



## No Room for Mistakes: Rethinking Nuclear Technology—

By Lloyd J. Dumas, University of Texas

The devastating terrorist attack that struck the U.S. on September 11, 2001, shattered New York's massive World Trade Center, a piece of the Pentagon, thousands of innocent lives, and the illusion that sophisticated technology and powerful weapons could keep America safe. Indeed, modern society has become increasingly vulnerable to the fruits of its own technological brilliance.

Following the attack, U.S. nuclear power plants and weapons facilities were put on high alert. Yet nuclear technologies are key to the Bush administration's plans to

radically rework the nation's security and energy policies: allowing for national missile defense by scrapping key elements of nuclear arms control, and crafting an energy strategy that casts a revived nuclear power industry as a major player. Terrorism is not the only danger. It is time to examine all the risks the U.S. is running by assuming that such dangerous technologies can be permanently kept under control, despite the limits inevitably imposed by the fallibility of human beings who design, build, and operate them.

People are just as error-prone today as ever. The evidence is all around us. According to a

1998 U.S. General Accounting Office study, human error contributed to almost 75% of the most serious U.S. military aircraft accidents in 1994 and 1995. A 1998 Union of Concerned Scientists study of ten nuclear power plants (representing a cross section of the industry) concluded that nearly 80% of reported problems resulted from worker mistakes or poorly designed procedures.

Over the past century, spectacular advances in technology have dramatically changed our ability to affect the physical world. The collision between our unchanging fallibility and the awesome power of the most dangerous technologies that we have created threatens our common future.

Nowhere is this clearer than with nuclear and other weapons of mass destruction.

For more than fifty years the U.S. has chosen these fearfully dangerous technologies as the foundation of a strategy of national security through the threat of devas-

tation. Always there has been the crucial assumption that these technologies can be kept under control indefinitely—that they will never be activated in unauthorized ways, that nothing terrible will happen until it is supposed to happen.

There have been many warnings that this assumption is not tenable in the long run. At least 89 serious nuclear weapons-related accidents have been publicly reported since 1950. According to a 1996 Department of Energy report, the margin of error in U.S. plutonium records averaged 0.8% since the late 1960s (for every 100 tons of plutonium, the U.S. lost track of 1,600 pounds). That is a sufficiently large error to have potentially missed unauthorized diversion of enough plutonium for hostile governments—or terrorists—to build more than 100 nuclear weapons. Furthermore, U.S. nuclear attack warning systems generated more than 1,150 serious false alarms between 1977 and 1984 (the only years for which the Pentagon has released data).

One particularly frightening incident occurred on January 25, 1995, when Russian warning radars appeared to detect a U.S. submarine-launched ballistic missile heading for Moscow. President Yeltsin was alerted, and Russian nuclear forces prepared to retaliate. Then, in the last minutes, it was determined that the missile was headed far out to sea. The rocket they had detected was real and it was American, but it was a scientific probe to study the Northern Lights. The Russian government had been told of the launch, but apparently—through human error—word never reached key military commanders.

Nuclear power is a different kind of dangerous technology, designed for benign purposes but capable of doing enormous damage if enough goes wrong. Despite heavy subsidization since its inception, nuclear power would likely have died in infancy if not for government intervention in 1957 to limit liability for the horrendous damage that studies had shown a major accident could cause. In this case, it was assumed that human fallibility could be prevented from triggering disaster largely by clever design. But like the weapons program, nuclear power has been plagued with design flaws, construction mistakes, and operator errors.

Chernobyl and Three Mile Island are only the most public warnings that have been given in the realm of nuclear power; there have been many more. And there is still no safe and cost-effective way to store nuclear waste (from power plants and weapons production) over the long term—another source of potential disaster. Yet the problem builds day by day.

### Key Points

- The efficacy of technologies used in achieving foreign policy goals is greatly affected by the inherent fallibility of human beings who interact with them.
- The collision between our fallibility and the awesome power of the most dangerous technologies we have created threatens our common future.
- We cannot assume that fallible humans can indefinitely control technologies with a potential for disaster as great as that of nuclear power or weapons of mass destruction.

# Problems with Current U.S. Policy

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In October 1999, three years after President Clinton signed it, the Senate rejected ratification of the Comprehensive Test Ban Treaty. The treaty would have banned all nuclear weapons tests. President Bush has so far supported the Senate's action and, in mid-2001, asked U.S. nuclear weapons scientists how long it would take to ready the Nevada Test Site for a resumption of nuclear testing.

