

Memorandum to: Supporters of a Comprehensive Test Ban
From: Christopher Paine and Thomas Cochran, NRDC¹
Subject: Hydronuclear Testing and Nuclear Weapons Proliferation
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Despite the Administration's avowed focus on preventing further nuclear weapons proliferation, senior Pentagon officials are urging President Clinton to exempt very small "hydronuclear" weapons tests from the Comprehensive Test Ban Treaty (CTBT) now under negotiation in Geneva, and they are seeking his approval to begin an extensive series of such tests during the current nuclear testing moratorium.

According to official sources, the effort to shield very low yield tests is being assisted by the same National Security Council (NSC) staff members who, during the first six months of 1993, had sought without success to protect the right to conduct tests as large as one kiloton. The Pentagon initiative is being opposed by other agencies, and the resulting policy deadlock means that the issue will soon be decided by the President. According to government sources, the draft memorandum for consideration by the President skews the "menu" of options in the direction of eventually conducting very-low yield tests -- regardless of which option is chosen in the near term -- because it omits the option of drafting or interpreting a CTBT to ban them outright. The draft memo omits mention of the considerable expert opinion that does not support the technical need for hydronuclear tests to maintain U.S. nuclear weapons. The memo also fails to analyze the potential nonproliferation benefits of banning such tests under a CTBT, and seriously underestimates the legal, political, and verification complexities of continuing these kinds of tests in an ostensibly "comprehensive" test ban environment.

Although no commonly accepted definition exists, a "hydronuclear test" may generally be described as a nuclear weapons test with a nuclear energy release from fission that does not exceed the amount released by the chemical high explosive, and it can be considerably less, on the order of a few pounds or even a fraction of a pound. The prefix "hydro" means that the core of the nuclear device behaves like a fluid when compressed by the chemical high explosive. In a hydronuclear test of weapon performance, the fission chain reaction is slowed down by replacing a portion of the fissile material core with non-fissile material, or by pressurizing the core with a neutron absorbing gas. Enough of a nuclear chain reaction is retained to permit careful measurements of the radiation released. Weapon designers can use these data to better predict the performance of the weapon in its full configuration.

Thus hydronuclear tests can serve a valuable role in the development of the full range of pure fission weapons, including first generation nuclear weapons of the implosion type with yields in the 5 to 30 kiloton range, more sophisticated designs with yields up to about a megaton, and advanced micro-nuclear weapons with yields of 5 to 500 tons. If legitimized under a CTB, these tests would be available to proliferators and existing nuclear weapon states alike to develop new fission weapon designs.

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The prospect of conducting such tests is already being used as a rationale for maintaining existing test sites. Continuing test activity at such sites will seriously complicate negotiation and verification of the CTBT, and a number of states involved in the current negotiations -- including India, Iran, Pakistan, Mexico, and Brazil -- have already expressed their desire that all test sites be closed under the treaty. Conversely, if countries such as India and Pakistan follow the weapon-state example, very likely the United States will find itself unable to verify that all *their* observed nuclear test activities are "legal".

Hydronuclear tests are not of significant value to the United States, because they fail to generate the conditions for *substantial* fusion of deuterium and tritium in the core, and thus do not provide a reliable means for extrapolating the performance of new or modified U.S. nuclear weapons, which depend critically on fusion reactions for their performance. While adding little of value to the already massive U.S. thermonuclear weapons data-base, hydronuclear tests could provide nuclear weapons proliferators with key data for development of advanced compact fission weapons deliverable by intermediate and long-range ballistic missiles, thereby increasing the nuclear threat to the United States and its allies. It boggles the mind to think that the President is about to be presented with a decision memorandum in which this technical windfall to future proliferators is not even mentioned, much less subjected to a detailed assessment of its likely impact on international security. Whether through bias or incompetence, sources say the NSC staff has strayed from its expected role as an "honest broker" in interagency disputes.

Specifically, for a proliferator seeking to develop more advanced pure fission weapons, hydronuclear tests can be used to: improve the timing of initiation of the chain reaction, thereby achieving larger blasts; improve blast-to-weight and blast to volume ratios, thereby facilitating design of compact missile warheads deliverable at long range; make more accurate predictions of the minimum and actual size of the blasts obtainable from a nuclear device; improve equation-of-state data relating the pressure, temperature and densities of materials at high pressures; confirm the rate of growth of the nuclear chain reaction in its early stages, thereby validating the nuclear explosive potential of a weapon assembly system; and explore nuclear safety aspects of a weapon detonated accidentally by penetration of a bullet or sudden impact at a single point. Before succumbing to the adroit efforts of the Pentagon and his own NSC staff to "steer" him toward a resumption of very low-yield nuclear weapons tests, the President would be well advised to solicit the views of highly regarded independent nuclear experts with no institutional or career stakes in the outcome of this decision.

Since the Comprehensive Test Ban Treaty (CTBT) negotiations began in January, the U.S. and other governments have sought to avoid further elaboration in the treaty text of a proposed basic obligation not to conduct "any nuclear weapons test explosion, or any other nuclear explosion." Instead, the U.S. government is working with other nuclear weapon states to preserve their ability to conduct hydronuclear tests by negotiating a common understanding among themselves regarding the scope of so-called "treaty compliant" activities. This common understanding would then be read into the negotiating record by the Chairman of the Conference as the putatively "authoritative" interpretation of the treaty's scope.

