have along with any nuclear weapons-usable materials they might have acquired.

The good news is that the states most constrained under the treaty would have little incentive to make more nuclear weapons materials covertly. This, in turn, could allow the treaty to have relatively relaxed forms of verification and be relatively effective. This would be so even though there is no reliable way technically to account fully for past fissile material production or to detect and prevent the diversion of nuclear fuel production to military purposes in a reliable and timely manner. Unfortunately, nuclear fuel-making states that currently lack nuclear weapons but may have a desire to make them covertly (e.g., Iran), could easily argue that their own declared nuclear fuel-making activities should not be inspected any more tightly than those of the nuclear weapon states under the proposed treaty. This could set a bad precedent.³⁸

The United States and allied governments are also trying to bring the Comprehensive Test Ban Treaty (CTBT) into force. In the United States, it is unclear if the White House can muster the votes needed in the U.S. Senate to permit ratification. What is clear, though, is that bringing the treaty into force would also require ratification by India, Pakistan, China, Egypt, and North Korea, and this is unlikely to happen soon.

Supporters of the CTBT claim that the United States has a general obligation under the Nuclear Nonproliferation Treaty (NPT) to ratify the CTBT. Yet, with A. Q. Khan's circulation of a proven, Chinese missile-deliverable warhead design to Libya, Iran, and Pakistan and the International Atomic Energy Agency's (IAEA) public validation and sharing of a workable bomb design by Saddam, it is unlikely that banning nuclear testing will prevent nonweapons states from develop-

ing workable first-generation nuclear weapons. A ban will, however, make it more difficult for complying nuclear weapons states to upgrade their existing arsenals. This may be desirable, but it has only an indirect connection, if any, to preventing the further proliferation of nuclear weapons to new states.

Finally, the United States has tried to secure civilian and military facilities and stores of nuclear weapons-usable materials against theft or sabotage and has tried to persuade nonweapons states not to make their own nuclear fuels. There has been some progress in getting several states to surrender the highly enriched uranium they use to fuel their research reactors and to exchange it for less dangerous, low-enriched uranium.

Getting other states to forgo making nuclear fuel, however, has been difficult. The UAE has agreed to do so, but Egypt, Turkey, Saudi Arabia, Vietnam, and Jordan have all held back from making such a commitment. Iran, Brazil, Argentina, South Korea, and South Africa have all either begun to make their own nuclear fuel or are committed to doing so in the next few years. Quiet U.S. efforts to create an international fuel bank in Mongolia, meanwhile, were rebuffed recently by the Mongolian government.³⁹

WHAT TO DO

The United States need not abandon its current nuclear control agenda. But it is clear that more will be needed to constrain what lies ahead. What else would help? These three things at least.

1. Take more concerted action alone, with our allies and friends, and with Russia to clarify and constrain China's offensive strategic military capabilities. In the first instance, this means clarifying precisely

what strategic forces China has deployed and is building. Beijing's recent revelations that it has built 3,000 miles of deep tunnels to protect and hide its dual-capable missiles and related nuclear warhead systems more than suggest the desirability of reviewing our current estimates of Chinese nuclear-capable missile and nuclear weapons holdings. Are China's revelations about its tunnels disinformation meant simply to intimidate; is it hiding more military assets than we currently assess it to have? It would be useful to get the answers.

It also would be useful to know what China is planning to do. How much military fissile material does China currently have on hand? How likely is it that it has or will militarize or expand these holdings? How many different types of nuclear weapons does China have or intend to deploy? How much fissile material does each type require? How many missile reloads does China currently have; how many is it planning to acquire? Have the Chinese developed or will they develop multiple warheads for the country's missiles? If so, for which missile types, and in what numbers?

How many nuclear and advanced conventional warheads is China deploying on its missiles, bombers, submarines, and artillery? What are its plans for using these forces? How might these plans relate to China's emerging space, missile defense, and anti-satellite capabilities? All of these questions, and more, deserve review within the U.S. Government, with America's allies and, to the extent possible, in cooperation with the Chinese.

As this review is underway, it also would be helpful to game alternative war and military crisis scenarios relating to China's possible use of these forces at a senior political level in the U.S. and allied governments.