President Bush has clearly acknowledged that nuclear arsenals are already too large. According to *Newsweek* (June 25, 2001), he was stunned to learn of the size of the U.S. nuclear arsenal, saying "I had no idea we had so many weapons. What do we need them for?" Yet, the Bush administration is pressing forward with its National Missile Defense (NMD) program, which will require the U.S. to withdraw from the Anti-Ballistic Missile (ABM) Treaty, a cornerstone of the nuclear arms reduction architecture signed during the Nixon administration. Combined with resumed testing, such a move offers the very real prospect of restarting the nuclear arms race with Russia and China and encouraging further proliferation of nuclear weapons by undermining treaty-based controls, to the great detriment of America's security.

U.S. national security policy is headed in the wrong direction. Nuclear weapons are not just unnecessary for security; they are counterproductive. In 1998, General George Lee Butler, the officer in charge of all American strategic nuclear weapons from 1991-94, told the National Press Club that he had "witnessed ... the catastrophic failure of both men and machines." He concluded, "The likely consequences of nuclear war have no political, military, or moral justification" and "The threat to use nuclear weapons is indefensible." Butler is not the only high-ranking former military officer to hold this view. On December 8, 1996, sixty retired generals and admirals (from all of the then-declared nuclear-armed nations) signed a joint statement at the United Nations endorsing the idea that nuclear weapons can and should be completely eliminated.

How and when disaster will strike, no one can say. The potential for catastrophic human error abounds, and human fallibility shows itself in many ways. Alcohol and drug abuse, mental illness, and other serious reliability problems are common and can be difficult to detect. From 1975-90, more than 66,000 U.S. military personnel were judged unreliable and permanently removed from nuclear duty for these reasons. It is unclear how long they had these problems before they were removed, while they were still actively working with nuclear weapons.

Boring and stressful work, common in both the nuclear military and the nuclear power industry, is a frequent source of human failure. Trying to circumvent individual unreliability by requiring that groups jointly undertake critical actions (such as launching nuclear-armed missiles) raises group reliability problems ranging from bureaucratic foul-ups to group psychosis. Replacing people by computers cannot circumvent the problem either, since computers are designed, built, programmed, and operated by human beings. The bottom

line is that there is simply no way to completely avoid the problems caused by human fallibility.

President Bush and Vice President Cheney have made it clear that, under their leadership, U.S. energy policy will focus primarily on expanding supplies of fossil fuels and encouraging the construction of nuclear power plants. Administration officials have said that the U.S. opposes the plan proposed at the G-8 summit in July 2001 to phase out fossil fuel subsidies and encourage worldwide expansion of renewable energy sources like solar and wind power. This plan, offered by the leading industrialized nations, recommends that rich countries "remove incentives and other supports for environmentally harmful energy technologies."

*The New York Times* (July 14, 2001) reported: "The White House says its opposition [to the G-8 plan] ... is based on a desire to let the marketplace, rather than government, decide how quickly renewable energy resources are adopted worldwide." Yet the removal of government subsidies outlined in the plan is crucial to letting the market operate. If fossil fuels had not been so heavily subsidized for so long, solar power, wind energy, and a host of other renewable energy sources would not have as difficult a time competing with them. The case of nuclear power is even clearer. Without enormous government subsidies, including special protection from liability, the market would have laid nuclear power to rest long ago.

The Bush administration's out-of-hand rejection of the Kyoto Protocol, the treaty intended to address global warming, has been a serious foreign policy liability, especially because no sensible alternative plan has yet been offered. To suggest that substantial expansion of nuclear power is a reasonable alternative approach to global warming is to ignore the fact that fallible humans simply cannot be relied upon to indefinitely control technologies that expose us to catastrophic risk, no matter how carefully those technologies are designed.

Technological development has much to offer. It has been critical to the growth of economic well-being around the world. But global policies must fully reflect recognition of the growing clash between the destructive potential of the most dangerous technologies we have created and the inherent fallibility that makes us human.

There are some dangerous technologies whose potential for disaster is so great that fallible human beings have no business dealing with them at all. Chief among these are nuclear and other weapons of mass destruction. But there are nonmilitary technologies, as well, whose more benign purpose can be served by many, less risky alternatives. Nuclear power is perhaps the preeminent example.

