

When the authors of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) crafted their landmark document in the mid-1960s, the “bargain” they reached with the non-nuclear weapon states required them to leave a number of nuclear activities in the category of “acceptable” uses. This grouping covered a broad range because the non-nuclear weapon states wanted to maintain the widest possible options in return for giving up their right to nuclear weapons. Beyond nuclear research and power reactors, these allowed uses included so-called “peaceful nuclear explosions” (or PNEs) for industrial purposes and the operation of naval propulsion reactors (NPRs) for commercial shipping.²

Subsequent experience, however, proved that neither PNEs nor NPRs made economic sense relative to cheaper, safer, and less environmentally hazardous conventional technologies. The signing of the Comprehensive Test Ban Treaty in 1996 marked a major step towards banning PNEs and eliminating this loophole in the NPT. But there has been no progress to date towards controlling the potential spread of NPRs. Fortunately, the high cost and complexity of NPRs have limited their possession to date to a very small number of states: namely, the five declared nuclear weapon states under the NPT. But the situation is now changing due to new interest by several regional powers in acquiring nuclear submarines for military purposes. These actors are benefiting both from the existence of an NPT loophole for trade in NPRs and the opening of post-Cold War trade barriers, particularly by Russia.

Among other regions, South Asia represents a particularly worrisome case. The May 1998 nuclear tests by India and Pakistan have accelerated an already heated arms race in the region. Both countries are now vigorously investigating the possible purchase or development (with foreign assistance) of nuclear submarines to extend the range of their ballistic missiles and to increase the reach and stealthiness of their anti-ship patrols. Russia now admits that it is providing assistance to India’s nuclear submarine program, despite India’s non-mem-

bership in the NPT. Meanwhile, China is working with Russian technicians to upgrade its existing, but unreliable, short-range nuclear submarines into long-range delivery vehicles for its ballistic missiles.³ Elsewhere, France has reportedly entered into discussions with Brazil

regarding nuclear attack submarines, despite that country’s only recent accession to the NPT and its prior nuclear ambitions.⁴

As a result of these changing conditions, what was intended as a commercial loophole in the NPT is now beginning to be exploited for explicitly *military* purposes. This situation poses the threat

of a new global arms race in nuclear submarines—ironically, with the sanction of the NPT. To understand the scale of this potential threat, it is worth keeping in mind that the number of nuclear reactors outside of safeguards on submarines in the weapon states is equal to the total number of all civilian power reactors under International Atomic Energy Agency (IAEA) safeguards.⁵ Allowing the spread of NPRs for military purposes to other states could undermine the IAEA’s role in global nonproliferation efforts and begin a dangerous trend towards leaving control of these materials up to chance.

In this context, the absence of international mechanisms to prevent the current possessors of nuclear submarines (China, France, Russia, the United Kingdom, and the United States) from exporting propulsion technology, highly enriched uranium (HEU) submarine fuel, and even complete nuclear vessels presents a serious obstacle to global nonproliferation efforts. To counter this growing threat, this essay argues that the nonproliferation community needs to undertake new cooperative measures to close this NPT loophole.

This essay begins by tracing the history of the NPT debate over NPRs and associated naval fuel cycle ac-

**VIEWPOINT:
CLOSING THE NPT
LOOPHOLE ON EXPORTS
OF NAVAL PROPULSION
REACTORS**

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tivities. It then analyzes the reasons why new states are now seeking to acquire nuclear submarines and the ease with which the current possessor states can export this technology both to non-nuclear weapon states *and* to states outside the NPT. It then outlines one possible route to halting this trade—the creation of a suppliers' regime to ban the export of NPRs for military purposes. In conclusion, the essay discusses prospects for the formation of such a regime and why its development would coincide with the national interests of all of the current possessor states, as well as international nonproliferation objectives.

A HISTORY OF THE NUCLEAR PROPULSION LOOPHOLE

In the mid-1960s, nuclear power was a relatively unexplored technology, and many states were still considering the possible use of NPRs for commercial shipping. Italy and the Netherlands, in particular, insisted on their right to develop nuclear propulsion in the negotiations leading up to the NPT.⁶ The United Kingdom, moreover, feared that an NPT restriction on trade in NPRs would prevent the United States from providing it with technology and HEU fuel for its existing fleet of nuclear submarines.⁷ Other countries without such specific needs were simply leery of giving the IAEA more power to inspect their national nuclear programs, particularly if such restrictions would *only* apply to non-nuclear weapon states.⁸ Similarly, the weapon states themselves were not eager to create regulations covering so-called “non-explosive military uses,” which might require IAEA inspections of their naval fuel cycles. Finally, the IAEA did not want to undertake this inspection responsibility due to the perceived impossibility of gaining reliable access to military facilities.