Such gaming would likely impact allied arms control and U.S. and allied military planning. With regard to the latter, a key focus would have to be how one might defend, deter, and limit the damage Chinese nuclear and non-nuclear missile systems would otherwise inflict against the United States, its bases in the Western Pacific, America's friends, and Russia. This could entail not only the further development and deployment of active missile defenses, but of better passive defenses (e.g., base hardening and improving the capacity to restore operations at bases after attacks) and possibly new offensive forces – more capable, long-range conventional strike systems to help neutralize possible offensive Chinese operations.

Such gaming also should prompt a review of our current arms control agenda. In specific, it should encourage discussion of the merits of initiating talks with China and Russia and other states about limiting ground-based, dual-capable ballistic and cruise missiles. Unlike air and sea-based missiles, these ground-launched systems can be fired instantaneously and are easiest to command and control in protracted nuclear exchanges – ideal properties for employment in a first strike. These dual-capable missiles also can inflict strategic harm against major bases and naval operations conventionally.

Ronald Reagan referred to these weapons as “nuclear missiles,” and looked forward to their eventual elimination. Toward this end, he concluded the Intermediate Nuclear Forces (INF) Treaty agreement, which eliminated an entire class of ground-based nuclear-capable missiles, and negotiated the Missile Technology Control Regime (MTCR), which was designed to block the further proliferation of nuclear-capable systems (i.e., missiles capable of lifting 500

kilograms or more at least 300 kilometers). With the promotion of space-based missile defenses, Reagan hoped to eliminate all such ground-based missiles.

What states have an incentive to eliminate these missiles? The United States has no intermediate ground-launched missiles, which it eliminated under the INF Treaty. Most of its shorter-range missiles are either air-launched or below MTCR range-payload limits. As for its ground-based ICBMs, they are all based in fixed silos, and as such are all nuclear sitting ducks. Russia, on the other hand, has a large, road-mobile ICBM force. Yet, it too is worried about growing Chinese precision missile strike capabilities that it cannot defend against.⁴⁰

India and Pakistan have ground-launched ballistic missiles, but some of their most seasoned military experts have recently called for the elimination of short-range missiles, since these can only serve to escalate border disputes. As for China, it has much to gain by deploying more ground-launched missiles, unless, of course, it causes India, Russia, and the United States to react. The United States has been developing hypersonic boost glide systems that could provide it with prompt global strike options. It also has hundreds of silo-based ICBMs that it could affordably convert to deliver conventional warheads precisely. None of this would be in China's interest. Talks about reducing such nuclear-capable ground-based systems should be explored.⁴¹

Finally, although it may not be possible to conclude a fissile material cutoff treaty anytime soon, all of the other nuclear weapons-state members of the United Nations Security Council should press China to follow their lead in unilaterally forswearing making fissile material for weapons. It also would be helpful to call

for a limited moratorium on commercial reprocessing with China and as many other states as possible. The U.S. Blue Ribbon Panel on nuclear energy recently determined that it would not be in America's interest to pursue commercial reprocessing in the near- or mid-term. Japan, meanwhile, is reviewing its own commercial reprocessing and fast reactor program, given its decision to move away from nuclear power. South Korea wants to recycle plutonium but is having difficulty persuading the United States to grant it permission to do so, with the many tons of U.S.-origin spent fuel located in South Korea.⁴²

China is committed to having AREVA build it a commercial reprocessing plant that is nearly identical to the one Japan is now reconsidering opening late next year at Rokkasho. China wants to site its plant adjacent to a major nuclear military production facility at Jiayuguan. As already noted, these "peaceful," commercial reprocessing plants produce at least 1,000 bombs' worth of nuclear weapons-usable plutonium annually. Still, they are not technically necessary for the operation of nuclear power and are uneconomical, compared with using fresh fuel and not recycling it. Promoting a limited plutonium recycling moratorium, in short, would be useful and could garner some support for a fissile material cutoff treaty.

2. Encourage nuclear supplier states to condition the further export of civilian nuclear plants upon the recipient forswearing the making of nuclear fuel and the opening of their nuclear facilities to the latest, most intrusive, international nuclear inspection procedures. Besides moderating increased pressures on more states to develop nuclear weapons options of their own or to increase their existing nuclear arsenals, the United States and other nuclear supplier

states need to do more to reduce the further spread of nuclear weapons in the Middle East. Here the worry is that Iran's pursuit of "peaceful" nuclear energy will serve as a model of sorts for Saudi Arabia (who wants to build 16 large-power reactors before 2030), Turkey (20), Egypt (1), Algeria (3), and Syria (1). When asked, none of these countries has been willing to forgo making nuclear fuel. Nor have any of them. So far, only Turkey and the UAE have ratified the IAEA's tough nuclear inspection regime under the Additional Protocol.

