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EDITOR'S NOTE

The first article in this double issue, by Pavel Podvig, explores an issue that had somewhat taken the back burner recently—the risk of an accidental nuclear exchange between the United States and Russia. In the view of the author, although such an accidental exchange is extremely unlikely, its probability is not zero even in peacetime. This is because both sides continue to keep part of its missile force on high alert, giving each the possibility of launch on warning. To address the risks, attempts to upgrade existing early warning systems, notably in Russia, a topic that the author has examined in detail in the past,[1] would *not* be helpful. If countries have concerns about the reliability of early warning systems, "these concerns should be dealt with by removing these systems from the decision-making process." Most valuable in reducing and perhaps eliminating risks of accidental war would be to take all nuclear weapons off of alert. This could be done best the author argues if it were done in a non-transparent way, unilaterally, and possibly even hidden from public view!

The following article, by Z. Mian, A. H. Nayyar, R. Rajaraman, and M.V. Ramana, also focuses on the capabilities of a nuclear weapon state, in this case, India. Under the U.S.–India joint statement of July 2005, India had the freedom to denote certain of its current and future nuclear reactors as military facilities, which would not be subject to international safeguards. In March 2006, India proposed its intended separation plan. The authors examine the implications of this plan for the Indian potential to expand its nuclear weapons arsenal, and conclude that if India chose to do so, it could significantly increase its production of weapon-grade plutonium.

The next article focuses on a possible way to detect a plutonium war head hidden in a container. Jonathan Katz shows that neutron detectors affixed to the outsides of a container could detect an *unshielded* plutonium sphere when the neutron output from the source is integrated over the duration of an ocean voyage. However, it would not be difficult to shield the plutonium source by surrounding it with neutron absorbing material.

The following article, by Frank von Hippel and Laura Kahn, as the previous article, is motivated by concerns over terrorist acquisition of nuclear weapons—in this case, the possibility of terrorists obtaining highly enriched uranium (HEU). Two recent articles in the journal examined the dangers of the use of HEU in research reactors and described how these reactors could be converted to the use of low enrich uranium (LEU).[2] The present article continues this analysis, in this case focusing on reactors used to produce radioactive isotopes for medical purposes. The authors show that in this case too, reactors can be converted to using low-enriched uranium targets instead of highly enriched uranium. As the article emphasizes, the cost of conversion is relatively small and would be "dwarfed by the annual savings in security costs if the production facilities were subject to the same security standards as U.S. Department of Energy facilities that contain significant quantities of HEU." Further, any new reactor to produce medical isotopes and associated processing facilities should certainly be designed to handle LEU targets.

The article by Robert Harney, Gerald Brown, Matthew Carlyle, Eric Skroch, and Kevin Wood develops a highly detailed model of the steps that a proliferator would need to take, under various constraints, to produce a crude nuclear weapon from scratch and in a covert, or semi-covert way. In the principal illustration used in the article, the authors note that it would take 5–9 years for a proliferator to produce the HEU and device for a completed uranium weapon. The authors argue that even if a proliferator were supplied with 250 kilograms of HEU, it would still take it about 2 years to produce a small stock of weapons.

The final article in the issue, by Eric Schneider and William Sailor, explores the future of civilian nuclear energy. It does so by analysis of three scenarios for the growth of nuclear energy over this century based on evolutionary and advanced reactors, with the scenarios differing by fuel cycle choice between once-through, transmutation, and breeding. The authors show convincingly that in the most plausible cases, the once-through fuel cycle will minimize nuclear power costs. For the transmutation and breeding fuel cycles to compete with the once-through, the price of uranium and/or the cost of repository space would have to increase astronomically. Aside from the economic superiority of the once-through fuel cycle, the authors argue that it also minimizes proliferation risks.

NOTES AND REFERENCES

1. P. Podvig, "History and the Current Status of the Russian Early Warning System," 10 (1) (2002), 21–60.

2. A. Glaser, "The Conversion of Research Reactors to Low-Enriched Fuel and the Case of the FRM-II." *Science and Global Security* 10 (1) (2002), 61–79 F. von Hippel, "A Comprehensive Approach to Elimination of Highly Enriched Uranium from All Nuclear-Reactor Fuel Cycles." *Science and Global Security* 12 (3) (2004), 137–164.