As a result of these objections, the eventual treaty left nuclear propulsion outside of the list of proscribed (or even controlled) nuclear activities, meaning that nuclear materials in propulsion reactors were not subject to safeguards, in either the weapon states or the non-weapon states. Nevertheless, as the IAEA's former Assistant Director General for External Relations David Fischer remembers: “It was generally recognized that this was a serious loophole in the safeguards prescribed by the Treaty.”⁹ Indeed, the possibility that a state might block an inspection by claiming that this fissile material was bound for a propulsion reactor was viewed by many as a dangerous proliferation threat. But the states parties did

not possess a consensus for closing this loophole. Thus, despite the clear problems it posed, the states parties went ahead with this exception for the greater good of the treaty.

Over time, there have been periodic discussions about bringing NPRs and their associated fissile materials under safeguards. Such efforts, for example, took place during the negotiations in 1971 on the application of full-scope safeguards in the context of IAEA Information Circular (INFCIRC)/153. According to Fischer, however, the only progress agreed to among the states parties was a requirement that “the State concerned would have to comply with [several conditions] before withdrawing nuclear material from safeguards for non-explosive military use.” According to the regulations, the material could not be used “in conflict with an undertaking the State may have given...that the *nuclear material* will be used only in a peaceful nuclear activity,” meaning that it could “not be used for the production of nuclear weapons or other nuclear explosive devices.” Furthermore, safeguards would again apply once the material was “reintroduced into a peaceful nuclear activity.”¹⁰ Thus, while these conditions forbade the use of material removed from safeguards for a bomb, they did not forbid its use in a propulsion reactor for *other* military purposes, since nuclear propulsion was not listed as a proscribed activity under the NPT. Moreover, they did nothing to remedy the absence in the NPT of any restrictions on the *transfer* of nuclear materials and technologies for use in a propulsion reactor. As a result, the loophole remained.

Despite the original commercial aims of certain countries, NPRs were not adopted for any widespread commercial uses, largely because of the availability of cheaper and safer alternative fuels and power generators. The Soviet Union developed the only truly “civilian-use” NPRs to power a small fleet of nuclear icebreakers operating in the Arctic region. All other NPRs operated during the Cold War—excluding those on U.S. aircraft carriers and some Russian surface cruisers—powered military-purpose nuclear submarines. For most states, conventional power plants (running on diesel fuel or gas) provided adequate cruising ranges for naval surface vessels without the need to employ expensive and potentially dangerous nuclear technology.¹¹ Despite some advances in “air independent” diesel technologies, however, the same claims could not be made for conventionally powered submarines.

WHY STATES SEEK NUCLEAR SUBMARINES

Nuclear reactors used in submarines offer certain military advantages to states that are able to deploy them effectively. Unlike diesel submarines, which need to surface every few days and carry heavy loads of liquid fuel, nuclear submarines can remain submerged for months at a time and carry several years' fuel supply on board. Thus, they offer tremendous advantages in terms of power projection capabilities, stealthiness, and the ability to serve as long-range launch platforms for strategic nuclear missiles. For these reasons, the United States invested heavily in nuclear-powered ballistic missile submarines as its primary launch vehicle for U.S. strategic forces during the Cold War. While the Soviet Union relied more heavily on ground-based missiles, it still devoted large portions of its defense budget, particularly during the 1970s, to the development of the largest nuclear submarine force in the world. France, the United Kingdom, and China also made significant investments in nuclear submarines, although China has yet to produce submarines capable of operating safely and reliably beyond its immediate coastline.

During the Cold War, there was very little movement towards establishing controls in the area of nuclear propulsion, for several concrete reasons. First, most states understandably were disinclined to reopen the NPT simply to negotiate an amendment to ban trade in NPRs. Given the difficulty of its original negotiation, few countries wanted to risk the NPT's broader benefits by subjecting it to possible additional amendments. The second reason for the lack of effort during the Cold War was the perceived low likelihood of nuclear submarine exports. The Soviet and U.S. navies jealously guarded every detail of their nuclear submarines for fear that design secrets might fall into the other camp. Thus, there seemed to be little threat that these technologies would be transferred by possessor states to untrustworthy parties. Yet, beneath this veneer of apparent multinational restraint, there were at least three serious instances before the Soviet breakup in 1991 in which the nuclear weapon states considered the sale of nuclear submarine technology to non-nuclear weapon states, including those outside the NPT.