All of this is a worry, since the IAEA cannot find covert enrichment or reprocessing facilities or reactor plants with much confidence (cf. recent history regarding nuclear plants in Iran, Iraq, North Korea, and Syria). Also, once a large reactor is operating in a country, fresh enriched uranium is on tap that could be seized for possible further enrichment to weapons grade in a covert enrichment plant. Finally, plutonium-laden spent fuel is available that could be reprocessed to produce many bombs' worth of plutonium. Admittedly, without the authority to inspect anywhere at any time without notice, one may not be able to verify the pledge of states not to make nuclear fuel with high confidence. Still, securing such a legal pledge is valuable: It at least would put a violating country on the wrong side of international law and so make such action sanctionable.

Other than the United States, though, no nuclear supplier state (i.e., Russia, France, Japan, China, or South Korea) has yet to ask any of their prospective customers if they might agree to commit not to make nuclear fuel and to ratify the Additional Protocol. Worse, the United States itself is backing away from insisting on these conditions.

Some in the U.S. Congress want to change this situation by making it more difficult to finalize any future U.S. nuclear cooperative agreements with non-nuclear weapons states like Saudi Arabia, Jordan, or Vietnam, unless they agree to the UAE nuclear cooperative conditions.⁴³ These congressmen know that the United States is paying France billions to supply the U.S. Department of Energy with a mixed-oxide fuel fabrication plant. The United States has also made billions more in taxpayer-backed federal energy loan guarantees available to French government-owned nuclear firms to build commercial nuclear plants in the United States. Russia, meanwhile, would likely ask for such loan guarantees for an enrichment plant it says it wants to build in the United States. The United States affords defense security guarantees to South Korea and Japan and is extending civilian nuclear assistance to the Russians. All of this affords reasonable leverage to encourage these other nuclear suppliers to follow America's lead.⁴⁴

Certainly, it would be useful to get as many of the key nuclear suppliers to agree to condition their nuclear exports along the same lines as the UAE agreement stipulations as possible. This could be done either through the U.S. leveraging its influence or by making the case before the Nuclear Supplier Group. Neither approach is mutually exclusive. Finally, clarifying what kinds of military diversions the IAEA can reliably detect and what kinds of diversions the agency is unlikely to detect in a timely fashion would be helpful.⁴⁵

3. Do more to reduce the access of states to the surplus nuclear weapons and fissile material stockpiles that they could convert into bombs. As already noted,

the United States and Russia maintain surplus nuclear weapons and nuclear weapons materials stockpiles, and India, Israel, Pakistan, the People's Republic of China (PRC), Japan, France, and the UK hold significant amounts of nuclear weapons-usable plutonium and uranium. This fissile material overhang increases security uncertainties regarding what each nuclear weapons country may have or could deploy relatively quickly. Given the verification difficulties with the proposed fissile material cutoff treaty and the improbabilities of such a treaty being brought into force, it would be useful to consider alternative approaches.

One idea detailed by several analysts at different times is a voluntary initiative now known as the fissile material control initiative (FMCI). It would call on nuclear weapons-usable material producing states to set aside whatever fissile materials they have produced in excess of their immediate military or civilian requirements for either final disposition or internationally verified safekeeping.⁴⁶ Russia and the United States have already agreed to dispose of 34 tons of weapons-grade plutonium, and Moscow has blended down 500 tons of weapons-grade uranium for resale as power reactor fuel. Much more can be done both between the United States and Russia and among the other fissile-producing states listed above. Encouraging as many states as possible to forgo recycling spent reactor fuel to produce plutonium-based reactor fuel also could be useful. Given that Germany, the UK, and the United States have essentially already made this decision for both the near- and mid-term, and Japan could easily justify doing likewise, much of a de facto, international recycling moratorium is already in place. The United States and other like-minded nations might do more to formalize this reality.