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## Key Problems

- U.S. rejection of the Test Ban, and plans to resume nuclear testing and build NMD despite the ABM Treaty, will restart the nuclear arms race and encourage proliferation.
  - Nuclear weapons are a national security liability. Sixty retired admirals and generals have publicly stated that nuclear weapons can and should be abolished.
  - U.S. energy policy favors fossil fuel and nuclear power technologies, opposing G-8 calls for conservation and more renewable energy use worldwide.
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# Toward a New Foreign Policy

The only rational policy for dealing with nuclear weapons is drastic reduction leading to complete elimination. In the post-cold war era, it is clearer than ever that such weapons are a national security liability rather than an asset. In the words of the Canberra Commission report of 1996, written by an eminent group of former military commanders and high-level defense officials from the major nuclear nations: "The possession of

nuclear weapons by any state is a constant stimulus to other states to acquire them... nuclear weapons diminish the security of all states." By now, dozens of high-ranking military officers have assured us that nuclear weapons are not necessary to providing the military dimension of national security.

In pursuit of this policy, the U.S. Senate should first ratify the Comprehensive Test Ban Treaty and work to insure that all nations strictly comply with its prohibition of all test explosions of nuclear weapons. No country on earth has less to learn from continued nuclear testing than the United States.

There is no prospect that working out the thousandth refinement of nuclear weapons design will add to U.S. security anywhere near as much as the first testing of nuclear weapons designs by militarily ambitious states will subtract from that security.

Second, the U.S. commitment to the ABM Treaty should be reaffirmed. Rather than an obsolete "relic of the cold war," this treaty is a cornerstone of the progress that has already been made in reducing the world's most powerful nuclear arsenals.

Third, though a battlefield missile defense may make some sense, the National Missile Defense program does not. Trying to build a highly speculative National Missile Defense at the expense of destroying the ABM Treaty will damage U.S. security. It will push Russia toward abandoning its already pledged nuclear arms reduction and China toward nuclear expansion, to insure that their deterrent forces remain viable. And NMD would encourage any so-called "rogue state" that might contemplate attacking the U.S. to do so stealthily, by terrorist assault with weapons of mass destruc-

tion, rather than by an easily traceable missile attack. At best, NMD would be a Maginot Line in the sky, creating the illusion of security, while interfering with Washington's ability to lead the world toward nuclear abolition.

Arguably, the most effective missile defense for any nation is the verified destruction under treaty of the missiles and warheads that might threaten it. Improving economic and diplomatic relations, so that those most feared have no reason or impulse to attack, is also an effective strategy.

When the U.S. signed and ratified the ABM Treaty, a pledge was made to abide by its provisions. At the Nonproliferation Treaty (NPT) review conference in May 2000, Washington declared that it was still committed to "the ultimate goal of a complete elimination of all nuclear weapons"—a formal treaty commitment under the NPT since 1968. The U.S. has fought wars on the grounds that it had to abide by commitments, that America's credibility was at stake. Does not the same reasoning apply here?

Finally, the U.S. should carefully phase out nuclear power in favor of technological alternatives that can provide adequate energy without the threat of human-induced disaster. Rather than opposing, Washington should enthusiastically support—even lead—international efforts to move toward renewable, ecologically benign energy sources and energy conservation technologies. Twenty-five years ago, in a book-length analysis, I detailed a wide variety of energy conservation strategies that could reduce annual energy consumption in the U.S. by 30-50% without lowering the standard of living. Many of these strategies made use of already existing technologies. If anything, it should be easier today, both because of technological advance and because Americans are so profligate in the use of energy.

Neither U.S. national security nor energy policy goals require relying on technologies that could, by accident or inadvertence, precipitate catastrophe. Other effective technological and nontechnological approaches are available, approaches that do not expose us to the risk of large-scale disaster as a consequence of our inherent human limitations. It will take some time and a great deal of political will, but there is no doubt that America can get there from here.

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## Key Recommendations

- The U.S. should actively seek strictly verified sharp reductions in arsenals of weapons of mass destruction, leading toward the goal of complete, worldwide abolition.
- Nuclear power should be phased out in favor of environmentally benign, renewable energy sources and conservation technologies.
- The U.S. should pursue foreign policy goals using both nontechnological approaches, such as improved economic and diplomatic relations, and technological alternatives that do not threaten large-scale human-induced disaster, either by accident or inadvertence.

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## Organizations

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## Websites

### Global Green USA

<http://www.globalgreen.org/>

### Nuclear Age Peace Foundation

Waging Peace in the Nuclear Age  
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