In 1987, Canada surprised the world by announcing plans to replace its ageing fleet of diesel submarines with a squadron of 10 to 12 nuclear attack submarines to patrol its vast Arctic waters and coastline.¹² Although the United States quietly opposed Canada's efforts, France

and the United Kingdom actively bid for the contract. In the end, the Canadian government balked at the high price tag and decided not to proceed with the deal. However, the fact that a non-nuclear weapon state had nearly bought a significant nuclear submarine capability set a dangerous precedent.

In 1988, the Soviet Union broke the barrier by leasing a 1960s-vintage Charlie-class nuclear submarine to India for three years. The Indian Navy wanted to gain experience in the operation and design of a nuclear vessel to inform its own nuclear submarine construction program.¹³ The Soviet Union did stipulate as part of the deal that India could not refuel the submarine and had to return the submarine intact after the lease period. Nonetheless, the deal represented the first instance in which a weapon state provided a nuclear submarine—complete with HEU fuel—to a state outside the NPT. It is worth noting that India's current design looks remarkably like a Soviet Charlie-class submarine.

A third case took place in early 1990, when reports surfaced that Pakistan had entered into negotiations with China about the possible acquisition of a nuclear submarine, very likely stimulated by the Indian deal with the Soviet Union.¹⁴ Although a deal was never completed—perhaps due to the low quality of China's nuclear submarines—the willingness of the Chinese government to undertake such talks suggests that the two sides may well resume negotiations in the future.

While the Cold War years provided no cases of actual sales of nuclear submarines to non-nuclear weapon states within the NPT or to states outside the treaty, the apparent willingness of at least three suppliers to push this envelope provides sobering evidence of the way in which even some of the NPT's declared nuclear powers view this loophole—as one to be exploited (at least in certain circumstances).

The conditions of the post-Cold War era, unfortunately, have only increased the incentives for at least one supplier, Russia, to move unabashedly through this window of opportunity. With the collapse of orders from the Russian Navy, desperate Russian naval design and production enterprises are searching for any possible means of survival. Russia has sold advanced Kilo-class diesel submarines to Iran, India, and China.¹⁵ Recent evidence now shows that, despite earlier Russian denials, this cooperation extends into the nuclear submarine sector with at least India and China. Meanwhile, declin-

ing demand for nuclear submarines due to force reductions in the United Kingdom, France, and the United States may increase incentives for these governments to open the door for their producers to make unprecedented sales abroad. Already, the United States has given the go-ahead to U.S. firms seeking to bid for a diesel submarine contract from Egypt.¹⁶ These trends point to a major proliferation danger unless something is done soon to halt this trade in submarines.

PROLIFERATION THREATS, NUCLEAR ACCIDENTS, AND OTHER DANGERS

The future spread of NPRs to new navies worldwide could cause several serious problems. Proliferation dangers include the threat of increasing various states' global power projection capabilities, their access to nuclear technologies and materials, and the likelihood of regional arms races. In addition to these proliferation threats, the increased use of NPRs will exacerbate the risk of both environmental disasters and inadvertent military confrontations.

During the Cold War, both the United States and Soviet Union suffered numerous accidents involving nuclear submarines, some of which sank with nuclear fuel and even nuclear weapons aboard, including the Soviet *Komsomolets* in 1989.¹⁷ Other disasters involved refueling problems and fires, which brought the total number of deaths caused by nuclear submarines to several hundred sailors and civilians on both sides. In addition, at least nine collisions between U.S. and Soviet/Russian nuclear submarines took place between 1968 and 1993.¹⁸ This number does not include a host of other collisions between "friendly" U.S. and North Atlantic Treaty Organization (NATO) member-state submarines, as well as collisions between U.S. nuclear submarines themselves. Indeed, as recently as March 1998, two U.S. nuclear submarines, one capable of carrying 192 nuclear warheads, collided off the coast of Long Island, New York.¹⁹

Given these tendencies in the U.S.-Soviet experience, it is not unreasonable to assume that these or worse problems will arise from the proliferation of nuclear submarines to additional states. For these reasons, as well as the weapons proliferation risks if submarine reactors spread and the security threats that submarines represent as missile delivery vehicles, serious attention is needed to combat these problems—while they are still controllable.