CONCLUSION: A FUTURE UNLIKE OUR PAST

It is easy to romanticize how stable the balance of nuclear terror between Russia and the United States was a half-century ago. That balance nearly tipped into nuclear war in the case of Berlin and the Cuban Missile Crisis. On the other hand, it is just as easy to overlay the political, military, diplomatic, and economic problems we are currently experiencing. However, 2012 is not 1937. In the late 1930s, war was increasingly seen as an economic imperative. Today, just the opposite is the case. Mutual deterrence, never all that strong or reliable during the height of the Cold War, will be less certain to prevail in places like Southwest Asia or the Middle East. Still, long-term industrial wars between the United States, Russia, or China seem difficult to imagine.

Unfortunately, wars between Pakistan and India; China and Taiwan; Israel and Iran; and India and Vietnam are possible. Increased diplomatic, political, economic, and military competition among China, Russia, India, the United States, or Japan also seems likely. Equally worrisome is the further spread of nuclear weapons capabilities to the Middle East, North Africa, and Turkey and the further proliferation of nuclear-capable missiles.

In this more volatile world, the United States will need to pay more attention to competing and negotiating with China on strategic military matters. Washington and its friends will also have to do more to stabilize relations between Pakistan, India, and China, and to firm up security alliance relations with Korea, Japan, and other key states in the Pacific.

While the hope of eliminating nuclear weapons may continue, the United States and other like-minded states will need to do more to reduce the numbers and types of ground-launched nuclear-capable missiles and the production of, and access to, nuclear weapons-usable materials. Finally, far more will need to be done to restrict and condition the further spread of “peaceful” nuclear energy programs to new states, lest the Middle and Far East be peppered with more Irans and North Koreas.

What will happen if we fail to take on these new, additional challenges? At a minimum, nuclear weapons and first-strike missiles will spread, and so increase the prospect of use. In the worst case, there will be wars that may well go nuclear. In this case, the 1930s and 1960s could end up looking quite benign.

ENDNOTES - CHAPTER 1

1. Cf., Matthew Continetti, “A World in Crisis: What the Thirties Tell Us about Today,” *The Weekly Standard*, January 3, 2011, available from www.weeklystandard.com/articles/world-crisis_524865.html; and “Briefing—Lessons of the 1930s: There Could Be Trouble Ahead,” *The Economist*, December 10, 2011, pp. 76-78.

2. See Natural Resources Defense Council, “Table of Global Nuclear Weapons Stockpiles, 1945-2002,” last revised November 26, 2002, available from www.nrdc.org/nuclear/nudb/datab19.asp.

3. The total number of deployed U.S. warheads includes 1,800 strategic warheads, and 180 tactical ones. The official number of deployed strategic warheads in the Russian Federation is 1,537. Estimates for the number of Russian deployed tactical warheads ranges from 3,000 to 5,000. For the strategic warhead figures, see U.S. Department of State, “New START Treaty Aggregate Numbers of Strategic Offensive Arms,” Fact Sheet, June 1, 2011, available from www.state.gov/t/avc/rls/164722.htm. Information on the estimates of deployed tactical warheads for the United States and

Russia is drawn from Hans M. Kristensen, "Tac Nuke Numbers Confirmed?" FAS Strategic Security Blog, *Federation of American Scientists*, December 7, 2010, available from www.fas.org/blog/ssp/2010/12/tacnukes.php.

4. See "New START Treaty Aggregate Numbers" Fact Sheet; Robert S. Norris and Hans M. Kristensen, "US Tactical Nuclear Weapons in Europe, 2011," *The Bulletin of Atomic Scientists* Vol. 67, No. 1, January/February 2011, pp. 64-73, available from bos.sagepub.com/content/67/1/64.full; Zia Mian, A. H. Mayyar, R. Rajaraman, and M. V. Ramana, "Fissile Materials in South Asia and the Implications of the U.S.-India Nuclear Deal," in Henry D. Sokolski, ed., *Pakistan's Nuclear Future: Worries Beyond War*, Carlisle, PA: Strategic Studies Institute, 2008, pp. 167-218; Shannon N. Kile, Vitaly Fedchenko, Bharath Gopalaswamy, and Hans M. Kristensen, "World Nuclear Forces," *SIPRI Yearbook 2011*, available from www.sipri.org/yearbook/2011/07; "Nuclear Weapons: Who Has What at a Glance," *Arms Control Association*, available from www.armscontrol.org/factsheets/Nuclearweaponswhohaswhat; "Status of World Nuclear Forces," *Federation of American Scientists*, available from www.fas.org/programs/ssp/nukes/nuclearweapons/nukestatus.html; Alexander Glaser and Zia Mian, "Fissile Material Stockpiles and Production, 2008," *Science and Global Security*, Vol. 16, Issue 3, 2008, pp. 55-73, available from www.tandfonline.com/doi/abs/10.1080/08929880802565131; Warner D. Farr, "The Third Temple's Holy of Holies: Israel's Nuclear Weapons," *USAF Counterproliferation Center*, Counterproliferation Paper No. 2, September 1999, available from www.au.af.mil/au/awc/awcgate/cpc-pubs/farr.htm; and Kenneth S. Brower, "A Propensity for Conflict: Potential Scenarios and Outcomes of War in the Middle East," *Jane's Intelligence Review*, Special Report No. 14, February 1997, pp. 14-15.