This strategy has several serious defects. First, the exact legal status of such a joint statement, and its ultimate force and effect on other treaty parties, remain to be determined. Second,

the nuclear-weapon states to date remain far apart in their respective conceptions of permissible low-yield tests, which reportedly range from zero yield to a few hundred tons of nuclear energy released. Lastly, even if a common understanding could be reached, verification difficulties and mutual suspicions of cheating will surely be the result, since these low-yield tests are not readily distinguished from nuclear test explosions banned by the treaty. Absent a right to virtual co-participation in underground hydronuclear tests, it will be exceedingly difficult to verify the difference between a "compliant experiment" with a 4 pound nuclear yield -- the limitation informally advocated by the United States -- and a "non-compliant explosion" with a nuclear yield of 40 pounds, 400 pounds, or possibly even greater yields. While it continues to protect the right to conduct hydronuclear tests, the current U.S. negotiating approach in Geneva does not embrace solutions to any of the difficulties just noted. For this reason, some senior U.S. intelligence officials oppose any loophole for treaty compliant nuclear testing activities at existing test sites.

If the CTB Treaty ultimately permits very low-yield nuclear tests, undeclared nuclear weapon states and other non-parties to the Nonproliferation Treaty (NPT) would be encouraged to take advantage of a new global norm which for the first time would legally sanction partial-scale nuclear weapon experimentation. The existence of such a new global norm will compete with the prevailing interpretation of the NPT. That treaty's prohibition on the "manufacture" of nuclear weapons is now interpreted to bar "preparations" for manufacture, including hydronuclear and "hydrodynamic" testing (i.e. non-nuclear explosive testing using surrogate materials). The United States and the other parties to the NPT do not accept the euphemism "hydronuclear experiment" as suitable testament to the non-weapons character of such tests when performed by a non-weapon NPT party or nuclear threshold state. Irrespective of yield, they are clearly viewed as *nuclear weapons tests* that violate the norm established by the NPT. But assuming a sufficiently small amount of nuclear energy is released, are such tests "nuclear weapons test *explosions*" falling within the scope of the CTB's proposed basic obligation?

There is no basis today in international law for concluding that a hydronuclear test would fall outside the scope of the CTB's proposed Basic Obligation, since the text is drawn directly from the existing LTBT obligation. A specific legal basis for exclusion will either have to be created within the treaty text -- a step sure to generate opposition from many states -- or else made part of the negotiating record in some unambiguous manner, presumably *without* altering the prevailing interpretation of the LTBT prohibiting above-ground nuclear tests, irrespective of their yield.

The Department of Energy (DOE) has recently acknowledged conducting 51 secret underground tests for one-point safety since the Limited Test Ban Treaty (LTBT) was signed on 5 August 1963. These are very low-yield tests in which the chemical high explosive is detonated at a single point to mimic what could occur in an accident. If the weapon has been designed properly, the nuclear energy released is on the order of four pounds or less, comparable to that in hydronuclear weapon performance tests. Very-low yield nuclear tests in the atmosphere, space, or underwater have long been regarded as banned nuclear explosions under the LTBT. Why would this category of tests not logically be barred from the "underground environment" as well under a "comprehensive" ban?

As a matter of law and policy, the United States has long recognized only four "environments" for nuclear testing: the atmosphere; space; underwater; and underground. There is

no "fifth environment" for permitted testing, such as might be created in an above-ground test chamber sealed against radioactive releases to the environment. But the Clinton Administration could inadvertently create one by declaring that very low-yield nuclear weapons tests do not constitute "nuclear weapons test explosions" under a CTB. This misstep could easily lead to a rapid proliferation of above ground test facilities for conducting low-yield nuclear "experiments" -- a veritable nightmare for proliferation. As long as the radioactive debris from such tests did not cross national boundaries, they could well be considered "legal" under the revised standard.

While the U.S. might continue to conduct its hydronuclear tests underground for safety and environmental reasons, other nations unconstrained by such concerns might elect to test above-ground, at a higher rate, or without expensive containment measures. In fact, the 1994 "Site Development Plan" for the Los Alamos National laboratory calls for the construction by the year 2002 of an Advanced Hydrotest Assembly Facility, costing \$422 million. Tests in this facility, which would have a system for recovering and recycling radioactive materials dispersed in high explosive tests, would use plutonium with a high concentration of the isotope Pu-242. In a high explosive weapons test, this blend of material behaves physically just like weapon-grade plutonium, but fissions much less easily, affording a minuscule nuclear energy release. This type of facility could support a high rate of testing and further development of advanced fission weapon designs.

There are domestic legal as well as diplomatic obstacles to the Pentagon's proposal for hydronuclear testing. First, until such time as a test ban treaty is ratified, and the Hatfield-Exon-Mitchell Amendment of 1992 is repealed, any proposal by the President to resume U.S. nuclear weapons testing, including very-low yield nuclear testing, would require amendment of the existing statute, which makes no provision for an extended hydronuclear test program to evaluate stockpile weapon performance.

Second, the President should be advised that any hurried attempt by the federal government to initiate a hydronuclear test program, by circumventing requirements of the National Environmental Policy Act, would spark vigorous litigation by public interest organizations. A separate Environmental Impact Statement is clearly required, including a full and fair analysis of "reasonable alternatives" to the proposed action. Whether or not the Administration could surmount these legislative and environmental hurdles, the very act of *attempting* to do so would only further erode public and foreign confidence in the President's commitments to a comprehensive test ban, a strengthened nuclear nonproliferation policy, environmental protection, and public accountability.

Since the marginal value of hydronuclear tests to insure the safety and reliability of existing U.S. stockpiled weapons is small in comparison to the their verification complexities and proliferation risks, such tests should be banned under the CTBT. This could be accomplished by a simple treaty provision or agreed statement of interpretation that would neither attempt to "define" a nuclear explosion, nor restrict non-explosive critical assemblies and laser-driven fusion devices for "peaceful" nuclear research. It would, however, further limit technical opportunities for nuclear weapon development by prohibiting "any release of nuclear energy caused by the assembly or compression of fissile or fusion material by chemical high explosive means."