Dangerous Thermonuclear Quest

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PRESS RELEASE

Thermonuclear Fusion Research Could Result in New Weapons and Greater Proliferation Dangers

New Report Says Parts of US and French Explosive Fusion Research May Violate Nuclear Test Ban Treaty; Calls for Moratorium and Public Debate

July 15, 1998 WASHINGTON, D.C. Key portions of the US "stockpile stewardship" program for nuclear weapons may violate the Comprehensive Test Ban Treaty, which bans all nuclear explosions, according to a new report issued here today. The report warns of severe new proliferation dangers that would develop if current and planned US, French, and Russian laboratory nuclear testing programs, such as the National Ignition Facility at the Lawrence Livermore National Laboratory in California, result in the development of pure fusion weapons.

The report, *Dangerous Thermonuclear Quest: The Potential of Explosive Fusion Research for the Development of Pure Fusion Weapons*, details current activities that are connected to the design of the thermonuclear components of weapons, commonly called "hydrogen bombs." It was released today by the Institute for Energy and Environmental Research (IEER), a non-profit institute in Takoma Park Maryland.

> "Pure fusion weapons have long been a dream for nuclear weapons designers. Present-day thermonuclear weapons need plutonium or highly enriched uranium to set off the hydrogen-bomb part," said Dr. Arjun Makhijani, principal author of the report and president of IEER. "But pure fusion weapons would not need either of these fissile materials. They would produce little fallout. They could be made very small or very huge. And the research involves interesting scientific challenges."

However, pure fusion weapons would present far greater nuclear proliferation dangers since the acquisition of highly enriched uranium or plutonium is currently the main obstacle to proliferation. By contrast, deuterium and tritium, the forms of hydrogen used in fusion research and weapons, are less difficult to make. Verification would also be more difficult. Most importantly, fusion weapons would likely lower the threshold for nuclear weapons use, because of their smaller size and lack of fall-out, the report said.

> "Major advances in substituting the fission trigger by non-nuclear components need to be made before the scientific feasibility of pure fusion weapons can be established," said Hisham Zerriffi, a physicist and co-author of the report. "Until now, the hurdles have been too huge to overcome.

> But experiments are now being conducted and devices are now under construction that may achieve explosive thermonuclear ignition without fissile materials."

Two of the facilities discussed in the report are huge laser fusion machines — the National Ignition Facility (NIF) under construction at the Lawrence Livermore National Laboratory, in Livermore California, as well as a similar facility near Bordeaux in France, called Laser Mégajoule (LMJ). They are both designed to use powerful lasers to achieve thermonuclear explosions in the laboratory.

The Comprehensive Test Ban Treaty (CTBT), which has been signed by over 150 countries including the United States and France, prohibits all nuclear explosions. The report states that the negotiating history shows that fission explosion of even a few pounds of TNT equivalent are banned under the CTBT.

> "We conclude that laboratory fusion explosions are also banned under the CTBT," said Makhijani "That makes the National Ignition Facility and the Laser Mégajoule project illegal under that treaty. It is really provocative for the United States and France to be building these facilities at the same time they are lecturing countries like India and Pakistan to stop their nuclear weapons programs. IEER calls for a moratorium on explosive fusion projects and experiments designed to achieve thermonuclear ignition. Far more public debate on this crucial issue is needed."

The report points out that there is as yet no public negotiating record of the CTBT that explicitly deals with laboratory fusion explosions. It argues, however, that since these are clearly nuclear explosions, they are prohibited by the CTBT. The fact that some of these experiments would be for energy research does not change the reality that they would be nuclear explosions.

Makhijani pointed out that once the scientific feasibility of pure fusion weapons is proven there would be inexorable pressures to actually develop them. "The time to stop is now, before the feasibility is established. Once feasibility is demonstrated, the pressures from the nuclear weapons laboratories as well as the military establishment to actually design and build weapons would be immense," he said.

The report discusses several different devices and experiments that relate to the potential development of pure fusion weapons. Besides the laser fusion machines NIF and LMJ, it describes joint US-Russian experiments at Los Alamos National Laboratory, near Santa Fe, New Mexico and a device called the wire-array z-pinch at the Sandia National Laboratory, in Albuquerque, New Mexico.

> "These machines are complementary," Zerriffi pointed out. "Lasers cannot be miniaturized into deliverable weapons. But NIF could be more easily used to design the thermonuclear fuel targets than the other two devices. The Magnetized Target Fusion experiments at Los Alamos could be used to perfect the use of chemical explosives in fusion weapons, while the wire-array z-pinch can generate intense x-rays, similar to those that are produced by the fission portion of present-day thermonuclear warheads."

The report recommended that questionable research and construction be stopped and that the next official meeting to review the CTBT, which may take place as early as September 1999, provide an official

interpretation of what activities are banned. It also pointed out the most fusion research, including all non-explosive magnetic fusion research for energy generation, as well as laser fusion experiments in machines that that cannot achieve ignition, would be permitted under the CTBT and could continue unaffected by the proposed bans.

MAIN FINDINGS AND RECOMMENDATIONS

Summary of Findings:

1. The scientific feasibility of pure fusion weapons has not yet been established. Until recently, there were no devices that could establish such feasibility.
2. Major advances in the last decade in plasma physics and in various manufacturing technologies have opened up new possibilities for pure fusion weapons.
3. Three major technologies could contribute to the establishment of the scientific feasibility of pure fusion weapons, and other weapons that do not require fission triggers: (i) inertial confinement fusion programs designed to achieve ignition (ii) the joint Magnetized Target Fusion program at Los Alamos (US) and Arzamas-16 (Russia), and (iii) non-fission methods of generating intense x-rays, such as the wire array z-pinch program at Sandia Lab.
4. Once ignition has been demonstrated at a laboratory level, it will be difficult to contain the development of pure fusion weapons. Fusion weapon proliferation controls will be far more difficult than with fission weapons because the materials are not currently under the same level of international control and because more of the relevant literature is non-classified.
5. Devices that use high explosives as part of the driver pose special dangers because they could be converted to practical weapons with less difficulty once feasibility is established.
6. There is no technical basis on which laboratory thermonuclear explosions can be excluded from the ban on all nuclear explosions under the Comprehensive Test Ban Treaty (CTBT).
7. The US and French laser fusion facilities known as NIF and LMJ are designed to create fusion explosions. Therefore, these facilities and all others so designed appear to be illegal under the CTBT.

Recommendations:

1. Construction of the National Ignition Facility at Livermore, California, the Laser Mégajoule project in France and planning of all other explosive research facilities designed to achieve thermonuclear ignition should be stopped.
2. The joint use of high explosive drivers and tritium fuel in fusion research should be banned.
3. The next CTBT conference should issue a formal opinion explicitly including laboratory thermonuclear explosions within the prohibition of nuclear explosions in Article I of the CTBT.
4. Magnetized Target Fusion experiments that would achieve ignition should be stopped.
5. The nuclear weapons states should declare formally that they are not going to design new nuclear weapons. As part of this declaration, they should explicitly renounce the development of pure fusion weapons and all other weapons that do not require fission triggers.
6. A widespread public debate on the disarmament and non-proliferation consequences of pure fusion weapons is needed to forestall the emergence of serious new problems.