5. The information used to generate this graph was drawn from the sources in Endnote 4. Also see Robert S. Norris and Hans M. Kristensen, "US Nuclear Forces, 2011," *Bulletin of the Atomic Scientists* Vol. 67, No. 2, March/April 2011, pp. 66-76, available from bos.sagepub.com/content/67/2/66.full; Robert S. Norris and Hans M. Kristensen, "Russian Nuclear Forces, 2011," *Bulletin of the Atomic Scientists* Vol. 67, No. 3, May/June 2011, pp. 67-74; and Robert S. Norris and Hans M. Kristensen, "Global Nuclear Weapons Inventories, 1945-2010," *Bulletin of the Atomic Scientists*, Vol. 66, No. 4, July 2010, pp. 77-83.

6. See Frank Von Hippel, "Plutonium, Proliferation and Radioactive-Waste Politics in East Asia," analysis published on the Nonproliferation Policy Education Center website on January 3, 2011, available from www.npolicy.org/article.php?aid=44&rid=2; and Takuya Suzuki, "Nuclear Leverage: Long an Advocate of Nuclear Energy, Nakasone Now Says Japan Should Go Solar," *Asahi.com*, July 7, 2011, available from www.asahi.com/english/TKY201107210339.html.

7. Zia Mian, *et al.*, "Fissile Materials in South Asia," pp. 193-95.

8. See "China's Nuclear Fuel Cycle," *World Nuclear Association*, updated December 2011, available from www.world-nuclear.org/info/inf63b_china_nuclearfuelcycle.html; and International Panel on Fissile Materials, *Global Fissile Material Report 2011*, p. 17, available from fissilematerials.org/publications/2012/01/global_fissile_material_report.html.

9. See "World-wide Ballistic Missile Inventories," *Arms Control Association*, available from www.armscontrol.org/factsheets/missiles.

10. For example, see John Mueller, *Atomic Obsession: Nuclear Alarmism from Hiroshima to Al-Qaeda*, New York: Oxford University Press, 2010, pp.129-42; John Mueller, *Overblown: How Politicians and the Terrorism Industry Inflate National Security Threats and Why We Believe Them*, New York: Free Press, 2006; and Steve Kidd, "Nuclear Proliferation Risk—Is It Vastly Overrated?" *Nuclear Engineering International*, July 22, 2010, available from www.neimagazine.com/story.asp?storyCode=2056931.

11. Cf. Robert Taber, *The War of the Flea*, Washington, DC: Brassey's Inc., 2002; and George and Meredith Friedman, *The Future of War*, New York: Crown Publishers, 1996.

12. See Sharon Weinberg, "How To: Visit A Secret Nuclear Bunker," *Wired*, June 11, 2008, available from www.wired.com/dangerroom/2008/06/how-to-visit-a/; 20th Century Castles LLC, which sells decommissioned U.S. missile bases including bases for Atlas, Titan, and Nike missiles, available from www.missilebases.com/properties; Smartbunker, which uses NATO bunkers to secure

and host computer servers, available from www.smartbunker.com/infrastructure; Siegfried Wittenburg, "East German Nuclear Bunker Opens to Tourists," *Spiegel Online International*, August 26, 2011; Burlington Bunker in Corsham, Wiltshire, UK, was formally a Cold War NATO nuclear bunker and is now a tourist sight, available from www.burlingtonbunker.co.uk/; and guided tours of a missile launch facility and silo are offered by the National Park Service at the Minuteman Missile National Historic Site in South Dakota, available from www.nps.gov/mimi/index.htm.