The current period is a critical turning point when naval propulsion technology is beginning to move from the protected realm of the five NPT nuclear weapon states to a number of other potential powers. India's path to development of a long-range nuclear submarine is being greatly enhanced by Russian assistance.²⁰ Without it, the process will be prolonged and much more costly, perhaps resulting in a decision to abandon (or at least scale back) this program. The same can be said of other states interested in acquiring nuclear submarines, such as Brazil and Pakistan. Given this range of possible threats from the proliferation of nuclear submarines, it is surprising that more effort has not been put into closing this anachronistic NPT loophole.

HOW MIGHT A NEW CONTROL REGIME BE CONSTRUCTED?

Despite the difficulties of negotiating any international treaty, there are several reasons why the prospects might be positive for a regime to ban the export of nuclear propulsion reactors for military purposes. The rest of this essay examines what such a treaty might look like and why it would further global security, while also serving the national interests of the states involved.

This new treaty would need to focus directly on the problem of exports of submarine technology and related fissile material to non-nuclear weapon states and to states outside the NPT. Such a "Nuclear Propulsion Reactor Control Regime" (or NPRCR) could most easily be organized as a supplier regime, and might be compared to the similar (though only partially successful) efforts represented by the Missile Technology Control Regime (MTCR). But chances are much better that a successful regime could be formed in the submarine field for a number of specific reasons.

First, the number of nuclear submarine suppliers is much smaller—only five compared to the more than a dozen states capable of constructing ballistic missiles and related technologies. Second, unlike missiles, which can be used for commercial space launches, nuclear propulsion reactors have only one current civilian use (to drive nuclear icebreakers), so it is much easier to distinguish the likelihood of a military end-use. Highly effective and transparent safeguards could easily be placed on any NPR exported for use in an icebreaker, as removing a propulsion reactor is virtually impossible once it is affixed to a platform and begins operation. Thus, the end-use could be simply and effectively verified.

Third, as discussed below, there are good reasons why states with nuclear navies should *not* want to see nuclear submarines proliferated around the world's oceans; such deployments could ultimately cause problems for themselves.

In order to be effective, an NPRCR would have to include several key elements. These would involve state pledges:

- not to transfer nuclear propulsion reactors, related technology, or reactor materials for use in any military vessel;
- not to provide any state (or sub-state actor) with know-how regarding the construction of nuclear propulsion reactors; and
- to require and to accept international safeguards (and inspections) by the IAEA both on any nuclear propulsion reactors transferred for use in civilian icebreakers and on nuclear materials utilized in these reactors.

Given this outline of a possible regime, what are its prospects? Unfortunately, there are no efforts currently under way within or among any of the weapon states to initiate such a regime. However, informal interviews conducted by the author with government officials from the United States, China, and Russia suggest that such a regime could receive support from within these governments.²¹ Moreover, there are other officials and analysts on the record supporting the concept of controls on submarines. Even in Russia, influential Duma officials like Deputy Defense Committee Chair Aleksei Arbatov have voiced their opposition to Russia's expanding submarine cooperation with potential rivals like China.²² Some Russian experts are more concerned with the developing potential of countries like India and Pakistan. Evgeniy Miasnikov of the Moscow Institute of Physics and Technology, for one, has called for a multilateral ban on the export of any submarine (or its component parts) that could serve as a long-range delivery vehicle for a threshold state.²³ Meanwhile, in the United States, there are strong voices opposed to selling any U.S. submarines abroad, much less nuclear ones. As naval analyst Charles Meconis writes, "The Navy has been adamant in its position to refuse subs for export."²⁴

Given these arguments, it can be demonstrated that each of the five current possessor states has a *much stronger* national security interest in keeping these threatening technologies—and the fissile materials that power them—out of the hands of potential adversaries. As outlined above, a supplier regime to ban the export of NPRS

need not have any impact on the existing fleets of nuclear submarines in the weapon states, nor would it force them to reduce their numbers or put their fuel cycles under safeguards. Moreover, as all of these states are putting an increasing percentage of their nuclear arsenals onto submarines in the post-Cold War period, they should have an increasing incentive to *minimize* the number of foreign nuclear attack submarines they might face, not only in possible military encounters but in possible accidents through collisions. Expanding the number of rivals with highly capable, long-range nuclear attack submarines will greatly complicate their own operations, by putting their own ballistic missile submarines at risk. Similarly, providing assistance to states that are seeking to build nuclear submarines capable of carrying ballistic missiles will greatly increase the chances that potential rivals might use them to hit the homeland of the exporting country, suggesting that these sales could be highly destabilizing. Another point worth considering is the likely action-reaction effect of any future sales of this technology. For example, a single sale to a country in South Asia, East Asia, or the Middle East could cause a "domino effect" that would be difficult to stop. Neighboring states might be induced to purchase their own nuclear submarines for any number of purposes: to protect their surface fleets, to protect their shipping lanes, to protect their second-strike nuclear capabilities (for non-NPT states like Israel, Pakistan, India), or to assist them in possible "back door" routes to the acquisition of fissile material for nuclear weapons (for Iraq or other aspirants).

