The proliferation of nuclear, chemical, and biological weapons, collectively referred to as weapons of mass destruction (WMD), is of grave concern to U.S. security. We are tackling the problem of proliferation across the entire spectrum of the threat, from preventing proliferation at the source, to detecting and reversing proliferant activities, to responding to the threatened or actual use of such weapons.

Proliferation Prevention and Detection

Livermore's Center for Global Security Research (CGSR) organized and hosted the After Globalization Conference attended by Vice Admiral Arthur Cebrowski (left photo, left foreground) and Former Secretary of State George Shultz (right foreground). CGSR Director Ronald Lehman (right photo, center) was a principal participant in the formal dedication of the Open Computing Center at Snezhinsk, Russia.

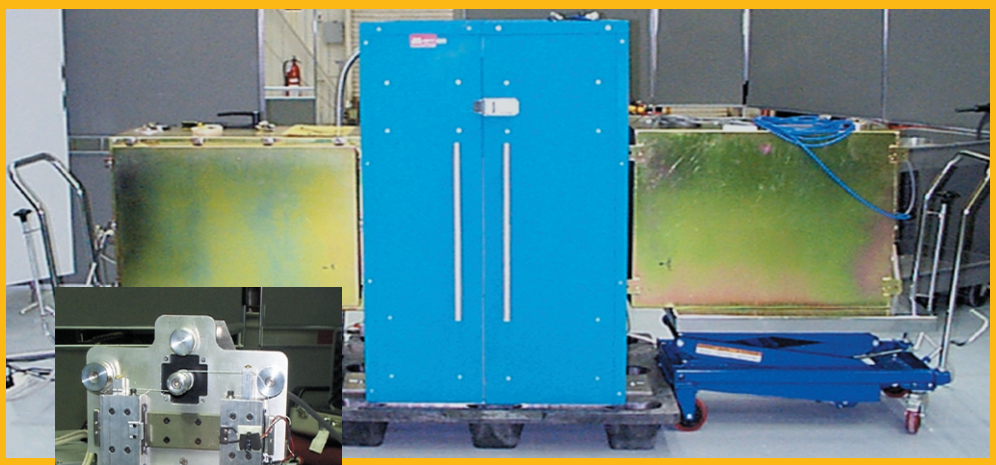
Reducing the Russian Nuclear Threat

Since the early 1990s, the U.S. and Russia have engaged in a range of negotiations designed to reduce the danger from nuclear weapons. Issues have included shutting down plutonium-producing reactors, monitoring nuclear stockpiles, inspecting stored nuclear material, and disposing of excess plutonium. Many of these negotiations have floundered on the shoals of the classified information that would need to be exchanged in order to verify the agreements.

As a way out of this impasse, Livermore and Los Alamos developed the concept of an information barrier—a set of hardware, software, and procedures—to allow measurements on classified objects but prevent classified information from being revealed to inspectors. We demonstrated such a system to Russian scientists and security specialists in August 2000 at Los Alamos. The Fissile Material Transparency Technology Demonstration consisted of measurements on a number of unclassified authentication sources as well as measurements on a weapon component. The extremely successful demonstration is enabling valuable headway on this difficult but essential treaty-monitoring issue of exchanging just the required information.

Through the DOE's Material Protection, Control, and Accounting (MPC&A) program, we are working to improve the security of Russia's weapons-usable nuclear materials. Livermore leads MPC&A project teams at Chelyabinsk-70, Sverdlovsk-44, the Bochvar Institute, and Krasnoyarsk-45. We are also working with the Northern and Pacific Fleets of the Russian Navy to enhance the protection of the nuclear fuel for their nuclear-powered vessels. This work involves direct interactions with the Russian Ministry of Defense, an activity that would have been inconceivable during the Cold War.

Livermore researchers examine the Russian-designed and -built plutonium oxide salt washer that is being tested for use in the U.S. plutonium disposition program. We are helping make nuclear materials more secure in the United States and worldwide.



Detectors, positioned on either side of a container with an unseen sample, can identify the presence of plutonium in retired weapons and determine whether the plutonium is newly manufactured or aged. A tungsten alloy shutter (inset) is a key system feature that helps to ensure that only unclassified information is provided to observers.

Assisting Conversion at Russian Nuclear Complex

Downsizing the Russian nuclear complex is a high-priority U.S. national security goal. However, such downsizing will eliminate the jobs of thousands of Russian weapons workers. To accelerate the downsizing process, the U.S. and Russia have launched the Nuclear Cities Initiative to create self-sustaining civilian jobs for displaced workers in the closed nuclear cities of Sarov, Snezhinsk, and Zheleznogorsk.

Livermore leads the DOE team working with Snezhinsk and its various civilian entities to develop commercial enterprises. For example, we have a contract with SPECTR-Conversion to develop improved technologies for oil-well-casing perforators. In November 2000, the Strela Open Computing Center was dedicated. This center will facilitate the ability of Western firms to tap Sneshinsk's expertise in computer programming, software development, and scientific computations for commercial applications.

We are also working with the Avangard Foundation (the commercial element of the Avangard Electro-mechanical Plant at Sarov) and Fresenius Medical Care AG (the world's largest provider of products and services for individuals with chronic kidney failure) to develop a manufacturing center at Sarov for dialysis machines and disposable products. Contracts were signed in March 2000, and fences were moved in June to enable work activities outside Avangard's high-security area. Several hundred former weapons workers will eventually be employed in this enterprise. This collaboration is a major milestone in U.S. efforts to engage a Russian weapons production facility.

Remote Sensing for Proliferation Detection

Chemicals associated with the various stages (research and development, production, testing, storage, use) of weapons of mass destruction are released into the environment at levels that may be detectable by technical means. Remote detection of these chemical signatures would provide clues that, in conjunction with other sources of information, could be used to infer the nature of the activities that generated them. We are developing optical remote-sensing techniques for detecting, identifying, and quantifying signatures of the proliferation or use of weapons of mass destruction.

For example, we have developed a hyperspectral infrared imaging spectrometer (HIRIS) for passive remote sensing of chemical signatures. The system was flown in several successful challenging flight campaigns this past year. The data from these flights are being used to refine the HIRIS remote gas analysis software and models and to further validate the instrument's performance.