13. See "Yamantau," *GlobalSecurity.org*, available from www.globalsecurity.org/wmd/world/russia/yamantau.htm; and "What's Going on in the Yamantau Mountain Complex?" *Viewzone*, available from viewzone.com/yamantau.html.

14. James R. Holmes, "China's Underground Great Wall," *The Diplomat*, August 20, 2011, available from the-diplomat.com/flashpoints-blog/2011/08/20/chinas-underground-great-wall/; and Bret Stephens, "How Many Nukes Does China Have?" *The Wall Street Journal*, October 24, 2011, available from online.wsj.com/article/SB10001424052970204346104576639502894496030.html.

15. See Endnote 9.

16. See, e.g., Ian Easton and Mark Stokes, "China and the Emerging Strategic Competition in Aerospace Power," in this volume.

17. See, e.g., Steven Lukasik, "To What Extent Can Precision Conventional Technologies Substitute for Nuclear Weapons?" in this volume.

18. Dr. Subhash Kapila, "India's New 'Cold Start' War Doctrine Strategically Reviewed," Paper No. 991, South Asia Analysis Group, April 5, 2004, available from www.southasiaanalysis.org/%5Cpapers10%5Cpaper991.html; and Commander Muhammad Azam Khan, "India's Cold Start Is Too Hot," *U.S. Naval Institute Proceedings*, March 2011, available from www.usni.org/magazines/proceedings/2011-03/indias-cold-start-too-hot.

19. See Rodney Jones, "War Games: Pakistan's Answer to Cold Start?" *The Friday Times*, May 13, 2011, available from www.thefridaytimes.com/13052011/page7.shtml.

20. See Mike Mazza, "Pakistan's Strategic Myopia: Its Decision to Field Tactical Nuclear Weapons Will Only Make the Subcontinent More Unstable," *The Wall Street Journal*, April 2011, available from online.wsj.com/article/SB10001424052748704099704576288763180683774.html?mod=googlenews_wsj.

21. See, e.g., Jacob Kipp, "Asian Drivers of Russian Nuclear Force Posture," in this volume; and Dr. Mark B. Schneider, "The Nuclear Forces and Doctrine of the Russian Federation and the People's Republic of China," testimony given October 12, 2011, before the House Armed Services Subcommittee on Strategic Forces, available from www.worldaffairscouncils.org/2011/images/insert/Majority%20Statement%20and%20Testimony.pdf.

22. See Ian Easton, "The Asia-Pacific's Emerging Missile Defense and Military Space Competition," January 3, 2001, available from www.npolicy.org/article_file/The_Asia-Pacifics_Emerging_Missile_Defense_and_Military_Space_Competition_280111_1143.pdf.

23. On China's no first use policies, see China's 2008 White Paper, "China's National Defense in 2008," available from www.fas.org/programs/ssp/nukes/2008DefenseWhitePaper_Jan2009.pdf; also see analysis of this paper by Hans M. Kristensen, "China Defense White Paper Describes Nuclear Escalation," *FAS Strategic Security Blog*, January 23, 2009, available from www.fas.org/blog/ssp/2009/01/chinapaper.php; and M. Taylor Fravel and Evan S. Medeiros, "China's Search for Assured Retaliation: The Evolution of Chinese Nuclear Strategy and Force Structure," *International Security*, Fall 2010, available from belfercenter.ksg.harvard.edu/files/Chinas_Search_for_Assured_Retaliation.pdf.

24. See Jonathan Watts, "Chinese General Warns of Nuclear Risk to US," *The Guardian*, July 15, 2005, available from www.guardian.co.uk/world/2005/jul/16/china.jonathanwatts; and Mark Schneider, "The Nuclear Doctrine and Forces of the People's Republic of China," *Comparative Strategy*, Spring 2009, available from www.tandfonline.com/doi/abs/10.1080/01495930903025276#preview. Also see an earlier version, dated 2007, available from www.nipp.org/Publication/Downloads/Publication%20Archive%20PDF/China%20nuclear%20final%20pub.pdf.

25. See Endnote 13.

26. See Endnote 22. Also see "China, Russia: PRC Navy Status, Development Prospects Detailed," Moscow, Russia, *Morskoy Sbornik (Nautical Collection)*, August 17, 2003, Translated in Open Source Center, Doc. ID: CPP20031120000002; and David Shambaugh, *Modernizing China's Military: Progress, Problems, and Prospects*, Berkeley, CA: University of California Press, 2002, p. 91.