For these reasons, the rationale for creating a regime like the proposed NPRCR is well-grounded. Given the threat nuclear submarine proliferation poses to 21st century security, urgent action is needed at the international level to begin a discussion on this and other possible solutions. While the discriminatory nature of such a regime may anger some states in the international community, the nuclear weapon states (in the spirit of NPT Article VI) could legitimately argue that they are already engaging in major reductions of their nuclear submarine forces and need to establish a future-oriented control regime in order to continue this progress.

CONCLUSION—HOW TO GET STARTED?

Given the difficulty of creating a new regime from scratch, it would make sense to begin the negotiations modestly. A first step might be the convening of an in-

ternational conference of experts on nuclear submarines—both governmental and non-governmental—from each of the five states. These specialists could consider various alternatives and craft a set of policy recommendations for consideration by their governments. A second step might involve each of these governments appointing a working group on nuclear submarine proliferation to weigh the alternatives and then engage in government-to-government negotiations with their counterparts, perhaps at breakout meetings of the weapons states at the First Committee of the United Nations in New York or at the Conference on Disarmament in Geneva. A treaty could then be drafted for signature and implementation, in cooperation with the IAEA as the inspecting body for any civilian transfers that might take place. Depending on the nature of the treaty, the signatories could invite participation by additional states to support the treaty.

The major opponents of such a process, given the current array of forces, would likely include the naval shipyards of the weapon states (especially in Russia) and those countries that are now seeking to acquire nuclear submarines. What might need to occur to bring Russia on board is some form of short-term compensation for Russian shipyards, perhaps in the form of additional funds for nuclear cleanup and the dismantlement of Russia's large number of decommissioned nuclear attack submarines. In regards to other states, while an NPRCR might well be supported by the vast majority of non-nuclear weapon states and hailed as a positive contribution to the cause of eventual global nuclear disarmament, additional measures might be needed to appeal to those countries that see an advantage in acquiring nuclear submarines. If one assumes that these countries want nuclear submarines primarily for security reasons, the possessor states might consider agreeing to limited, multilateral nuclear submarine keep-out zones to assuage claims of discrimination and provide a meaningful negative security assurance.

While this essay does not purport to have worked out the best answer or the specific details of future negotiations towards preventing nuclear submarine proliferation, it has tried to point out the urgency of this emerging problem and one possible means for combating it. If such a supplier regime could be negotiated, its positive effects could be far-reaching. In regards to international security, banning exports of NPRs for military purposes would greatly reduce the dangers facing the military and

civilian vessels of all countries at sea, while nipping in the bud a dangerous incipient race in nuclear submarines as delivery vehicles for weapons of mass destruction. Such a regime would also promote greater environmental security, while diminishing the chances of nuclear accidents at sea caused by collision or malfunction. Finally, and perhaps most importantly, such a regime would close a remaining loophole in the NPT, thus putting another solid plank under the nonproliferation regime and helping to set the stage for a successful NPT Review Conference in 2000.

Given these advantages, it would seem expedient for the five NPT nuclear powers to explore plans to negotiate an NPRCR or similar cooperative agreement at the earliest possible date. Clearly, the sooner this remaining NPT loophole is closed by agreement of the five potential nuclear submarine supplier states, the better conditions will be for post-Cold War nuclear nonproliferation.

¹ The author thanks George Bunn for his expert advice and useful comments on an earlier draft of this viewpoint. He also thanks Kevin Orfall for his research assistance.

² Due to their controversial status as an allowable military use, NPRs were simply not mentioned in the NPT, thus making them legal by omission. The nature of this loophole served the interests of the United States and Soviet Union. It allowed them to keep their existing naval nuclear fuel cycles and submarines outside of safeguards, while also not granting them another "discriminatory" benefit under the treaty.

³ Igor Kudrik, "Russia helps India build nuclear submarine," Bellona Foundation website, September 22, 1998 (<http://www.bellona.no/e/russia/nfl/news/980917-2.htm>); see also mention of Russian admissions regarding nuclear assistance in "China should receive its third 'Kilo' by November," *Jane's Defence Weekly*, July 30, 1997, p. 16.

