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Directorate of Intelligence

Science and Weapons Review

Friday
26 November 1993

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Science and Weapons Review

A Publication of the
Office of Scientific & Weapons Research

Friday, 26 November 1993

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FRANCE: Proposal for Dual-Use Laser Facility

France plans to construct a 1-megajoule neodymium glass laser facility, which will include two target chambers—one for classified indirect drive target experiments and one for direct drive target experiments. Civilian control over the facility must be guaranteed before European organizations will fund it.

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FRANCE

Proposal for Dual-Use Laser Facility

proposed French plans for the construction of a 1-megajoule (MJ) neodymium glass laser facility. France plans to include two target chambers in the facility—one for classified indirect drive target (see inset) experiments and one for direct drive target experiments. The former would be used for and other research; the latter would be available to researchers from the European Community (EC) for fusion energy research. The French hoped to begin construction in 1997, but this start date depends on the successful completion of a two-year joint developmental program with the United States and subsequent approval by multiple funding authorities.

the estimated cost of the facility is $600 million. primary motivation for including the target chamber for external use was to attract EC funding for the program. to avoid objections to the construction of a military-related project, the CEL-V and the Centre National de la Recherche Scientifique (CNRS) had agreed to promote the possible future use of the facility for energy research.

Comment:

The CNRS and the EC are highly unlikely to provide funding for construction of the French-proposed MJ laser facility unless the facility clearly is established to be a civilian research facility under the control of civilian authorities. Many European laser scientists would be reluctant to perform research at a military facility. In addition, civilian European inertial confinement fusion researchers strongly would object to being excluded from the indirect drive target chamber.

Fusion and Electricity

Magnetic confinement fusion (MCF) and inertial confinement fusion (ICF) are two approaches to controlled nuclear fusion research. MCF uses magnets to contain the hot plasma in which fusion reactions occur; the tokamak is the best known and most advanced of the MCF research devices. In ICF research, energy from a driver (laser, light-ion accelerator, or heavy-ion accelerator) is used to implode (compress) small targets containing fusion fuel (deuterium and tritium). This implosion allows many fusion reactions to occur in a very short time before the dense plasma disassembles.

MCF research is devoted to developing a source of energy for the production of electricity; that is, to replacing the fossil fuel furnaces used in electrical power plants. ICF—laser fusion, in particular—research began in the nuclear weapons programs of the United States and the former Soviet Union. The large laser fusion facilities in France have been part of its nuclear weapons program. Nonetheless, ICF also has nonmilitary applications. For example, in the 1970s the Japanese undertook a laser fusion program with the goal of producing electrical power. A civilian laser fusion effort also began in Europe in the 1970s; during the 1980s the emphasis of this effort moved to heavy-ion fusion as a leading candidate for future energy production.

Two types of ICF targets have been developed—direct drive and indirect drive. Direct drive targets are imploded directly by the energy from the driver. In indirect drive targets, the driver energy is converted into X-rays that are used to compress the target. Most information on research with direct drive targets is unclassified, but in the nuclear weapons states most—but not all—research on indirect drive targets is classified. The Japanese also have an extensive and advanced laser fusion research program using indirect drive targets. In addition, European heavy-ion fusion researchers are cooperating with the Japanese on the development of indirect drive targets for energy research.