27. As to how many nuclear weapons China has, no one knows. A sharp critic of an estimate that China might have as many as 3,000 nuclear weapons, though, was hardly reassuring regarding the actual total. He emphasized that China could *only* "theoretically" have as many as 1,660 nuclear weapons. For more on this controversy, see Hans Kristensen, "No, China Does Not Have 3,000 Nuclear Weapons," *FAS Strategic Security Blog*, December 3, 2011, available from www.fas.org/blog/ssp/2011/12/china-nukes.php#more-5086.

28. The numbers used to generate this chart came from the sources cited in Endnote 5, plus William Wan, "Georgetown Students Shed Light on China's Underground Missile System for Nuclear Weapons," *The Washington Post*, November 29, 2011; Hans Kristensen, "No, China Does Not Have 3,000 Nuclear Weapons"; and Robert Burns, "US Weighing Steep Nuclear Arms Cuts," *Associated Press*, February 14, 2012, available from www.boston.com/news/nation/washington/articles/2012/02/14/ap_newsbreak_us_weighing_steep_nuclear_arms_cuts/.

29. On these points, see Von Hippel, "Plutonium, Proliferation and Radioactive-Waste Politics"; Henry Sokolski, "The Post-Fukushima Arms Race?" *Foreign Policy Online*, July 29, 2011, available from www.foreignpolicy.com/articles/2011/07/29/the_post_fukushima_arms_race; and Takuya Suzuki, "Nuclear Leverage: Long an Advocate of Nuclear Energy, Nakasone Now Says Japan Should Go Solar," *The Asahi Shimbun*, July 22, 2011, available from www.asahi.com/english/TKY201107210339.html.

30. See Julian Borger, "South Korea Considers Return of US Tactical Nuclear Weapons," *The Guardian*, November 22, 2010, available from www.guardian.co.uk/world/2010/nov/22/south-korea

us-tactical-weapons-nuclear; and David Dombey and Christian Oliver, "US Rules Out Nuclear Redeployment in South Korea," *Financial Times*, March 1, 2011, available from www.ft.com/cms/s/0/e8a2d456-43b0-11e0-b117-00144feabdc0.html#axzz1oCEG4jBm.

31. See "India to Commission Breeder Reactor in 2013," *Express Buzz*, February 20, 2012, available from expressbuzz.com/nation/india-to-commission-breeder-reactor-in-2013/365268.html; and Paul Brannan, "Further Construction Progress of Possible New Military Uranium Enrichment Facility India," *ISIS REPORTS*, October 5, 2011, available from isis-online.org/isis-reports/detail/further-construction-progress-of-possible-new-military-uranium-enrichment-f/7.

32. See "Russia to Provide 'Seeker' Tech for Agni-V ICBM," *Pakistan Defense*, October 26, 2011, available from www.asian-defence.net/2011/10/russia-to-provide-seeker-tech-for.html; Air Marshal (Ret.) B. K. Pandey, "Agni-V to Be Launched By March End," *SP's Aviation.net*, available from spsaviation.net/story_issue.asp?Article=900; "Why Is This DRDO Official in Moscow?" *TRISHUL*, October 5, 2011, available from trishul-trident.blogspot.com/2011/10/why-is-this-drdo-official-in-moscow.html.

33. See "Report: Saudis to Buy Nukes if Iran Tests A-bomb," *MSNBC*, February 10, 2012, available from worldnews.msnbc.msn.com/_news/2012/02/10/10369793-report-saudi-arabia-to-buy-nukes-if-iran-tests-a-bomb; Andrew Dean and Nicholas A. Heras, "Iranian Crisis Spurs Saudi Reconsideration of Nuclear Weapons," *Terrorism Monitor*, Vol. 10, Issue 4, February 23, 2012, available from www.jamestown.org/programs/gta/single/?tx_ttnews%5Btt_news%5D=39048&tx_ttnews%5BbackPid%5D=26&cHash=9aecde0ac8f6849d8877289c07a49ad7; and Mustafa Alani, "How Iran Nuclear Standoff Looks from Saudi Arabia," *Bloomberg*, February 15, 2012, available from www.bloomberg.com/news/2012-02-16/how-iran-nuclear-standoff-looks-from-saudi-arabia-mustafa-alani.html.