⁴ Reali Junior, "Europeans Fight for Space in Brazilian Arms Market" (in Portuguese), *O Estado de Sao Paulo*, August 7, 1997 (on-line version: <http://www.estado.com.br>), as abstracted in the Center for Nonproliferation Studies' Nuclear Abstracts Database.

⁵ David Fischer, *History of the International Atomic Energy Agency: The First Forty Years* (Vienna: International Atomic Energy Agency, 1997), p. 187.

⁶ George Bunn, U.S. participant in the NPT negotiations, telephone conversation with author, February 1998; see also *ibid.*, pp. 272-273. The Netherlands was interested in nuclear submarines, according to Fischer.

⁷ See Marie-France Desjardins and Tariq Rauf, "Opening Pandora's Box? Nuclear-Powered Submarines and the Spread of Nuclear Weapons," *Aurora Papers* 8 (Ottawa: the Canadian Centre for Arms Control and Disarmament, June 1988 [revised version]), p. 15.

⁸ *Ibid.*

⁹ Fischer, *History of the International Atomic Energy Agency*, p. 272.

¹⁰ International Atomic Energy Agency Information Circular (INFCIRC)/153 (Corrected), June 1972, Part I, No. 14 ("Non-Application of Safe-

guards to Nuclear Material to be used in Non-Peaceful Activities”), Items (a)(i), (a)(ii), and (b) (IAEA website: <http://www.iaea.org/worldatom/infcircs/infl53.html>) (italics in original).

¹¹ The United States and Russia were the two exceptions. Given that they had already developed NPRs for submarines, they decided to use them to propel some of their largest surface ships as well, including U.S. aircraft carriers and Russian heavy cruisers.

¹² Fischer, *History of the International Atomic Energy Agency*, p. 273; also, Desjardins and Rauf, “Opening Pandora’s Box?” p. 3.

¹³ Leonard S. Spector (with Jacqueline R. Smith), *Nuclear Ambitions: The Spread of Nuclear Weapons, 1989-1990* (Boulder, Colo.: Westview Press), p. 50.

¹⁴ *Ibid.*, p. 52.

¹⁵ See, for example, “Russia to supply India with another ‘Kilo’ submarine,” *Interfax* (Moscow), June 11, 1998; also, “China should receive its third ‘Kilo’ by November,” p. 16.

¹⁶ On the U.S. provision of marketing licenses to two U.S. companies to compete in the Egyptian submarine tender, see Charles Meconis, “U.S. May Approve Submarine Exports,” *Arms Trade News* (April 1997), p. 1.

¹⁷ For a detailed account of these and other accidents on both sides, see Georgi Kostev, *Nuclear Safety Challenges in the Operation and Dismantlement of Russian Nuclear Submarines* (Moscow: Committee for Critical Technologies and Non-Proliferation, 1997), pp. 18-37.

¹⁸ Joris Janssen Lok, “Setting a collision course for nuclear catastrophe,” *Jane’s Defence Weekly*, March 13, 1993, p. 16 (Lok cites seven collisions from 1968-1987); two additional U.S.-Russian collisions (one in 1992 and one in 1993) are documented by Evgeniy Miasnikov in his commentary, “Collision of Two U.S. Nuclear Powered Submarines on March 19, 1998,” website of the Center for Arms Control, Energy, and Environmental Studies, Moscow Institute of Physics and Technology (<http://www.armscontrol.ru/lat/subs/collisions/comm0319.htm>).

¹⁹ CNN (Washington), March 19, 1998.

²⁰ Kudrik, “Russia helps India build nuclear submarine.”

²⁰ Author’s interviews with officials in the U.S. State Department, the U.S. Arms Control and Disarmament Agency, the Chinese Ministry of Defense, and the Russian Foreign Ministry (names withheld to protect anonymity requests), May-September 1998.

²² Lecture by Russian Duma member Alexei Arbatov, Monterey Institute of International Studies, Monterey, California, August 4, 1997.

²³ Evgeniy Miasnikov, “Restricting Submarines—Beyond the MTCR: Non-proliferation and disarmament of nuclear-capable delivery systems,” website of the Center for Arms Control, Energy, and Environmental Studies, Moscow Institute of Physics and Technology (<http://www.armscontrol.ru/subs.conventional/inesap0495.htm>).

²⁴ See Meconis, “U.S. May Approve Submarine Exports,” p. 2.