34. See RIA Novosti, "Turkey Considers Uranium Enrichment for Own Nuclear Power Plants," January 1, 2009, available from www.gab-ibn.com/IMG/pdf/Tr1-Turkey_considers_uranium_enrichment_for_own_nuclear_power_plants.pdf.

35. Turkish nuclear engineers in the late 1970s investigated how plutonium from spent light-water reactor fuel might be used to make nuclear explosives. They determined that it was quite feasible. See U.S. Department of Energy, Office of Nonproliferation and International Security, *International Safeguards: Challenges and Opportunities for the 21st Century*, Washington, DC: National Nuclear Security Administration, NA-24, October 2007, pp. 93-94.

36. See Bruno Tertrais, "Alternative Proliferation Futures for North Africa," in this volume.

37. Burns, "US Weighing Steep Nuclear Arms Cuts."

38. On these points, consider Christopher A. Ford, "Five Plus Three: How to Have a Meaningful and Helpful Fissile Material Cutoff Treaty," *Arms Control Today*, March 2009, available from www.armscontrol.org/act/2009_03/Ford.

39. Badrakh, "Mongolia Abandons Nuclear Waste Storage Plans, Informs Japan of Decision," *Business-Mongolia.com*, October 17, 2011, available from www.business-mongolia.com/mongolia/2011/10/17/mongolia-abandons-nuclear-waste-storage-plans-informs-japan-of-decision/.

40. See Jacob Kipp, Endnote 21.

41. For a fuller discussion, see the "Missiles for Peace" Chapter by Henry D. Sokolski in this volume. Also listen to the audio of a panel discussion, "Missiles for Peace," held at the Carnegie Endowment for International Peace in Washington, DC, September 13, 2010, available from d2tjk9wifu2pr3.cloudfront.net/2010-09-13-Sokolski.mp3.

42. See "U.S Unlikely to Allow S. Korea to Reprocess Nuclear Fuel: Diplomat," *Yonhap News Agency*, March 3, 2012, available from english.yonhapnews.co.kr/northkorea/2012/03/08/23/040100000AEN20120308007100315F.HTML; and Frank Von Hippel in Endnote 6 above.

43. See H.R. 1280, "A Bill to Amend the Atomic Energy Act of 1954 to Require Congressional Approval of Agreements for Peaceful Nuclear Cooperation with Foreign Countries and Oth-

er Purposes,” reported out of the House Committee on Foreign Affairs during the first session of the 112th Congress, available from thomas.loc.gov/cgi-bin/query/z?c112:H.R.1280; and “Chairman Ros-Lehtinen Opening Statement: HR1280, The Atomic Energy Act of 1954,” April 20, 2011, available at www.youtube.com/watch?v=Qrvz2_gzik8.

44. See Henry Sokolski, “What Nuclear Power’s Revival Will Now Require: Tightening the Rules,” testimony given before a hearing of the House Committee on Foreign Affairs, March 17, 2011, available from www.npolicy.org/article.php?aid=629&rtid=8; and “Obama’s Nuclear Mistake: The President Converts Bush’s Anti-Proliferation ‘Gold Standard’ into Lead,” *National Review Online*, February 7, 2012, available from www.npolicy.org/article.php?aid=1149&rtid=5.

45. See “In Pursuit of the Undoable: Troubling Flaws in the World’s Nuclear Safeguards,” *The Economist*, August 23, 2007, available from www.economist.com/node/9687869?story_id=9687869; and *World At Risk: The Report of the Commission on the Prevention of WMD Proliferation and Terrorism*, December 2, 2008, pp. 49-50, available from www.cfr.org/terrorism/world-risk-report-commission-prevention-wmd-proliferation-terrorism/p17910.

46. For the original presentation of the Fissile Material Control Initiative, see Robert J. Einhorn, “Controlling Fissile Materials and Ending Nuclear Testing,” presented at an international conference on nuclear disarmament, “Achieving the Vision of a World Free of Nuclear Weapons,” held in Oslo, Norway, February 26-27, 2008, available from www.ctbto.org/fileadmin/user_upload/pdf/External_Reports/paper-einhorn.pdf. Mr. Einhorn currently serves as the U.S. Secretary of State’s Special Advisor for Nonproliferation and Arms Control.